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### RESEARCH ARTICLE

## FACTORS MILITATING AGAINST QUALITY OF ACADEMIC PERFORMANCE OF SECONDARY SCHOOL STUDENTS: A CASE STUDY OF SECONDARY SCHOOL STUDENT IN ONDO STATE, NIGERIA.

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Parents, social environment, library, laboratory, motivation, examination.

#### Abstract

This paper reviewed the salient factors militating against quality of academic performance of secondary school students; A case study of secondary school students in Ondo State, Nigeria. Sequel to the findings, the following conclusions were made; Adequate use of library, conducive school environment, motivation of teachers, parental factors, and effective use of equipped laboratory were the factors militating against quality of academic performance of secondary school students in Ondo State, Nigeria. Consequently, it was recommended among others that; educational budgetary allocation should be increased both at federal, state and local government levels to finance both the federal and the state public secondary schools, regular payment of teachers salary, promotion of teachers and other emoluments should be made available and the salary scale of teachers should be equal to their counterparts in other fields like medicine. In addition, more infrastructural facilities should be provided by the government and nongovernmental organization to all secondary schools and books in the library should be up-to-date.

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#### Introduction:-

In Nigeria public discussions frequently focus on educational standards. The public's unhappiness becomes more prominent following the annual release of the West African Senior School Certificate Examination results. Student outcomes do not match the government and parental investment. All stakeholders are concerned about why the system is turning out graduates with poor results. The most important factor in the effectiveness of schools and in the quality of a child's education are the competent teacher to teach effectively. The National Policy of Education states, "No Education system can rise above the quality of teachers in the system" (FGN, 2006). Ogunsaju (2004) states that the academic standard in all Nigerian educational institutions has fallen considerably below societal expectations. Blumende (2001) corroborated this view when he reported that the decline in the quality of education cannot be ignored by anyone who is aware of the significant role of education as an instrument of societal transformation and development. There is a need to focus on teachers' adequacy and competency in respect to their pedagogical practices and strategies and mastery of the curriculum and subject content (Chall & Popp, 1990; Stuart, 2004; Rodgers, 2001).

In Ondo state, education remains the largest industry and government contributes to ensures that funds, instructional

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materials, seminar and teaching personnel are made available for the sectors. Government has also continuously encouraged secondary education by adopting the social and demand approach towards planning the sector and by subsidizing the senior School certificate examination (SSCE) fee in the state over a long period of time. An indication of government interest in the general education in the state reflected in the 1999 budgetary estimates of the state till date.

Of course, despite the efforts being made towards ensuring that citizens have equal educational opportunities, training opportunities as well as making other training facilities readily accessible to the users so as to improve students' academic performance in both internal and external examination, it has been observed by (Ajayi, 1998; Adepoju, 2002; Owoeye, 2000), that all is not well with the system as a result of the poor performance of students recorded in public examinations in the recent years. The persistent poor performance of secondary school students in public examinations such as the senior school certificate examinations (SSCE), national examination council (NECO) in Ondo State, Nigeria in recent times has made the developments of secondary education in the state a difficult task. Parents, guardians and other stakeholders in education industry have variously commented on the performances of secondary school students particularly in English language and mathematics (Adepoju, 2002). Researchers and stakeholders in education industry have in the recent past identified several factors as the causes of poor performance of students in public examinations. Among such factors identified are poor location of the school, incessant changes in government policies, closure of schools, which is contingent upon teachers' strike action, home-school distance, high student teacher ratio, inadequate supervision, monitoring and evaluation machinery, poor and non-conducive environment among others (Adepoju, 1995; 1998; 2002; 2003; Adeboyeje, Olaniyi Adepoju 2003).

### **Militating factors:-**

The following factors contribute positively to students' academic performance: adequate use of library, school environment, motivation of teachers, parental factors and effective use of equipped laboratory among others.

- a. **Parental factors:** Parental factor is one of the most important factor contributing to the academic performance of students. This factor is so important because students spent most of their life with their parents, Fan (2001) demonstrated that parents' educational aspiration for their children proved to be strongly related to students' academic growth. Research studies have found that parental educational level has a significant impact on child's learning, (Khan & Malik, 1999). Similarly, Schneider and Lee (1990) linked the academic success of the East Asian students to the values and aspirations they share with their parents, and also to the home learning activities in which their parents involve with them. In fact, all parents have desired to do something better for their children according to their available resources. But the extent and effectiveness of parental support depends on a variety of reasons, such as, ethnicity, family income, and home environment and their awareness about the importance of education.

Research studies indicated that socio economic status is correlated strongly with parents' educational ambition for their children. Khan, Khan and Zubairi (1999) stated that "interacting with and sharing the child's activities is affected by level of parents' education and income. In the families with low socioeconomic status, majority of the illiterate parents do not have understanding of the requirements of their children's education. Some poor parents make some arrangements for helping their children in studies and to do their home assignments, while others rely on school for the education of their children, as they do not have enough resources to spend extra money on home tuitions etc. This results into poor performance and academic achievement of their children. The findings of the study conducted by Okpala, and Smith (2001) also supports the view that economic circumstances are significantly correlated with academic achievement. Research studies indicated that the nature of the parental support change at different age levels of children. Gonzalez-Pienda et al. (2002) have found that parental support is likely to decrease as children move from primary to middle and then to high school grades. Similarly, a research study by Fan, (2001) showed that children also develop sense of responsibility and perform better as they grow older. The study indicated that those students whose parents had higher expectations for their children's academic achievement performed better from the beginning of their academic career and accelerated faster in their academic progress during the transition period of middle to high grades.

The children also seek emotional support from parents when they face some academic problems at school. Educated and sensible parents always encourage their children and give proper guidance in school related matters, but illiterate and economically deprived parents may act violently and thus upset their children more. Some parents also



helps their children to do assignment and give them less work to do at home, this gives the students the opportunity to spend more hours reading their books and conduct more research outside of what they were thought in the classroom. Research studies indicated that parental support in doing home tasks has significant effects in students' achievement, (Singh, Granville, Sandra, & Dika, 2002; Eilam, 2001). If parents are educated, and have better understanding of how to break a problem into parts, or know more effective motivational techniques, then they can help their children more effectively. A study conducted by Voorhis (2003) demonstrated that those students who reported more parental involvement in connection with daily homework, doing their homework assignments more regularly.

**b. Social environmental factors:** School facilities have been observed as a potent factor to quantitative education. The importance to teaching and learning with the provision of adequate instructional facilities for education cannot be over-emphasized. According to Akande (1985), learning can occur through one's interaction with one's environment. Environment here refers to facilities that are available to facilitate students learning outcome. It includes books, audio-visual, software and hardware of educational technology; so also, size of classroom, sitting position and arrangement, availability of tables, chairs, chalkboards, shelves on which instruments for practical are arranged (Farrant, 1991 and Farombi, 1998). According to Oni (1992), facilities constitute a strategic factor in organizational functioning. This is so because they determine to a very large extent the smooth functioning of any social organization or system including education. He further stated that their availability, adequacy and relevance influence efficiency and high productivity. In his words, Farombi (1998) opined that the wealth of a nation or society could determine the quality of education in that land; emphasizing that a society that is wealthy will establish good schools with quality teachers, learning infrastructures, such students may learn with ease thus bringing about good academic achievement. In their contribution, Ajayi and Ogunyemi (1990) reiterated that when facilities are provided to meet relative needs of a school system, students will not only have access to the reference materials mentioned by the teacher, but individual students will also learn at their own paces. The net effect of this will increase overall academic performance of the entire students.

According to Hallak (1990), facilities form one of the potent factors that contribute to academic achievement in the school system. They include the school buildings, classroom, accommodation, libraries, laboratories, furniture, recreational equipment, apparatus and other instructional materials. He went further to say that their availability, relevance and adequacy contribute to academic achievement. He however, quickly added that unattractive school buildings and overcrowded classrooms among others contribute to poor academic attainment. In another development, Aliyu (1993) as cited by Johnson (1998) found that there was no significant difference between students in secondary schools with and without adequate instructional facilities. However, he submitted that instructional facilities were indispensable to academic achievement of students in English Language, Mathematics, Biology and Geography while students could perform well in other subjects without adequacy of sophisticated instructional materials. He concluded that the effect of instructional facilities on students' academic achievement is more felt in pure and social sciences.

**c. Effect of libraries:** Library is an essential factor in teaching-learning process. It forms one of the most important and essential educational services needed for the success of the students. The main purpose of school library is to make books available to the pupils/students, at his easy convenience, all books, periodicals and other reproduced materials which are of interest and value to him but which are not provided or assigned to him as basic or supplementary textbooks. The importance of library has been demonstrated by the government when she expressed in the National Policy on Education (NPE) that every state Ministry needs to provide funds for the establishment of libraries in all her educational institutions and to train librarians and library assistants. As a resource, it occupies a central and primary place in any school system. It supports all functions of school-teaching and provides service and guidance to its readers. Fowowe (1988) stated that a library must be up-to-date and at the same time allow access to older materials. It must be properly supported financially to fund materials and services among others. While itemizing the types of libraries, Ola (1990) thought that secondary school library in whatever form, has replaced the traditional method of 'chalk and talk' in imparting knowledge to students and that its effect on academic performance need not to be over-emphasized. He therefore, concluded that a well equipped library is a major facility which enhances good learning and achievement of high educational standard. In his words, Farombi (1998) reiterated that school libraries may not be effective if the books therein are not adequate and up-to-date as its impact may only be meaningful if the library could be opened to the students always for a considerable length of time in a school day. With all the above mentioned

facts, it is sad to know that many schools operate without libraries (Shodimu, 1998) whereas Ogunseye (1986) had earlier noted that total absence of an organized school library would continue to spell dooms for thousands of secondary school students. This statement clearly implied that many schools operate without libraries and this situation had affected the academic performance of their students. Reporting the state of library in Lagos Secondary Schools, Shodimu (1998) submitted that the guidelines that each school should be provided with a library with 100 students seating capacity was not followed as most of the schools he sampled had seating capacity of less than 100 students.

- d. Effect of motivation:** Business Dictionary.com define motivation as activation of a contractor's physical and manpower resources for transfer to a construction site until the completion of the contract. It is generally assumed that motivation influences people's attitude and performance at work. Taylor and Vest (2002) asserts that pay is an important reward used in motivating the behaviour of employees. Teacher motivation is directly linked to the instructors' desire to take part in the pedagogical process and interest in sharing their knowledge with the students. It determines their involvement or non-involvement in the teaching activities. Teachers put educational philosophy and objective into the knowledge they transfer to their students. Meanwhile, they are the most important factor in a generation's education process, so it is important that they perform to the best of their abilities in the educational activity. Each country's authorities must pay attention to the factors that affect teachers' performance which has a direct effect on students' performance.

Teachers' motivation is influenced by a myriad of factors, including compensation, success in the classroom, their dedication to the profession, the training they receive, the prospect of promotion and career advancement. Compensation influences teacher education, but in many cases it is not the most or the only important factor. Teachers may be compensated through salaries, bonuses, training programs or special assistance such as shelter and transport support. If teachers are not paid, or if they are not paid on a regular basis, their motivation will be affected and they might start teaching irregularly or leave their jobs. Teachers' motivation is influenced by their working conditions too. An appropriate environment in which the teacher feels safe and healthy and has access to supportive resources and facilities will help teachers participate more in the process of teaching, management and administration. Moreover, teacher motivation is influenced by the number of hours the instructor has to work every week, the number of students in the classroom and at the same time by parents' involvement and support. Individuals are motivated by money, power or praise. As teachers can't motivate students by offering money or power, they should focus on praise. Some students are self-motivated and their actions are a result of their desire to face challenges. Teachers can praise, promote and encourage this personal trait by showing students their efforts are worthwhile and that they will benefit from them.

- e. Factor of laboratory:** Laboratory has been conceptualized as a room or a building specially built for teaching by demonstration of theoretical phenomenon into practical terms. Olaniyonu (1997) maintains that in secondary schools, the modern teaching of sciences will necessitate laboratories. In the words of Ogunleye (1997), one of the recurrent problems of teaching of science is that of large classes. He remarks that one of the objectives of teaching science in schools is to communicate the knowledge of science in schools and to ensure that students acquire the process skills of science. This cannot be effectively achieved unless students are exposed sufficiently to practical work and laboratory experimentation. Unfortunately, Ogunleye continued, that many secondary schools established over the years still remain without science laboratories while others have laboratories that are not sufficiently equipped. Similarly, Farombi (1998) argued the saying that "seeing is believing" as the effect of using laboratories in teaching and learning of science and other science related disciplines as students tend to understand and recall what they see than what they hear or were told, similarly Ogunniyi (1983) said that there is a general consensus among science educators that the laboratory occupies a central position in science instruction.

**According to Ango (1986) laboratory work:-**

- Stimulate learners' interest as they are made to personally engage in useful scientific activities and experimentation;
- Promotes that science is not only product or process;
- Affords the learners the basic skills and scientific method of problem solving;
- Knowledge obtained through laboratory work promotes long term memory, on similar objectives.

Soyibo (1990) said laboratory helps to provide a forum wherein the learner is given the exercise to subjects, his beliefs, ideas, statements, and theoretical propositions etc to some forms of experimental test.

Soyibo and Nyong (1994) has shown that school with well-equipped laboratories have better results in the school certificate science examinations than those that are ill-equipped. Corroborating this, Gana (1997) reiterated that students instructed entirely by the laboratory methods had higher attitudes scores but lower achievement scores than students instructed entirely by the traditional lecture or textbook mode. On the same topic, Yadar (2001) opined that no course in science and mathematics can be considered as complete without including some practical work. Thus practical work forms an important feature in any science and mathematics course (UNESCO, 2008), and lastly, Olainiyonu (1997) maintains that in secondary schools, the modern teaching of science will necessitate laboratories.

### **Conclusion and recommendations:-**

After a careful review of available literature, this paper concludes that library, school environment, motivation of teachers, parental factors, and lack of equipped laboratory were the major factors militating against quality of academic performance of secondary school students in Ondo State.

To this end, the paper recommends, among others, that:

- 1) The parents should take proper care of their children and bearing child without taking care off should be counted as punishable offence by government.
- 2) More infrastructural facilities should be provided by both the government and non-governmental organizations to fast-track the growth of educational system in the state.
- 3) Constructions of libraries in the schools and communities with E-learning facilities with current books should be embarked upon.
- 4) Regular payment of teachers salaries, promotions and other incentives should be embarked upon.
- 5) Standard laboratories with reagents and latest equipments should be build by both the Government and NGO across the secondary schools in the state.
- 6) More qualified teachers should be employed to solve the problem of shortage of teachers in various schools in the state and equipped with latest teaching techniques through in-service training.

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### RESEARCH ARTICLE

#### POLYCYSTIC OVARIAN SYNDROME AND EATING DISORDER: ARE THEY ASSOCIATED.

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Poly Cystic Ovary Syndrome, Binge eating disorder, Obesity, subfertility

#### Abstract

**Background:** Polycystic ovarian syndrome is a common female endocrine disorder and affecting up to one in five women of reproductive age between 15-49 years. The etiology of polycystic ovarian syndrome is uncertain, but a number of risk factors are associated with polycystic ovarian syndrome is subfertility, obesity, insulin resistance, cardiovascular disease and hormonal disturbance. Hormonal imbalance, behavioral and cognitive health is related to abnormal eating habit like binge eating. Binge eating disorder is characterized by eating large amount of food in a discrete time period and feeling out of control. About one third women of polycystic ovarian syndrome reported binge eating disorder.

**Objective:** To determine the association of binge eating disorder with polycystic ovarian syndrome in Civil Hospital of Karachi To determine the risk factors associated with polycystic ovarian syndrome in Civil Hospital of Karachi

**Methodology:** This case control study was conducted in civil Hospital Karachi. Data was collected by using a structured questionnaire with a sample size of 280 (140 cases and 140 controls). Data entry was done in EpiData software and was analyzed by using SPSS Version 21. Descriptive analysis was performed for socio demographic variables. Univariate analysis was done to determine crude association between independent and dependent variables by calculating odds ratio and 95% confidence interval. Multivariable analysis was performed to eliminate the confounder

**Results:** About 280 women (140 cases and 140 controls) were enrolled into the study. The Univariate analysis showed that polycystic ovarian syndrome among overweight women (BMI 25-29.9) was 2 times more (OR=2.0, 95 % CI=1.41-3.56, pvalue= 0.01) and among obese women (BMI  $\geq$ 30) was 12 times more (OR=12.1, 95 % CI=5.03-29.24, pvalue= $<$ 0.001) as compared to control (normal BMI18.5-24.9) women kilogram per meter square , polycystic ovarian syndrome among binge eating disorder score ( $\geq$ 17) was found 4 times more (OR=4.3, 95 % CI=2.42-7.88, pvalue= $<$ 0.001) as compared to control non binge eating score ( $<$ 17) women . Multivariate analysis showed polycystic ovarian syndrome among obese (BMI  $\geq$ 30) was found ten times more (AOR=10.4, 95 % CI=4.11-26.4, pvalue= $<$ 0.001) as

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compared to control (normal BMI 18.5-24.9) women and polycystic ovarian syndrome among women with binge eating disorder score ( $\geq 17$ ) was found seventeen times more (AOR=17.8, 95 % CI=1.29-24.63, pvalue=0.03) as compared to non-binge eating score.

**Conclusion:** Our study concluded that binge eating disorder is significantly associated with polycystic ovarian syndrome. Results will help health care provider making good health choices for preventing and managing not only binge eating disorder but also women having polycystic ovarian syndrome with binge eating disorder.

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## **Introduction:-**

Polycystic ovarian syndrome is a common female endocrine disorder, affecting up to one in five women of reproductive age between 15-49 years<sup>1,2</sup>. The global prevalence of polycystic ovarian syndrome is 3-7%<sup>3</sup>, in the developed countries prevalence is 4-12%<sup>1</sup>, and in Pakistan its prevalence is 52 %<sup>4</sup>. The clinical features are menstrual disorder with an ovulation, clinical and/or biochemical features of hyperandrogenism and the presence of polycystic ovaries in ultrasonography<sup>5</sup>. The etiology of polycystic ovarian syndrome is uncertain, but a number of risk factors were associated with polycystic ovarian syndrome are subfertility, obesity, insulin resistance, cardiovascular disease and hormonal disturbance<sup>6</sup>. Hormonal disturbance lead to behavioral and emotional health condition is related with abnormal eating behavior like binge eating<sup>7,8</sup>.

Binge eating disorder is characterized by eating large amount of food in a discrete time period and out of control<sup>9</sup>. The remission of binge eating in diagnosed binge eating disorder is reported as 67% in a 12 year follow-up study<sup>10</sup>. Binge eating can lead to other serious physical health problems and death<sup>7</sup>. There is an important role of polycystic ovarian syndrome in the pathogenesis of binge eating disorder<sup>11</sup>. Polycystic ovarian syndrome patients have reduced the secretion of cholecystokinin and changes in insulin sensitivity and androgen levels which lead to abnormal appetite regulation and tendency to binge eating<sup>12</sup>. About one third women of polycystic ovarian syndrome reported binge eating disorder.<sup>13</sup> Therefore polycystic ovarian syndrome symptoms become worse when polycystic ovarian syndrome diagnosed with binge eating<sup>13</sup>.

Binge eating disorder is also associated with Obesity<sup>14</sup>. The risk of obesity is also higher in women with polycystic ovarian syndrome as compared to healthy controls<sup>15</sup>. The healthy controls and polycystic ovarian syndrome women had found a linear correlation with body mass index<sup>16</sup>. Body mass index of polycystic ovarian syndrome women were strongly correlated with type 2 diabetes mellitus<sup>17,18</sup>. Risk of developing type 2 diabetes mellitus is increased in polycystic ovarian syndrome women as compared to non-polycystic ovarian syndrome (control) women<sup>19,20</sup>. About fifty to seventy five percent of women with polycystic ovarian syndrome occurred type 2 diabetes mellitus<sup>21</sup>. Family history of type 2 diabetes mellitus particularly with obesity both increase risk of type 2 diabetes mellitus in polycystic ovarian syndrome women<sup>22</sup>.

Women with polycystic ovarian syndrome are increased risk of anovulation infertility. Infertility was important characteristic of polycystic ovarian syndrome defined by Stein and Leventhal<sup>1</sup> and is one of the common presenting complaints<sup>23</sup>. The infertility burden is increasing among the women with polycystic ovarian syndrome<sup>24</sup>. Infertility due to an ovulation affected 75% of women with polycystic ovarian syndrome<sup>25</sup>. Women with polycystic ovarian syndrome were reported 50% primary infertility and 25% reported secondary infertility<sup>26</sup>. In Pakistan, this type of research study had not been conducted that's why this study was undertaken to explore the relationship between polycystic ovarian syndrome and binge eating disorder. The data from this study can be helpful for future research studies.

## **Objectives:-**

To determine the association of binge eating disorder with polycystic ovarian syndrome in Civil Hospital of Karachi  
To determine the risk factors associated with polycystic ovarian syndrome in Civil Hospital of Karachi



**Rationale Of The Study:-**

In Pakistan, this research study had not been conducted that's why this study was undertaken to explore the relationship between polycystic ovarian syndrome and binge eating disorder while a same pilot study was done at Stavanger university hospital with a small sample size and this study was used appropriate sample size. Data of this study provide information of binge eating disorder developing the risk of polycystic ovarian syndrome. Early evaluation of individual with binge eating disorder will improve eating pattern and will reduce binge eating. This study explored association should help to decrease serious health outcomes related to it and lower spending on its medical treatment

**Methods And Materials:-****Sample Description:-**

The sample size was calculated by using openEpi version 3. The sample size of the study was calculated on the basis of references (Proportion of binge eating among polycystic ovarian syndrome group = 20% and Proportion of binge eating among control group = 8.3%) taken from study conducted at University of Oslo<sup>27</sup> Sample size was calculated 280 (140 of case and 140 of control)

**Criteria For Sample Selection:-**

Sample selection was made through following selection criteria:

**Inclusion Criteria:-**

The study included, cases those who fulfilled the Rotterdam diagnostic criteria for polycystic ovarian syndrome mentioned in operational definition, non-pregnant and non-lactating, married or single of reproductive age 15-49 years of age and willing to participate in the study

**Exclusion Criteria:-**

The study excluded, operated cases of polycystic ovarian syndrome, women with any psychiatric problem or using psychiatric medications, women with sign and symptoms of hypothyroidism (my edema), women with sign and symptoms of Cushing syndrome, women with another gynaecological problem and women who refuse to participate

**Research Design:-** A Case control study

**Methods:-****Sample Technique:-**

Non Probability Consecutive sampling technique was used. Consecutively all the participant (case and control) was included while duration of study and fulfilling inclusion criteria

**Duration Of Study:-**

This study was completed in 7 month after approval of BASR.

**Source Of Data:-**

Polycystic ovarian syndrome case and control group women were selected from gynae. OPD in civil hospital Karachi

**Tool For Data Collection:-**

The data was collected by administering questionnaire for assessment of eating behavior among the women with polycystic ovarian syndrome and women in control group by used binge eating scale (BES) was used.<sup>35</sup>

**Instrument:-****Binge Eating Scale (Bes)<sup>9, 28, 29</sup>**

The binge eating scale (Gormally, Black, Daston and Rardin, 1982)<sup>9, 28</sup> is gold standard for binge eating disorder and internal Consistency is 0.89, sensitivity 84.6%, specificity 94.9 %<sup>29</sup>. The questionnaire is based on behavioral characteristic (e.g. large amount of food consume) and feelings or cognitive and (e.g. guilt or shame). It consists of 16 items, eight items describe the behavior characteristic and eight describe cognitive or feeling characteristics. Each item contains three to four response options that statement reflects a range of each characteristic measure. The total score range from 0-46. A cut off value point 17 was used. The individuals were characterized in two groups. These

groups were described as; no binge eating (score < 17) and binge eating (score  $\geq 17$ ). Analysis of each item (0-3), 0 indicates no binge eating problem, 1-3 indicate binge eating problems.

**Human Subjects:-**

**CASE:-**

Participants who was diagnosed for polycystic ovarian syndrome condition according to the selection criteria was selected from gynaecological outpatient department of civil hospital

**Control:-**

The participant who was normal on ultrasound investigation and free from polycystic ovarian syndrome symptoms

**Data Collection:-**

**Study Setting:-**

The study was conducted in the gynaecological outpatient department (OPD) of Civil Hospital Karachi

**Study Population:-**

Women attended the gynae. OPD of civil hospital Karachi

**Ethical Consideration:-**

The study was approved by Institutional Review Board (IRB) of Dow University of Health Science. Informed consent was obtained from those who were willing to participate in the study after explaining the study purpose.

**Procedure Of Data Collection:-**

Data was collected after obtaining the permission from concerned hospital authorities. The structured interview was conducted by using binge eating scale in polycystic ovarian syndrome women (cases) and normal women (control). Prior to the study the participant was seated in comfortable area and informed consent was obtained from both the cases and controls. The data was collected by the investigator herself both from the cases and control groups from gynae OPD of civil hospital Karachi. Cases were collected from gynae. Opd of civil hospital whose fulfill Rotterdam criteria (above mention in operational definition) and control was also selected in same setting population. The questionnaire was translated into Urdu and if other language participant participated so interpreter was helped with (i.e. her relative or any other same language person available at that time) who was translated in her language and got appropriate answers of question.

**Statistical Analysis:-**

Data entry was done on EpiData software. Data was double entered for removing the missing value or check error rate which should be <0.001. Cleaning and coding of the data was done prior to analysis Using Statistical package for social science (SPSS) version 21. Descriptive Analysis was carried out for socio demographic variables. Mean and Standard Deviation for age, height and weight was calculated. Frequency and percentage was calculated for age, BMI, age at marriage and household income marital status, education, addiction, ethnic group, family history of PCOS, menstrual irregularity, subfertility, obesity, history of diabetes, family history of diabetes and binge eating disorder.

For Inferential statistics the sample was divided into two groups: those having PCOS and those did not have PCOS. These two groups were compared according to socio-demographic variables and variables related to binge eating disorder by means of odds ratio and 95% confidence interval , p-value  $\leq 0.05$  was taken as significant. Univariate analysis was run to determine crude association by odds ratio between independent and dependent variable. Association between risk factors and the outcome was determined by logistic regression analysis. Adjusted odds ratio and then 95% confidence interval was calculated to eliminate the confounders.

**Results:-**

**Sociodemographic Characteristics:-**

The socio demographic characteristics of study participants are presented in Table 1 (a), (b).

**Table 1 a:-** Socio demographic characteristic of study participants (n=280).

S. No.	Characteristics	Mean	Standard Deviation (SD)
1	<b>Weight (Kg)</b>	64.76	±9.56
2	<b>Height (meter)</b>	1.567	±0.076
		<b>Frequency (n)</b>	<b>Percentage (%)</b>
3	<b>Age (years)</b>		
	<b>Mean(SD)27(±4.34)</b>		
	15-30	233	83.2
	31-45	47	16.8
4	<b>Body Mass Index<sup>a</sup> (BMI)</b>		
	Normal	84	30
	Underweight	9	3.2
	Overweight	133	47.5
	Obese	54	19.3
5	<b>Marital status</b>		
	Unmarried	144	52.5
	Married	136	47.5
6	<b>Age at marriage(n=136)</b>		
	≤25	86	64.7
	>25	50	35.3
7	<b>Education</b>		
	Illiterate*	90	32.1
	1 to 10 years of schooling	155	55.4
	Greater than 10 years of schooling	35	12.5
8	<b>No. of Children(n=136)</b>		
	≤2	46	34.3
	>2	88	65.7
9	<b>Monthly household income(PKR)**</b>		
	≤10000	128	47.5
	>10000	152	54.3

\* cannot read and write, \*\*Pakistani Rupees, †married (married, divorce, separated),  
<sup>a</sup> BMI classification according to the recommended of the WHO (normal18.5-24.9, underweight<18.5, overweight25-29.9,obese≥30)

**Table 1 b:-** Socio demographic characteristic of study participants (n=280).

S. No.	Characteristics	Frequency (n)	Percentages (%)
10	<b>Family History of PCOS<sup>a</sup></b>		
	Yes	64	22.9
	No	216	77.1
11	<b>Addiction of any substance</b>		
	Yes	109	38.9
	No	171	61.1
12	<b>Type of Addiction</b>		
	Smokeless Addiction <sup>b</sup>	88	80.7
	Smoke Addiction	21	19.3
13	<b>Obesity</b>		
	Yes	54	19.3
	No	226	80.7
14	<b>Type of Obesity</b>		
	Class I(High)	48	88.9
	Class II (Very High)	5	9.3

	Class III (Extremely High)		1	1.9
15	<b>History of Diabetes</b>			
	Yes		0	0
	No		280	100
16	<b>Family History of Diabetes</b>			
	Yes		64	22.9
	No		216	77.1
17	<b>Exercise</b>			
	Yes		15	5.4
	No		265	94.6
18	<b>Binge eating disorder</b>			
	Binge Eating ( $\geq 17$ )		76	27.1
	Non Binge Eating ( $< 17$ )		204	72.9
^polycystic ovarian syndrome , <sup>b</sup> niswar, pan, others				
<sup>c</sup> Obesity classification according to the recommended of the WHO (class I(high)30-34.9,class II (very high)35-39.9,class III(extremely high)>40)				

The mean height of study participants was  $1.56 \pm 0.07$ . The mean weight of study participants was  $64.7 \pm 9.56$ . The study participants mean age was  $27 \pm 4.34$  and 83.2% were range of 15-30 years of age. The body mass index showed 30% normal (18.5-24.9), 3.2 % underweight ( $< 18.5$ ), 47.5% overweight (25-29.9) and 19.3% obese ( $\geq 30$ ) kilogram per meter square. Just half 52.5% unmarried and 47.5% were married. The age at marriage of study participants (n=136) less than equal to 25 years was 64.7% and greater than 25 years of age was 35.3%. Regarding no of children 34.3% had equal and less than 2 children and 65.7% were greater than 2 children. The 32.1% were illiterate and majority of study participants had education 1 to 10 years of schooling was 55.4%. Those having monthly house hold income less than equal to 10,000 Pakistani rupees were 45.7% where as those having greater than 10,000 were 54.3%. About 38.9% of study participants were used addiction and among these 80.7% used smokeless addiction (niswar, pan, gutka, others). The study participants having family history of polycystic ovarian syndrome were 22.9%. The study participants with family history of diabetes were 22.9% while the study participants 100% were non-diabetic. Only 5.4% study participants were exercise daily. The study participants having binge eating ( $\geq 17$ ) were 27.1% while 72.9% were non-binge eating ( $< 17$ )

#### Scoring:-

The score of binge eating among polycystic ovarian syndrome and non-polycystic ovarian syndrome is summarized in Table 2.

**Table 2:-** Binge Eating Scores , Frequency(n) and percentages(%) in PCOS(n=140) and Non-PCOS(n=140).

"Non-polycystic ovarian syndrome.

S.No.	Characteristics	Total scoring	PCOS <sup>o</sup> (Cases)		NON-PCOS <sup>o</sup> (Controls)	
			Frequency (n)	Percentage (%)	Frequency (n)	Percentage (%)
1	<b>Binge Eating *</b>	$\geq 17$	57	40.7	19	13.6
2	<b>Non Binge Eating **</b>	$< 17$	83	59.3	121	86.4
<sup>o</sup> Polycystic ovarian syndrome, *binge eating scale scores ( $\geq 17$ ), **non-binge eating scale scores ( $< 17$ ),						

In patients with polycystic ovarian syndrome 40.7% had score  $\geq 17$  and in non-polycystic ovarian syndrome women only 13.6% has score  $\geq 17$  according to binge eating scale. In polycystic ovarian syndrome 59.3% had score  $< 17$  and in non-polycystic ovarian syndrome 86.4% has score  $< 17$  according to binge eating scale

#### Unadjusted Odd Ratio:-

Table 3 (a), (b) shows,

**Table 3 a:-** Association of polycystic ovarian syndrome with socio demographic characteristics of study participant (n=280) (Unadjusted).

S. No.	Characteristics	PCOS <sup>^</sup> (cases)	NON-PCOS <sup>''</sup> (controls)	Unadjusted OR <sup>°</sup> (95%CI <sup>°</sup> )	p-value
1	<b>Age (years)</b>				
	15-30	111	122	0.56(0.29-1.07)	0.08
	31-45	29	18	1	
2	<b>Body Mass Index<sup>a</sup> (BMI)</b>				
	Underweight	2	7	0.60(0.11-3.10)	0.5
	Overweight	65	68	2.0(1.41-3.56)	0.01
	Obese	46	8	12.1(5.03-29.24)	<0.001
	Normal	27	57	1	
3	<b>Marital status</b>				
	Married	74	60	1.53(0.96-2.46)	0.07
	Unmarried	66	80	1	
4	<b>Age at marriage</b>				
	≤25	38	29	0.40(0.2-0.83)	0.01
	>25	36	31	1	
5	<b>Education</b>				
	Illiterate*	46	44	2.26(1.05-4.87)	0.03
	1 to 10 years of schooling	71	31	1.23(0.73-2.08)	0.4
	Greater than 10 year of schooling	23	29	1	
6	<b>No. of Children</b>				
	≤2	44	39	0.72(0.35-1.48)	0.3
	>2	28	21	1	
7	<b>Monthly household income(PKR)**</b>				
	≤10000	74	86	1.78(1.11-2.87)	0.01
	>10000	66	54	1	

<sup>°</sup>odd ratio, <sup>°</sup>confidence interval, <sup>^</sup>married (married, divorce, separated), \* cannot read and write, \*\*Pakistani Rupees, <sup>^</sup>polycystic ovarian syndrome, <sup>''</sup>non-polycystic ovarian syndrome

<sup>a</sup> BMI classification according to the recommended of the WHO (normal18.5-24.9, underweight<18.5, overweight25-29.9,obese≥30)

**Table 3 b:-** Association of polycystic ovarian syndrome with socio demographic characteristics of study participant (n=280) (Unadjusted)

S. No.	Characteristics	PCOS <sup>^</sup> (cases)	NON-PCOS <sup>''</sup> (controls)	Unadjusted OR <sup>°</sup> (95%CI <sup>°</sup> )	p-value
8	<b>Family History of PCOS<sup>^</sup></b>				
	Yes	41	25	1.76(1.006-3.13)	0.04
	No	99	115	1	
9	<b>Addiction of any substance</b>				
	Yes	68	41	2.28(1.39-3.73)	0.001
	No	72	99	1	
10	<b>Type of Addiction</b>				
	Smokeless Addiction <sup>b</sup>	62	15	5.9(3.64-17.89)	<0.001
	Smoke Addiction	6	26	1	
11	<b>Obesity</b>				
	Yes	15	132	8.0(3.64-17.89)	<0.001
	No	26	8	1	
12	<b>Family History of Diabetes</b>				
	Yes	41	23	2.1(1.18-3.75)	0.01

	No		99	117	1	
13	<b>Exercise</b>					
	Yes		9	5	2.0(0.69-6.24)	0.1
	No		131	134	1	
14	<b>Binge eating disorder</b>					
	Binge Eating* ( $\geq 17$ )		57	19	4.37(2.42-7.88)	<0.001
	Non Binge Eating**(<17)		83	121	1	
* odd ratio, ° confidence interval, ^ polycystic ovarian syndrome , <sup>b</sup> smokeless addiction(niswar, pan ,huqa, others)						
*binge eating scale scores ( $\geq 17$ ), **non-binge eating scale scores (<17),"non-polycystic ovarian syndrome						

The odds of having polycystic ovarian syndrome among overweight women (BMI 25-29.9) was found 2 times more (OR=2.0, 95 % CI=1.41-3.56, pvalue= 0.01) and among obese women (BMI  $\geq 30$ ) was 12 times more (OR=12.1, 95 % CI=5.03-29.24, pvalue=<0.001) more as compared control (normalBMI18.5-24.9) women kilogram per meter square. The odds of having polycystic ovarian syndrome among illiterate women were found 2 times more (OR=2.26, 95 % CI=1.05-4.87, pvalue=0.03) as compared to control women greater than ten years of schooling. The odds of having polycystic ovarian syndrome among monthly household income less than ten thousand was reported 2 times more (OR=2, 95 % CI=1.11-2.87,pvalue=0.01) as compared to control women who had monthly income more than ten thousand Pakistani rupees. The odds of having polycystic ovarian syndrome among addictive who reported 2 times more (OR=2.28, 95 % CI=1.39-373, pvalue=0.001) as compared to control(non-addictive) women. The odds of having polycystic ovarian syndrome among smokeless addictive (niswar, pan, gutka, others) was reported 6 times more (OR=5.9, 95 % CI=2.08-17.06, pvalue=0.001) as compared to control (smoke addiction) women. The odds of having polycystic ovarian syndrome among those who had family history of polycystic ovarian syndrome were 2 times more (OR=1.76, 95 % CI=1.006-3.13, pvalue=0.04) as compared to control women who did not have polycystic ovarian syndrome history in their family. The odds of having polycystic ovarian syndrome among those who had family history of diabetes was found 2 times more (OR=2.1, 95 % CI=1.18-3.75, pvalue=0.01) as compared to control women who did not have family history of diabetes. The odds of having polycystic ovarian syndrome among binge eating score ( $\geq 17$ ) were reported 4 times more (OR=4.3, 95 % CI=2.42-7.88, pvalue=<0.001) as compared to control non-binge eating score (<17) women.

While other variables results were not statistically significant difference in age, underweight, marital status, age at marriage, no of children, one to ten year of schooling and exercise. ADJUSTED ODD RATIO

Table 4 (a), (b) shows,

**Table 4 a:-** Association of polycystic ovarian syndrome with socio demographic characteristics of study participant (n=280) (Adjusted).

S. No.	Characteristics	PCOS <sup>a</sup> (cases)	NON-PCOS <sup>b</sup> (controls)	Adjusted AOR <sup>c</sup> (95%CI <sup>d</sup> )	p-value
1	<b>Age (years)</b>				
	15-30	111	122	0.4(0.18-1.26)	0.1
	31-45	29	18	1	
2	<b>Body Mass Index<sup>a</sup> (BMI)</b>				
	Underweight	2	7	0.6(0.11-3.30)	0.5
	Overweight	65	68	1.75(0.96-3.18)	0.06
	Obese	46	8	10.4(4.11-26.4)	<0.001
	Normal	27	57	1	
3	<b>Marital status</b>				
	Married	74	60	2.5(0.48-13.0)	0.2
	Unmarried	66	80	1	
4	<b>Age at marriage</b>				
	$\leq 25$	38	29	3.6(0.80-16.5)	0.09
	>25	36	31	1	
5	<b>Education</b>				
	Illiterate*	29	44	0.74(0.04-12.1)	0.8



	1 to 10 years of schooling	71	31	0.70(0.04-10.7)	0.8
	Greater than 10 year of schooling	23	29	1	
6	<b>No. of Children</b>				
	≤2	44	39	0.37(0.08-1.67)	0.2
	>2	28	21	1	
7	<b>Monthly household income(PKR)**</b>				
	≤10000	74	86	7.3(1.35-39.9)	0.02
	>10000	66	54	1	
*Adjusted odd ratio, °confidence interval, ºmarried (married, divorce, separated),* cannot read and write, **Pakistani Rupees,					
ª BMI classification according to the recommended of the WHO (normal18.5-24.9, underweight<18.5, overweight25-29.9,obese≥30),					
^polycystic ovarian syndrome, "non-po ovarian		Syndrome			

**Table 4 b:-** Association of polycystic ovarian syndrome with socio demographic characteristics of study participant (n=280)(Adjusted)

S. No.	Characteristics	PCOS <sup>^</sup> (cases)	NON-PCOS <sup>''</sup> (controls)	Adjusted AOR <sup>¸</sup> (95%CI <sup>°</sup> )	p-value
8	<b>Family History of PCOS<sup>^</sup></b>				
	Yes	41	25	0.54(0.11-2.60)	0.4
	No	99	115	1	
9	<b>Addiction of any substance</b>				
	Yes	68	41	1.25(0.55-2.80)	0.5
	No	72	99	1	
10	<b>Type of Addiction</b>				
	Smokeless Addiction <sup>b</sup>	62	15	9.2(1.13-75.4)	0.03
	Smoke Addiction	6	26	1	
11	<b>Obesity</b>				
	Yes	43	132	7.5(2.46-23.0)	<0.001
	No	97	8	1	
12	<b>Family History of Diabetes</b>				
	Yes	41	23	2.5(0.48-13.0)	0.2
	No	99	117	1	
13	<b>Exercise</b>				
	Yes	9	5	1.6(0.48-5.8)	0.4
	No	131	134	1	
14	<b>Binge eating disorder</b>				
	Binge Eating* (≥17)	57	19	17.8(1.29-24.63)	0.03
	Non Binge Eating**( <17)	83	121	1	
*Adjusted odd ratio, °confidence interval, ^ polycystic ovarian syndrome <sup>b</sup> smokeless addiction (niswar, pan, others)					
*binge eating scale scores (≥17), **non-binge eating scale scores (<17),"non-polycystic ovarian syndrome					

After adjusting other variables the odds of polycystic ovarian syndrome among obese (BMI ≥30) were reported ten times more (AOR=10.4, 95 % CI=4.11-26.4,pvalue=<0.001) as compared to control (normal BMI 18.5-24.9) women kilogram per meter square. The odds of having polycystic ovarian syndrome among monthly household income less than ten thousand was found seven times more (AOR=7.3, 95 % CI=1.35-39.9,pvalue=0.02) as compared to control women who had monthly house hold income more than ten thousand Pakistani rupees. The odds of having polycystic ovarian syndrome among smokeless addictive (niswar, pan, gutka, others) was reported nine times more (AOR=9.2, 95 % CI=1.13-75.4, pvalue=0.03) as compared to control (smoke addiction) women. The odd of having polycystic ovarian syndrome among binge eating disorder score (≥17) was found seventeen times more (AOR=17.8, 95 % CI=1.29-24.63, pvalue=0.03) as compared to control non-binge eating score (<17) women

**Discussion:-**

The socio demographic variables including age, education and family history of polycystic ovarian syndrome in our study was not statistically significant in women having polycystic ovarian syndrome. The house hold income and smokeless addiction (niswar, pan, others) in our study was reported statistically significant in women having polycystic ovarian syndrome. In contrast to another study conducted in Germany where socio demographic variables in fifty women having polycystic ovarian syndrome and fifty healthy controls were not statistically significant<sup>30</sup>. Given this study finding showed that some socio demographic variables increasing the risk of developing polycystic ovarian syndrome

In accordance with our result reported obesity and polycystic ovarian syndrome was statistically significant. Another study conducted in United States of America among the polycystic ovarian syndrome patients in tertiary care center reported obesity increased the risk of developing polycystic ovarian syndrome<sup>31</sup>. Many same other studies were conducted in Greece and Spain had similar results<sup>32,33</sup>. A study in Pakistan showed that high percentages of affected polycystic ovarian syndrome women were found to be obese<sup>34</sup>. Our result thus indicated that obesity increases risk of developing of polycystic ovarian syndrome.

In our study was reported that binge eating disorder was associated with polycystic ovarian syndrome. A study conducted in United Kingdom among the 230 women reported that binge eating disorder in women having polycystic ovarian syndrome was not significant because of poor selection criteria<sup>28</sup>. Another study conducted in Stavanger university hospital showed that among 25 polycystic ovarian syndrome women and 24 control (healthy) women with polycystic ovarian syndrome 16% reported moderate and 4% severe binge eating disorder but the result from this study could not be found association of polycystic ovarian syndrome and binge eating syndrome<sup>27</sup>. This study finding will help to reduce the risk of developing of polycystic ovarian syndrome and may help through life style modification prevent from binge eating disorder and its developing complications.

**Limitations:-**

Limitations of the present study was included,

- The study was conducted in one hospital so the result could not be generalized to whole population
- It is a case control study and recall bias is inherent in case control designed. This study may encountered recall bias

**Strength And Weakness Of The Study:-****Strength:-**

- This study determined multiple factors associated with polycystic ovarian syndrome
- This study validated scale for binge eating disorder and questionnaire for socio demographic data was used
- The study protocol was approved by Institutional Review Board (IRB) of Dow university of health sciences
- Adjustment of sample size from previous study through reliable software of open EPI version 3
- Used Urdu translation of questionnaire for understanding and got appropriate answers

**Weakness:-**

- In this study was used consecutive technique for selection of participants

**Conclusion:-**

Our study concluded that binge eating disorder is significantly associated with polycystic ovarian syndrome. Results will help health care provider making good health choices for preventing and managing not only binge eating disorder but also women having polycystic ovarian syndrome with binge eating disorder

**Recommendations:-**

This study recommended that,

- Early evaluation and management of binge eating disorder in young girls to reduce the risk of developing polycystic ovarian syndrome
- It will prevent by followed long term consequences e.g. diabetes and cardiovascular disease and non-communicable diseases are also a big burden in our part of world
- Advice life style modification among women with similar problem and will improve her social functioning and quality of life

- This study will also help in public health programs, making strategy for binge eating prevention in health policy of Pakistan and can be reduce social burden of binge eating disorder

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### RESEARCH ARTICLE

#### KNOWLEDGE ON PRECONCEPTION CARE: AN ISSUE AMONG REPRODUCTIVE AGE WOMEN ATTENDING GYNAE/OBSTETRIC OPD OF NATIONAL MEDICAL COLLEGE.

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##### Key words:-

knowledge, Preconception care, Reproductive age women.

#### Abstract

**Introduction:** Preconception care is recognized as a critical component for both maternal and child health promotion. Preconception care may help to reduce the mortality and morbidity rates. Preconception is the integral part of antenatal care because it helps to reduce potential risk, promote healthy pregnancy and fetal outcome and improve readiness for pregnancy. It is designed for maintenance of health before pregnancy and to those who had previous problem with pregnancy.

**Methods:** The descriptive cross sectional study was carried out among 55 reproductive age women visiting the Gynecological/Obstetric OPD of National Medical College Teaching Hospital, Birgunj with the objective to find the knowledge on preconception care by using pretested structured interview schedule. The collected Data were analyzed by using SPSS and MS Excel.

**Results:** The study concludes that the majority 69.09% of reproductive age women had moderate knowledge regarding preconception care. There was significant association of knowledge regarding preconception care with occupation (P value 0.025) and area of residence (P value 0.021) of the reproductive age women, whereas there was no association seen with the age, education, types of family, religion, no. of children and family monthly income.

**Conclusions:** The finding suggests that education and information booklet and various mass media should be developed to increase the level of knowledge on preconception care among reproductive age women.

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#### Introduction:-

Pregnancy is a unique, exciting and often joyous time in a woman's life, as it highlights the woman's amazing creative and nurturing powers while providing a bridge to the future. (Evert, 2005)

Preconception care is the set of preventive, promotive and curative interventions given to the women before pregnancy with an intention of healthy mother and baby. Preconception care is designed for preventive measures, health maintenance and health promotion before pregnancy.

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The aim of preconception care is to prepare your body for pregnancy, birth and beyond. This preparation ideally should occur at least four months prior to trying to fall pregnant. (Naish and Roberts, 1998)

There is evidence that health problems (like nutritional problems such as anemia and obesity, vaccine preventable diseases such as rubella) and problem behavior (like tobacco and alcohol, risk factors i.e. genetic conditions) can contribute to poor maternal and child health outcomes.

World Health Organization reports that more than half of all maternal deaths occur in Sub-Saharan Africa and nearly a third occur in South Asia ( Dovey, 2015) .Everyday in 2015, about 830 women died due to complications of pregnancy and childbirth.

By seeking the health care facilities and utilizing the family planning method, unplanned pregnancies can be prevented. Later gestational complications like pre eclampsia, macrosomia etc, it is found that preconception care is associated with improved outcome.

The objectives of the study were to assess the level of knowledge on preconception care and to find out the association between knowledge on preconception care with the selected demographic variables of reproductive age women.

### Materials & Methods:-

The descriptive cross sectional study was carried out among 55 reproductive aged women visiting Gynaecological/Obstetric OPD of National Medical College Teaching Hospital, Birgunj, Nepal. The sample size was determined on the basis of correct proportion of knowledge on preconception care which was found to be 15.42% as per the study conducted by Gautam and Dhakal (2015). Non probability sampling technique was adopted to select the women for data collection. The total 55 women of reproductive age were interviewed from 2073/5/23-2073/6/7 by using pretested structured interview schedule (Bhojpuri Version) which was developed in consultation with nine experts in respective fields. Knowledge score were categorized as adequate level (>75% of the total score), moderate level (50-75% of the total score) and inadequate level (<50% of the total score). The data were compiled and analyzed by using SPSS and MS Excel.

### Results:-

The findings revealed that more than one third 36.36% of reproductive age women were of 20-24 yrs of age, maximum 45.45% of them were illiterate, majority 74.54% of them were housewife, majority 67.27% of them belonged to joint family, more than half 60% belonged to Hindu religion, 30.90% of women had two children in number, majority 69.09% of them had monthly family income(in NRS) 5,000-25,000, more than half 50.9% of women reside in urban area and more than one third 36.36% of women got information from radio/television.

Data shown in table 1 shows that majority of women were having moderate level of knowledge regarding preconception care. Data shown in table 2 shows the significant association of knowledge regarding preconception care with the occupation (p=0.025) and area of residence (p=0.021) of the reproductive age women

**Table 1:-** Frequency and Percentage of Knowledge Level of Reproductive Age Women Regarding Preconception Care.

n=55

Knowledge level	Frequency	Percentage
Adequate knowledge	6	10.91
Moderate knowledge	38	69.09
Inadequate knowledge	11	20



**Table 2:-** Association of Knowledge Regarding Preconception Care with Selected Socio-Demographic Variable  
n =55

Demographic Variables	$\chi^2$ value	Degree of freedom	Asymptomatic Significant (two sided)
Age	36.248	36	0.457
Education	56.423	48	0.189
Occupation	54.393	36	0.025*
Type of family	15.886	12	0.197
Religion	20.750	36	0.980
No of children	40.466	36	0.280
Family monthly income (in NRS)	43.583	36	0.180
Residence	23.942	12	0.021*

**Discussions:-**

The findings of this study revealed that more than one third 36.36% of reproductive age women were of 20-24 yrs of age, maximum 45.45% of them were illiterate, majority 74.54% of them were housewife, majority 67.27% of them belonged to joint family, more than half 60% belonged to Hindu religion, 30.90% of women had two children in number, majority 69.09% of them had monthly family income(in NRS) 5,000-25,000, more than half 50.9% of women reside in urban area and more than one third 36.36% of women got information from radio/television.

The findings of the study showed that more than two third 69.09% of reproductive age women were having moderate knowledge level regarding preconception care. Present study findings are in congruent with the similar study conducted by Gautam and Dhakal (2015) in Tulsipur municipality of Dang district, Nepal, among 227 reproductive age women to assess the knowledge on preconception care among reproductive age women. The study showed that reproductive age women have average level of knowledge regarding preconception care.

There was significant association of knowledge regarding preconception care with occupation and place of residence among reproductive age women. The result of the study was supported by quantitative study conducted at Saradha College of education, Salem and Gover Arts College for women to assess the level of knowledge regarding preconception care. The total sample was 100. The sample was collected by non- probability convenient sampling technique. The study showed that there was significant association of knowledge regarding preconception care with the area of residence.

**Conclusion:-**

A descriptive cross-sectional study was conducted to assess the knowledge on preconception care among reproductive age women. In this study, total number of 55 reproductive age women was selected to assess the knowledge on preconception care. Majority 69.09% of the reproductive age women had moderate knowledge. The results showed that the knowledge level regarding preconception care was independent with age, education level, religion, type of family, no. of children, monthly income whereas was dependent on occupation and residence.

The findings of the study suggest more education and information should be needed to increase the level of knowledge regarding preconception care. Education to the women and couples about preconception care and promoting contraceptive use reduces the rapid and unplanned pregnancies. Education can be given in the health care setting, community as well as through different mass Medias.

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### RESEARCH ARTICLE

#### Prevalence of hepatitis B and C among some high risk groups in Egyptian children attending Benha University hospital.

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Egypt, children, HCV seropositivity, HCV prevalence, HBV seropositivity, HBV prevalence, real-time PCR, ELISA

#### Abstract

**Background:** Hepatitis C virus (HCV) is a global health problem especially in Egypt. Hepatitis B virus (HBV) is a major cause of chronic liver diseases especially cirrhosis and hepatocellular carcinoma. HBV incidence is markedly reduced after mass vaccination programs application.

**Objectives:** to detect HCV and HBV seroprevalence among some high risk children with molecular confirmation of viremia by real-time PCR for seropositive cases.

**Materials and methods:** A comparative cross sectional study was conducted on 5 groups of Egyptian children attending Benha University Hospital (diabetes mellitus, thalassemia, hemodialysis, previously exposed to surgery and healthy children). All children were subjected to full history taking, physical examination and laboratory investigations including HCV antibodies by 4<sup>th</sup> generation ELISA, HBsAg, HBsAb using ELISA, liver function tests and CBC, HCV and HBV viremia detection by real-time PCR for ELISA positive subjects.

**Results:** HCV seropositivity was detected in 5%, 15%, 30%, 50% and 10% for healthy, diabetic, thalassemia, hemodialysis and previously exposed to surgery, respectively. As regard HBV, only a hemodialysis case was positive for both HBsAg and HBV-DNA. Low social class, blood transfusion, frequent intravenous injection, previous surgery and previous hospitalization are major risk factors for HCV transmission.

**Conclusion:** The study revealed high HCV seropositivity prevalence among the studied high risk groups. PCR should be done for all HCV seropositive cases to confirm the presence of viremia.

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**Introduction:-**

Chronic viral hepatitis B (HBV) and C (HCV) infections represent a substantial healthcare burden worldwide with significant global morbidity and mortality; up to 1 million annual deaths are attributable their sequelae including cirrhosis and hepatocellular carcinoma (HCC) [1].

HCV infection has an overall prevalence of 1-3% with 3-4 million new cases every year [2] and 200 million carrier individuals worldwide [3]. Two billion persons have been infected with HBV worldwide and more than 350 million persons have chronic infections [4]. HBV infection and incidence has been markedly reduced after mass vaccination programs [5]. HCV seroprevalence in Egypt has been 14.7 in the year, 2008 [6].

HCV is mainly transmitted by parental route; however about 10% of cases are sporadic without well-defined transmission routes. HCV has rarely been transmitted by transfusion of blood products since the introduction of organ and blood donor screening by antibody testing in 1991 [7].

Intravenous drug users (IDUS) injections and shaving by community barbers have been major risk factors [8]. HCV is suggested to be associated with diabetes mellitus (DM) due to frequent injections [9].

In the last decade, HCV antibodies (HCV-Ab) prevalence in thalassemia varied among countries including Egypt from 12.5 to 100% [10]. HCV-Ab prevalence in Egypt among hemodialysis patients was 35% which may be due to shared dialysis machines, repeated blood transfusion, nosocomial routes, surgery, and multi-dose drug vials [11].

Major surgery also contributes to HCV transmission. HCV viremia prevalence in major surgery was reported to be 8% [12].

**Objectives:-**

Our study aimed to detect hepatitis C virus and hepatitis B virus seroprevalence with subsequent detection of HCV-RNA and HBV-DNA in seropositive cases among some high risk groups of Egyptian children.

**Subject and method:-**

This cross sectional study was conducted at the Pediatric Department of Benha University Hospital over the period from 2015 to 2016 upon 100 Egyptian children (6-17 years); 20 apparently healthy children, 20 diabetes mellitus (DM) children on insulin therapy, 20 thalassemia children on regular blood transfusion, 20 chronic renal failure children on regular hemodialysis and 20 children with previous surgery (P surgery).

Patients with clinically suspected or known chronic liver or metabolic diseases were excluded.

**Ethical considerations:**

A written informed consent was obtained from children' guardians before participation. Also, an approval from the Research Ethics Committee in Benha faculty of medicine was obtained. The study agreed with the Helsinki Declaration of 1975 that was revised in 2000.

All children were subjected to predesigned questionnaire including age, sex, residence and socioeconomic status using Fahmy and Elsherbini score [13] and exposure to some risk factors associated with HCV transmission, thorough clinical examination and laboratory investigations.

**Sampling:**

Venous blood sample (5ml) was collected from every subject. Two ml were put on EDTA of which 1ml was used for CBC, while the other ml was centrifuged to separate plasma for HBV-DNA virus load quantitation. Three ml blood were centrifuged to separate serum and was kept at (-20oC) until further biochemical investigations.

**Laboratory investigations:**

CBC was performed by Symex XS-800I cell counter [14]. Liver function tests including serum aspartate amino transferase (AST) [15]; serum alanine aminotransferase (ALT) [15] and total and direct bilirubin were done by biosystem A15 auto-analyzer [16]. HCV-Ab by Innostest HCV-Ab IV ELISA kit (Innogenetics GmbH, Hanover, Germany) [17].

HBs-Ab by ETI-AB-AUK-3 ELISA kit (DiaSorin, Saluggia, Italy) [18] and HBs-Ag by SURASE B-96 (TMB) ELISA kit (Medical Technology Promedt Consulting GmbH, Germany) [18] were also performed with absorbance reading on ELISA reader TECAN Infinite F50 (Singapore). According to international standards anti-HBs  $\geq 10$  IU/L, was considered protective against HBV infection [19]. Weak response to HBV vaccine after full vaccination dose was defined as 10-100 IU/L while strong response were at a level  $>100$  IU/L [20].

Determination of HCV-RNA and HBV-DNA viral load was performed for ELISA positive cases only.

#### **Determination of HCV-RNA viral load:**

QIAamp Viral RNA mini Kits were used for viral RNA extraction from 145 $\mu$ l serum by Qiacube automatic extractor (Qiagen, Germany), then absolute reverse transcription (RT)-PCR quantitation using artus HCV RG RT-PCR Kit with 10 $\mu$ l RNA template (Qiagen, Germany) following the manufacturers' instructions. A standard curve was generated using 4 quantitation standards (Qs) on StepOne real-time PCR system (Applied Biosystems, USA).

#### **Determination of HBV-DNA viral load:**

Viral DNA extraction from 200 $\mu$ l plasma by Qiacube automatic extractor using QIAamp DSP virus kit (Qiagen, Germany), then quantitative PCR was performed using Artus HBV PCR kit (Qiagen, Germany) following the manufacturers' instructions on StepOne real-time PCR system using 20 $\mu$ l DNA template. A standard curve was generated using 5 Qs on StepOne real-time PCR system (Applied Biosystems, USA). Qs are defined as IU/ $\mu$ l. Result (IU/ml) = result (IU/ $\mu$ l) x elution volume ( $\mu$ l) / sample volume (ml) for either HCV- or HBV-viral load.

#### **Statistical analysis:-**

Collected data were tabulated and analyzed using SPSS version 20 software (SPSS Inc; Chicago; ILL Company). Quantitative data were expressed as mean $\pm$ standard while categorical data were presented as number and percentage. The difference between two means was statistically analyzed using the student t test. Chi square and Z tests were used as tests of proportion. Each high risk group data were compared to that of the healthy group as a reference group. p value $<0.05$  was significant.

#### **Results:-**

This study included 100 children; 22% of them were HCV seropositive, 51% were male, 50% were below 12 years, 77% were from rural residents and 29% were of low social class.

Table (1) showed non-significant difference between seropositive and seronegative HCV children regarding sex and residence. The majority of seropositive children (81.8%) were of age group (12-17y) versus 41% of the seronegative. Most seropositive HCV children (63.6%) were of low social class while only 13.6% were of high social class versus 19.2% and 28.2% respectively of the seronegatives. These differences were statistically significant (p $<0.01$  for both).

Risk factors like blood transfusion, frequent IV injection, previous surgery, previous hospitalization, ear piercing, community barber shaving, exposure to blood (p $<0.01$  for all) and birth attendant's delivery (p $<0.05$ ) were statistically significantly higher among seropositive HCV children compared to the seronegatives.

Laboratory investigations; serum AST and ALT were significantly increased among seropositive HCV patients but insignificant other tests (hemoglobin, leucocytes, platelets, total bilirubin and direct bilirubin) compared to the seronegatives.

Table (2) showed non-significant difference as regard sex and residence in the studied groups but significant increased age in hemodialysis and social class in the previous surgery group compared to the healthy children (p $<0.05$ ).

Risk factors; frequent IV injection and previous hospitalization and abdominal pain complaint described statistical increase in DM compared to controls (p $<0.01$  for both).

As regard thalassemia and hemodialysis children; risk factors like blood transfusion, frequent IV injection, previous surgery, previous hospitalization, exposure to blood and complaining of abdominal pain, dark urine, yellow sclera and easy fatigue described statistical increase compared to controls (p $<0.01$  for all).

As regard the previous surgery group; frequent IV injection, previous surgery, previous hospitalization and abdominal pain complaint showed high statistical increases ( $p < 0.01$  for all) and statistical increase in HCV family history ( $p < 0.05$ ) compared to controls.

HCV seropositivity prevalence was 15%, 30%, 50% and 10% and HCV viremia was 5%, 25%, 50% and 10% for DM, thalassemia, hemodialysis and previous surgery groups respectively compared to 5% in the controls with statistically significant increase in thalassemia and hemodialysis ( $p < 0.01$  for both).

Only one hemodialysis case was positive for HBs-Ag and HBV-DNA. As regard the child immune state against HBV immunization (HBs-Ab), the negative immune state children were 48%, the weak responders were 25% and the strong responders were 27%. There was non-significant difference in the high risk studied groups compared to the controls.

### **Discussion:-**

HCV infection is a serious medical challenge that is complicated by severe liver disease, including fibrosis, cirrhosis, and HCC [21]. Egypt is considered one of the highest HCV prevalence [4]. HBV is a main reason of chronic liver disease; especially cirrhosis and HCC [5].

Our study revealed that HCV prevalence among controls was 5% that agreed with Barakat and Elbashir, who reported 5.8% for HCV seroprevalence in healthy children, with 4.4% HCV viraemia [22]. Our study showed increased HCV seropositivity among males (54.5%), rural areas (90.9%) and low class (63.6%), this agreed with Mohamoud et al., who reported higher HCV prevalence in males [23], also in agreement with Mostafa et al., who demonstrated higher prevalence in rural areas [24].

In this study, blood transfusion was found in 50% of seropositive children. The Egypt Demographic and Health Survey (EDHS) in 2008 estimated that blood transfusion was identified in 24.3% of the HCV positive cases in a nationwide sample [6], a result that agreed with our study.

In many countries the main drive of HCV incidence and prevalence is intravenous drug using [25]. Surgical including dental procedures were statistically highly significant in this study. HCV transmission in Egypt is primarily associated with inadequate infection control during dental and medical care procedures [26]. Kalil et al. stated that various medical procedures even if minor contribute to HCV susceptibility [27]. Barakat and Elbashir reported that history of previous blood transfusion, circumcision for boys by informal health care providers, surgical intervention, and dental treatment are the most significant risk factors for HCV infection [22].

As regard diabetic group our study reported that, the prevalence of anti-HCV positivity was 15%. El-Karakasy et al. reported a lower rate of anti-HCV of 3.6% among diabetic children attending Cairo Children University Hospital in Egypt [28]. In this study there was highly significant increase in both IV injection and previous hospitalization in DM compared to the healthy. Children with T1DM are usually hospitalized for either diet education (a week) or monitoring and diabetic control (several weeks) they perform self-monitoring of blood glucose by finger puncture many times daily. Particular HCV risk factors in DM include using shared spring-triggered finger-stick device for blood glucose monitoring or contaminated multi-dose insulin vials with the risk of patient to patient transmission [29].

As regard thalassemia in the present study, HCV seropositivity prevalence was 30% similar to a study by Din et al. in which HCV prevalence in thalassemia was strikingly increased as up to 49% [30], and was also similar to another study done in Iran which reported 15.7% to 63.8% for HCV prevalence in thalassemia [31]. All thalassemia patients in this study were subjected to common risk factors such as blood transfusion, exposure to previous surgery, frequent IV injections and previous hospitalization. These risk factors for HCV transmission in thalassemia were highly significant compared to the healthy. Both seropositive and seronegative patients of this group received blood transfusion so we couldn't confirm that blood transfusion was the main risk factor for HCV transmission in thalassemia especially after implementation of blood donors screening, this agrees with a study by Alavian et al. which reported that the risk of HCV transmission has decreased significantly after the introduction of routine anti-HCV screening of blood donors in developed countries and that the main risk factor for acquiring HCV infection before that was blood transfusion [32].



Another study reported that HCV is transmitted primarily by direct contact with infected blood and transfusion of blood products and intravenous and percutaneous drug use [33]. Nemati et al. reported that shaving by community barbers, unsafe injections by health care providers, tattooing and ear piercing, known to be associated with HCV infection [34], but in our study all except IV injection were non statistically significant.

In the current study, HCV seropositivity in hemodialysis was 50%, a similar result was reported by Abed et al. [35] and was nearer to that reported by the Egyptian Renal Registry which reported 49% to 64% for HCV prevalence in Egypt [36]. Bastiani et al. reported 10.17% for HCV prevalence in dialysis which was lower than our result [37]. This study reported that blood transfusions, intravenous injection, previous surgery, previous hospitalization, exposure to blood are significant risk factor for HCV transmission in hemodialysis compared to the healthy. In contrast, another study by Zhao et al. reported no evidence of patient-to-patient HCV transmission in their hemodialysis centers [38]. Halle et al. evidenced that HCV seroprevalence rate in hemodialysis was 11.8% and it was associated with longer duration on dialysis [39].

As regard children previously exposed to surgery in this study, HCV seropositivity rate was 10% and prior hospitalization, prior surgery and IV injection were statistically highly significant compared to the healthy. This agreed with Masood et al. who studied 387 patients admitted for elective surgery. After screening they found that 6% of patients enrolled in their study were positive for both HBV and HCV. HBsAg was positive in 6.5% of patients while 11.3% were positive for HCV. They found that the reuse of contaminated syringes, contaminated surgical instruments and blood products were risk factors. They concluded that HBsAg and anti-HCV prevalence in hospitalized surgical patients was very high. They suggested routine preoperative screening for HBV and HCV [40]. Chaudhry et al. also conducted another study among patients reporting in surgical outpatient department of Fauji Foundation Hospital Rawalpindi during 2006, they screened 2056 patients and found 2.8% and 7.56% for HBV and HCV seropositivity respectively with male predominance in both the groups [41].

As regard prevalence of viremia in seropositive cases, the present study reported 100% for the healthy, 33.3% in diabetes, 83.3% in thalassemia, 100% in dialysis and 100% in the previously exposed to surgery. El-Karakasy et al. reported rates of HCV-RNA positivity by PCR among children with positive HCV-Ab by ELISA as 40% [28]. The decreased frequency of PCR positivity than that of seropositivity by ELISA could be attributed to the following: HCV-Ab positive subjects in absence of HCV-RNA positivity could be attributed to either HCV infection clearance while the patient remains HCV-Ab positive or a false positive ELISA test [42]. HCV-RNA presence in serum is a dependable indicator of ongoing viral reproduction and infectivity where follow-up of infected cases is necessary [43].

RT-PCR is the gold standard technique for the diagnosis of HCV infection, allowing serum HCV-RNA determination; however, obstacles such as technical difficulties, expenses and unavailability may prevent it from being used as a screening test on a large scale of patients on a regular basis [44].

As regard the laboratory investigations among seropositive and seronegative patients in our study there was no significant difference as regard to CBC but there was significant increase in liver enzymes among HCV seropositive than seronegative children. Our result agreed with Bhattacharya et al. who found that HCV can cause asymptomatic infection [45]. Persistently elevated ALT levels were recorded in several Egyptian pediatric and adult studies and consequently, HCV infection is not always benign in Egyptian children [46].

Regarding HBV seropositivity, only one hemodialysis child was positive for HBs-Ag and HBV-DNA viral load. HBV infection has been markedly reduced after mass vaccination programs [5]. In our study, negative HBs-Ab titre group (seroprotected) represented 48%; higher than that of Eldesoky et al. which was 40.5% of the healthy vaccinated children in the age group from 3 to 13 years [47], but similar to the result of Khashaba et al., that was 46.2% among 91 screened preschool children [48]. Meanwhile positive HBs-Ab titre group represented 52% which were near the results of Jafarzadeh and Montazerifar which reported that 47.9% of Iranian children had protective level of HBs-Ab  $\geq 10$  mIU/ml at 10 years interval after primary vaccination [49] and that of Khashaba et al. who reported that 53.8% were seroprotective [48]. HBV infection has been documented in hemodialysis patients who have not maintained anti-HBs concentrations  $>10$  mIU/ml [50].

Table 1: Socio-demographic data, risk factors and laboratory investigations of the studied children as regard HCV seropositivity.

Variables	Seropositive HCV (n.=22)	Seronegative HCV (n.=78)	Test	p
	n.(%) or mean±SD			
Sex (♂/♀)	12(54.5)/10(45.5)	39(50.0)/39(50.0)	0.14 <sup>S</sup>	0.7
Age (≤12/>12) year	4(18.2)/18(81.8)	46(59.0)/32(41.0)	11.42 <sup>S</sup>	0.001 <sup>**</sup>
Residence (Urban/Rural)	2(9.1)/20(90.9)	21(26.9)/57(73.1)	3.08 <sup>S</sup>	0.07
Social class (H/M/L)	3(13.6)/5(22.7)/14(63.6)	22(28.2)/41(52.6)/15(19.2)	16.45 <sup>S</sup>	0.001 <sup>**</sup>
Blood transfusion (35)	11(50)	24(30.8)	2.37 <sup>∞</sup>	0.008 <sup>**</sup>
Frequency of IV injection (84)	21(95.5)	63(80.8)	5.29 <sup>∞</sup>	0.001 <sup>**</sup>
Prior surgical procedure (42)	10(45.5)	32(41)	3.99 <sup>∞</sup>	0.001 <sup>**</sup>
Prior hospitalization (80)	21(95.5)	59(75.6)	4.83 <sup>∞</sup>	0.001 <sup>**</sup>
Non-medical circumcision (21)	9(40.9)	12(15.4)	0.66 <sup>∞</sup>	0.254
Ear piercing (49)	10(45.5)	39(50)	5.14 <sup>∞</sup>	0.001 <sup>**</sup>
Family history of HCV (11)	0(0)	11(14.1)	-	-
Common barber Shaving (50)	12(54.5)	38(48.7)	4.31 <sup>∞</sup>	0.001 <sup>**</sup>
Exposure to blood (33)	10(45.5)	2(2.6)	3.1 <sup>∞</sup>	0.001 <sup>**</sup>
Birth attendants delivery (34)	12(54.5)	22(28.2)	1.8 <sup>∞</sup>	0.036 <sup>*</sup>
History of schistosomiasis (1)	1(4.5)	0(0)	-	-
Hemoglobin (g/dl)	11.9±3.1	11.1±2.1	1.26 <sup>#</sup>	0.21
Red blood cells (x10 <sup>6</sup> /ml)	4.29±0.96	4.35±0.62	0.24 <sup>#</sup>	0.8
Leucocytes (x10 <sup>3</sup> /ml)	5.6±1.72	6±1.7	0.9 <sup>#</sup>	0.36
Platelets (x10 <sup>3</sup> /ml)	199.5±75.8	248.3±113.3	1.71 <sup>#</sup>	0.09
Serum AST (IU/ml)	50.2±25.1	35±20.2	2.3 <sup>#</sup>	0.02 <sup>*</sup>
Serum ALT (IU/ml)	43.6±24.5	26.7±13.6	3.0 <sup>#</sup>	0.004 <sup>**</sup>
Total bilirubin (mg/dl)	0.96±0.2	1±0.3	0.4 <sup>#</sup>	0.64
Direct bilirubin (mg/dl)	0.4±0.3	0.37±0.3	0.46 <sup>#</sup>	0.64

H: high, M: middle, L: low, IV: intravenous, HCV: hepatitis C virus, AST: Aspartate Aminotransferase, ALT: Alanine aminotransferase, <sup>S</sup>: Chi square test, <sup>#</sup>: student test, <sup>∞</sup>: Z test, <sup>\*</sup>: significant, <sup>\*\*</sup>: high significant,

Table 2: Socio-demographic data, risk factors and laboratory investigations of high risk groups compared to healthy.

Variables	Healthy(n.=20)	DM(n.=20)	Thalassemia(n.=20)	Hemodialysis(n.=20)	P surgery(n.=20)
Sex (♂/♀) <sup>S</sup>	11(55)/9(45)	12(60)/8(40)	11(55)/9(45)	9(45)/11(55)	8(40)/12(60)
Age Y(mean±SD) <sup>#</sup>	11.3±3.6	11.2±3.6	11.3±3.9	14.8±3 <sup>**</sup>	12.4±3.2
Age Y (≤12/>12) <sup>S</sup>	12(60)/8(40)	13(65)/7(35)	10(50)/10(50)	4(20)/16(80)	11(55)/9(45)
Urban/Rural <sup>S</sup>	3(15)/17(85)	5(25)/12(75)	6(30)/14(70)	2(10)/18(90)	7(35)/13(65)
S.Class(H/M/L) <sup>S</sup>	3(15)/13(65)/4(20)	4(20)/13(65)/3(15)	3(15)/8(40)/9(45)	3(15)/6(30)/11(55)	12(60)/6(30)/2(10) <sup>*</sup>
Blood transfusion <sup>S</sup>	0(0)	1(5)	20(100) <sup>**</sup>	13(65) <sup>**</sup>	1(5)
IV injection <sup>S</sup>	7(35)	18(90) <sup>**</sup>	20(100) <sup>**</sup>	19(95) <sup>**</sup>	20(100) <sup>**</sup>
Previous surgery <sup>S</sup>	0(0)	2(10)	6(30) <sup>**</sup>	14(70) <sup>**</sup>	20(100) <sup>**</sup>
P hospitalization <sup>S</sup>	3(15)	17(85) <sup>**</sup>	20(100) <sup>**</sup>	20(100) <sup>**</sup>	20(100) <sup>**</sup>
NM Circumcision <sup>S</sup>	5(33.3)	2(11.1)	2(11.1)	11(55)	1(5)
Ear piercing <sup>S</sup>	9(45)	8(40)	9(45)	11(55)	12(60)
HCV F History <sup>S</sup>	0(0)	3(15)	2(10)	1(5)	5(25) <sup>*</sup>
C barber Shaving <sup>S</sup>	11(55)	11(55)	11(55)	9(45)	8(40)
Common Razors <sup>S</sup>	1(5)	0(0)	0(0)	1(5)	0(0)
Exposure to blood <sup>S</sup>	0(0)	1(5)	20(100) <sup>**</sup>	12(60) <sup>**</sup>	0(0)
Birth attendants D <sup>S</sup>	10(50)	3(15)	4(20)	12(60)	5(25)
Schistosomiasis <sup>S</sup>	0(0)	0(0)	1(5)	0(0)	0(0)
Diarrhea <sup>S</sup>	9(45)	10(50)	5(25)	9(45)	8(40)
Abdominal pain <sup>S</sup>	11(55)	19(95) <sup>**</sup>	18(90) <sup>**</sup>	17(85) <sup>**</sup>	17(85) <sup>**</sup>
Dark urine <sup>S</sup>	0(0)	0(0)	8(40) <sup>**</sup>	8(40) <sup>**</sup>	0(0)
Easy fatigue <sup>S</sup>	8(40)	17(85)	20(100) <sup>**</sup>	20(100) <sup>**</sup>	9(45)
Jaundice <sup>S</sup>	0(0)	1(5)	8(40) <sup>**</sup>	8(40) <sup>**</sup>	0(0)
Poor G health <sup>S</sup>	5(25)	13(65)	20(100) <sup>**</sup>	19(95) <sup>**</sup>	4(20)
School absence <sup>S</sup>	0(0)	3(15)	18(90) <sup>**</sup>	19(95) <sup>**</sup>	0(0)
HCV-Ab (P/N) <sup>S</sup>	1(5)/19(95)	3(15)/17(85)	6(30)/14(70) <sup>**</sup>	10(50)/10(50) <sup>**</sup>	2(10)/18(90)
HCV-RNA in SPC	100%	33.3%	83.3%	100%	100%
HBs-Ag (P/N) <sup>S</sup>	0(0)/20(100)	0(0)/20(100)	0(0)/20(100)	1(5)/19(95)	0(0)/20(100)
HB-DNA in SPC	-	-	-	100%	-
HBs-Ab (H/W/N) <sup>S</sup>	6(30)/4(20)/10(50)	5(25)/5(25)/10(50)	5(25)/6(30)/9(45)	4(20)/4(20)/12(60)	7(35)/6(30)/7(35)

DM: diabetes mellitus, P: previous, Y: year, H: high, M: middle, L: low, IV: intravenous, P: previous, S: Social, NM: Non-medical, F: family, C: common, D: delivery, G: general, HCV: hepatitis C virus, RNA: ribonucleic acid, HB: hepatitis B, s: surface, Ag: antigen, SPC: seropositive cases, Ab: antibody, P: positive, N: negative, W: weak, <sup>5</sup>: chi square test, #: student t test, \*: significant, \*\*: high significant.

### Conclusion:-

The present study revealed that the HCV seropositivity prevalence in apparently healthy children was 5% and a significant high prevalence of HCV seropositivity in thalassemic children (30%) and hemodialysis children (50%) was reported. HCV seroprevalence in diabetic children was 15% and in children previously exposed to surgery was 90%. Risk factors as blood transfusion frequent IV injections, previous hospitalization and exposure to blood were the most common for HCV transmission. PCR should be done for all HCV seropositive cases to confirm viremia.

### Recommendations:-

There must be greater efforts for prevention of hepatitis B and C in Egypt including:

- 1- Strict emphasis on infection control measures in hemodialysis and hematology units.
- 2-Routine investigations every 6 months for early detection and treatment of infected persons
- 3-All children must be vaccinated against hepatitis B with confirmation on booster doses.
- 4- Molecular screening for blood donors must be done.
- 5- Confirmation on having personal instruments for each individual.
- 6- Replacement of injections with oral medications if possible.

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### RESEARCH ARTICLE

#### FINANCIAL PERFORMANCE UNDER MGNREGA IN PUNJAB.

Shaveta Kaushal.

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**Manuscript Info**  
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**Abstract**  
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**Introduction:-**

The Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) is an Indian job guarantee scheme, enacted by legislation on August 25, 2005. The scheme provides a legal guarantee for one hundred days of employment in every financial year to adult members of any rural household willing to do public work-related unskilled manual work at the statutory minimum wage of 123 per day. The Central government outlay for scheme is Rs.40,000 crore in Financial Year 2010-11. This act was introduced with an aim of improving the purchasing power of the rural people, primarily semi or un-skilled work to people living in rural India, whether or not they are below the poverty line. Around one-third of the stipulated work force is women. The law was initially called the National Rural Employment Guarantee Act (NREGA) but was renamed on 2 October 2009 as Mahatma Gandhi National Rural Employment Guarantee Act .

During Phase I, this act was notified in 200 districts (most backward) of 27 States with effect from February 6, 2006 and then extended to additional 130 districts in the financial year 2007-08 under Phase-II. The remaining 274 rural districts have been notified under the NREGA with effect from April 1, 2008 under Phase III. In February 2006 under Phase-I this scheme was started in most literate district of Punjab, i.e., Hoshiarpur. In the year 2007, under Phase-II three more districts, Amritsar, Jalandhar and Nawanshehar, were also covered under this scheme. In fact, Punjab state did not have any earlier experience of implementation of employment generation programme. In many districts, the administration was finding it difficult to implement this programme. The administration has involved such agencies or themselves prepared district MGNREGA plans. The concerned agencies have constituted expert teams which interact with the concerned officials, assessed physical and financial achievements, problems, prospects and challenges associated with the task. This task involves estimation of number of job seekers village-wise, type of work to be done, work sites, facilities to be created at work sites, conversion of physical targets into monetary targets and other associated requirements. The activities identified in Punjab are like digging of ponds, de-silting of ponds, afforestation on common and waste land, land development of common and waste land, drainage of water from water logged/flood affected areas, rural connectivity, strengthening of road berms, minor irrigation works, provision of irrigation of land owned by SCs, beneficiaries of Indira Awas Yojana, etc. It is obvious that although the state as a whole has been covered under NREGA. Other features, At least 50% of works will be allotted to Gram Panchayats for execution, A 60:40 wage and material ratio has to be maintained/no contractors and machinery is allowed. The Central Government bears the 100 percent wage cost of unskilled manual labour and 75 percent of the material cost including the wages of skilled and semi skilled workers, Social Audit has to be done by the Gram Sabha, Grievance redressal mechanisms have to put in place for ensuring a responsive implementation process, all accounts and records relating to the Scheme should be available for public scrutiny.

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By analyzing the figure of employment generation in all districts of Punjab it becomes clear that Roop Nagar has provided approximately 36 person days at an average to each person and provided employment, which is the highest in the state. In Roop Nagar 31350 people from 21226 households registered for the scheme and 21134 job cards were issued out of this 4622 people demanded employment and 4602 of them were provided with 165807 person days of work. In this district 163 families completed 100 days of employment during whole phase. Ferozpur lies at the bottom of the pool with a figure of approximately 13 days of work per person was provided. A sum total of 170951 people from 94957 households got registered for the scheme during the period 2006-2011 which is much greater than 31350 people registered at Roop Nagar, 94928 of them, which is almost every household was issued a job card but the number of people who demanded employment was much more less at 22059. A total of 21950 of these people were provided with 295528 person days of work and 45 families completed the 100 days of employment in this district.

#### **Funding of MGNREGA:-**

The funding of MGNREGS will be shared between both the central and state governments. The Central Government established Mahatma Gandhi National Rural Employment Guarantee Act at the central level and meet the cost of components such as, (i) 100 per cent wage expenditure of unskilled manual work, (ii) 75 per cent material cost and payments made to semi skilled workers, (iii) administrative expenses. The state meet the cost of (i) Unemployment allowances, (ii) 25 per cent of expenditure on material and payment made to the skilled and semi-skilled workers, (iii) administrative expenses.

Section 16 explains the role of the Gram Panchayat and mandates that atleast 50 per cent of the work in terms of cost has to be implemented through the Gram Panchayat. Thus the MGNREGA assigns a wide ranging role to PRIs right from registering of workers up to monitoring and social audit and responsibility for transparency and accountability on them, especially on the Gram Panchayat. The potential of MGNREGA to strengthen good governance at the local level mainly through its consistent information and accountability systems and transparent and participatory processes realized right in the beginning and acted on. The Gram Panchayat is assigned the major responsibilities of awareness building and environment creation to spread the message of NREGA, mobilizing and registering the job seekers, issue of job cards, preparation of projects and their approval, ensuring facilities to workers, making payments through banks and maintaining records.

The data on NREGA show that between February 02, 2006 and September 30, 2009, a sum of Rs. 192.25 crore was released against the total allocation of Rs. 850 crore. This comes out to be only 22.62 percent of the total allocation. When this scheme was extended from one district to four districts in 2007-08, the allocation was raised from Rs.50 crore to Rs. 300 crore, but the released funds were raised from Rs. 30.81 crore to just 37.08 crore. Similarly, when the scheme was extended to all the districts in 2008- 09, no increase in allocation of funds was made. The release of funds was not equivalent with increase in number of districts covered under the scheme. This amount was increased from 37.08 crore in 2007-08 to Rs. 73.16 crore in 2008-09, whereas the number of districts covered increased from 04 to 20 in 2008-09.

The lack of proper planning, low performance in employment generation, slow issue of job cards, identification and execution of works have led to low utilization of funds available under this programme. For instance, in the year 2008-09, the total availability of funds in Punjab under this programme stood at Rs. 114.85 crore, but the utilization level stood at 63 percent. The districts of Hoshiarpur, Amritsar, Nawanshehar, Bathinda, Muktsar and Gurdaspur spent a major share as well as a high proportion of available funds. But, the districts of Jalandhar, Ferozpur, Ludhiana and Patiala spent less than 30 percent of the available funds (Table:1). In year 2009-10, the financial performance deteriorated as the proportion of funds available and used fell from 56.30 percent compared to 63.0 percent in 2008-09. The districts of Jalandhar, SAS Nagar (Mohali) and Tarn Taran continue to show very low utilization of available funds even below 25 percent (Table: 2). It is also true that the proportion of spending on the wages fell from above 40 percent in 2008-09 to below 33 percent of the funds available in 2009-10. This again reflects poor picture on the functioning of NREGA programme in the state. Moreover, there are a lot of variations across the districts; some showing very high percentage of spending on the wages and others showing very low percentage of spending on the wages. This shows a tendency among powerful implementing personnel to divert funds for material costs where high scale pilferages are possible.

NREGA has been extremely useful from the social and economic perspectives. In fact, the largest part of possible benefits, especially in terms of the employment share, has gone to the weaker sections of society. In the year 2010-

11, the total availability of funds under this programme stood at Rs.226.91crore, but the utilization level increased to 73.08 per cent, which is more as compared to the last two years. Hoshiarpur, Amritsar, Bathinda, Muktsar and Gurdaspur spent a major share as well as a high proportion of available funds. But, the districts Nawanshahar, Kapurthala, SAS Nagar Mohali, Roop nagar spent less than 60 per cent of the available fund. It is interesting to note that in utilization of fund, situation of district Nawanshahar has deteriorated and of SAS Nagar Mohali utilization of fund improved surprisingly from 19.18 per cent to 55.89 per cent (Table:3).. The expenditure incurred under this programme is highly productive in nature. It is leading to creation of productive assets both through the labour and material costs. This Act has transforming the rural lives by improving living conditions, increasing sustainable agrarian activities and reduces distress migration. NREGA is also an opportunity to redefine the rural Indian women's identity in various ways; decision making, spending their wages independently or on their children's education and clearing debts, alleviate poverty and provide a social floor. These are going to increase both directly and indirectly the productivity of tangible and non-tangible assets in the rural areas and Optimum utilization of the human and economic resources of the villages.

**Table:1:-** Financial Performance under NREGA in Punjab, 2008-09.

District	O.B. as on 1st April of the year	Release during Current Year or of Last Year Received during Current Year		Misc.	Total Availability	Cumulative Expenditure (Percentage)					
		Centre Share	State Share			On Wages	On semi-skilled and skilled wages	On Material	Administrative Expenses		Total
									Recurring	Non Recurring	
<b>Phase I</b>											
Hoshiarpur	508.66	1862.53	143.41	55.12	2569.72	48.69	3.69	26.30	1.54	0.00	80.21
Sub Total	508.66	1862.53	143.41	55.12	2569.72	48.69	3.69	26.30	1.54	0.00	80.21
<b>Phase II</b>											
Amritsar	380.09	630.94	70.1	84.18	1165.31	62.42	6.62	23.49	4.43	0.24	97.20
Jalandhar	1015.75	0	0	0	1015.75	12.01	0.01	5.18	1.86	0.00	19.07
Nawanshahar	318.59	0	0	0	318.59	49.22	1.07	21.10	4.53	3.25	79.18
Sub Total	1714.43	630.94	70.1	84.18	2499.65	40.25	3.23	15.74	3.40	0.53	63.15
<b>Phase III</b>											
Barnala	81.42	279.24	31.03	3.99	395.68	35.49	0.00	27.79	1.68	5.59	70.55
Bathinda	176.07	325.53	36.17	1.28	539.05	58.88	0.00	25.01	2.42	0.00	86.31
Faridkot	23.01	93.25	0	1.95	118.21	30.83	0.00	8.23	0.00	0.00	39.07
Fatehgarh Sahib	107	89.58	9.95	4.48	211.01	41.42	0.64	22.34	3.33	0.00	67.72
Ferozepur	51	349	57.2	0	457.2	20.63	0.00	7.12	1.45	0.00	29.19
Gurdaspur	146.72	268.87	29.88	54.5	499.97	49.13	0.28	26.55	1.19	0.00	77.15
Kapurthala	8.82	95.89	0	0	104.71	40.01	6.55	17.48	2.09	0.00	66.13
Ludhiana	231.24	170.83	0	0	402.07	13.70	0.00	2.84	0.00	8.53	25.07
Mansa	19.14	403.93	22.66	0	445.73	26.11	4.22	13.19	0.58	0.00	44.10
Moga	0.91	92.95	10.33	0	104.19	54.06	0.00	35.89	0.14	0.00	90.09

Mukatsar	52.79	233.98	9.66	104.01	400.44	50.57	0.00	5.18	2.75	1.66	60.16
Patiala	96.21	480.48	53.39	8.94	639.02	30.29	1.74	9.58	1.48	1.49	44.57
Rupnagar	165.1	242.52	26.95	0	434.57	11.20	0.49	6.11	2.87	7.89	28.56
Sangrur	16.2	1058.64	136.3	71.09	1282.23	29.54	4.92	14.77	2.84	3.11	55.18
SAS Nagar	0	134.36	14.93	81.5	230.79	54.14	5.84	30.43	0.28	9.31	100.00
Tarn Taran	0.05	134.36	14.93	1.48	150.82	37.97	0.00	24.06	0.69	0.00	62.72
Sub Total	1175.68	4453.41	453.38	333.22	6415.69	34.24	1.84	15.54	1.80	2.62	56.05
Total	3398.77	6946.88	666.89	472.52	11485.06	38.78	2.56	17.99	2.09	1.58	63.00

Source: www.nrega.nic.in

**Table 2:-** Financial Performance under NREGA in Punjab, 2009-10

District	Actual O.B as on Ist April of the Year	Release during Current Year or of Last Year Received during Current Year		Misc .	Total Availability	Cumulative Expenditure (Percentage)						
		Centre Share	State Share			On Unskilled Wage	On Semi-skilled and Skilled Wage	On Material	Adm. Exp		Total	
						Rec. Exp	No-Rec Exp	Total Adm. Exp				
<b>Phase-I</b>												
Hoshiarpur	510.03	3572.72	414.39	11.23	4508.36	<u>25.91</u>	<u>0.72</u>	<u>30.78</u>	0.66	0.15	<u>0.81</u>	<u>58.22</u>
Sub Total	510.03	3572.71	414.38	11.23	4508.36	25.91	0.72	30.78	0.66	0.15	0.81	58.22
<b>Phase-II</b>												
Amritsar	49.06	2895.34	278.25	23.06	3245.71	<u>29.57</u>	<u>1.96</u>	<u>24.96</u>	4.37	0.06	<u>4.43</u>	<u>60.92</u>
Jalandhar	1385.05	0	0	0	1385.05	<u>34.84</u>	0	<u>16.45</u>	2.32	0.01	<u>2.33</u>	<u>53.62</u>
Nawanshar	157.96	536.35	40.85	6.51	741.66	<u>17.84</u>	<u>0.01</u>	<u>4.62</u>	2.28	0.01	<u>2.29</u>	<u>24.76</u>
Sub Total	1592.07	3431.68	319.1	29.57	5372.42	29.31	1.19	19.96	3.55	0.04	3.59	54.05
<b>Phase-III</b>												
Barnala	72.74	253	28.11	0	353.85	<u>34.11</u>	0	<u>12</u>	3.9	0	<u>3.9</u>	<u>50.01</u>
Fatehgarh Sahib	153.09	108.67	6.19	1.98	269.92	<u>36.56</u>	<u>0.01</u>	<u>22.5</u>	12.25	0.61	<u>12.85</u>	<u>71.92</u>
Ferozepur	467.66	375	25	0.51	868.17	<u>39.21</u>	0	<u>20.9</u>	4.21	2.95	<u>7.16</u>	<u>67.26</u>

<u>Gurdaspur</u>	114.2 4	1189.0 1	80.9 7	11.2 9	1395.51	<u>49.55</u>	0	<u>27.73</u>	4.83	0	<u>4.83</u>	<u>82.1</u>
<u>Kapurthala</u>	84.28	119.36	13.2 5	2.82	219.71	<u>35.95</u>	0	<u>21.13</u>	3.85	0	<u>3.85</u>	<u>60.9</u> <u>2</u>
<u>Ludhiana</u>	397.2 6	193.13	10.3 4	3.68	604.41	<u>44.75</u>	<u>0.22</u>	<u>22.54</u>	6.62	0.6 4	<u>7.26</u>	<u>74.7</u> <u>6</u>
Roopnagar	194.1 3	465.21	51.6 8	0.85	711.87	<u>23.13</u>	<u>0.7</u>	<u>25.42</u>	1.49	0	<u>1.49</u>	<u>50.7</u> <u>4</u>
<u>SAS Nagar</u>	22.88	283.7	31.5 2	0	338.1	<u>7.26</u>	0	<u>11.02</u>	0.51	0.3 6	<u>0.87</u>	<u>19.1</u> <u>6</u>
<u>Tarn Taran</u>	69.25	830	92.2 1	0.29	991.75	<u>9.75</u>	0	<u>6.43</u>	1.62	0.0 4	<u>1.67</u>	<u>17.8</u> <u>5</u>
<u>Patiala</u>	402.5 2	316.54	35.1 7	4.14	758.36	<u>53.1</u>	<u>0.49</u>	<u>19.49</u>	3.21	0.0 4	<u>3.26</u>	<u>76.3</u> <u>3</u>
Faridkot	72.03	217.24	12.9 4	9.27	311.48	<u>28.94</u>	0	<u>12</u>	3.57	2.6 6	<u>6.23</u>	<u>47.1</u> <u>8</u>
<u>Bathinda</u>	239.4 6	1421.3 7	94.6 3	38.7 2	1794.17	<u>28.17</u>	0	<u>10.86</u>	4.53	0.4 4	<u>4.97</u>	<u>44</u>
<u>Mukatsar</u>	351.0 2	1021.7 2	113. 52	0.5	1486.76	<u>43.01</u>	0	11.53	1.06	0.3 1	<u>1.38</u>	<u>55.9</u> <u>2</u>
<u>Moga</u>	10.33	59.08	1.84	0	71.25	36.11	0	11.55	0	0	0	47.6 6
<u>Mansa</u>	363.1 6	539.21	53.3 9	0	955.76	<u>32.96</u>	<u>0.09</u>	<u>17.79</u>	0	0	0	<u>50.8</u> <u>3</u>
Sangrur	939	439.65	48.8 5	3.24	1430.74	<u>41.8</u>	<u>0.12</u>	<u>16.47</u>	3.81	0.7 8	<u>4.6</u>	<u>62.9</u> <u>8</u>
Sub Total	3953. 03	7831.8 8	699. 62	77.2 8	12561.81	35.68	0.1	16.98	3.3	0.5 2	3.82	56.5 8
Total	6055. 13	14836. 28	1433 .1	118. 08	22442.59	32.19	0.48	20.46	2.83	0.3 3	3.16	56.3

Source:www.nrega.nic.in

**Table:3:-** Financial Performance under NREGA in Punjab 2010-11

Districts	Actual O.B as on 1st April of the year	Release during current years of last year received during current year		Misc.	Total Availability	Communicative Expenditure (%)						Total
		Centre share	State share			On Unskilled wage	On Semi-skilled and skilled wage	On Material	Adm. Exp.			
									Rec. Exp.	Non-Rec. Exp.	Total Adm. Exp.	
<b>Phase-I</b>												
Hoshiarpur	2030.8	0	0	46.67	2833.93	56.90	4.28	36.55	2.25	0	2.25	82.37
Sub-total	2030.8	0	0	46.67	2833.93	56.90	4.28	36.55	2.25	0	2.25	82.37
<b>Phase-II</b>												
Amritsar	1480.4	0	0	29.07	2597.94	54.87	3.43	34.78	6.61	0.28	6.90	76.87
Jalandhar	457.78	0	0	0	1095.92	60.12	0.92	31.67	7.27	0	7.27	73.60

Nawansha hr	199.1	0	0	4.9	607.22	58.40	1.31	31. 36	7.4 2	1.5 0	8.92	54.2 1
Sub-total	2136.9 2	0	0	33.97	4301.08	56.60	2.56	33. 62	6.8 7	0.3 4	7.20	72.8 4
<b>Phase-III</b>												
Barnala	302.61	0	0	1.75	699.32	72.61	0.62	22. 20	4.5 6	0	4.55	57.1 4
Bhatinda	592.23	0	27.5	7.28	1595.5	64.54	0.58	27. 71	6.5 2	0.6 3	7.16	70.4 4
Faridkot	121.04	0	11	1.14	474.07	61.72	1.06	25. 96	8.7 7	2.4 9	11.2 6	66.1 5
Fatehgarh Sahib	58.08	10.79	1.19	1.29	542.89	53.41	0	39. 14	7.2 2	0.2 3	7.44	75.2 6
Ferozpur	120.6	0	24.75	0	1507.09	57.79	.008	38. 19	3.1 7	0.8 3	4.01	85.8 7
Gurdaspur	49.8	200	22	3.69	1193.52	58.77	1.37	33. 99	5.6 5	0.2 1	5.87	83.1 0
Kapurthala	103.28	0	0	1.68	479.31	59.79	1.12	34. 72	4.3 5	0	4.36	47.6 4
Ludhiana	204.18	0	29.79	3.71	1303.43	60.90	.23	32. 66	5.9 9	0.2 4	6.21	73.2 4
Mansa	273.83	0	0	5.01	799.61	58.99	0	38. 34	2.5 2	0.1 6	2.67	69.1 1
Moga	14.44	0	2.36	0	488.29	65.62	0	30. 67	3.2 8	0.4 2	3.70	96.4 3
Muktsar	743.89	0	0	12.93	1757.45	63.26	0.03	31. 64	4.1 5	0.9 1	5.06	74.6 6
Patiala	212.57	0	0	5.29	851.79	55.37	0.67	33. 24	5.6 2	5.0 9	10.7 2	75.2 4
Roop nagar	420.52	0	44	5.87	947.38	57.89	2.77	30. 30	7.0 3	1.9 9	9.03	54.3 3
Sangrur	581.98	0	0	8.27	1243.44	61.42	0.41	31. 51	6.5 8	0.0 8	6.66	67.7 5
SAS Nagar	324.61	0	0	2.85	566.28	72.93	0.09	41. 43	1.8 5	3.1 1	4.95	55.8 9
Taran Taran	726.43	0	85.8	2.83	1112.28	50.91	1.86	42. 06	5.0 8	0.0 8	5.16	67.5 4
Sub-total	4850.0 9	210.7 9	248.3 9	63.59	15556.65	59.94	0.60	33. 43	5.1 2	0.8 9	6.01	71.5 4
Total	9017.8 1	210.7 9	248.3 9	144.2 3	22691.66	58.88	1.49	33. 91	5.0 4	0.6 6	5.71	73.0 8

Source:www.nrega.nic.in

This brings out that there is a further scope for improvement in functioning of NREGA, although the reduction in variations in the performance among different districts in the state. This could be done through systematic planning and its implementation through the Panchayati Raj Institutions. There is also need to create better awareness. Investments made under NREGA are expected to generate employment and purchasing power, improve the quality of life, raise economic productivity, promote women's participation in the workforce, strengthen rural infrastructure, reduce distress migration, and regenerate natural resources.

#### Deficiencies and Suggestions:

1. The Act is based on the fact that the workers would demand work as a right and the Panchayat or the Government would ensure that the person is provided with work within 15 days of receipt of such an application. If not, then unemployment allowances is to be provided but data reveals the fact that no unemployment allowances has been given.

2. Appropriate mechanisms are required, which allow Panchayats to enjoy the flexibility of the programme and encourage them take up works that are extremely important to build long term sustainable productive structures that may enhance the livelihood promotion capacity within the village. Panchayats should be allowed to involve external resource persons/agencies, duly recognised by the Government, for technical sanction of the project as well as evaluation of the work done so that the monopoly of the Government civil engineers may be diluted.
3. Panchayats need greater capacity building support to improve their knowledge and skills to keep their accounts, measurements of works, as well as maintenance their records, muster rolls, and conduct social audits.
4. The NREGA is a programme has immense potential to improve the Gap between urban and rural India and lead to rural development in terms of basic infrastructure like roads, in terms of agricultural productivity from irrigation works, and it provides a stable income for the workers, their income graph would be much smoother with the NREGA.
5. The 60:40 wage material ratio is unrealistic. Technically, also the cost of unskilled labour is never high as 60 per cent but the cost of material is always higher than 40 per cent. So there is need to change the Wage Material Ratio.
6. Funding of share between Centre and State i.e.75: 25 respectively. But data reveals that state couldn't have adequate fund to release and match with the funding of MGNREGA.

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### RESEARCH ARTICLE

#### A STUDY OF AWARENESS REGARDING HOUSEHOLD FOOD INSECURITY, FOOD PRACTICES AND HEALTH RISKS AMONG THE RURAL WOMEN OF ALLAHABAD DISTRICT.

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##### Key words:-

Household food insecurity, Health risk, Nutritional knowledge, Awareness program

#### Abstract

**Background:** The lives of rural women population are characterized by limited education, lack of knowledge pertaining to health aspects & also limited influence on decisions affecting their lives. Thus, awareness is one major factor for development of this group of population.

**Objective:** 1) To study the awareness regarding Household Food Insecurity, Food Practices and Health Risks among the rural women of Allahabad District aged between 18-25 years. 2) To assess the impact of Health and Nutritional Awareness Program on the awareness level of selected population.

**Material and Methods:** The data were collected through semi-structured questionnaire among 600 rural women from the villages belongs to Jasra and Chaka block of Allahabad district. Pre test was carried out before the exposure of awareness documentary followed by post test to assess the impact of health and nutritional awareness programme.

**Results:** The knowledge of rural women regarding health and nutrition aspects improved significantly after intervention. There was a considerable increase in the awareness levels of rural women with regard to knowledge of household food insecurity, food practices and various health risks among rural Indian women.

**Conclusion:** The informative & educable intervention definitely has a positive effect on awareness levels which would eventually encourage expansion of knowledge & positive health habits.

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#### Introduction:-

Young population ranges from 18-25 years of age which includes adolescent and reproductive age women. This is a period of preparation for undertaking greater responsibilities including earn livelihood & healthy responsible parenthood. Future of the society depends on these young women as they form a great human resource for the society. Nutritional & health need of the young women are also more because of more requirements for growth spurt & increase in physical activity. Young women need more of all nutrient particularly calcium, iodine & iron. The need for more iron during this period is due to growth spurt, the onset of menstruation and need during the pregnancy (WHO, 2001).

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Within the family, compared to male, the women's health, nutrition, education & development are more neglected which has adverse effect on reproductive health. Young women face more problems than male in the family, largely due to socio-cultural factors. There are limited choices available for the future & girls are caught in the cycle of early marriage, pregnancy & childbearing (Cogswell *et al.*, 2003). Education regarding the nutrition & other health aspect during study period will help the young reproductive age rural women for their future life.

In spite of many efforts from different governmental & non governmental agencies focusing on different health aspects, this young population, especially the women, is deprived of the basic health care & awareness.

With the above background, the present study was formulated in order to see the awareness of reproductive age women in relation to health & to assess the effect of educational intervention on their knowledge levels in Allahabad District.

### Materials and Methods:-

This study was a cross sectional and descriptive study and 600 women were selected as unit of the study. The 3 villages of Chaka (Dandupur, Dhanuha, Sarangapur) and Jasra block (Semara, Kanjasa, Dalbabari) from Allahabad district were selected as area of the study and 100 respondents were randomly selected from each village as unit of study. The predesigned and pretested pro forma was used to elicit desired information. The Pre-Test questionnaire was filled by the respondents before the exposure of awareness documentary and Post-Test questionnaire was filled after the exposure with awareness documentary again by the respondents to assess the impact of nutritional awareness program. The data obtained was subjected to statistical analysis by using appropriate statistical techniques.

### Results and Discussion:-

**Table 1:- Awareness regarding Anaemia among the study Participants.**

S. No	Variables	Pre Test		Post Test	
		N	%	N	%
1.	<b>Aware of Anaemia?</b>				
	Yes	286	47.7	506	84.3
	No	314	52.3	94	15.7
2.	<b>Awareness regarding Symptoms of Anaemia?</b>				
	Yes	114	19	523	87.2
	No	486	81	77	12.8
3.	<b>Aware of Preventive Measures to be taken for Anaemia?</b>				
	Yes	246	41	518	86.3
	No	354	59	82	13.7
4.	<b>Are you aware about the Treatment of Anaemia?</b>				
	Yes	231	38.5	492	82
	No	369	61.5	108	18

The awareness regarding anaemia among the selected respondents was depicted in the Table-1. The observed data shows that only 47.7% respondents were aware about the condition of Anaemia and after the awareness program, the response for the same has been improves i.e. 84.3%. Correct response for the awareness regarding symptoms of anaemia was given by only 19% respondents before the education but after nutrition education, it was 87.2%. Most of the rural women were not aware about the preventive measures of the anaemia (59%) and available treatment for the anaemia (61.5). after the health and education program, response regarding both has been significantly improved i.e. 86.3% and 82% respectively. The observed data revealed that the majority of women were unaware about the term Anaemia and a very small group of women have the awareness regarding symptom, preventive measures and treatment of anaemia which may be resulted in the major health risks among rural Indian women (Patel *et al.*, 2013).

**Table 2:-** Awareness regarding Nutritional Management of Anaemia among the study Participants-

S. No	Variables	Pre Test		Post Test	
		N	%	N	%
1.	<b>Can Anaemia be treated by Iron Rich Foods?</b>				
	Yes	316	52.7	548	91.3
	No	284	47.3	52	8.7
2.	<b>Inclusion of Vitamin C helps in Iron Absorption?</b>				
	Yes	107	17.8	339	56.5
	No	493	82.2	261	43.5
3.	<b>Do you aware about Iron Rich Foods?</b>				
	Yes	241	40.2	561	93.5
	No	359	59.8	39	6.5
4.	<b>Do you aware about Vitamin C rich Foods?</b>				
	Yes	234	39	569	94.8
	No	366	61	31	5.2

The data regarding awareness about nutritional management of anaemia among the study participants was illustrated in the Table-2 in which the observations shows that about 52.7% women were aware that anaemia can be treated with the consumption of iron rich food and this percentage were improved (91.3%) after the exposure with awareness documentary. Among the selected women only 17.8% women were aware that vitamin C helps in the absorption of iron in the body, but after the education the response for the same has been significantly improved i.e. 56.5%. Most of the rural women were unaware about the iron rich foods (59.8%) and vitamin C rich foods (61%). But after the nutritional awareness program, the response regarding the both has been significantly improved i.e. 93.5% and 94.8% respectively. The observations shows that rural women were aware about role of iron rich food in treating anaemia and the iron rich foods into some extent but most of them were unaware regarding role of vitamin C in the iron absorption and the novel food sources of vitamin C. so this condition may leads to low level of serum iron due to poor absorption in the intestine even in the presence of iron rich foods in the daily diet (Pareek *et al.*, 2015).

**Table 3:-** Awareness regarding Indigenous Food Processing Practices among the study Participants.

S. No	Variables	Pre Test		Post Test	
		N	%	N	%
1.	<b>Aware of different Indigenous Food Processing Practices?</b>				
	Yes	133	22.2	456	76
	No	467	77.8	144	24
2.	<b>Aware of Nutritional Benefits of Indigenous Food Processing Practices?</b>				
	Yes	127	21.2	471	78.5
	No	473	78.8	129	21.5
3.	<b>Aware about different food products developed by Indigenous Food processing Practices?</b>				
	Yes	302	50.3	571	95.2
	No	298	49.7	29	4.8
4.	<b>Aware of role of Indigenous Food products in obtaining Household Food Security?</b>				
	Yes	513	85.5	374	62.3
	No	87	14.5	226	37.7

The data regarding awareness about indigenous food processing practices among the selected respondents were collected and gathered in the Table-3. The observations shows that only 22.2% rural women were aware about different indigenous food processing practices, but after the education program the response for the same has been significantly improved i.e. 76%. The correct response for nutritional benefits of the indigenous food processing practices was given only by 21.2% women before the nutritional awareness program but after the awareness it was 78.5%. Most of the rural women were unaware about the different foods prepared by using indigenous food processing practices (50.3%) and role of indigenous food products in obtaining household food security (85.5%). After the health and nutrition education program, the response for the both has been significantly improved i.e. 95.2% and 62.3% respectively. The obtained data revealed that most of rural population was unaware about the term indigenous food processing methods and their nutritional benefits (FAO, 2009), (FAO, 2013).

**Table 4:-** Awareness regarding Household Food Security among the study Participants-

S. No	Variables	Pre Test		Post Test	
		N	%	N	%
1.	<b>Do you aware about the term “Food Security”?</b>				
	Yes	47	7.8	229	38.2
	No	553	92.2	371	61.8
2.	<b>Do you aware about the major consequences of Household Food Insecurity?</b>				
	Yes	58	9.7	212	35.3
	No	542	90.3	388	64.7
3.	<b>Aware about different measures to combat Household Food Insecurity?</b>				
	Yes	37	6.2	194	32.3
	No	563	93.3	406	67.7
4.	<b>Aware of reasons behind higher percentage of Food Insecure Women in India?</b>				
	Yes	201	33.5	489	81.5
	No	399	66.5	111	18.5

The observation regarding awareness level of rural women of Allahabad district about household food security were gathered in the Table-4. The obtained data shows that a very low percentage of women were aware about the term Food Security which was improved to 38.2% after the exposure of the respondents with the awareness documentary. Majority of the women (90.3%) were unaware about major consequences of the household food insecurity but after the exposure with awareness material, the percentage was improved to 35.3%. Most of the selected women were not aware about the different measures to combat household food insecurity (93.3%) and reason behind the higher percentage of food insecure women in India (66.5%) but after the exposure with awareness material, the response for the both has been significantly improved i.e. 32.3% and 81.5% respectively. The observations revealed that there was a lack of awareness regarding food security and related aspects in the selected research area (Muro, et al., 2007).

### Conclusion:-

Based on the obtained data it can be concluded that among the selected respondents, women are aware about the term anaemia (47.7%) more than the symptoms (19%), preventive measures (41%) and treatment of anaemia (38.5%) while they were also aware about impotence of iron rich foods in the treatment of anaemia (52.7%) but having low level of awareness regarding iron and vitamin C rich foods (40.2% and 39% respectively). Most of the rural women were unaware about indigenous food and related processing techniques (22.2%) and very low level of awareness were recorded about the concept of food security and related aspects (7.8%). After the exposure with the health and nutrition education program, the response for each question has been significantly improved and this will may leads to better health and healthy life of the selected respondents.

### Recommendation:-

It can be concluded from the above study that educational intervention, if given in right manner, can bring out positive changes in its true sense & can modify or change the lives of people. This holds true more for the younger population as they are the future men & women who would promote growth & development of our nation.

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### RESEARCH ARTICLE

#### THE WARNING SIGN OF PREMALIGNANCY LEUKOPLAKIA- A REVIEW.

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#### Abstract

The most commonly encountered and accepted precancerous lesions in the oral cavity are leukoplakia, OSMF, Lichen planus. Oral leukoplakia causes no great discomfort, and it is rarely disfiguring. It is undiagnosed by patient and neglected by many clinician. Investigation and treatment of leukoplakia helps to prevent the patient from turning into malignancy.

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#### Introduction:-

The most commonly encountered and accepted precancerous lesions in the oral cavity are leukoplakia and erythroplakia<sup>(1)</sup>. Since the term leukoplakia was introduced by Schwimmer in 1877 it has been applied in many different ways. The most important variation is between those who use it in a clinical sense alone, and those who restrict the term to lesions that show, histologically, a significant degree of epithelial dysplasia: in other words, to lesions that presumably are more likely to become malignant<sup>(2)</sup>. Commonly, oral leukoplakia causes no great discomfort, and it is rarely disfiguring. Therefore, our main concern about this condition arises from the well-established observation that about 4% of patients with leukoplakia ultimately develop squamous cell carcinoma within the area of leukoplakia (Pindborg 1971), this progression often being on a very long time scale. However, this general figure conceals many variations, and special reference should be made to leukoplakia associated with the use of tobacco.<sup>(2)</sup> The site of involvement may also have a marked influence on the risk of malignant change. Of all leukoplakias, those of the floor of the mouth and the ventral surface of the tongue, and especially leukoplakia confined to those areas, seem to carry a very high risk of malignant change<sup>(2)</sup>.

#### Defination:-

**WHO (1978):** "A white patch or plaque that cannot be characterized clinically or pathologically as any other disease".

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**Warnakulasuriya et al.(1978):** “Leukoplakia should be used to recognize white plaques of questionable risk having excluded (other) known diseases or disorders that carry no increased risk for cancer”.

**First International Conference on oral leukoplakia. Malmo, Sweden :** “ A white patch or plaque that cannot be characterized clinically or pathologically as any other disease and is not associated with any physical or chemical causative agent except use of tobacco”.

#### **Etiology:-**

A number of locally acting etiologic agents, includes: Tobacco, Alcohol, Candidiasis, Electrogalvanic reactions, Herpes simplex and Papillomaviruses, Sunlight (specifically, ultraviolet radiation ).

These have been implicated as causative factors for leukoplakia. True leukoplakia is most often related to tobacco usage; more than 80% of patients with leukoplakia are smokers. The development of leukoplakia in smokers also depends on dose and on duration of use, as shown by heavier smokers’ having a more frequent incidence of lesions than light smokers. Cessation of smoking often results in partial to total resolution of leukoplakic lesions.

Smokeless tobacco is also a well-established etiologic factor for the development of leukoplakia; however, the malignant transformation potential of smokeless tobacco–induced lesions is much lower than that of smoking-induced lesions.

Alcohol consumption alone is not associated with an increased risk of developing leukoplakia, but alcohol is thought to serve as a promoter that exhibits a strong synergistic effect with tobacco, relative to the development of leukoplakia and oral cancer. In addition to tobacco, several other etiologic agents are associated with leukoplakia. Sunlight (specifically, ultraviolet radiation) is well known to be an etiologic factor for the formation of leukoplakia of the vermilion border of the lower lip. *Candida albicans* is frequently found in histologic sections of leukoplakia and is consistently (60% of cases) identified in nodular leukoplakias but rarely (3%) in homogeneous leukoplakias. The terms “candidal leukoplakia” and “hyperplastic candidiasis” have been used to describe such lesions. Human papillomavirus (HPV), particularly subtypes HPV-16 and HPV-18, have been identified in some oral leukoplakias. there is evidence that HPV-16 may be associated with an increased risk of malignant transformation.<sup>(3)</sup>

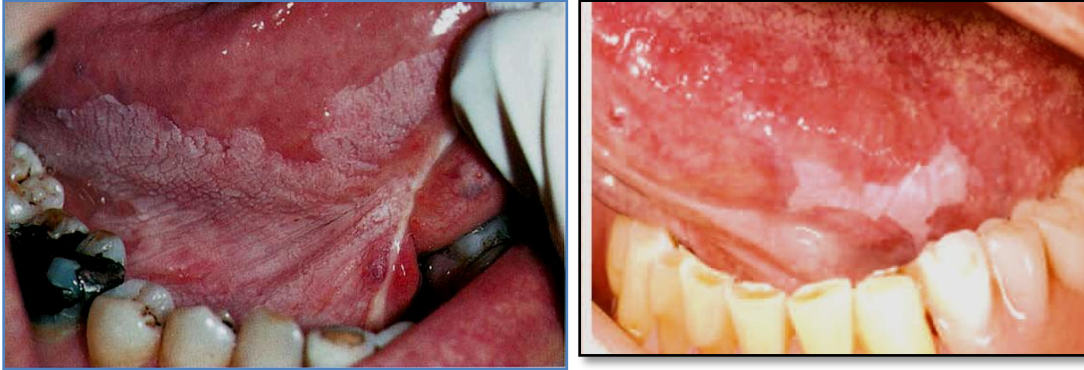
#### **Clinical features:-**

The incidence of leukoplakia varies by geographic location and patients’ associated habits. For example, in locations where smokeless tobacco is frequently used, leukoplakia appears with a higher prevalence . Leukoplakia is more frequently found in men, can occur on any mucosal surface, and infrequently causes discomfort or pain. Leukoplakia usually occurs in adults older than 50 years of age. Prevalence increases rapidly with age, especially for males, and 8% of men older than 70 years of age are affected. Approximately 70% of oral leukoplakia lesions are found on the buccal mucosa, vermilion border of the lower lip, and gingiva.<sup>(1)</sup> They are less common on the palate, maxillary mucosa, retromolar area, floor of the mouth, and tongue. However, lesions of the tongue and the floor of the mouth account for more than 90% of cases that show dysplasia or carcinoma.



Homogenous leukoplakia on left buccal mucosa & lateral border of tongue





**Figure:-** Diffuse leukoplakia on floor of mouth and left lateral border of tongue

#### **Clinical Subtypes:-**

Many varieties of leukoplakia have been identified.

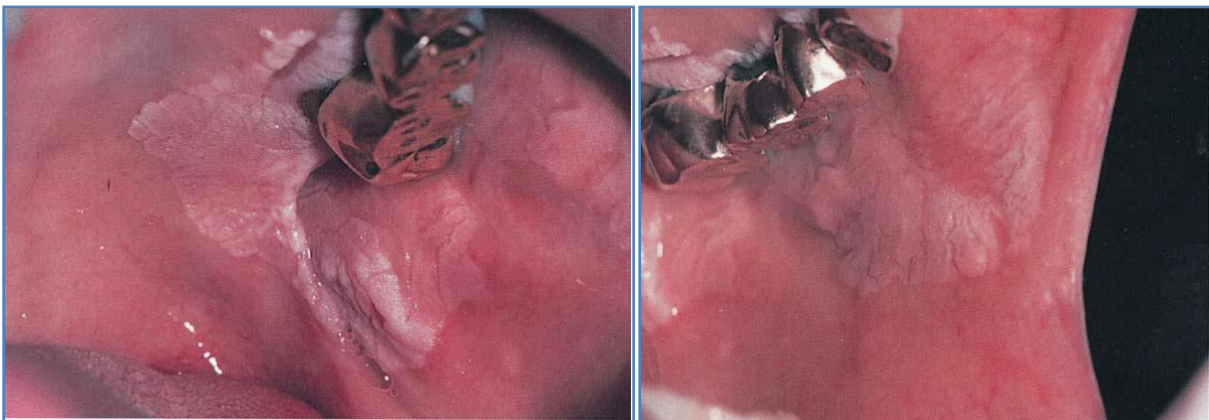
**“Homogeneous leukoplakia”** (or “thick leukoplakia”) refers to a usually well-defined white patch, localized or extensive, that is slightly elevated and that has a fissured, wrinkled, or corrugated surface. On palpation, these lesions may feel leathery to “dry, or cracked mud-like.”

**Non homogenous** variety includes:

**Nodular (speckled) leukoplakia** which is granular in nature. The name refers to a mixed red-and-white lesion in which keratotic white nodules or patches are distributed over an atrophic erythematous background. This type of leukoplakia is associated with a higher malignant transformation rate, with up to two-thirds of the cases in some series showing epithelial dysplasia or carcinoma.

**“Verrucous leukoplakia”** or **“verruciform leukoplakia”** is a term used to describe the presence of thick white lesions with papillary surfaces in the oral cavity. These lesions are usually heavily keratinized and are most often seen in older adults in the sixth to eighth decades of life. Some of these lesions may exhibit an exophytic growth pattern.

**Proliferative verrucous leukoplakia (PVL)** was first described in 1985. The lesions of this special type of leukoplakia have been described as extensive papillary or verrucoid white plaques that tend to slowly involve multiple mucosal sites in the oral cavity and to inevitably transform into squamous cell carcinomas over a period of many years. PVL has a very high risk for transformation to dysplasia, squamous cell carcinoma or verrucous carcinoma. Verrucous carcinoma is almost always a slow growing and well-differentiated lesion that seldom metastasizes.



**Figure:-** Proliferative verrucous leukoplakia (PVL)

Leukoplakia begins as thin, gray, or gray white plaque that may appear somewhat fissured or wrinkled, & are typically soft & flat. They usually have sharply demarcated borders but occasionally blend gradually into normal mucosa.

This early stage is sometimes referred as 'preleukoplakia' but preferable designated 'Mild or thin leukoplakia'. Thin leukoplakia may disappear or continue unchanged but as time progresses as many as two thirds of such plaques slowly extend laterally & acquire a distinctly white appearance from a thick keratinized layer. They may become leathery to palpation & fissures may deepen, but there should be only a few, if any, localized nodule or surface projections. At this stage the lesion is severe often called 'homogenous or thick leukoplakia'.<sup>(4,5)</sup>

#### **L C P STAGING: (L - size C - Clinical P – Pathological:-**

Recently the Leukoplakia was graded according to size, clinical and pathological stages it is known as LCP Staging :

L x = Size not specified, L 1 = Less than 2cm, single/ multiple, L 2 = 2 to 4 cm, single/ multiple  
L 3 = More than 4cm, single/ multiple, C 1 = Homogenous, C 2 = Non homogenous  
P x = Not specified, P 0 = No epithelial dysplasia, P 1 = Distinct epithelial dysplasia

	<b>Pathological</b>	<b>Clinical</b>
STAGE 1	L1 P0	L1 C1
STAGE 2	L2 P0	L2 C1
STAGE 3	L3 P0	L3 C1
STAGE 4	L3 P1	L3 C

#### **Investigations:-**

The following investigation should be done to detect the lesion which includes biopsy, toluidine blue (tolonium chloride.), lugol's iodine solution, punch biopsy, exfoliative cytology, brush biopsy, chemiluminiscent illumination.

#### **Histopathology:-**

Specific microscopic characteristics of dysplasia include:

Drop-shaped epithelial ridges, Basal cell crowding, Irregular stratification, Increased and abnormal mitotic figure, Premature keratinization, Nuclear pleomorphism and hyperchromatism, and An increased nuclear cytoplasmic ratio.<sup>(4,5)</sup>

#### **Treatment:-**

**Nonsurgical treatments (Medical management) options for oral leukoplakia :**

##### **Carotenoids:-**

**Beta-Carotene :** The carotenoids are a group of extremely hydrophobic molecules with little or no solubility in water . Beta-carotene is a carotenoid commonly found in dark green, orange or yellowish vegetables, such as spinach, carrots, sweet potato, mango, papaya, and oranges . Beta-carotene is a vitamin A precursor. The only known effect of excessive beta-carotene intake is a state in which the skin becomes strongly yellowish, the so-called carotenodermy, which disappears in a few weeks after the reduction of consumption. While some authors have demonstrated the absence of side effects in patients that have received beta-carotene treatment, in other studies, the supplement diet based on beta-carotene caused headaches and muscle pain in some of the patients. The use of beta-carotene has been recommended in order to prevent oral leukoplakia and possibly oral cancer<sup>(5)</sup>. The potential benefits and protective effects against cancer are possibly related to its antioxidizing action. This function is accomplished through a ligation between beta-carotene and oxygen, which is an unstable reactive molecule, thus diminishing the damaging effects of free radicals<sup>(6)</sup>.

**Lycopene :** Lycopene is a carotenoid without provitamin A action. This is a fat-soluble red pigment found in some fruit and vegetables. The greatest known source of lycopene is tomatoes, which are widely employed in cooking. There is a positive relationship between lycopene consumption and a reduction in the risk of the development of degenerative diseases caused by free radicals, such as cancer and cardiovascular diseases. Lycopene has the uncommon feature of becoming bound to chemical species that react to oxygen, thus being the most efficient biological Antioxidizing agent.<sup>(7)</sup> In addition to its antioxidizing property, lycopene also has the capacity to modify intercellular exchange junctions, and this is considered to be an anticancer mechanism. Lycopene is better absorbed



in oil resin capsules and in tomato juice than in the form of raw tomatoes. No systemic significant toxic effect of lycopene has been observed and there is no evidence of side effects from the treatment with lycopene. Lycopene is a promising candidate in reducing cancer and chronic diseases in human beings; however, further research is needed to clarify its potential function in human health, according to the following criteria.

#### **Vitamins:-**

##### **L-Ascorbic Acid (Vitamin C):-**

L-ascorbic acid (L-AA), the so-called vitamin C, is found in citrus fruits such as kiwi, strawberries, papaya, and mango. The current US recommended daily allowance for ascorbic acid ranges between 100–120 mg/per day for adults. It has been suggested that a daily intake of at least 140 mg/day is required for smokers because they usually present a reduction of the L-AA concentration in serum leukocytes.<sup>(8)</sup> L-AA has antioxidizing properties and reacts with superoxide produced as a result of the cells' normal metabolic processes; this inactivation of superoxide inhibits the formation of nitrosamines during protein digestion and helps avoid damage to DNA and cellular proteins. L-AA toxicity does not occur, since vitamin is water-soluble and a decrease in absorption efficiency occurs when consumption exceeds 180 mg/day.<sup>(9)</sup>

##### **Retinoic Acid (Vitamin A):-**

The current definition of retinoid includes all the natural and synthetic compounds with an activity similar to that of Vitamin A. Vitamin A exists in the human body as various interconvertible compounds, notably retinal (essential for vision) and retinol, which is the most potent analogue and the main form of storage and transportation. Retinoic acid is obtained from carotene and animal products such as meat, milk, and eggs, which, while in the intestine, are converted, respectively, into retinal and retinol<sup>(10)</sup>. In the systemic use with dosage of 300.000 IU of retinoic acid (Vitamin A), a clinical resolution of the 50% has been demonstrated. In topical use with dosage range from 0.05% to 1% a clinical resolution from 10% to 27% has been obtained<sup>(11)</sup>.

##### **Bleomycin:-**

Bleomycin, a cytotoxic antibiotic, was first used for the treatment of neoplasms of the penis and scrotum, but has also been employed for squamous cell carcinoma of the head and neck region, oesophagus, and skin. The most commonly adverse effects are mucocutaneous reactions, which include stomatitis, alopecia, pruritic erythema, and vesiculation of the skin. The use of topical 1% bleomycin in DMSO was evaluated for the treatment of dysplastic OL.<sup>(12,13)</sup>

##### **Photodynamic Therapy:-**

Photodynamic therapy (PDT) is a noninvasive method for the treatment of premalignant lesions and head and neck cancers. The principle of PDT is a non thermal photochemical reaction, which requires the simultaneous presence of a photosensitising drug (photosensitiser), oxygen, and visible light. After a period to allow the photosensitiser to collect in the target tissue, the photosensitiser is activated by exposure to low-power visible light of a drug-specific wavelength. Illumination of the tumour by light at the activating wavelength results in the destruction of cells by a non free radical oxidative process. These reactive oxygen species may damage crucial cell components, such as structural proteins, enzymes, DNA, and phospholipids. PDT is a cold photochemical reaction, and the photosensitizing agents are of inherently low systemic toxicity. PDT damage heals mainly by regeneration rather than scarring. Due to the organ preserving principle of PDT, important structures are maintained with good functional and cosmetic outcome. Several photosensitisers have been developed during the past. Haematoporphyrin and haematoporphyrin derivatives were the first photosensitisers.<sup>(14)</sup>

##### **Surgical treatment:-**

A consensus considered that surgery is the 1st choice in the management of oral leukoplakia, but it has not been demonstrated that totally removing the lesion will exclude the malignant transformation.

The surgical treatment is a diagnostic tool which is used also in the evolution of oral leukoplakia as part of its surveillance. there are different surgical techniques: laser, scalpel, electrocauterisation and cryosurgery.

The **laser surgery** has been reported as most appreciated in the last 30 years . There are two main benefits of the laser: the haemostatic effect and the limited scars post treatment. This can be performed for extensive lesions. It also has reduced post operative discomfort but the main disadvantage is that the histological diagnosis of the excised area will be missing. Furthermore comparing different laser techniques, CO2 laser, neodymium: yttrium aluminum

garnet (NdYAG) laser, and potassium-titanyl-phosphate (KTP) there are differences in recurrence rates (34.2%, 28.9%, and 17 %) <sup>(15)</sup>.

**Electrocoagulation** can be used alone or as an adjuvant to scalpel surgery. It induces thermal damage in the surrounding tissues thus causing postoperative pain and edema and tissue scarring.

#### **Cryotherapy:-**

It is a method which permits the destruction of lesion tissue by freezing. It is carried out by either an “open” or a “closed” system. The open-system cryotherapy is the direct application of cryogen on the lesion using a cotton swab or by an open spray. The closed system of cryotherapy brings a greater degree of control with more complex and delicate apparatus. The main advantages of cryotherapy are the bloodless intervention, reduced risk of post-operative infection, and the lack of scarring <sup>(16,17)</sup>.

#### **Conclusion:-**

It is estimated that most of all cancers and cancer mortality worldwide are preventable through early detection, as it provides a greater chance of initiating early and successful treatment. Only sure way to avoid cancer is not to be born, but we can reduce our chances for cancer by a balanced approach to cancer prevention, early detection and effective early treatment. The main objective of secondary prevention is early detection of PMDs when they can be treated most effectively. PMDs are often undiagnosed due to lack of public awareness and due to lack of knowledge among medical professionals. Clinical appearance and diagnosis of a lesion is not adequate to determine its premalignant nature, as not all white lesions turn malignant. Diagnostic biopsy and histopathological examination should be considered for any mucosal lesion that persists for more than 14 days after obvious irritants have been removed.

Prognosis and patient survival is directly related to stage and grade of cancer at initial diagnosis.

Dentists and other health care professionals need to understand and play an important role in the early detection and diagnosis of oral cancer and potential malignant disorders as it can prevent the development of severe dysplasia of potential malignant disorders or provide a better prognosis for patients affected by oral cancer through an immediate treatment.

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### RESEARCH ARTICLE

#### Knowledge, attitude and practices of Saudi Men towards testicular cancer and testicular self-examination in The Western Region of Saudi Arabia.

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Testicular Cancer, Testicular-Self Examination, Awareness.

#### Abstract

**Background:** Since early detection is the key for a better prognosis in different types of malignancies, this paper was conducted to determine the level of knowledge, attitude and practice of testicular cancer and testicular self-examination among the population in the western region of Saudi Arabia.

**Materials and Methods:** This cross-sectional study was conducted in March 2016 at King Abdullah Sports City and Red Sea Mall Jeddah, Saudi Arabia, where 1600 male subjects aging 15 and above were interviewed, and the data were collected using a questionnaire.

**Results:** It was determined in this study that knowledge level about TC is extremely insufficient where 61.36% reported lack of knowledge about TC. It also showed how lack of awareness of TSE and poor health education can reflect on the knowledge and practice of TSE where only 16.88% were educated.

**Conclusion:** it is highly recommended to encourage and promote health education programs among the public regarding how common TC is in young males, as well as focus on the importance of practicing TSE regularly. It is also recommended that health care professionals should educate and periodically evaluate the role of such practices when it comes to early detection and better management of TC.

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#### Introduction:-

Testicular cancer (TC), is the most common malignancy in men between 15 and 35 years of age, accounting for 20% cancer diagnosed in men within this age group [1]. Yet, it represents only 1% of all malignancy in men [2]. The international agency for research on cancer in 2012, produced an estimate of 55266 TC cases worldwide, with a next 5 years prevalence rate of 214666 cases [3].

Not many decades ago, TC's mortality rate reached 11% of all cancer related mortality, with a 5-year survival rate of 64% [4]. More recently, however, with the new diagnostic and therapeutic modalities at hand, a new dawn has emerged in terms of prognosis, making TC one of the most curable cancers in adults, with an overall survival rate reaching >95% in 10 years [5].

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Early detection is becoming, the only way to improve outcomes in accordance with the current successful therapeutic algorithm.

Determinants of early detection and diagnosis of TC are two-fold, one: Knowledge and oncology awareness of the male population, especially the young sector, and two: Performance of regular monthly testicular self-examination (TSE) as one of the first signs of TC is often a lump or swelling in the testis [6].

Conflicting views are found in the literature about whether TSE should be encouraged to the public, as some suggest that the costs outweigh the benefits, both because of the relatively low incidence compared to other health concerns and because of the anxiety they feel such a focus would provoke [7]. In 1996, Best et al, conducted a study by providing information about TSE to 1,286 high school male students and compared them to a control group after 6 and 18 months. The comparison demonstrated that while the knowledge level increased significantly, the anxiety level did not [8].

Some medical associations, such as the American Urological Association recommend TSE for the early detection of TC [9]. The American cancer society (ACS) recommends that examining a man's testicles should be a part of general physical exam, as well as a cancer-related check-up. Regular TSE has not been adequately evaluated enough to establish that it indeed lowers the risk of TC mortality. Thus, the ACS does not recommend regular TSE for all men. Still, some recommend that all men examine their testicles monthly after puberty [10].

In Saudi Arabia, few studies have been conducted to assess level of awareness about TC and TSE, and as a result, no general recommendations nor acknowledged expert opinions in the country addressed the issue. Therefore, the present study was conducted to assess the knowledge level, attitudes and practices of the general population about TC and TSE in Saudi Arabia.

### **Methodology and Materials:-**

This is a cross-sectional study, which was conducted during March, 2016, in 2 public venues (King Abdullah Sports City, and Red Sea Mall) in Jeddah, Saudi Arabia. A total of 1600 randomly selected male subjects were interviewed by Medical Students.

Males above 15 years were interviewed. Exclusion criteria included the inability to perform TSE (e.g. bilateral undescended testis, hand motility disorders, etc.), and males with severe mental disability.

### **Data collecting tools:-**

A questionnaire was utilized to help collect data. It consisted of three sections. The first covered subjects' demographic characteristics. The second addressed questions regarding knowledge of TC, while the third addressed participants' knowledge, attitude and practices of TSE. All completed forms were anonymous.

### **Statistical analysis:-**

Levels of knowledge were calculated as total scores by setting different code systems to positive questions (Disagree = 0, Do not know = 1, Agree = 2) and negative questions (Disagree = 2, Do not know = 1, Agree = 0) then by transforming the scores into percentages and classifying into weak (<50%), average (50-75%), and high (>75%). Statistical analysis was performed with Statistical Package for Social Sciences (SPSS version 22.0).  $P < 0.001$  was set as statistically significant in comparison.

### **Results:-**

The demographic characteristics (Age, Marital Status, Education and Occupation) of the participants are shown in table 1.

Table (1):- The frequency and percentage of demographic characteristics (Age, Marital Status, Education and Occupation)		
	N	%
<b>Age</b>		
15-19	371	23.19
20-24	495	30.94
25-29	317	19.81
30-34	153	9.56
35-39	113	7.06
>40	151	9.44
<b>Range</b>		
Mean±SD	±	
<b>Marital Status</b>		
Single	1084	67.75
Married	483	30.19
Divorced	30	1.88
Widower	3	0.19
<b>Education</b>		
Middle School	112	7.00
High School	722	45.13
Under-graduate	724	45.25
Post-graduate	42	2.63
<b>Occupation</b>		
Student	597	37.31
Employed	767	47.94
Unemployed	236	14.75

**TC Knowledge:-**

61.36% of the interviewed males (n=978) did not know that it is possible to get TC. Less than 10% had received some form of education regarding TC (Table 2). With regard to the knowledge of risk factors for Testicular Cancer, table 2 shows responses reflecting the knowledge about symptoms and risk factors of TC.

Table (2):- The frequency and percentage of Risk Factors of TC and Symptoms of TC		
	N	%
<b>Risk factors of TC</b>		
Age	225	14.06
Prior trauma to the testis	611	38.19
Undescended testicle	299	18.69
Race and ethnicity	179	11.19
Family history of TC	470	29.38
Smoking	524	32.75
<b>Have you been educated on the risks of developing TC?</b>		
Yes	148	9.75
No	1452	90.75
<b>Symptoms of TC</b>		
Painless lumps on the testicle	377	23.56
Swelling and hardness of the testicle	839	52.44
Aching in the lower abdomen	364	22.75
Painful lumps on the testicle	439	27.44
Redness and itchiness of the scrotum	313	19.6
Nausea and fatigue	139	8.69

A general lack of knowledge was evident from the significantly high prevalence of answering "I don't know" to all three questions (P<0.001) (Table 3).

Table (3):- The frequency and percentage of response to the following questions:

Items		Agree	Disagree	Do not know	Weight	%	Chi-square	
							X <sup>2</sup>	P-value
<b>Do you think that TC has a cure?</b>	<b>N</b>	757	47	796	2310	72.1875	666.639	<0.001*
	<b>%</b>	47.31	2.94	49.75				
<b>If someone is diagnosed with TC, will he become infertile?</b>	<b>N</b>	452	280	868	1772	55.375	342.740	<0.001*
	<b>%</b>	28.25	17.50	54.25				
<b>TC can be prevented.</b>	<b>N</b>	737	144	719	2193	68.53125	426.624	<0.001*
	<b>%</b>	46.06	9.00	44.94				

#### Knowledge, attitude and practices of TSE:-

Table 4 highlights the responses of subjects about knowledge, attitude and practice of TSE.

Only 16.88% (n=270) stated that they had been educated regarding the benefits of TSE. Among those who received education, 54.98% gained this knowledge either at school or through a physician. More than 90% of the participant men had never performed a TSE.

Table (4):- The frequency and percentage of Knowledge and practice of TSE

	N	%
<b>Have you heard of TSE?</b>		
Yes	313	19.56
No	1287	80.44
<b>Have you ever been taught how to perform TSE?</b>		
Yes	161	10.06
No	1439	89.94
<b>Have you ever performed TSE?</b>		
Yes	182	11.38
No	1418	88.63
<b>Have often do you perform TSE?</b>		
Never	1449	90.56
Once a year	68	4.25
Every 6 months	32	2.00
Every 3 months	16	1.00
Every 1 month	15	0.94
Often (every week)	20	1.25
<b>Have you ever been educated on the benefits of TSE?</b>		
Yes	270	16.88
No	1330	83.13
<b>If you have been educated, please indicate how this education was obtained?</b>		
No, I have not been educated	58	21.40
At school	57	21.03
By a doctor	92	33.95
Other	64	23.62

#### Discussion:-

This represents the first study; in Saudi Arabia to examine the knowledge, levels of practice and attitude towards TC and TSE. Several other studies have been conducted, in other countries, involving public audience [11], medical students [12], hospital technicians [13] and residents [14, 15] as subjects.

#### TC Knowledge:-

Our study subjects have shown significantly low levels of knowledge towards TC, where 93% have a weak level of knowledge. For example, 38.19% believed that prior trauma to the testis is a risk factor and 52.56% and 19.6%



believed that redness and itchiness of the scrotum is a symptom of TC. This lack of knowledge can be explained by the educational level of the majority of the subjects where 90.38% are either undergraduates or high school graduates ( $P < 0.001$ )

The percentage of subjects who has heard of TC in the current study is much lower than shown in another study that was conducted among technicians working in hospitals, which showed 63.6% having heard about TC. Given the fact that such subjects work in the health care field, a degree of higher awareness level is to be expected [13]. Furthermore, a different questionnaire was used to assess TC-related knowledge in the two studies

As for knowledge about the treatment and prevention of TC, a similar low level of knowledge was demonstrated. A significant percentage of subjects responded with "I don't know" to questions about likelihood of TC cure (49.75%) and prevention (44.9%).

#### **TSE Knowledge, Practice and Attitude:-**

The current study suggests a low level of knowledge about TSE among Saudi men, with 19.56% having heard about TSE, and only 11.38% having ever performed it. These results are in keeping with even lower TSE knowledge and practice levels which were previously reported among young European men and medical students [11, 12]

Among the 16.88% who were educated about TSE, 33.95% stated having received their education from a physician. These findings support the role of physicians in teaching TSE. Unfortunately physician's participation in patient TSE education has been variable in different reports. A study involving pediatric residents revealed a high prevalence of 40% who regularly engaged in teaching TSE to their patients [14]. However, an earlier study showed only 17.5% of physicians taught TSE to adolescent male patients on a routine basis [15]. Such an increase in prevalence of teaching is promising, but a similar study in our country is necessary to state a definite comparison.

#### **Conclusion:-**

The results of this study shows a great lack in knowledge level about TC. It also demonstrates how the lack of knowledge and awareness of TSE and poor spread of education are primary barriers to TSE. Given the excellent prognosis of TC when detected early, it would be advisable to direct attention towards public education programs. Furthermore, emphasis should be given to patient education regarding TC and TSE but healthcare professionals.

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### RESEARCH ARTICLE

#### DEVELOPMENT IN WOODS A SUSTAINABLE BUILDING.

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Wood, as a green building.

#### Abstract

Timber from plantation, growth and conversion in to Wood's design with the innovation of glulam, cross laminated timber (clt) makes it flexible, suitable for a wide range of building types and applications, both structural and aesthetic. Wood can be used in many types of buildings, from single-family homes to multi-storey condominiums and offices, schools, health facilities, recreational centres and public gathering areas. It is suitable not only as a finish material, bringing warmth and natural beauty to interior and exterior applications, but as a structural material, offering a cost-effective way to meet building code.

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#### Introduction:-

##### Wood:-

Along with stone, clay and animal parts, wood was one of the first materials worked by early humans. Microware analysis of the Mousterian stone tools used by the Neanderthals show that many were used to work wood.

Wood is an organic, hygroscopic and anisotropic material. It's thermal, acoustic, electrical, mechanical, aesthetic, working, etc. But wood has some disadvantages too.

##### General feature of a tree body:-

As vascular plants, trees are organized into three major organs: the roots, the stems, and the leaves. The leaves are the principal photosynthetic organs of higher vascular plants. They are attached by a continuous vascular system to the rest of the plant so that free exchange of nutrients, water, and end products of photosynthesis (oxygen and carbohydrates in particular) can be carried to its various parts.

##### Seasoning of Wood:-

Seasoning is the process of removing the moisture content from wood to minimize structural problems when used in construction or to provide less smoke and more uniform combustion when used as firewood.

##### Different Ways of Seasoning Wood:-

i. Air Seasoning: The traditional method for drying wood, air seasoning is also the longest, taking six to nine months. To air season wood, stack logs or planks outside on pallets in such a manner that air can circulate vertically and horizontally through the timbers. The raised pallets also keep wood away from vegetation and damp ground. Plank and log ends are often wrapped or sealed to prevent excessive moisture loss through these areas. Protect the drying wood from the elements with an overhead canopy.

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**ii. Kiln Seasoning:** The most common and effective commercial process for drying wood is kiln seasoning, which accelerates the process of removing moisture through the use of external energy. Drying takes two days to one weekend, depending on the type of wood. Two methods, progressive and compartmental, are used for kiln seasoning. In a progressive kiln, timber enters at one end and travels on a trolley through chambers with different air conditions to progressively dry the wood. This method produces a constant flow of seasoned timber. Wood seasoned via the compartmental process remains in a single building where it is subjected to a program of varying conditions until the moisture content is removed. This process is used for hard-to-dry or expensive wood.

**iii. Solar Kiln:** This method combines the speed of kiln seasoning with the low energy of air drying. Solar kilns have single-thickness windows on the south side of the structure that work as collectors to trap the sun's energy. Heat collectors, made from black metal are attached near the top of the window sashes. Various methods force the heated air to circulate through the kiln to dry the wood. Some solar kilns have insulation to retain heat at night. This process takes approximately twice as long as traditional kiln seasoning. Because of its gentle nature, it is well suited to producing wood for furniture fabrication.

**iv. Microwave Seasoning:** Microwave seasoning uses pulsed energy directed into timbers to drive out moisture in a manner that will not cause seasoning degrade. This method also provides advantages such as high speed and high quality and is well suited for seasoning lumber, blocks, veneer, chips, paper and wood-based composite materials. Areas in the wood with the most moisture absorb the most energy resulting in even temperature during the drying process and uniform moisture content. These factors enhance quality and reduce timber checking and warping.

#### Cross section of a tree trunk:-

**i. Annual or growth rings:** These indicate rapid growth resulting in thin walled fibre or smaller proportion of the denser wood.

**ii. Bark:** the outer layer, corklike and provides protection to the tree from knocks and other damage.

**iii. Bast:** the inner bark carries enriched sap from the leaves to the cells where growth takes place.

**iv. Cambium:** layer of living cells between the bast and the sapwood.

**v. Crown:** the branches and leaves that provide its typical summer shape.

**vi. Heartwood:** mature timber, no longer carries sap, the heart of the tree, and provides the strength of the tree.

**vii. Medulla ray:** (rays) food storage cells radiating from the medulla.

**viii. Pith or medulla:** the centre of the tree, soft and pithy especially in the branches.

**ix. Sapwood:** new growth, carries the raw sap up to the leaves.

**x. Trunk:** main structure of the tree, produces the commercial timber.

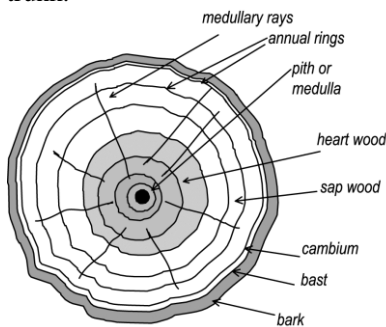
**xi. Root structure:** Absorbs water and minerals from the soil.

#### Hardwoods and Softwoods:-

There are two main groups of timber producing trees used commercially; softwoods and hardwoods.

**i. Softwoods:** Softwoods are coniferous trees and the timber is not necessarily 'soft'. They are 'evergreen'. (The larch is an exception) Their general characteristics are: i. Straight, round but ii. Slender, tapering trunk.

**ii. Hardwoods:** Hardwood trees are broadleaf and generally deciduous. The general characteristics are: i. Stout base that scarcely tapers but divides into branches to form a wide, round crown. ii. The leaves are broad and may have single or multi lobes. Fig 2 shows three trunk.



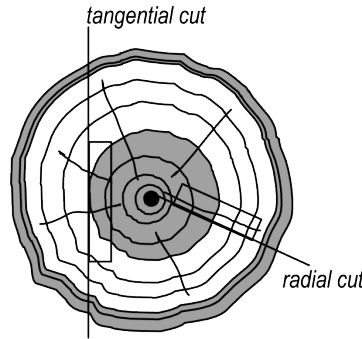
The tree trunk showing growth rings

**Fig 1.3:-** Represent tree trunk showing growth ring. Source: Geoff's Woodwork

**Conversion of timber:-**

As soon as possible after felling the tree should be converted into usable timber. There are two main methods of converting timber: Through and through (or Plain or Crown sawn) which produces tangential boards and Quarter Sawn which produces radial boards.

Through and through produces mostly tangentially sawn timber and some quarter sawn stuff. (Fig 1.5) Tangential timber is the most economical to produce because of the relatively less repetitive production methods. It is used extensively in the building industry.

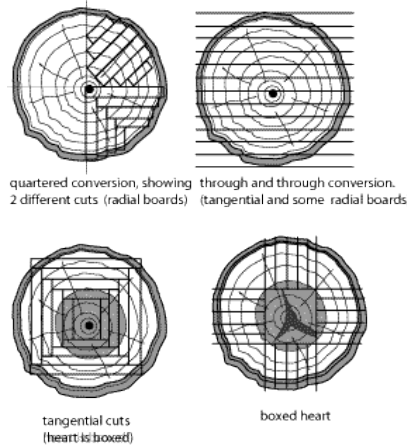


**Fig 1.4:-** through and through produces mostly tangentially. Source: Geoff’s Woodwork.

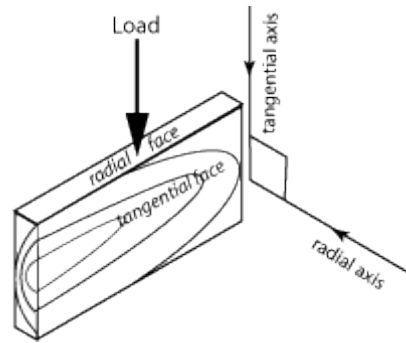
There are other ways but they are all variations of tangential and radial cuts to obtain the best or most economical boards for the use it is to be put.

Tangential boards (crown, plain or flat sawn) are used extensively for beams and joists. See fig 1.5 below.  
 Radial boards (radial, figured or quarter sawn) are typically cut on 'the quarter' and produce a pattern of the medullary rays especially in quartered oak. See fig 1.5 below

Crown sawn is obtained by sawing tangentially to the annual rings. See fig 1.5 below.  
 Rift sawn is the cut which falls between crown and true quarter sawn. See fig 1.5 below  
 Quarter sawn boards are radial cut from the centre of the tree. See fig 1.5 below



**Fig 1.5:-** Showing methods of conversion of a timber. Source: Geoff’s Woodwork.



**Fig 1.6:-** shows method at which timber conversion has taken place. Source: Geoff's Woodwork  
**Types of Woods Processed:-**

### 1. Hard Wood

**i. Oak:** Oak is the most widely used hardwood. There are more than 60 species of oak grown in the U.S., which can be separated into two basic varieties; white and red. Properties: Oak is a heavy, strong, light colored hardwood. Uses: It is used to craft outdoor furniture and decorative carvings. Redwood burls have a "cluster of eyes" see fig 2.1.



**Fig 2.1** showing sample of oak wood. Source: hooved signs

**ii. MAPLE:** Properties: Maple is so hard and resistant to shocks that it is often used for bowling alley floors. Its diffuse evenly sized pores give the wood a fine texture and even grain. Burls, leaf figure, and birds-eye figures found in maple are used extensively for veneers. See fig 2.2 below. Uses: Maple is used extensively for colonial furniture, making.



**Fig 2.2** showing a sample of maple wood. Source: hooved signs

**iii. MAHOGANY:** is a tropical hardwood indigenous to South America, Central America and Africa. Properties: Mahogany is strong, with a uniform pore structure and poorly defined annual rings. It has a reddish - brown color and may display stripe, ribbon, broken stripe, rope, ripple, mottle, fiddleback or blister figures. Uses: Mahogany is used extensively in the crafting and furniture making see fig 2.3 below.



**Fig 2.3** showing a sample of mahogany wood. Source: hooved signs

**iv. CHERRY:** Cherry is grown in the Eastern half of the U.S. It is sometimes called fruitwood. The term fruitwood is also used to describe a light brown finish on other woods. Properties: A moderately hard, strong, closed grain, light to red-brown wood, cherry resists warping and checking. It is easy to carve and polish. Uses: Cherry veneers and solids are used in a variety of styles. See fig 2.4 below.



**Fig 2.4** showing a sample of cherry wood. Source: hooved signs

**v. WALNUT:** Walnut is one of the most versatile and popular cabinet making woods. It grows in Europe, America and Asia. There are many different varieties. Properties: Walnut is strong, hard and durable. Uses: used in all types of fine cabinet work. See fig 2.5 below



**fig 2.5** showing a sample of walnut wood. Source: hooved signs

**vi. ROSEWOOD:** Very hard and has a dark reddish brown color. It is fragrant and close grained. It is hard to work and takes high polish. Used in musical instruments, piano cases, tool handles, art projects, veneers and furniture. See fig 2.6 below.



**Fig 2.6** showing a sample of rose wood. Source: hooved signs

**vii. TEAK:** True teak is indigenous to Southeast Asia, but similar wood species also grow in Africa. Properties & Uses: Teak is a yellow to dark brown hardwood which is extremely heavy, strong and durable. See fig 2.7 below



**Fig 2.7** showing a sample of rose wood. Source: hooved signs

#### **SOFTWOODS**

**i. HICKORY:** There are 15 species of hickory in the eastern United States, eight of which are commercially important. Properties: Hickory is one of the heaviest and hardest wood. See fig 2.8



Fig 2.8 showing a sample of hickory wood. Source: hooved signs

**iv. CEDAR:** Several species of cedar grow in the southern United States, Central and South America. Properties & Uses: Cedar is a knotty softwood which has a red-brown color with light streaks. Simple cases and storage closets are also constructed from this light, brittle wood. See fig 2.12 below



**Fig 2.13** showing a sample of cedar wood. Source: hooved signs

v. **REDWOOD:** Indigenous to the Pacific United States. Properties & Uses: It is used to craft outdoor furniture and decorative carvings. Redwood burls have a "cluster of eyes" figure. See fig 2.14 below



**Fig 2.14** showing a sample of red wood. Source: hooved signs

vi. **BIRCH:** There are many species of birch. Properties & Uses: Birch is a hard, heavy, close grained hardwood with a light brown or reddish colour. See fig 2.15 below.



**Fig 2.16** showing a sample of birch wood. Source: hooved signs

vii. **BEECH:** The American beech is a single species which grows in the eastern half of the United States. Properties & Uses: Beech is a hard, strong, heavy wood with tiny pores and large conspicuous medullary rays, similar in appearance to maple. Uses: used for frames, a variety of bent and turned parts. See fig 2.17 below.



**Fig 2.17** showing a sample of beech wood. Source: hooved signs

viii. **IRCH:** There are many species of birch. The yellow birch is the most commercially important. European birch is fine grained, rare and expensive. See fig 2.18 below



**Fig 2.18** showing a sample of irch wood. Source: hooved signs

#### **Application of Wood as a Building Material:-**

**i. Quick to Build: Saves Money:** Some wooden home manufacturers can construct a 100m<sup>2</sup> wooden house, on site within 7 days. When compared with brick, stone or concrete, wood constructions certainly do save time, and inherently with that come savings in labour. Wood-framed houses enable easy modifications during and after the building process and it's because of the ease, versatility and cost effectiveness which makes it such a popular and inexpensive choice. Insulated concrete form homes (ICF) can be costly, troublesome and time consuming to alter post builds.

#### **ii. Environmentally friendly**

Houses made from trees are sustainable, renewable and environmentally friendly. Did you know that wooden structures absorb and store atmospheric CO<sub>2</sub>, even taking into account haulage, is carbon neutral (in fact, it's the only carbon neutral construction material). Mature trees actually use absorb less carbon than younger, faster growing trees, therefore it could be beneficial in the battle on climate change to cut the older trees, use them in construction and plant new carbon munching trees in their place.

**iii. Mechanical Properties & Working Properties:** Wood, although light has a remarkably high tensile strength. Let's take wood which has a tensile strength of 0,6/cm<sup>3</sup> and the specific gravity is 100 N/mm<sup>2</sup>, as well as steel which has a tensile strength of 7,89/cm<sup>3</sup> and the specific gravity is 500 N/mm<sup>2</sup>.



When it comes to how workable wood is, few things can surpass it. Wood can be whittled in beautiful and creative ways, which can make for almost magical designs. The accuracy and finish that can be achieved with wood can help carve an ordinary design into something extraordinary. Further to that, wood is fairly easy to maintain and to repair.

**iv. Safe, Light, Sturdy & Durable:** One of the many reasons why wood is still used today, despite huge strides in engineering excellence, is its durability weight and safety. Wood has a little bit of give in it which means it can bend slightly, which is a property which bricks don't have. Therefore, if the foundations shift slightly, the wooden home can flex and move with the change rather than crack. Even the smallest shift in the foundations of a brick house will cause cracks to appear in the mortar (not a good look). They are cheaper to rebuild if destroyed by a hurricane.

**v. Wood a Versatile and Innovative Way to Build:** Wood is the building material of the future—versatile, beautiful, and durable. Wood is being used in new and exciting ways to build taller multi-storey structures. Large public buildings like arenas, gymnasiums, office buildings, and apartment complexes can be constructed from wood. New wood products, like Cross Laminated Timber and Glulam, are changing the face of construction, allowing taller wood buildings.

**vi. Building Wooden Skyscrapers:** The use of Cross Laminated Timber (CLT) is opening up new possibilities for using wood in non-residential, multi-storey buildings. Developed in Europe in the 1990s, CLT is an engineered wood panel typically consisting of three, five or seven layers of dimensional lumber. Kiln-dried boards are layered perpendicular to one another and then glued. This cross lamination provides dimensional stability, strength and rigidity. A recent study conducted on behalf of the Canadian Wood Council concluded that CLT is feasible for 12 stories or more.

In November 2012, the International Code Council approved a code change to expand the use of cross laminated timber through the building code's heavy timber construction classification.

**vii. Providing Strong and Beautiful Structure:** Glulam makes efficient use of wood by bonding smaller pieces of dimension lumber together to form larger beams and columns. Used in place of concrete for beams and columns, Glulam can bring innovation and beauty to both commercial and residential buildings.

### Conclusion:-

Wood is the building material of the future. New wood products, like Cross Laminated Timber and Glulam, are changing the face of construction, allowing taller wood buildings.

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### RESEARCH ARTICLE

#### EXPERIMENTAL AND THEORETICAL STUDY OF GOLD ADSORPTION ONTO POLYMERIC SORBENT.

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##### Key words:-

low-content gold, copper ore, copper concentrate, waste copper, PSTDT-polymer.

#### Abstract

Polystyrene-azo-thiazandithion-2,4 (PSTDT) polymer was used to increase the gold content for analysis of waste copper, copper ore and concentrate. The optimum conditions of the sorption capacity of sorbent,  $[H^+]$ , temperature and time dependence enrichment of gold content were examined to increase analysis efficiency by using treatment of PSTDT polymer. The molecular structure of PSTDT polymer with gold were successfully determined using by FT-IR and theoretical calculations.

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#### Introduction:-

The atomic absorption spectroscopy (AAS) method is usefully for determination of low-content precious elements in biological (Olmedo et al., 2013), and geological samples (Hoffman., et al 1998). One of the precious metals is gold. Comparison of different gold recovery methods as amalgamation, cyanidation was investigated previously (Hylander et al., 2007). Hoffman et al. (Hoffman., et al 1998), described the gold analysis in geological samples by fire-assaying methods which includes instrumental neutron activation, AAS, graphite furnace-atomic absorption or inductively coupled plasma emission mass spectroscopy. The functional polymers can be used for determination of low-concentration gold in ores and minerals by using AAS such as silicon organic adsorbent PSTM-3T (Pozhidaev et al., 2013). The PSTM-3T polymer also had been investigated for removal of copper and chromium ions from aqueous solution (Narantsogt et al., 2014). PSTM-3T polymer includes thiocarbamide functional group which forms the metal complexes.

The Erdenet Mining Corporation (EMC) is one of the largest copper and molybdenum mining and processing factories in the world that located on the northern of Mongolia. The copper is concentrated by using flotation method of sulfide minerals. The concentration of gold in waste copper, copper ore and copper concentrate has been determined by using the AAS in Central Laboratory of Chemistry of EMC which method is not efficiency. The enrichment of precious metals is very useful for recovery and analytical chemistry. Monitoring the gold concentration in waste copper, copper ore and concentrate is important for mining. In recent, the polymer compound is treated into ores to increase the concentration of plate and precious metals. One of the polymer is the polystyrene-azo-thiazandithion-2,4 (PSTDT) which firstly synthesized by Basargin et al (Basargin et al., 1995). The PSTDT polymer can be selectively determine the low-content gold samples by using enrichment method. In this present work, we determined the gold content in waste copper, copper ore and concentrate of EMC.

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## Materials and Methods:-

### Materials:-

Poly-styrene-azo-thiazandithion-2,4 (PSTDT) polymer (Astralabor, Russia) was used to determine the gold content in waste copper, copper ore and concentrate. The PSTDT polymer (Fig. 1a) is not dissolve in water, acid, base and organic solvents that includes nitrogen and sulfur atoms at ortho-position which forms a stable chelate complex with gold. Gold atom substitutes a hydrogen atom of imine group and connects with sulfur atom by coordination bond (Fig. 1b) (Pozhidaev et al., 2013). Standard solution and certified reference sample were used 1 mg/ml gold solution (ACROS Organics) and 0.211 ppm gold content (OREAS 13b), respectively.

### Optimum condition gold adsorption

In order to define the optimum condition as temperature (20 °C, 50 °C and 100 °C), time (5–30 minutes) and HCl (0.5, 1.0, 1.5 N), HNO<sub>3</sub> (0.5, 1.0, 1.5 N) affecting to the gold adsorption, 25 mg PSTDT with 500 ppb gold standard solution were taken for 100 ml solution and stirred on the magnetic mixer. Gold contents in the solution were measured by spectrophotometry (MAPADA V-1600PC) to form the color complex with rodasol-XC. Adsorption efficiency of the gold was calculated as following equation:

$$R = \frac{q_a - q_f}{q_a} \times 100\% \quad (1)$$

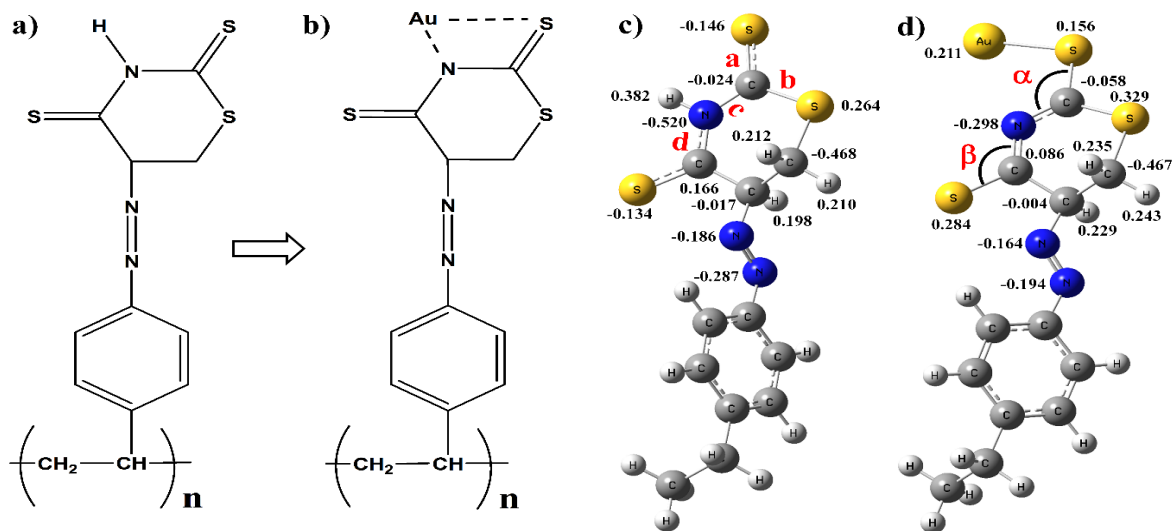
Where,  $R$ ,  $q_a$ , and  $q_f$  are the adsorption efficiency (%), concentrations (ppb) of the gold in the standard solution and filtrate solution, respectively.

### A. Sorption capacity of sorbent

The solutions of gold with concentrations of 5, 10, 15, 20, 25, 30, 35, 40, 45, 50 and 55 ppb were prepared from the standard solution to determine the maximum amount of gold per adsorbent. 50 mg PSTDT added into each solutions at optimum condition then filtrate solutions were analyzed to adsorption efficiency. Sorption capacity of sorbent is calculated following equation:

$$SCS_{Au} = \frac{(C_0 - C) * V}{m} \quad (2)$$

Where,  $C_0$ ,  $C$  -gold concentration in initial and remained solution, respectively,  $V$  -50 ml standard solution,  $m$ - 50 mg sorbent



**Fig. 1:** Representation of molecular structure of PSTDT polymer (a) and PSTDT-Au (b). The optimized structures of PSTDT (c) and PSTDT-Au (d) with Mulliken atomic charges for selected atoms. Sulfur, nitrogen, carbon, hydrogen, and gold atoms are shown by yellow, blue, dark grey, light grey and yellow, respectively.

**Determination of gold content in samples:-**

Experimental procedures were applied to gold determination can be broadly divided into three stages as the sample decomposition, enrichment and analysis stages which were summarized as a scheme in Figure 2

*Sample decomposition stage* Samples were calcinated at 650 °C then were dissolved in nitric acid and were evaporated the solution. The powder had been calcinated at 450 °C to form the copper oxide. The formed oxide was dissolved in solution of  $\text{H}_2\text{SO}_4 : \text{H}_2\text{O}_2$  (3 %) with ratio 1 : 10. The excess solution of hydrogen peroxide was added and boiled the solution then was added NaCl and KI with concentration of 10 % to separate the gold, platinum, silver and palladium. This procedure was repeated twice. The precipitate was filtered and calcinated at 600 °C. The precipitate was dissolved in “Aqua regia” solution and evaporated then dissolved in 1 N hydrochloric acid. (A solution).

*Enrichment stage* 50 mg sorbent( PSTDT) were added into “solution A” to enrich the gold in the optimum condition by mixing. After the formation of chelate complex, the solids were filtered and were calcined at 550 °C then dissolved in 100 ml hydrochloric acid (1 N) then filtrate.

*Analysis stage* The sample burned by air-acetylene flam at 2125 - 2400 °C and measured the gold content at 242.7 nm wavelength using flame atomic absorption spectroscopy (FAAS) (Perkin Elmer AAnalyst 800).

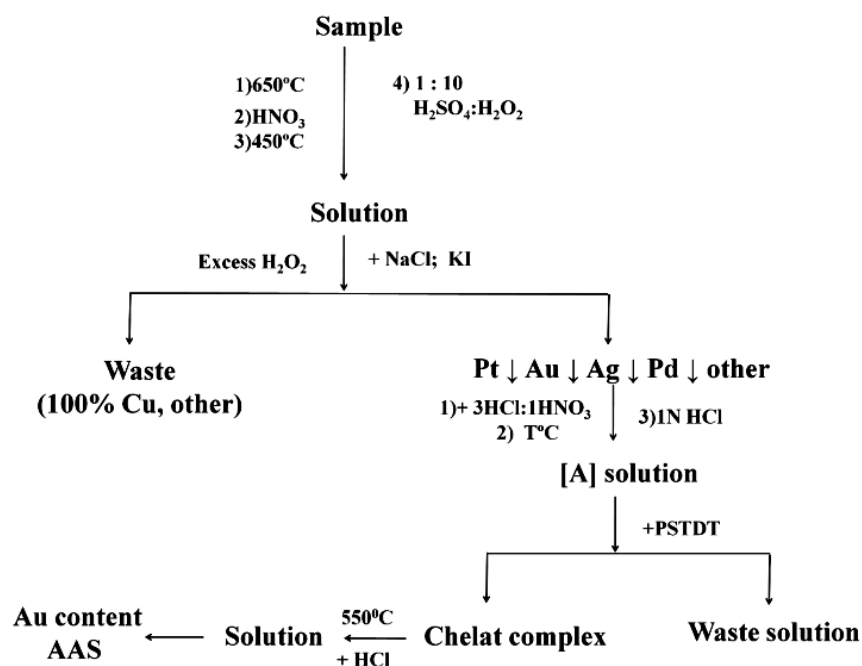


Fig. 2:- Scheme of experimental procedures for determination of gold content.

**Frontier-Transform Infrared (FT-IR) spectroscopy:-**

The chemical bond frequencies of functional groups of polymer before and after treatment of sample were analyzed by using Frontier-Transform Infrared (FT-IR) spectrophotometer (IRPrestige-21, Shimadzu, Tokyo, Japan). The powdered samples were mixed with KBr and made the pellets. The FT-IR spectra were obtained with frequency range of 4000 – 400  $\text{cm}^{-1}$ .

**Computational method:-**

The optimization and frequency calculations of PSTDT and PSTDT-Au (Fig. 1c and d) complex were carried out using density functional theory (DFT) with Becke three parameter method (Becke, 1993), (Becke, 1988) and (Lee Yang Parr et al., 1988), correlation exchange with 6-31G(d) (Hehre et al., 1987) and LanL2DZ basis sets by Gaussian09 program. (Barone et al., 2009) 6-31G(d) basis set was applied for H, C, N, and S atoms, and LanL2DZ was applied for Au cation. Spin multiplicity of PSTDT and PSTDT-Au complex was singlet and doublet, respectively. All the convergent precisions were the system default values, and the all calculations were carried out

on the standard lab-level workstations with AMD Opteron 285 dual core CPU. Data visualization was carried out using Gauss View 03 (Frish et al., 2007).

### Result and Discussion:-

Firstly, the adsorption optimum conditions of the sorption capacity of sorbent,  $[H^+]$ , temperature and time dependence of PSTDT polymer for gold adsorption were established as  $<45 \text{ mg/g}$ ,  $1 \text{ N}$ ,  $20 \text{ }^\circ\text{C}$  and  $15 \text{ min}$ , respectively (Fig. 3 and Fig. 4).

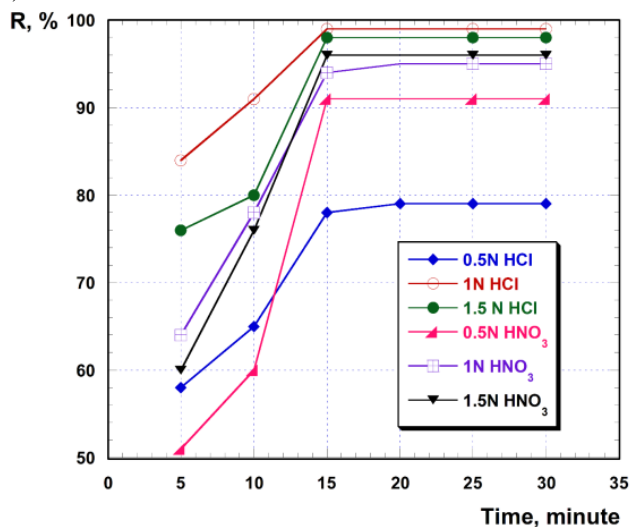


Fig. 3:- Time dependence of adsorption efficiency for the different acids.

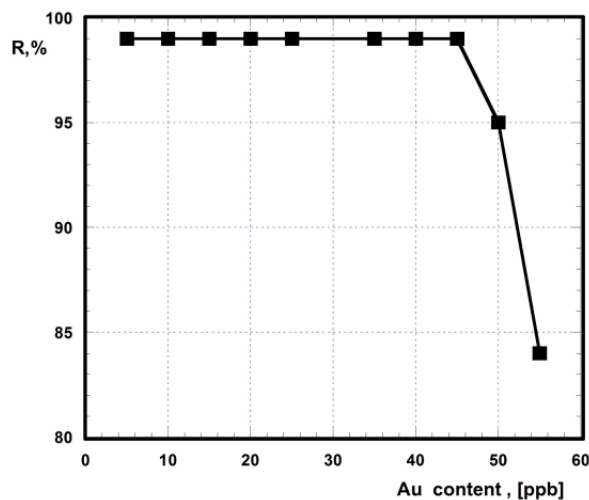


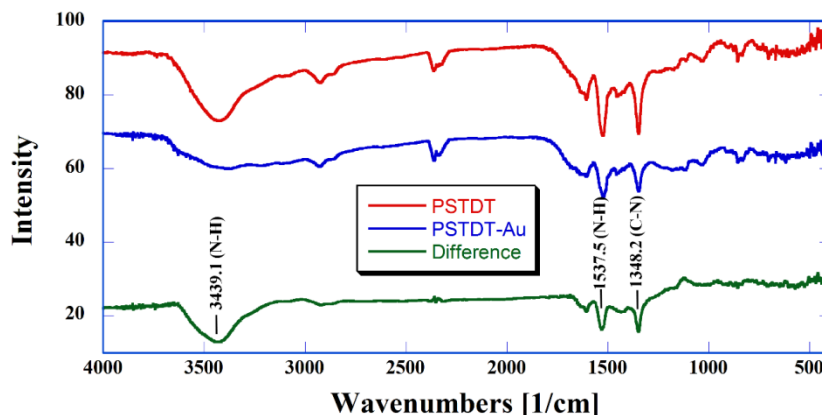
Fig. 4:- Adsorption efficiency of PSTDT polymer depends on the gold concentration.

Table 1 shows that the determined gold contents in copper ore, copper concentrate and waste copper by using our chemical treated (CT) flame atomic absorption spectroscopy (FAAS) to compare with assay analysis (AA) FAAS and inductively coupled plasma (ICP) mass spectrometry (MS) methods. The gold contents in copper concentrate and waste copper by using CT-FAAS were higher than by using ICP-MS method which mean that the low-content gold determination is enriched by the PSTDT polymer are higher efficiency in analysis of copper industry.

**Table 1:-** The Comparison of Gold Content by Using Different Methods of Chemical Treatment (CT), Assay Analysis (AA) Flame Atomic Absorption Spectroscopy (FAAS) and Inductively Coupled Plasma (ICP) Mass Spectrometry (MS).

Samples	Gold content, ppm		
	CT-FAAS	AA-FAAS	ICP-MS
Copper ore	0.004	NA	0.005
Copper concentrate	0.048	0.040	0.044
Waste copper	0.005	NA	0.002
OREAS 13b (0.211 ppm)	0.214	0.210	0.213

The functional groups of PSTDT polymer before and after treatment of gold samples were identified using FT-IR experiment and the spectrum is shown in Fig. 5.



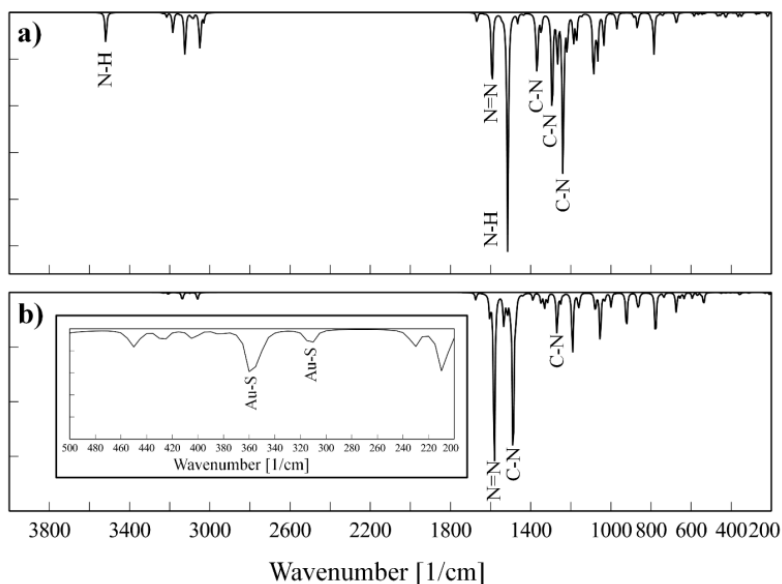
**Fig. 5:-** FT-IR spectra of PSTDT polymer before (red) and after (blue) treatment of gold sample and their difference (green).

In Fig. 5, the observable IR signals for PSTDT polymer were 1521.8 and 3375.4  $\text{cm}^{-1}$  for N-H, 1348.2  $\text{cm}^{-1}$  for C-N (Table 2).

**Table 2:-** The Comparison of Theoretical and Experimental Frequencies of PSTDT and PSTDT-Au. The Percentage of Relative Deviation of Model in Different Frequencies is Shown In Parenthesis.

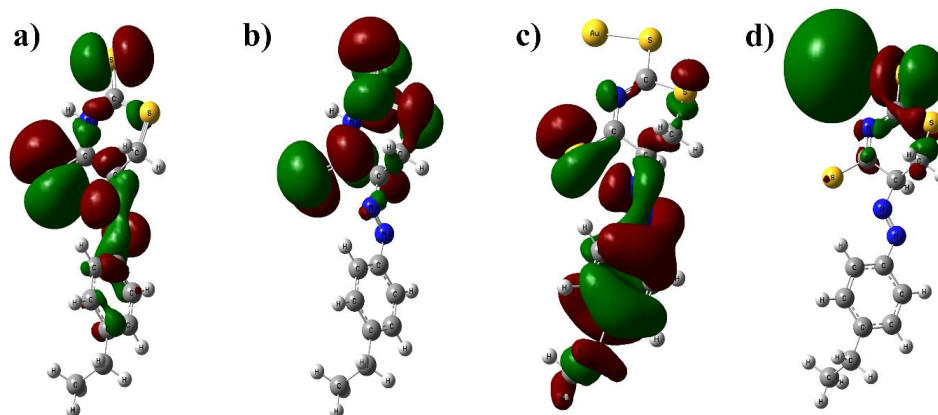
Groups	Wavenumbers, [1/cm]					
	PSTDT	Exp.	$\Delta$ [%]	PSTDT-Au	Exp.	$\Delta$ [%]
N-H	3518.5	3375.4	-4.0	-	-	-
	1514.6	1521.8	0.5	-	1525.7	-0.3
C-N	1367.9	1348.2	-1.5	1487.7	1348.2	-10.3
	1292.8	-	-	1268.6	1348.2	5.9

The intensities at these wavenumbers were decreased after the treatment of PSTDT to copper samples. The differences of the intensities of -NH group are shown in the figure which means that the gold was adsorbed onto PSTDT polymer. The -CS group shows the important for the sorption of the metal (Narantsogt et al., 2014) therefore the vibration intensity of C-N bond was decreased in Fig. 5. The IR signals were similar with the group frequencies (Coates., 2004) vice versa the frequencies do not shown for PSTDT polymer after treatments of the gold sample. It shows that the gold atom substituted the hydrogen atom of imine group and connected with sulfur atom by coordination (Fig. 1b) Pozhidaev et al., 2013). The theoretical calculations were carried out by B3LYP method with 6-31G(d) basis set and optimized PSTDT polymer and PSTDT-Au structures are shown in Fig. 1c and d with Mulliken atomic charges for selected atoms. After the Au adsorption "a" bond length, "α" and "β" bond angles were increased (Fig. 1c and d). Au-S and Au-N bond lengths are 2.338 Å and 3.089 Å, respectively, which are similar results with previous report. In this study, the frequency calculations of optimized structures of PSTDT polymer and PSTDT-Au (Fig. 1c and d) were investigated using the B3LYP method with 6-31G(d) basis set to compare the experimental IR results.. In theoretical calculations, the values for N-H bond frequencies have relative deviation less than 4 % and the deviations of values for C-N bond frequency are 1.5 % (Table 2). Calculated frequencies of CN bond in PSTDT-Au were 1487.7  $\text{cm}^{-1}$  and 1268.6  $\text{cm}^{-1}$  and deviated by 10.3 % and 5.9 % from experimental value of PSTDT polymer. The experimental IR spectrum of PSTDT-Au system had shifted intensities of CN bond vibration. The theoretical frequency result of NH bond disappeared on IR spectrum of PSTDT-Au structure and N=N bond intensity was increased from IR spectrum of PSTDT (Fig. 6).



**Fig. 6:-** Calculated IR spectra of PSTDT (a) and PSTDT-Au (b). IR spectrum of PSTDT-Au between  $200\text{ cm}^{-1}$  and  $500\text{ cm}^{-1}$  (b, inset).

The calculated frequencies of Au-S were  $314.3\text{ cm}^{-1}$  and  $356.8\text{ cm}^{-1}$  (Fig. 6b). N=N bond characteristic was dramatically changed and indicated in HOMO orbitals (Fig. 7a and c). LUMO orbitals are shown in Fig. 7b and d where Au-S bond had partial occupation of LUMO orbital. The theoretical frequency values are in good agreement with experimental values, the same as previous reports (Narantsogt et al., 2014), (Pousti et al., 2013). Finally, the PSTDT polymer is a good enrichment of gold content to use the analysis of gold in copper samples.



**Fig. 7:** HOMO (a and c) and LUMO (b and d) orbitals of PSTDT and PSTDT-Au, respectively.

#### CONCLUSION:-

The low-content gold determination in samples of copper industry was clearly examined using CT-FAAS, FT-IR and theoretical calculations. The optimum conditions of the sorption capacity of sorbent,  $[\text{H}^+]$ , temperature and time dependence of PSTDT polymer for gold adsorption were  $<45\text{ mg/g}$ ,  $1\text{ N}$ ,  $20\text{ }^\circ\text{C}$  and  $15\text{ min}$ , respectively. The analysis efficiency of gold determination was increased after treatment of PSTDT polymer. The chemical interactions and molecular structure of PSTDT polymer with gold were successfully determined using by FT-IR and theoretical calculations.

#### ACKNOWLEDGMENT:-

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### RESEARCH ARTICLE

#### PATENTING GENOMICS INNOVATIONS: POST-MYRIAD CHALLENGES AND POSSIBILITIES

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#### Abstract

Patenting gene and its nucleotide sequence has been a controversial subject since the release of working draft of the Human Genome Project. A number of US Supreme Court judgments pronounced in the recent past and accordingly revised patent examination strategies of the United States Patent and Trademark Office (USPTO) created a huge confusion in the field of biotechnology.

The present article explores the volatile nature of judicial decision-making in modern biotechnology arena and attempts to analyze and gauge the practical impact of the landmark judgment of *Association for Molecular Pathology v. Myriad genetics Inc.* The present article also reveals how the *Myriad* judgment changed the USPTO's long-standing practice of granting patents on isolated DNA molecules and set a new patent-eligibility standard for genes and DNA related innovations.

The present article also endeavors to investigate the challenges and possibilities of patenting isolated proteins, sequence homology and protein three-dimensional structure based innovations in post-*Myriad* US patent regime.

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#### Introduction:-

After the release of working draft of the Human Genome Project, the US Patent and Trademark Office (USPTO) received a number of letters from stakeholders including the then NHGRI<sup>1</sup> director Francis Collins arguing a revision of its acceptability norms for gene and DNA sequence related patent applications. In 2001, USPTO issued a guideline raising the bar on patent-eligibility standard for DNA related patent applications stating that identification of gene sequence alone is not patentable, but that discoveries directed to genes isolated from their natural environment might be patentable if they possessed "specific, substantial and credible utility".<sup>2</sup> USPTO specifically clarified in its revised guidelines that even if a gene was discovered from its natural source but "isolated" and "purified" from other molecules naturally associated with it would be patent-eligible as long as the requirements of title 35 of the US code were met. And in such cases questions whether the gene is an invention or discovery will not

<sup>1</sup> The National Human Genome Research Institute (NHGRI) is a division of the National Institute of Health (NIH) originally established as the National Centre for Human Genome Research (NCHGR) in 1989 to carry out the International Human Genome Project (HGP).

<sup>2</sup> Federal Register, Pub. L. No. 4, 66 1092-99 (2001)

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arise even if the isolated gene in question has a nucleotide sequence similar to its natural counterpart.<sup>3</sup> However, USPTO has always been of the opinion that purified state of synthetic gene is different from those of the naturally occurring compounds. Hence, there is no objection in granting patents for such genes as ‘composition of matter’ or ‘a matter of manufacture’.<sup>4</sup> Patent applications directed to isolated gene never faced unavoidable challenge at the USPTO, however, the scenario dramatically changed in 2013 when the US Supreme Court invalidated three disputed patents of Myriad Genetics Inc. related to BRCA gene. The *Myriad* judgment has not only set a new interpretation standard for §101 but also created an uncertain environment for future patent applications related to genes and DNA molecules. The present article investigates the adverse effect of *Myriad* judgment caused to gene or DNA based future patent applications and possibilities of patenting other genomics innovations in post-*Myriad* American patent regime.

## Landmark Court Decisions And Changing Patent-Eligibility Jurisprudence in Modern Biotechnology Arena:-

### 2.1 The US Supreme Court Judgment On Gene Patenting And Legal Uncertainty

In patent ecosystem, it is a well-observed phenomenon that even a brilliant discovery or a breakthrough innovation does not by itself is patent-eligible unless they meet the statutory requirements<sup>5</sup>. This fact becomes more prominent when the real world experience of genomic technology is brought to Courts in the form of actual cases. In 2013, a landmark judgment of the US Supreme Court completely changed the scenario of gene patenting in America. The US Supreme Court’s ruling on *Association for Molecular Pathology v. Myriad genetics, Inc.* altered the USPTO’s thirty years old practice of granting patents on isolated genes and DNA molecules<sup>6</sup>. In *Myriad* case, the observation of the US Supreme Court was completely different from the observation once had in *Parke-Davis & Co. v. H. K. Mulford Co.*, an age-old landmark case on adrenaline patent dispute. It was then noted by the Supreme Court that compounds “‘isolated’ from nature are patentable even if it were merely an extracted product without change; there is no rule that such products are not patentable.” Surprisingly, the US Supreme Court completely undermined the long history of natural product patenting and relied heavily on the *Mayo v Prometheus*, a process-patent litigation, to decide *Myriad*’s disputed patents directed to genomic DNA. The controversial patent dispute between Mayo Collaborative Services and Prometheus Laboratories was related to diagnostic test and method of determining appropriate dose of thiopurine metabolite for the treatment of patients suffering from autoimmune diseases. The US Supreme court held in that patent dispute that giving drugs to patient, measuring metabolites for that drug etc. as claimed in US patent No. 6,355,623 and 6,680,302, were not allowable as they were close to *natural law* exception of the US patent statute. Though the *Prometheus* patent dispute was not entirely relevant for *Myriad*’s human gene patenting issue, however, it influenced the US Supreme Court to a large extent which led to rejection of nine claims directed to genomic DNA of three disputed patents.<sup>7</sup> The Court clarified its position stating that “a naturally occurring DNA segment is a ‘product of nature’ and not patent eligible merely because it has been isolated”. The Supreme Court’s decision in *Myriad* is not only an unexpected departure from a long-standing affirmation of isolated DNA patenting but also raises obvious questions regarding the volatile nature of judicial decision-making in the modern biotechnology arena.

In *Myriad* litigation, the US Supreme court set a new patent-eligibility standard applicable for all future patent applications related to gene or DNA sequence. The “new and useful...composition of matter”-requirements as set forth in §101 or claiming naturally occurring phenomena (*natural law*<sup>8</sup> *exception*) will be judged based on the

<sup>3</sup>*Id.*

<sup>4</sup>*See infra* 16.

<sup>5</sup>*Funk Brothers Seed Co. v. Kalo Inoculant Co.*, 333 U.S. 127.

<sup>6</sup>The Federal Circuit pointed out in *Myriad* Case that the USPTO has issued patents directed to DNA for almost thirty years. The FC also pointed out that 2,645 patents claiming “isolated DNA” has already been issued by the USPTO.

<sup>7</sup> Claims 1,2,5,6 and 7 of US patent No. US 5,747,282; Claim 1 of US patent No. US 5,693,473 directed to BRCA-1 gene and Claims 1, 6 and 7 of US patent No. US 5,837,492 directed to BRCA-2 gene.

<sup>8</sup> As described in MPEP §2106, in addition to the terms laws of nature, physical phenomena, and abstract ideas, judicial exceptions have been described using various other terms, including natural phenomena, products of nature, natural products, naturally occurring things, scientific principles, system that depends on human intelligence alone, disembodied concept, mental process and disembodied mathematical algorithms and formulas, for example. The exceptions reflect the judicial view that these fundamental tools of scientific and technological work are not patentable.

primary enquiry—whether the claimed invention is meant for creating “incentives that lead to creation, invention, and discovery or impeding the flow of information that might permit, indeed spur, invention”.<sup>9</sup> In this regard, the US Supreme Court observed that a delicate balance is required to be maintained in order to arrive at a rational conclusion. The Court further clarifies that the synthetic DNA fragments e.g. exons-only DNA fragment or cDNA is patent-eligible like before<sup>10</sup>, even if the nucleic acid sequence of the synthetic DNA molecule is similar to that of the naturally occurring gene codes for the same protein.

### Challenges and Possibilities In Genomics Innovations:-

Though the magnitude of *Myriad* judgment is huge, however, it is not a blanket prohibition for patenting all DNA/gene sequence of human origin or any other origin, but for those DNA/genes that are *merely* “isolated” from natural environment and do not show *markedly different* characteristics (as established in *Diamond v. Chakrabarty*) in terms of modification in the nucleic acid chain.

Immediately after the *Myriad* judgment, USPTO again changed its examination strategy towards gene-related innovations. According to a memorandum<sup>11</sup> issued by the USPTO on 13<sup>th</sup> June 2013, patent examiners were instructed to reject all product claims directed to naturally occurring DNA molecule whether it was isolated or not.

#### 3.1 Nucleotide sequence-based innovations

DNA sequence information represented by A, T, G, and C alone is not a patent-eligible subject matter under the US patents law as it is nothing more than a typical nucleic acid sequence information.<sup>12</sup> However, according to *Myriad* interpretation standard of §101, *markedly different* DNA fragment or gene described by nucleic acid sequence in the form of A, T, G and C is patent-eligible provided they meet the utility requirements as set forth in the current US patent statute.

Similarly, ESTs<sup>13</sup> are also patent-eligible under the current US patents law if they meet the criteria of utility, novelty and non-obviousness. Moreover, the *Myriad* judgment further strengthened the patent-eligibility of EST as the Supreme Court has completely acknowledged patent eligibility of cDNA.<sup>14</sup>

A reasonably favorable environment is also expected for nucleotide homology-based innovations. There is no specific rule in the United States for DNA sequence homology based patent applications. Therefore, it is most likely that USPTO will continue to assess such patent applications based on their own technical merits. According to general practice, the USPTO accepts homologous DNA sequences (both nature and the degree of homology) of genes or fragments thereof as a patent-eligible subject matter as long as they satisfy other criteria, e.g. sufficiency of disclosure, credible utility etc. The USPTO has a coherent approach for sequence homology related broad claims. Claims reciting whole nucleotide genus is also allowable in a single patent application on the condition that the representative nucleotide species are adequately described in the specification. Though protection of whole nucleotide genus sometimes leads to cross-species patent coverage because of the fact that some homology/percent identity claims encompasses a large number of macromolecule variants which may belong to entirely different species<sup>15</sup> or orthologs, however, USPTO does not raise any unavoidable objection in accepting them. Additionally, DNA homologs are not considered to be non-patentable *merely* because of the reason that the function and utility of the claimed DNA homologs have asserted through bioinformatics method analyzing sequence homology with prior-art nucleic acid sequence found in public databases.<sup>16</sup>

<sup>9</sup> 12-398 *Association for molecular pathology v. Myriad genetics, Inc. (06/13/2013), (us 2013).*

<sup>10</sup> *Id.*

<sup>11</sup> MEMORANDUM from Deputy Commissioner for Patents Examination Policy to Patent Examining Corps, Supreme Court Decision in *Association for Molecular Pathology v. Myriad Genetics, Inc.* (USPTO Jun. 13, 2013).

<sup>12</sup> *Supra note 2*

<sup>13</sup> Expressed Sequence Tags (ESTs) are small chain of nucleic acids, generally 200-800 base pair (bp) in length, generated from randomly selected cDNA clones. ESTs are extremely useful for purpose of gene identification and verification of gene prediction. --- *John Parkinson (ed.). Expressed sequence Tags (ESTs): Generation and analysis, vol.533, Humana Press 2009.*

<sup>14</sup> *Supra note 9.*

<sup>15</sup> Letter from Eli Lilly and Co. to USPTO, COMMENTS OF ELI LILLY AND COMPANY ON THE REVISED INTERIM WRITTEN DESCRIPTION GUIDELINES 132 (USPTO).

<sup>16</sup> *supra note 2*, at 1096

### 3.2 Amino acid sequence-based innovations

USPTO has a non-stringent practice regarding the acceptability of protein homology-based claims. Amino acid sequence disclosed for a single species is considered to be a *representative of the genus* because all member amino acid sequence have at least certain degree of percent identity with the parent genus and therefore obtaining patents on this subject matter does not involve major challenges as long as the description of representative amino acids fulfills enablement requirements stipulated in §112 of U.S.C. 35.

According to recent USPTO guideline<sup>17</sup> issued on March, 2014, claims directed to proteins are close to judicial exceptions i.e. natural phenomena or natural product. Therefore, proteins are not patent-eligible under §101 unless they are *significantly different*<sup>18</sup> from the judicial exception regardless of the use of words like, “isolated”, “recombinant”, or “synthetic” etc. in claims reciting a protein. Similar to DNA sequence, amino acid sequence of a protein or peptide alone is not patent-eligible unless it is *markedly different* (in terms of addition, deletion or substitution of amino acid(s)) from the naturally occurring protein molecule<sup>19</sup>.

In advent of major breakthroughs in bio techniques, functional genomics products, e.g. therapeutic proteins produced by recombinant DNA (rDNA) technology have been successfully used worldwide including in the USA to treat a wide range of diseases for which there was no cure using pharmaceutical drugs.<sup>20</sup> Proteins/peptides are considered to be potential drug candidate for various practical reasons which include target specificity, non-interference with other biological processes of the human body etc. Because of these useful characteristics, researcher’s principle objective always focused on producing synthetic protein/peptide molecules that are structurally (both in terms of amino acid sequence information and three-dimensional conformation) similar to those found in human body<sup>21</sup> for example, Humulin®.<sup>22</sup> Although these man-made variants of structurally resembling molecules are often confused with the molecules found in nature and contested during prosecution, however, patenting these therapeutic macromolecules should not face any additional challenge in post-*Myriad* US patent regime because of the fact that the Court’s observations on isolated genomic DNA will certainly have some limits and will not necessarily be applicable for isolated proteins or peptides and encoding amino acid sequence thereof. Any adverse impact to isolated protein patenting can also be ruled out in view of the *Prometheus* judgment. In *Mayo Collaborative Services v. Prometheus Labs, Inc.*, the Court stated that “all inventions at some level embody, use, reflect, rest upon, or apply laws of nature, natural phenomena, or abstract idea,” and “too broad an interpretation of this exclusion principle could eviscerate patent law”.<sup>23</sup> In addition to that, in *Myriad*, the Court had no observation regarding patent-eligibility of isolated proteins and USPTO has no specific guidelines in this regard either. Hence, it can be said that isolated proteins/peptides of natural origin or their recombinant variants are still patent-eligible under §101 of the US patent law.

### 3.3 Structural Genomics Innovations

Besides patenting isolated therapeutic proteins and amino acid sequence based innovations, it is also evident that trends of protecting structural genomics innovations have been increased significantly around the world. Three-dimensional structural information of protein is always proved to be crucial; naturally, protection of this spatial information has great value for bio technology industry. According to a report on the comparative study<sup>24</sup> conducted

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<sup>17</sup>MEMORANDUM from Deputy Commissioner for Patents Examination Policy to Patent Examining Corps., 2014 Procedure For Subject Matter Eligibility Analysis Of Claims Reciting Or Involving Laws Of Nature/Natural Principles, Natural Phenomena, And / Or Natural Products (USPTO Mar. 4, 2014).

<sup>18</sup>*Id.*

<sup>19</sup> USPTO, *supra* note 17.

<sup>20</sup>Tom Strachan and Andrew Read, *Human Molecular Genetics* (New York: Garland Science/Taylor & Francis Group, c2011., 4th ed. 2011).

<sup>21</sup>*Id.*

<sup>22</sup>Humulin® is a polypeptide hormone manufactured by Eli Lilly &Co. from a non-disease-causing laboratory strain of *Escherichia coli* bacteria, is the world’s first recombinant DNA drug approved by the FDA. Structurally, this rDNA originated insulin is indistinguishable from pancreatic human insulin designed to save millions of lives around the world suffering from diabetes.

<sup>23</sup>10-1150 Mayo collaborative services v. Prometheus laboratories, Inc. (03/20/2012), (US 2012).

<sup>24</sup> Trilateral Co-operation between EPO, JPO and USPTO was set up in 1983 with the objectives including improvement of the quality of patent examination process, improving quality of incoming applications, solving

by trilateral patent offices, inventions that claim protein three-dimensional structural coordinates fall under the category of “information contents” which is further interpreted as nothing more than “mere presentation of information or abstract ideas”. Therefore, innovations related to this technological field are not patent-eligible under §101.

However, protein three-dimensional structures represented by spatial arrangements of atoms or structural coordinate data are considered to have technical effect as long as they are used in an *in silico* or bioinformatics screening method to generate chemical compounds. In 1999, USPTO granted a patent in this area for the first time for an invention directed to the use of structural coordinates of interleukin-1 $\beta$  converting enzyme (ICE) and mutants thereof to screen and design potential drug candidate. Since then a number of patents have been granted by the USPTO, e.g. patent No. US6,490,588 and US6,329,184 to name a few for inventions directed to protein three-dimensional structure and their use in structure-based-drug-design (SBDD).

The patent-eligibility standard has certainly been raised for gene-related innovations in light of a number of Supreme Court judgments<sup>25</sup> and revised USPTO guidelines; however, there has been no sign of increase in the number of rejection of patent applications from 2012 until now. Patent prosecution history of post *Myriad* era suggests that USPTO has been issued patents for genomics innovations after a thorough patent-eligibility assessment under § 101; naturally, that process led to a substantial increase in the issuance of office action until grant.

### Conclusion:-

It was initially estimated that the material consequence of the Supreme Court judgment in *Myriad* patent litigation would be far-reaching. However, it seems that the practical impact of this judgment to gene related future patent applications will not be severe as anticipated. The trend of filing patent applications at the USPTO and issued patents in the area of gene or DNA related innovation is still maintaining its usual momentum. Most importantly, no significant irregularity in this regard has been noticed in post-*Myriad* patent regime.

However, in light of revised patent practice of the USPTO, chances of obtaining patents is certainly higher for those genomics innovations that are more restricted to non-naturally-occurring nucleotides, such as cDNA or nucleotides of man-made variants. On the other hand, isolated proteins and its recombinant variants including their encoding amino acid sequences should not face any additional challenge at the USPTO as the breadth of *Myriad* judgment is limited to isolated genomic DNA or genes of human origin. Inventions directed to sequence homology or percent identity is likely to be assessed based on their individual technical merit and scope of the invention, like before. Whereas, other genomics innovations, e.g. innovations directed to protein 3D structures and their applications in drug discovery (SBDD) are less susceptible to any direct impact of *Myriad* judgment. Though spatial information of protein itself is far beyond any patent protection, however, protection for the use of such structural information in the production of useful products will continue to be allowable under the useful and credible utility doctrines until any specific guidelines in this regard is issued by the USPTO in contrary to present examination practice.

Finally, it can be said that the Supreme Court decisions and USPTO guidelines issued in various occasions since 2012 certainly elevated the standard of subject matter eligibility of biotechnology innovations. However, the overall patent granting scenario in biotechnology domain has not been changed significantly in post-*Myriad* era except the fact that there has been an increase in the number of office action till the grant of each biotechnology patent application.

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common problems related to IPR protection, harmonization in practice between three patent offices etc. -- *Report on Comparative Study on Protein 3-Dimensional (3-D) Structure Related Claims (2002)*.

<sup>25</sup>Supreme Court's ruling on diagnostic method claims (*Mayo Collaborative Services v. Prometheus Laboratories, Inc.*, 566 U.S. \_\_\_, 132 S.Ct. 1289 (2012)); Supreme Court's rejection of patents directed to isolated genomic DNA segments (*Ass'n for Molecular Pathology v. Myriad Genetics, Inc.*, 569 U.S. \_\_\_, 133 S.Ct. 2107 (2013)) and Supreme Court's observation on abstract idea in *Alice Corp. v. CLS Bank Int'l*, 134 S.Ct. 2347 (2014).



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### RESEARCH ARTICLE

#### HEAVY IONS REACTIONS WITH TWO NUCLEON TRANSFER.

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#### Abstract

The  $^{64}\text{Ni}(^{16}\text{O}, ^{14}\text{C})^{66}\text{Zn}$  two proton pickup reactions has been studied ,at 56Mev of  $^{16}\text{O}$  projectile energy, the differential cross section have been evaluated in the frame work of the exact finite-range distorted wave Born approximation using folding model for the real part of optical nuclear potential. The calculated angular distributions are fitted with the experimental data .

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#### Introduction:-

The two nucleon transfer reactions have been taken on great importance ,because they are very sensitive to nuclear spectroscopy, heavy ion transfer reactions are valuable tools for getting precise spectroscopic information's [1 , 2]. The right framework in which the reaction be treated is Distorted Wave Born Approximation ( DWBA) ,or Coupled Channel Born approximation (CCBA) methods [3,4] with inclusion the nuclear recoil. Two nucleon transfer reactions induced by heavy ions had been widely considered [5] by using DWBA with nucleon –nucleon interactions which include both attraction and repulsion.

In the present study ,the differential cross section of heavy ion reaction with two proton pickup reaction have been calculated in The  $^{64}\text{Ni}(^{16}\text{O}, ^{14}\text{C})^{66}\text{Zn}$  reaction at 56 Mev of  $^{16}\text{O}$  projectile energy, analysis concentrated on g.s. ,first  $2^+$  ,first  $3^-$  excited levels. The  $^{64}\text{Ni}(^{16}\text{O}, ^{14}\text{C})^{66}\text{Zn}$  are studied by Mermaz [7] by using coupled channel Born approximations and distorted wave born approximation calculations and he conclude that the relative intensities among various states are better reproduced by CCBA than DWBA calculations , the present work is like Memaz study using DWBA but the optical potential model was taken to be folded for the real part of optical potential , the phenomenological optical potential are often successfully used to describe the heavy ion elastic scattering data ,the use of folding model allows us to predict potential and eliminate the ambiguities which appear with the phenomenological potential. Folding model gives better interpretation as a basic physical ingredients the nuclear densities folded with a nuclear interaction in correct way. The calculated angular distributions are fitted with the experimental data.

#### The differential cross section of heavy ion reaction with nucleon

##### Transfer:

The differential cross section of heavy-ion reaction with two nucleons pickup  $A(b,a)B$  where  $A$  is the target  $B$  is the residual nucleus , $b$  is the projectile  $A=B + c$  , and  $a = b + c$  , and the  $c$  is the two – proton cluster, is given by the expression:

$$\frac{d\sigma}{d\Omega} = \frac{m_{aB} m_{bA} K_{aB}}{(2\pi\hbar^2)^2 K_{bA}} \frac{1}{2S_b + 1} \sum_{LM} |T_{fi}|^2$$

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Where  $m_{bB}, m_{bA}$  are the reduced masses of pair (a, B), (b, A) respectively, and the matrix element  $T_{fi}$  represent the DWBA transition amplitude that has the form :

$$T_{fi} = \sum_{L_{cB} L_{cb} N_{cB} N_{cb}} B_{cB} \beta_{LM}$$

Where:

$$\beta_{LM} = \frac{(-1)^L}{\sqrt{2L+1}} \int dr_{bA} dr_{aB} X^*(r_{bA}) f_{LM}(\mathbf{r}_{cB}, \mathbf{r}_{cB})$$

$$f_{LM} = \sum_{\Lambda \bar{\Lambda}} (-1)^{L_{cB} + \Lambda} \{ L_{cB} \Lambda L_{cb} | LM \rangle \Phi_{\Lambda}^*(r_{cB}) V(\mathbf{r}_{cB}) \Phi_{\bar{\Lambda}}(\mathbf{r}_{cB})$$

$$B_{cB} = i^L \sum_{L_c} \left( \frac{2J_a + 1}{2L_c + 1} \right)^{\frac{3}{2}} (-1)^{L_{cB} + L_c - J_B} U(I_B L_{cB} J_a L_{cb}; L_c L) A_{cB}^* A_{cb}$$

The dependence on kinematics and the reaction mechanism is contained in the factor  $\beta_{LM}$ , where  $f_{LM}(r_{cB}, r_{cB})$  is the finite-range form factor. The spectroscopic dependence lies in the factor  $B_{cB}$ , and the two spectroscopic amplitude  $A_{cB}, A_{cb}$  contained therein. and  $V(r)$  is nuclear optical model potential in form of Wood-saxon, this form is given as :

$$V(r) = \frac{-V_0}{1 + \exp\left\{\frac{r - R_v}{a_v}\right\}} + \frac{-W_0}{1 + \exp\left\{\frac{r - R_w}{a_w}\right\}}$$

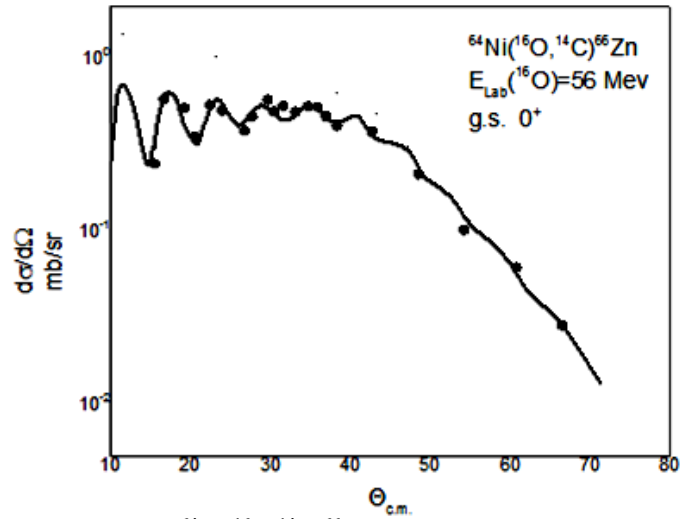
Where, the parameters  $V_0, R_v$  and  $a_v$ , are the strength, radius and diffuseness of the real potential, while the parameters  $W_0, R_w$  and  $a_w$ , are the strength, radius and diffuseness of the imaginary part which are determined by fitting scattering reaction of the corresponding interaction of two heavy ions.

**Numerical calculations and result and discussion and conclusion:-**

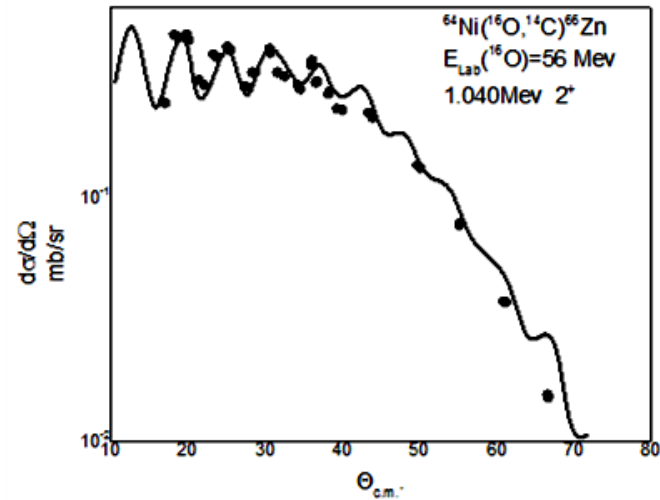
The differential cross section has been numerically carried out for  $^{64}\text{Ni}(^{16}\text{O}, ^{14}\text{C})^{66}\text{Zn}$  reaction at 56 Mev, in the frame work of the exact finite-range distorted wave Born approximation, and the real double -folded potential used in an optical model analysis of elastic scattering data. The potentials were calculated by convoluting the M3Y effective nucleon - nucleon interaction [8], the necessary parameters of the optical potential are shown in table (1). here the results obtained for the differential cross section are shown in figure(1), figure(2) and figure(3).

**Table ( 1 ) : Optical potential parameters used in DWBA calculations**

Reaction	$E_{lab}$ (Mev)	$W_0$ (Mev)	$a_w$	$R_w$	$r_c$	Ref.
$^{16}\text{O} + ^{64}\text{Ni}$	56 Mev	20	0.283	1.311	1.25	7

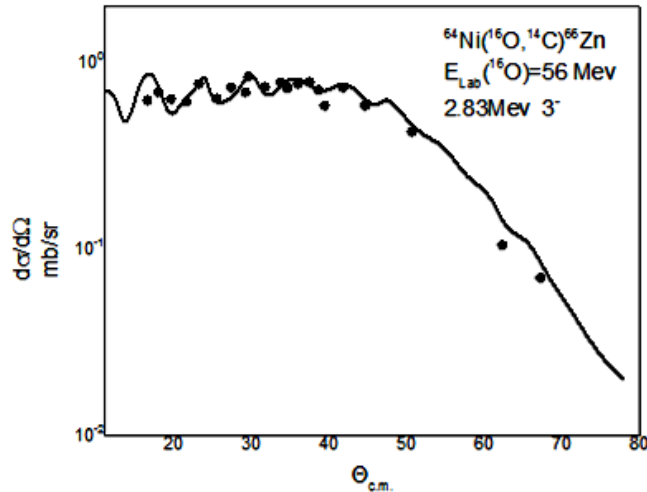


**Figure 1:-** The differential cross section  $^{64}\text{Ni}(^{16}\text{O},^{14}\text{C})^{66}\text{Zn}$  reaction at 56 Mev incident energy leading to  $^{66}\text{Zn}$  ground state .The solid curve is the present calculation and the dots are the experiment data taken from reference (9).



**Figure2:-** The differential cross section  $^{64}\text{Ni}(^{16}\text{O},^{14}\text{C})^{66}\text{Zn}$  reaction at 56 Mev incident energy leading to  $^{66}\text{Zn}$  at 1.040 Mev  $2^+$  state .The solidcurve is the present calculation and the dots are the experiment data taken from reference (9)





**Figure3:-** The differential cross section  $^{64}\text{Ni}(^{16}\text{O}, ^{14}\text{C})^{66}\text{Zn}$  reaction at 56 Mev incident energy leading to  $^{66}\text{Zn}$  at 2.830 Mev  $3^-$  state. The solid curve is the present calculation and the dots are the experiment data taken from reference (9).

The shape of all angular distributions are in a good agreement with the experimental data except that the angular distribution for transition  $2^+$  states, it seem to be several degrees forward of the DWBA curve. In conclusion in this study despite the better shape of angular distributions with a little difference in the shape of angular distributions calculated by DWBA using the double-folding model for the real part of optical potential and the previous calculations without using the folded model, the CCBA calculations (8) which include multiple processes are more suitable than DWBA they give better a greement with experimental data, and the double-folding potential are found to be appropriate to reproduce the cross-section and capable of producing realistic prediction of the angular distribution.

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### RESEARCH ARTICLE

## ENVIRONMENTAL AND ECONOMIC FEASIBILITY STUDY OF THE PROJECT OF IMMOBILIZATION OF SANDY DUNES IN BABYLON PROVINCE IN IRAQ.

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### Abstract

Desertification this scourge that threatens the whole world, especially Africa and dry and semi-arid areas in Asia and the Americas, In Africa were victims of drought and desertification in Somalia in 2012 only a quarter of a million victims of men, women and children, The United Nations estimates that desertification costs accounted for half of the costs that the world loses from the annual production for the whole world, so it has to be effective and pause to stop this scourge, which came on everything and everybody.

This study was conducted in the Babylon province, located between longitudes  $43^{\circ} 42' - 45^{\circ} 50'$  east and latitudes  $32^{\circ} 7' - 33^{\circ} 8'$  north on the sand dunes area which is located towards the east of the province of Wasit province, these dunes formed by more than 50 years ago and remained in a state of constant motion without taking any previous procedures, the idea, as processed the first time the year 2014 was the preparation of this study to demonstrate the role of the control and treatment of area 913 square kilometers of these dunes in scattered areas.

The results showed that the soil analyzes of tissues soil of the area is alluvial loamy with the proportion of medium salinity and tissues sand dunes loamy, Using visual satellite Land sat 7 for the years 2001, in 2006, Land Sat 8 2014 and Quick bird 2012 afternoon that there are eleven site for these dunes, the degree of desertification of the region, according to the world rankings is the kind of moderate and desertification in which the production at least 10%-15%, and that can be controlled at the present time using windbreaks through the use of resistant varieties environmental and climatic conditions as well as the use of spray-axial and fixed irrigation systems also cultivate various crops of wheat, barley, corn and other, this could prove to be effective both fenders crops or whether there was a follow-up, maintenance and continuing to work for a period of not less than ten years.

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### Introduction:-

Desertification affects the lives of one billion in more than one hundred countries under rain-fed and irrigated agriculture systems (3.6) billion hectares where he loses the world (10) million hectares per year of land desertification and annual productivity losses, according to statistics from the nineties of the twentieth

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century exceeded 42 billion dollars, while the United Nations estimates that the costs of activities to combat desertification prevention, repair and rehabilitation of the land will not cost only half of this Annually in addition to the social problems associated with desertification and danger migration from the countryside to the city and the cross-border migration and others.

Desertification is known, according to the United Nations Convention of 1994 to combat desertification is exposed land degradation in arid, semi-arid and dry sub-humid, leading to the loss of plant life and biodiversity in, and lead to the loss of topsoil and then the loss of the ability of the land for agricultural production and support of animal and human life, is the sand dunes of the most dangerous results of desertification due to its negative effects on all vital aspects of life, Valaoasf dust and sand are hinting harmful, these storms pollute the environment and affect human health and agricultural production as damage physiological processes of plants (breathing, assimilation photosynthesis, pollination and flowering).

The poor soil and water management and climate factors harsh changed largely agricultural land to soil wasteland covered with sand from wind erosion and sand dunes, and the longer the problem of desertification in Iraq, especially the sedimentary easy in central and southern Iraq, most of the agricultural land, as it was the emergence of salt and cracked agricultural land degradation natural vegetation and sand dunes are moving.

Phenomenon has been exacerbated in the last two decades significantly as a result of practice is correct in the exploitation of natural resources (plant, soil, water), as irrigation methods is Almqguenh logging and Alhjert, overgrazing and agriculture in the territory unsecured rain depending on rain and caused by the military machine of destruction of class the surface of the soil, which made it vulnerable to erosion and that we observe through sand storms that have become familiar in recent years (Mustafa & Eulewi 2013).

In the area of our research, there is an important point to be taking all their aspects, namely the region's vulnerability to sandy dunes of the kind semicircular For over the past fifty years and which are lengths between 40-50 meters and heights on average between 1 to 3.5 meters and may increase in some places (data Division cultivate the Nile 2014), and these values compared to a few countries of the world as it rises up, for example, 300 meters, the dunes semicircular most dangerous and its impact on the environment, agriculture and public facilities with the most difficult to install vital means, as it cannot grow plants on them, either due to reveal its roots and uprooted and either cover the plants, due to the speed of movement and the movement of sand dunes from its place and rapid loss of moisture due to perpetual motion constituent her which does not allow the growth of vegetation, Dunes of sand grains made up by 59% and the few remaining percentages represent granulated silt and some organic detritus Other, and ranges from the size of grains of sand between 0.02 to 2 mm and is composed chemically of the same chemical components of the rocks from which arose, the dunes are either homogeneous or heterogeneous, and color either be light yellow to the presence of metal quartz and the lack of organic material, or reddish-brown and the presence of iron oxides .

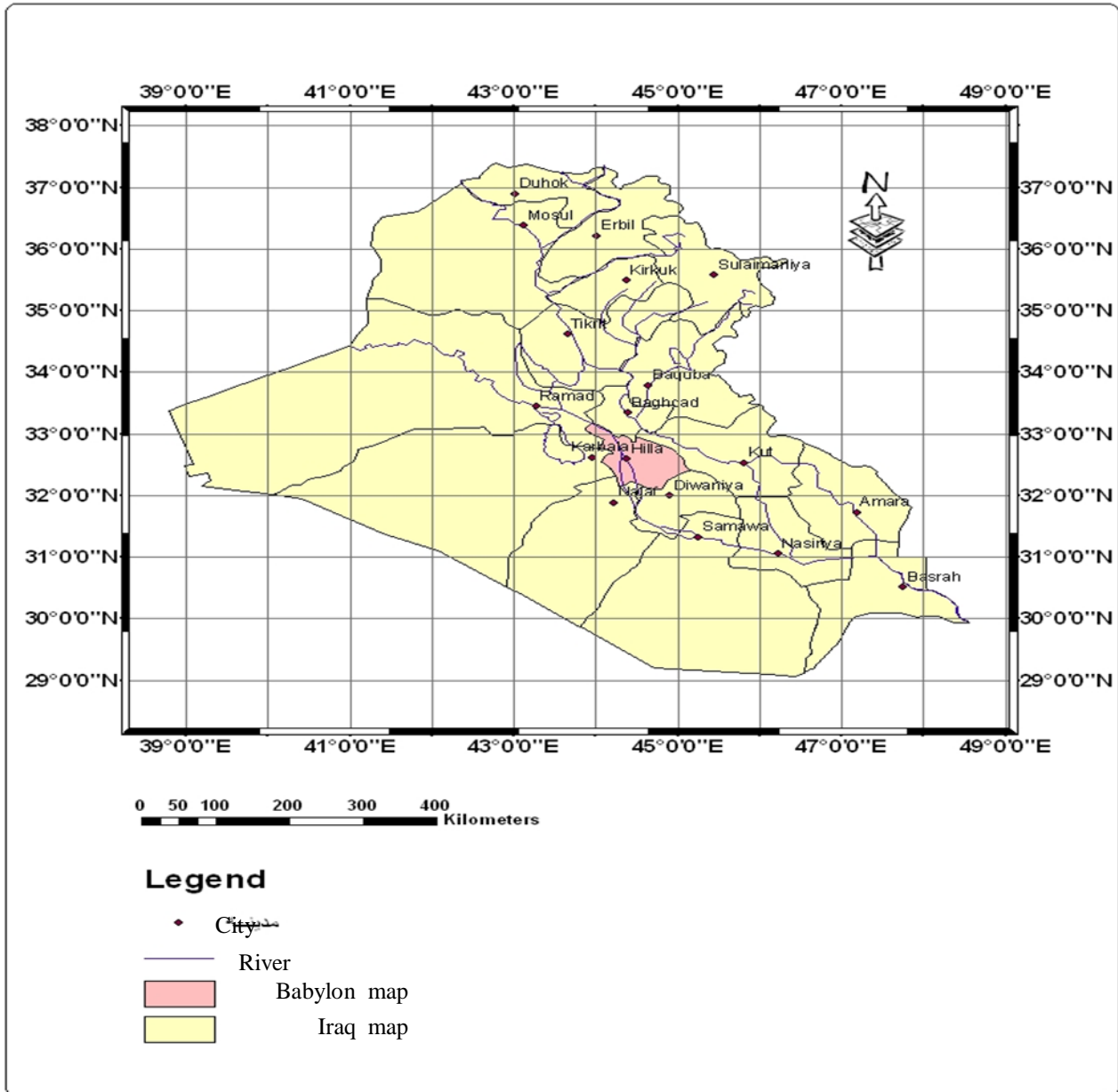
#### **The aim of the study:-**

1. Identify the sand on the map of the province of Baby londune sites and calculate the area and evaluated in terms of influencing the present and future.
2. Identify the best way to address the mand the expense of speculative costs necessary for this treatment and for the purpose of coverage of projects to combat desertification and restore their effectiveness as productive agricultural land.

#### **Materials and methods of work:-**

##### **Location:-**

Babil province, lies between latitudes 32 7-33 8 north and between longitudes 4342-4550 in the east, and is bordered to the east and the Was it province, to the west of Karbala and Anbar, either from the north bounded by Baghdad and south of Najaf and Qadisiyah, and Babil province represents the northern part of the region Euphrates in Iraq and the area accounted for 1.2% of the total area of Iraq (Figure 1).



**Fig.1:-** Babylon province geographical location for Iraq.

#### **The climate :**

The climate is characterized by a climate of Babylon province by observing two main summer and winter, as it extends the summer from May to September, while the winter shall be between November to February, with varying degrees of heat between these two chapters, as it recorded the highest average temperatures in July and August It is 42.6, 40.2 respectively, while lower average temperature in winter was in January and February and were 10.9, 13.2 respectively, the annual total of rain falling on the province 98.5mm and the highest amount of rain fall to be in November(15.5mm), January(16.2 mm)and January(20.8 mm), while the highest rate of relative humidity record was in January is 70% (Encyclopedia of Hilla, cultural, 2012).

#### **Soil of the site:-**

Soil preservation are sedimentary, as made up of different layers Texture between loamy slimy to loamy mud slimy, with the difference installation of metal within the soil section where we find soft material (clay and silt) close to the

surface with the appearance of coarse sand particles to the rear and then followed by fine sand with the topography of the site flat in general.

#### The field work:-

has been done several site visits for two months from February to April / 2015 brought some samples of each of the sites between the sample 3-5 for each site, whether a sample or sample dunes untapped agricultural soil and close to the dunes site was conducted the necessary tests her in the laboratories of the Faculty of Agriculture / University denominator green and these analyzes are the values of pH, tissues and soil salinity of the soil and other tests have been immobilization as shown in table 1.

#### laboratory work:-

Used in the study range of programs for the purpose of display, storage and processing of digital data and satellite images from remote sensing, which are used in environmental studies and drawing Applied maps and these programs are :

- Arcgis / INFO and includes a range of programs is the most important program of the Arc Map and Arc Catalog program, - If the program Arcmap 10.2.1 adopted to deal with satellite images of the moon Landsat years (2001.2006 and 2014) in a manner Category Observer (super classification) , The program adopted Arc Catalog 10.2.1, Sort Alboleikonat own Btaos dunes Satellite images taken in 2014 , Then the program adopted Arc Map 10.2.1 Once again relegated to the province on the map.

- ERDAS Imagine 9.2 : This program supports the work of the mosaic of satellite images .

#### data that have been adopted in the study:-

-Satellite images of the satellite Landsat 7 Taken during 2001 and 2006 Where it was used for the movement of sand dunes Within the study area through the comparison between years (2001 - 2006 - 2014).

-Satellite pictures of the satellite quickbird taken in the world in 2012.

-Satellite images of the satellite Landsat 8 taken in 2014.

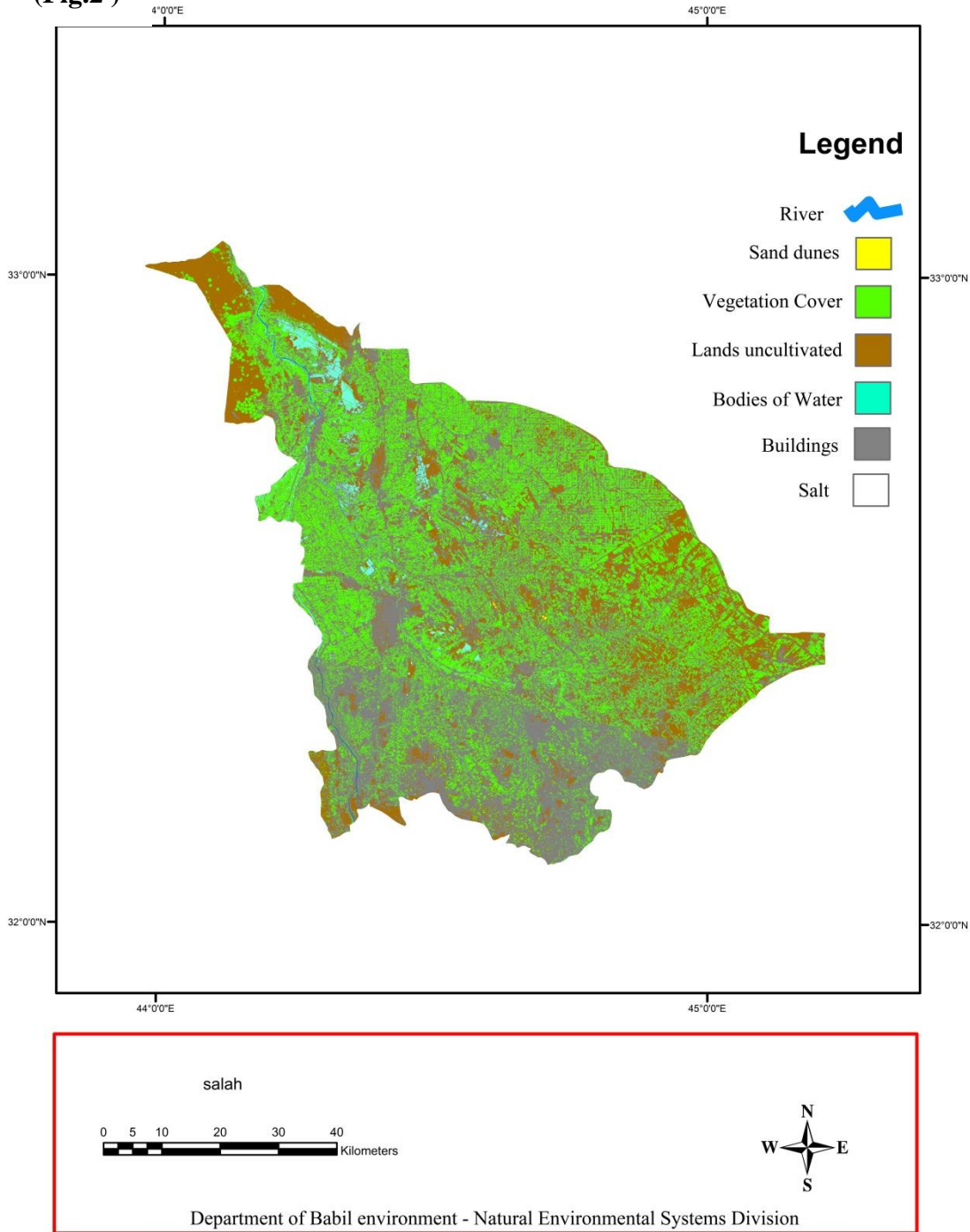
. It was then a comparison between the desertified areas of sites that have been marked in the satellite images of the satellite Landsat captured in 2014 With satellite images of the satellite quickbird 2012 with a high-precision surveying Through the comparison between the two types of images (Directorate of Babylon environment data 2015) The distinction eleven locations desertified areas of condition (sand dunes) within the province of Babylon, Seven places them within hand Midhtah and three within the Nile hand the site atheist As the total area (913 Donem) (Agriculture Department data Babel 2014) As it is shown in Figure 2 .

**Table (1):-** Data for samples

Sequence	samples	Region (province)	PH	Ec Ds/m	Texture
1	1	11 Khamisah	7.22	5.29	Loamy Sand
2	2	11 Khamisah	7.03	4.22	Loamy Sand
3	3	3 Biermanh	6.99	6.01	Loamy Sand
4	4	3 Biermanh	7.25	5.37	Loamy Sand
5	5	42 Shahe	6.94	3.21	Silty Mix
6	6	42 Shahe	7.12	4.77	Loamy Sand
7	7	42 Shahe	6.56	3.04	Silty Mix
8	8	42 Shahe	7.56	5.89	Loamy Sand
9	9	7 Allaq	7.78	4.89	Loamy Sand
10	10	7 Allaq	7.01	3.33	Silty Mix
11	11	7 Allaq	7.66	4.66	Loamy Sand
12	12	7 Allaq	7.89	5.10	Loamy Sand
13	13	7 Allaq	7.45	6.88	Loamy Sand
14	14	Hlbh and Zarijh	7.23	4.78	Silty Sound
15	15	Hlbh and Zarijh	7.05	6.42	Loamy Sand
16	16	Hlbh and Zarijh	7.22	4.55	Loamy Sand
17	17	Hlbh and Zarijh	7.08	5.22	Loamy Sand

Babil Governorate visible satellite Landsat8 taken in 2014

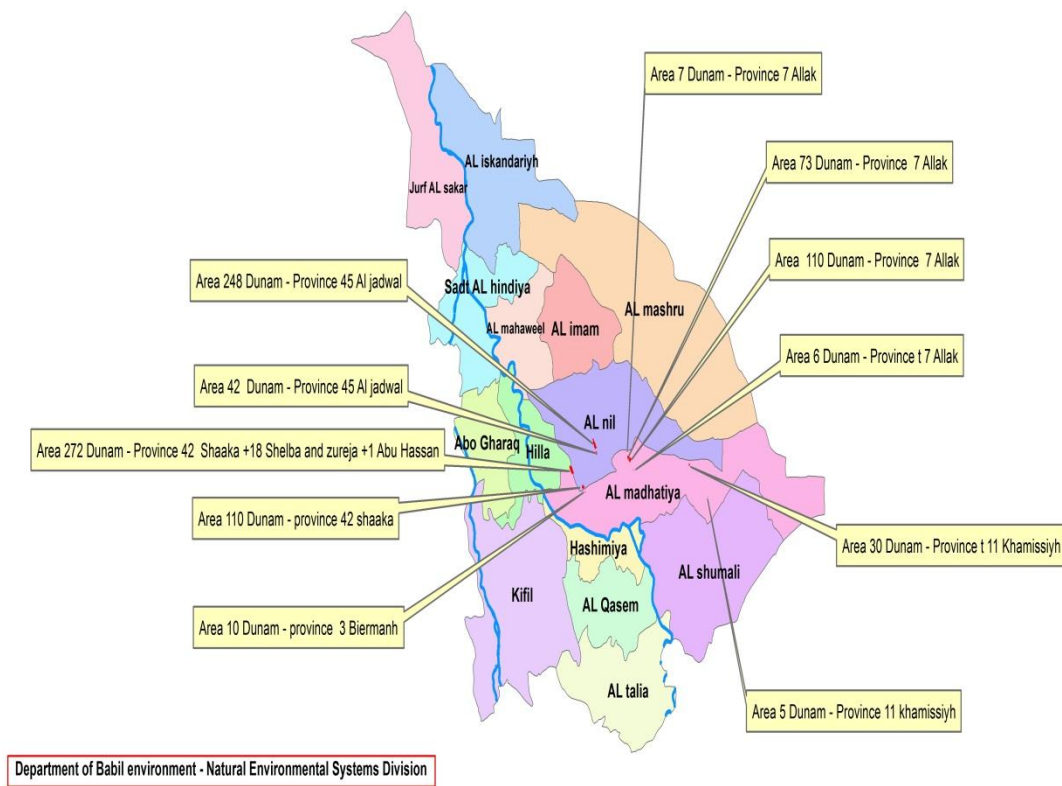
(Fig.2)



**Results and discussion:-**

Sand dunes have been identified sites by satellite images Identifying areas of these sites, a body Taos or hills with different heights , It can be described shaped dunes two of these sites under the terms of MidhtahBalrasah , What dunes form in the rest of the other sites are eleven crescent number locations within the province of Babylon, Seven places them within hand Midhtah and three within the Nile hand, he site is located ten atheist in the region between

the Nile hand and spend Center ,Where the total area (913 Donem) , And that the section of this land agrarian reform and other private properties sectionformat format, It is land reclaimed water scarcity factor has led to the left by the peasants for many years without cultivation, Which led to its transformation into a state of desertification, Note that observed during the visit, the presence of adjacent agricultural land available with a water quota planted crops (wheat, barley and water melon) , In light of the results obtained from the analysis of samples can say that the region's soil (Agriculture soil), It is loamy alluvial type With PH neutral and values of Ecsmall to medium The tissues soil sandy dunes are loamy and values PH neutral With values (Ec) Medium, With the rise in the region above sea level between the (28-44) m (Figure 3) .



**Fig .3)( Map sand dunes of the Governorate of Babylon, (Iraq)**

According to the United Nations classification of desertification, there are four degrees or classes of cases of desertification, namely: -

- desertification light: a case of damage or destruction of the very light in vegetation and soils do not result in a significant impact on the ability of biological environment.
- desertification moderate: a case of the average damage to vegetation resulting be small dunes or small grooves in the soil as well as soil salinization, which reduces the production rate of 10-15% has been up to 25%.
- desertification severe: a proliferation of shrubs and grasses is desirable in the pasture at the expense of the desired species and undesirable results in increased activity of erosion which affects the vegetation and reduce production by up to 50%.
- desertification very severe: a build up huge sand dunes naked active and configure many of the canyons and valleys and salinization of the soil and results in soil degradation which is the most dangerous in the types of desertification.



In light of the above values of global rating can say where the region that are studied within Category II (moderate desertification), as the dunes of the region, whether small dunes were intermediate or an effect one way or another crept through and cover crops planted near wheat and barley crops, with some salinity in the region and the output of both ground water which rises in the winter, or through the abandoned land unused and that the lack of water, especially in the spring and summer, So we must take appropriate action in a timely manner before you escalate this phenomenon and take other areas difficult to control in the future as well as measures to increase with the cost over time, and actions to be taken for the purpose of treatment according to what is included in the disclosure of speculative, table 3 below are as follows:

1. Conducting settlement processes and modification, especially sand dunes below an altitude about 1:00 m.,if it mixed with soil and use to grow and it is phased out, the dunes, which increases the height of 1m. can be transferred to low or low-altitude areas, and thus it will also be phased out.
2. The provision of water to share these spaces through an incision sub-tables For the purpose of delivering water to irrigation and modern irrigation which will be installed for watering of these spaces and to spray the axial and fixed irrigation systems.
3. Cultivation of land mentioned in the first paragraph, some important strategic crops like wheat, barley and maize a period of not less than ten years, especially since there is a section of sprinkler irrigation systems used by some farmers in the regionProclaimed before a period of five years or less (Figure 3).
4. Planting trees (winds battering ram) next to the sand dunes site wizard by three parallel lines and the length of the line depends on the light dune movement within the region (Table 2), so this line leads into effect in stopping the advance of the dunes, the distance between the line and another line 10 m.,the distance between the seedling and the another seedling within the same line (2-3) meters by species to be selected from that (*Casuarinaequisetifolia*, *Tamarix articulate*, *Azaclirachtaindica* , *Salix matsuda*, *AcciacycolopsOther* ), So grown toward perpendicular to the direction of the prevailing winds (north-west) These types have benefits is to stop sand encroachment, Sand also contribute to improving the environmental conditions and climate zones such as reducing pollutants and reduce temperatures,It is also a national treasure in the future in terms of utilization of timber in various fields, and the following tracks proposed the coordinates for the first line of the fenders, to be taken after every line and at a distance 10 m., among other lines and last, according to the distances and dimensions dunes and undeveloped areas beyond the line.



**Figure (2):-** a neighboring irrigation systems for the sand dune A neighboring irrigation systems for the sand dune )  
4Fig. (



**Table (2):-** lengths windbreaks of the site with its coordinates

T	windbreaks site	lengths windbreaks/km	coordinates
1	1.415	Hilla, District 18 Shalaby and Zraga	N 32 28 19.0 E 044 33 2.8 N 32 27 42.8 E 044 32 29.4
2	1.22	Between the Nile and 42 ShaheMidhtah, District 3Biermanh	N 32 26 25.5 E 044 35 17.7 N 32 25 58.0 E 044 34 55.8
3	1.130	Nile , 42 Shahe	N 32 26 15.3 E 044 34 30.8 N 32 26 45.0 E 044 34 56.1
4	1.338	Nile District Algadwal 45	N 32 30 18.5 E 044 36 36.6 N 32 29 43.7 E 044 36 6.0
5	0.647	Nile District Algadwal 45	N 32 29 14.3 E 044 37 1.7 N 32 28 59.6 E 044 36 44.0
6	0.252	Midhtah,District 7 Alalaq	N 32 29 9.7 E 044 41 52.0 N 32 29 3.8 E 044 41 45.3
7	1.130	Midhtah,District 7 Alalaq	N 32 28 34.2 E 044 41 39.1 N 32 29 0.2 E 044 42 9.8
8	0.288	Midhtah,District 7 Alalaq	N 32 27 37.3 E 044 42 44.8 N 32 27 45.0 E 044 42 51.0
9	0.500	Midhtah, District 11 Khamisah	N 32 28 14.3 E 044 51 38.8 N32 28 1.4 E 044 51 27.3
10	0.326	Midhtah, District 11 Khamisah	N 32 25 37.4 E 044 54 23.0 N 32 25 44.9 E 044 54 31.8

Note / Coordinates taken from your GPSEtrex type by the researchers during the fieldwork

**Table (3):-** disclosure of the private speculative area search

	the details	unit rate/ Dinar /Donim	the number
1	A settlement , adjustment and transfers	2000000	641 Donim
2	Apartments tributaries subset of the nearest water source	1500000	6Km.
3	Sprinkler irrigation systems pivotal area of 80Donim	100000000	2
4	prinkler irrigation systems pivotal area of 68 Donim	100000000	1
5	Sprinkler irrigation systems fixed area 73Donim	95000000	1
6	Sprinkler irrigation systems fixed to the area of 42Donim	40000000	3
7	Sprinkler irrigation systems fixed to the area of 42	55000000	1

	Donim		
8	Sprinkler irrigation systems fixed to an area of 21Donim	55000000	1
9	Sprinkler irrigation systems fixed area of 10Donim	20000000	1
10	Sprinkler irrigation systems fixed to the area of 7 Donim	10000000	1
11	Sprinkler irrigation systems fixed to an area of 5 Donim	10000000	1
12	Planting trees (windbreaks) by three lines and the distance between the line and another line 5m. And the distance between the seedlings and other (3) m.by species to be selected Grown toward perpendicular to the direction of the prevailing winds (north-west , a length of 24 km Number (9000) seedlings, ,3000 dinars per seedlings (processing, transport, and agricultur).	3000	9000
13	Pump 20 horsepower Ghattas.	7000000	10
14	Generators with a capacity of 30 KV	15000000	10
15	Buying a car pick-up truck Double Qmarp	38000000	1
16	Buy fuel	35000000	
17	Other	100000000	
	Total	2376000000	

Note / Iraq Donim = 2500 m<sup>2</sup> )

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### Recommendations:-

1. must achieve a meeting of peasants who will adopt the project that for the peasants on the project and ensure that consent is given by referral as this has a great importance is in the success of the project through the peasants cooperation with the implementing agency.
2. vowed peasants within the project area to continue the cultivation of agricultural land that will be addressed through the project, a period of not less than ten years in order to ensure that the desertification of the land again after the success of the treatment process.
3. vowed peasants within the project area perpetuation windbreaks which is cultivated through the project and in the stage after the completion of the project.
4. accelerate the completion of land reclamation projects of others Reclaimed and the completion of land reclamation almost reclaimed Considering that personal dune sites in this study is basically the land is reclaimed It has been turned into this advanced stage of desertification Because left by the peasants without cultivation because of the scarcity of irrigation water.
6. search for alternative sources of irrigation water in areas agricultural that the water quota were not available by surface water through the use of competent companies to dig wells with the support and awareness of the importance of farmers and the acquisition of modern irrigation Instead of the old means of irrigation in areas where water quota available to them.
7. Activating the role of remote sensing and geographic information systems whether in monitoring the movement of dunes of the region and other areas or follow the modern techniques of this information In the treatment of dunes and stop the movement of desertification, which is as juvenile has to be stopped.

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### RESEARCH ARTICLE

#### MULTI FOCI OF COMMITMENT'S IMPACT ON KNOWLEDGE SHARING IN PAKISTAN'S ADVERTISING AGENCIES.

Sadaf Ishaque and Ambreen Harris.

#### Manuscript Info

#### Abstract

#### Manuscript History

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#### Introduction:-

“Knowledge” and “Knowledge Management” is considered as key ingredient of success in today’s business organizations such as Professional Service Firms (PSF) (Alvesson 2004). If a PSF wants to flourish it has to work upon the mantra of knowledge acquisition and sharing among the people of an organization. Knowledge-intensive organizations should influence their separate knowledge assets through knowledge distribution to generate shared knowledge possessions. Knowledgeable employees have the power to control Knowledge sharing. Knowledge economies are emerging phenomenon, in this scenario attaining and sustaining knowledge is key to gain a competitive edge (Neuman, 2000). Regrettably, knowledge management is difficult job due to multi-faceted form of the borders, cultures, procedures and firm structures involved (Nonaka & Takeuchi, 1995).

A knowledge resource is explained by “know-what” or “know how”. Knowledge should be shared at collective level instead of individual to benefit the firm. The practice of knowledge sharing is, nonetheless, governed by the members of staff. Prior research indicates employee attitudes/behavior, i.e. their commitment level, is vital to this employee govern and their successive knowledge obtaining and knowledge providing (Lin, 2007; Hislop, 2003).

Commitment of employee plays a vital role in knowledge sharing among them and ultimately effect success of any project. Employee Commitment to firm, team members, occupation and Client has the impact on knowledge sharing. The effect of worker commitment on know-how distribution behavior is specifically vital in modern organizations, such as Professional Service Firms (PSFs). Employee’s willingness plays its role in knowledge sharing; willingness is driven by the level of commitment with external and internal institutions with which an employee interacts. Prior research expose the higher client commitment may limit employee’s team and organization commitment. (Swart et al,2014)

This editorial pulls on observed data from PSF (Advertising Agencies across Pakistan) to ask: ‘How do multi foci of commitment; including organization, profession, team and Client commitment of employee may influence their knowledge distribution behavior within their firm?’ thus, it creates two offerings to present works:

1. It inspects the numerous kinds and multi centers/foci of worker loyalty to the firm
  2. It studies “2” kinds of knowledge distribution: knowledge giving and knowledge gaining within the firm.
- In order to deliver a successful project, commitment of a team member/employee is very important, whether it is an organizational commitment, professional commitment, team commitment or client commitment. Higher the

commitment is higher will be the positive results. Advertising agencies cannot deliver a successful project to its client unless its project team is committed. No idea will be successful until or unless it is shared by its team members. No research has been done on the influence of different kinds and multi foci of commitment on knowledge sharing and project success in Pakistan.

It is to express here this study is previously conducted by Swart et al in 2014 in different work setting where this study is conducted in Pakistan which will assist in generalizing the findings of previous study.

There is no work or literature or industrial analysis of advertising agencies has been done before by any researcher in Pakistan. This research has been done on above mentioned phenomenon on advertising agencies.

#### **Literature Review:-**

There are numerous definitions of project, in 2012 Schwalbe defined project as a temporary endeavor undertaken to create a unique product or service. Whereas, number of researches being conducted on the subject of "Project success". Baccarini (1999) emphasized the subsequent features of project success as under:

- a) The success of project management is a measure of time; cost and quality are secondary to the higher product success objectives of goal and purpose. Therefore, a project that is a project management disappointment is supposed as a successful project because the greater-level goal of product accomplishment is happened.
- b) Project management success can affect the accomplishment of victory of the project. Worthy project management promise project success and is capable stop project failure. Good project management techniques find out the loopholes and try to fix it as they occur. However, poor project management cost a lot by decrease market shares, profitability etc.
- c) Success of the project can also be affected by time. We can only get to know about this when project final product has been utilized after numerous years of completion of the project. We can get to know about the project management success on longtime basis.

Professional Service Firms are defined as Knowledge concentrated firms (Alvesson,2004). Whereas, knowledge could be defined as "know-how" based on surrounded experiences, standards, info and professional instinct that offers an outline for assessing and combining new know-how and information. In organizations, it commonly goes into inserted in papers or warehouse and also in firm's agendas, schedules, and duties" (Davenport, 1998). Knowledge could be classified into two main categories a) explicit knowledge; that could be readily codified and expressed in words and b) tacit knowledge; it is based on experience that cannot be readily translated into words. PSFs' competitive advantage is based on tacit knowledge and knowledge workers of firm (Sewart, 2011). Tacit knowledge of knowledge workers assists PSFs in client services and solution. Knowledge exists at both individual and collective level of the firm; it is only beneficial for the firm if it being shared among the members of the firm (Davenport, 1998).

Knowledge sharing plays a crucial role in planned management arena, where know-how is considered for example "the supreme strategically-important resource which [organizations] possess," and a primary basis of worth making, (Spender, 1996; Teece, 1997). A phenomenon of knowledge sharing is directed by the employees; which makes it interpersonal communication trend (Empson,2011).

Various investigators propose that the present economic scenery is surely finest well-defined as a 'knowledge economy'. In today's economy, Knowledge, or know-how, is the foundation of acquisition and upholding a competitive advantage. Knowledge resources have been extensively known to be the main carters of organization reasonable benefit. Specialists have proposed that the capability to continuously form, abolish, and reconstruct new resource mixtures that are cherished by clients/Clients and secure against definite competitors is serious and critical. This capability has been well-defined as a dynamic competency/capability (Teece, 1994).

Previous researches suggest employee commitment towards the organization plays a substantial role in willingness to share tacit knowledge with team members (Hislop, 2003). This attitude of willingness is dependent on element of trust among the members and commitment of an employee. It is interpreted that lower level of trust and commitment may lead to the reluctance to share tacit knowledge (Lin,2007). "Organizational commitment may significantly impact the enthusiasm of employees to share their know-how"(Scarborough, 2000). It is repetitively stated that organization's biggest asset is "Knowledge" it possess but it's not individual level based collective level know-how creates a difference (Alvesson, 2005).

Knowledge sharing is bi-directional phenomenon; knowledge gaining and providing. This transition of providing and gaining is based on interpersonal activity; in this transition shared knowledge could be interpreted differently by the receiver and provider as per their own knowledge and context in which knowledge is shared (Watzlawick,1976). An individual integrates his new knowledge with the one he already has, this process of integration is referred to as representational re-description (Karmiloff-Smith,1992).

Previous research suggests that when knowledge is shared within the firm it triggers synergy among the resources which assist in gaining competitive advantage and maximizing human capital of the firm. Firm is dependent on human capital; knowledge workers in delighting firm's clients and it helps firm in securing success (Swart,2014). Recent studies have revealed that employee commitment is not within the organization attitude it could go beyond boundaries of organization. Previous researches have classified employees' commitment into two levels; micro and macro level. Micro level of commitment's foci includes; commitment towards management, team and customers (Becker, 2009). Whereas, macro level's foci include organization, profession, unions and employees' career (Vandenberghe, 2009).

Organizational Commitment (OC) is not a latest subject of study; excessive research has been done in this area. There are three types of organizational commitment;

- a) Affective commitment; where employee's feelings are attached with an organization and there is an emotional bond.
- b) Continuance commitment; employee is attached with the organization because of economic reasons as organization is paying him well.
- c) Normative Commitment; in this case employee feels his moral obligation to stay with the organization and perform his chores (Meyer & Allen, 1991).
- d)

The second significant focus of commitment is Team commitment (TC). Research suggests that team commitment plays an adequate role in PSFs context, by creating synergy among the members in order to transfer and integrate up to date knowledge to satisfy clients at its best (Swart,2007). There is no doubt in an organization employees interact more with their team members in comparison to the other colleagues (Redman and Snape, 2005).

Past research has examined the correlated relationship between commitment and employees' profession. Employees having high professional commitment are the one who invest more on their knowledge base and career development to stay competitive (Greenwood & Empson, 2003). In PSFs, employees have to share knowledge to polish their skills and maintaining the external professional networks.

In relevance to the other foci of commitments a little less is done in the field of client commitment (Vandenberghe, 2009). In PSFs context employees' interaction with clients is frequent and they have to satisfy them through knowledge they possess.

An individual who is having high commitment towards any particular focus, there is possibility his willingness to knowledge sharing towards other focus may decrease; if he has high commitment towards clients he could be unwilling to share knowledge within the organization.

This study explores how employee commitment towards different foci has impact on the willingness of knowledge sharing at work? Previous research suggests that organizational commitment is positively correlated to the willingness attitude to share knowledge (Hislop,2003). It leads to first hypothesis of the study:

*H1: Different types of employee commitment to the firm/organization are positively associated to knowledge sharing with coworkers in the organization (in Projects).*

An employee who is devoted to their professional development and committed towards that is likely to be reluctant to share their knowledge with members of the organization (Alvesson, 2004).

*H2: Different types of employee commitment to the Occupation/Profession are positively associated to knowledge sharing with coworkers in the organization (in Projects).*

Prior research states that trust and commitment among the team members leveraged the willingness behavior of members to share knowledge with each other but limit it to share with rest of the members of the organization (Newell & Swan, 2000), it leads to third hypothesis of the study;

*H3: Different types of employee commitment to the project team are positively associated to knowledge sharing with coworkers in the organization (in Projects).*

In general, prior research in this domain says that synergy between all foci of commitment; organization, profession, team and client can play a positive role to share knowledge and in gaining a competitive edge (Vandenbergh, 2009). This prompt to the last hypothesis of the study;

*H4: Different types of employee commitment to the Client are negatively associated to knowledge sharing with coworkers in the organization (in Projects).*

### Research Methodology:-

This is a hypothesis testing based correlation study. The research is designed with an aim to study the impact of employee commitment with the organization, team, profession and client to knowledge sharing, as they apply in the Advertising Agencies of Pakistan. To gather the data survey methodology was used on the basis of questionnaire. Details of questionnaire adaptation are mentioned in a table 1 below. 223 respondents were surveyed from different advertising agencies' project teams in the three major cities of Pakistan which include; Islamabad, Lahore and Karachi. This paper has used SPSS and applies (frequency, alpha, correlation, and regression).

**Table 1:-** Questionnaire Adaptation

Variables	Adaptation
Kind of Commitment	Meyer and Allen's (1991)
Foci of Commitment	Klein (2009)
Dimension of continuance employee commitment	Stinglhamber (2002)
Knowledge Distribution	Wilkesmann (2009)

### Results and Analysis:-

In this study 22.4% respondents were female and 77.6% were male. Among the respondents 48.4% were having 0-5 years' experience, 40.4% were of 6-10 years and 11.2% were those who were having 11 years above experience. Position based classification of respondents is: 17.9% were Project Managers, 9% were Project Coordinator, 57.4% were Project team members and 15.7% falls in the support staff category. Following table describing correlation among the variable under study;

**Table 2:** Correlation among all the study variables

		OC	PC	TC	CC	KS
OC	Pearson Correlation	1				
	Sig. (2-tailed)					
PC	Pearson Correlation	.863**	1			
	Sig. (2-tailed)	.000				
TC	Pearson Correlation	.760**	.762**	1		
	Sig. (2-tailed)	.000	.000			
CC	Pearson Correlation	.799**	.804**	.745**	1	
	Sig. (2-tailed)	.000	.000	.000		
KS	Pearson Correlation	.764**	.722**	.792**	.663**	1
	Sig. (2-tailed)	.000	.000	.000	.000	

\*\* Correlation is significant at the 0.01 level (2-tailed).

OC (Organizational Commitment) PC (Professional Commitment) TC (Team Commitment) CC (Client Commitment) KS (Knowledge Sharing).

*Hypothesis testing and finding*

Result against the H1; different types of employee commitment to the firm/organization are negatively associated to knowledge sharing with coworkers in the organization (in Projects) is depicted in the table below:

**Table 3: Hypothesis 1; Regression Model**

Model	R	R Square	F	Std. Error of the Estimate	Sig.	$\beta$ Value
1	.764 <sup>a</sup>	.584	310.477	.661	.000	0.787
a. Predictors: (Constant): OC						
b. Dependent Variable: KS						

Correlation is abbreviated as “R” which is 0.764 in the above table which shows there is a positive relationship between organizational commitment and Knowledge sharing. The table above shows that R Square (Regression) is 0.584 (F=310.477,  $p < .000$ ).

The regression results show that the explained variation in the knowledge sharing is 58.4% explained by the given variables i.e. R square is 0.584

Unstandardized  $\beta$  value .787 ( $p < 0.000$ ) signifies that for every unit change in the independent variables (Organizational Commitment), the dependent variable is positively affected by .787 units. Hence we will reject the null hypothesis. H1 is accepted; organization commitment affects the Knowledge Sharing and ultimately affects project success

Result against the H2; Different types of employee commitment to the Occupation/Profession are positively associated to knowledge sharing with coworkers in the organization (in Projects) is depicted below:

**Table 4: Hypothesis 2; Regression Model**

Model	R	R Square	F	Std. Error of the Estimate	Sig.	$\beta$ Value
1	.722 <sup>a</sup>	.521	240.280	.710	.000	.746
a. Predictors: (Constant): PC						
b. Dependent Variable: KS						

Correlation is abbreviated as “R” which is 0.722 in the above table which shows there is a positive relationship between Professional commitment and Knowledge sharing and is significant at the 0.01 level. The table above shows that R Square (Regression) is 0.521 (F=240.280  $p < .000$ ).

The regression results show that the explained variation in the knowledge sharing is 52.1% explained by the given variables i.e. R square is 0.521

Unstandardized  $\beta$  value .746 ( $p < 0.000$ ) signifies that for every unit change in the independent variables (Professional Commitment), the dependent variable is positively affected by .746 units. Hence H2 is accepted; Professional commitment affects the Knowledge Sharing and ultimately affects project success.

Result against the H3; Different types of employee commitment to the project team are positively associated to knowledge sharing with coworkers in the organization (in Projects).

**Table 5: Hypothesis 3; Regression Model**

Model	R	R Square	F	Std. Error of the Estimate	Sig.	$\beta$ Value
1	.792 <sup>a</sup>	.627	371.324	.626	.000	.936
a. Predictors: (Constant): TC						
b. Dependent Variable: KS						

Correlation is abbreviated as “R” which is 0.792 in the above table which shows there is a positive relationship between team commitment and Knowledge sharing. The table above shows that R Square (Regression) is 0.627 (F=371.324  $p < .000$ ).

The regression results show that the explained variation in the knowledge sharing is 62.7% explained by the given variables i.e. R square is 0.627

Unstandardized  $\beta$  value .936 ( $p < 0.000$ ) signifies that for every unit change in the independent variables (Team Commitment), the dependent variable is positively affected by .936 units. Hence H3 is accepted; team commitment affects the Knowledge Sharing and ultimately affects project success.

Results of H4; Different types of employee commitment to the Client are negatively associated to knowledge sharing with coworkers in the organization (in Projects) are depicted in table below;

**Table 6:** Hypothesis 4; Regression Model

Model	R	R Square	F	Std. Error of the Estimate	Sig.	$\beta$ Value
1	.433 <sup>a</sup>	.188	51.058	.924	.000	.714
a. Predictors: (Constant): CC						
b. Dependent Variable: KS						

Correlation is abbreviated as "R" which is 0.433 in the above table which shows there is a weak relationship between client commitment and Knowledge sharing. The table above shows that R Square (Regression) is 0.188 ( $F=51.058$   $p < .000$ ).

The regression results show that the explained variation in the knowledge sharing is 18.8% explained by the given variables i.e. R square is 0.188

Unstandardized  $\beta$  value .714 ( $p < 0.000$ ) signifies that for every unit change in the independent variables (Client Commitment), the dependent variable is affected by .714 units. Hence we will reject H4; which is resulted in client commitment affects the Knowledge Sharing within the organization.

### Discussion:-

Employee motivation and commitment derives success and failure of Knowledge management. (Galletta, 2003) states that inspiration and obligation plays a vital role in fruitfully implementing Knowledge Management Systems (as antecedents).

Above results and answers have significant implications for concept and for exercise. Study investigation has donated to the inadequate but increasing investigation on relationship among worker commitment and knowledge distribution (Hislop, 2003; Lin, 2007). This research has established on the various kinds (Meyer and Allen, 1991) and foci of worker commitment to comprehend the impact on know-how sharing behavior

**Table 7:** Hypothesis summary

HYPOTHESES	DECISION
H1: Different types of employee commitment to the firm/organization are positively associated to knowledge sharing with coworkers in the organization (in Projects).	Accepted
H2: Different types of employee commitment to the Occupation/Profession are positively associated to knowledge sharing with coworkers in the organization (in Projects).	Accepted
H3: Different types of employee commitment to the project team are positively associated to knowledge sharing with coworkers in the organization (in Projects).	Accepted
H4: Different types of employee commitment to the Client are negatively associated to knowledge sharing with coworkers in the organization (in Projects).	Rejected

Affective employee commitment to the project team and its members and the occupation is positively associated to knowledge sharing behavior. This shows emotive commitment with team-and-professional working (Becker, 2009) enlightens the know-how distribution behavior.

Normative employee commitment (i.e.; a feeling of obligation to the organization) is a further vital impact on knowledge distribution behavior. This behavior can be enhancing by rewards and other mediums of motivation.



Continuance employee loyalty to the customer is weakly associated to knowledge distribution or sharing behavior. Team members are less expected to part their know-how with project colleagues when they pursue to become customer and business experts and want to endure to work with a certain customer/client. These experts have established highly customer focused know-how that may be hard to share with other experts in the project.

### **Conclusion & Implications:-**

The goal of this study is to examine the impact of different kinds of employee commitment (affective, normative and continuance commitment) and foci of commitment (organization, professional, customer and project team) on knowledge sharing. This study has examined organization affective commitment, organization normative commitment and organization continuance commitment, same goes with other foci of commitment. An investigation result evidently shows that the numerous kinds and foci of worker commitment are connected to organizational knowledge distribution behavior.

Project managers should try to motivate their team members in order to increase their commitment to organization, profession and team particularly so that they share their specialized knowledge within the organization. This will ultimately give competitive advantage and will result in greater chances of project success.

This investigation has been able to inspect the types of employee loyalty and also various foci of commitment within the project. This delivers that there is a link among each kind and foci of commitment and two directional know-how distribution behaviors. Research showed that foci that are proximal (i.e. team and profession) generate emotive commitment, which impacts on know-how distribution, while more distal foci, such as the firm, will tend to rely on normative to support know-how distribution behavior.

Lastly, it has showed that firms will be confronted with strategic knowledge management challenges when inspiring very robust customer commitment that indications to the growth of customer oriented knowledge, which desires to be stable with the ability to leverage this know-how inside the firm. This will eventually influence on the competitive ability of the firm, which consequences from the combined effects of knowledge distribution.

Results of analysis revealed that almost all different types and multi-foci of commitment have an influence on knowledge distribution behavior with colleagues in the firm. As knowledge sharing increases chances for project success increases. Knowledge is vital and beneficial on the collective level. Therefore, the analysis leads to interpretation that, knowledge is a vital resource as we are living in a knowledge economy. Commitment on various levels increases knowledge sharing behavior that will ultimately lead to project or organization success.

In future this study could be done with the higher sample size; Future investigator could do comparative analysis in terms of different industries as this study is based on the Advertising Agencies projects only. Future studies can also study some moderating and mediating effect on the relation of commitment and knowledge sharing. Potential researchers can also check the impact of different variables from a new perspective or different perspective that differentiate the more successful organization than the less one. This perspective could be leadership quality, rewards, and likewise impact on a knowledge sharing or other management practices impact.

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### RESEARCH ARTICLE

## REVIEW ON EMERGING POLLUTANTS AND ADVANCED OXIDATION PROCESSES.

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### Abstract

Emerging pollutants are a modern day threat to water quality and security globally. These pollutants are largely as a result of pharmaceuticals and chemical compounds from personal care products that get washed through the sewerage system back into the environment. The long term effects of these compounds are not fully understood but have exhibited in some cases acute effects in aquatic flora and fauna. Science in many respects have caught up with rapid testing of water quality for these compounds however treatment processes in water works are lagging behind despite the many available method that effectively remove these compounds, namely advanced oxidation processes as reviewed.

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### Introduction:-

By 2025, 1800 million people will be living in countries or regions with absolute water scarcity and two thirds of the world population could be under stress conditions (UNDP, 2006). This figure may seem unbelievable but put in perspective the impending crisis is very much possible when one considers the fact that in 1900 the global population was two billion, this figure was exceeded to six billion in 2000 and is on a trajectory of nine billion by 2050. An ever increasing population is always a threat to the environmental sustainability and natural resources such as freshwater. Rising global populations and growing industries, advances in technology and medicine have resulted in the production of new chemical compounds more than ever before in the history of the planet with many of their effects left unknown or slow to discovery. Modern day advances in rapid testing analytical instruments we are now able to detect once undetectable agents that pose a threat to the planet's dwindling water resource. Agents such as low concentrations of emerging contaminants in natural and drinking waters pose a real threat as they undermine water quality and have shown to have detrimental effects on aquatic biota as it was discovered that a significant amount of these compounds were present especially in surface water environment.

Water quality is a global issue. According to UN estimates, the world produces 1500km<sup>3</sup> of wastewater annually. That much waste or 'used' water represents more than six (6) times the volume of freshwater in all the world's rivers combined (UN WWAP, 2003). This becomes more worrisome and a threat to life as we know it when two and a half billion people have no means to proper sanitation (UNICEF, 2009) which means, a large volume of the waste produced goes untreated or improperly disposed. Seventy per cent of these people live in Asia. In china for example, with its rapid economic growth and urbanization, still 70% of its household wastewater goes untreated and end up in in the natural environment which means gallons of emerging contaminants are finding their way into the seas, rivers, aquifers and lakes.

Emerging pollutants (EP/EC) are defined as any synthetic or naturally occurring chemical or organism that is not usually monitored in the environment with potentially known adverse ecological and human health effects (Czech and Bikirowka, 2013). In contrast to other known aquatic pollutants, little is known about them and therefore lacks effects strength

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(Barcelo and Ketrup, 2004; Burger and Moolan, 2006; Jiao and Cheng, 2008), and or negatively affect hormone synthesis and metabolism (Rice et al., 2003; Ying et al., 2004; Bradlow et al., 2005). Emergent pollutants that have adverse effects in ways like those mentioned are referred to as Endocrine Disrupting Compounds (EDCs) and have been characterized as a cause of reproductive disturbance in humans and wildlife (Hayes et al., 2002; Samir et al., 2006; Campbell et al., 2006).

Classes of Emerging Contaminants	Major sub Classes	Sub-classes	Examples	Sources
PPCPs	Pharmaceutical	Antiepileptic	Carbamazapine, <b>primidone</b>	WWTP
		antibiotics	Roxithromycin	WWTP
		Antiseptic	Triclosan	WWTP
		anti-inflammatories	Ibuprofen	WWTP
	Personal care products	Polycyclic mucks	HHCB	WWTP
		UV protection screens	BP2 BP3	WWTP
	Synthetic hormone	ethinylestradiol		WWTP

**Table 1:-** Classification of emergent compound.

		(EE2), DES		
<b>EDCs</b>	Industrial compounds	Phenolic compounds	sufacants	WWTP, run off
		phthalates	(DEP, DBP, DMPs)	WWTP, run off
		Fire retardants	Brominated fire retardants	textile, paint, fabric industry
		PCBs		steel industry
	Harmones	atural and synthetic	estrone	
	Heavy metals		mercury, cadmium, lead	mining and mettallurgy
<b>Pesticides</b>	Organochlorine		Aldrin	agricultural run off
	Organophosphate		ethion	agricultural run off
	Cabamate		Benomyl	agricultural run off
	Triazines		Simazine, cyanazine	agricultural run off
	Pyrethroids		bifenthrin	agricultural run off
	Chlorophenoxy Herbicides		triclopyr	agricultural run off

The main issue with these emergent compounds is that they have the ability to pass through conventional wastewater treatment plants without detection and removal. There is therefore an urgent need to build on present scientific knowledge and to create technologies that are adequately able to detect and monitor these pollutants as well as to remove them from waste water systems efficiently and economically. The first report of pharmaceuticals in wastewater treatment plant was published by Hignite and Azarnoff, 1977. Since then there has been an upward trend in the research of emergent contaminants, their effects, detection and classification in water science and management. Sauve and Desrosiers, (2014), in a review of emergent contaminants introduced three broad definitions of how these pollutants may be considered. Emergent contaminants, by the French scientists, were explained as pollutants that appeared only recently due to an increase in new chemicals such as pharmaceuticals and personal care products, pollutants that have been in the natural system for a period of time but has recently raised concerns or a new perspectives of the concerns of known contaminant. For this review three (3) pharmaceuticals and their occurrence and fate in the environment were discussed. Table 1 outlines the major classifications of ECs with examples. The review also discusses recent studies on advanced water treatment methods that have been proven to effectively degrade ECs.

Emergent pollutants enter water ways as most pollutants do, through point or non-point sources as depicted in the schematic diagram, fig 1 One of the most prevalent sources has been waste water treatment plants (Huang et al., 2003). This is because of the surreptitious nature of the compounds that allows them to pass through unnoticed and untreated by conventional treatment methods (Muller et al., 2010; Petrovic et al., 2013; Czajka and Londry, 2016). Since this discovery researchers have been in earnest to develop effective methods to remove these harmful compounds from waste water treatment plants so as to prevent them from getting into the environment. Bolong et al., (2009) reviews some of these advanced methods in details some of which will be explored in later sections of this review.

There have been an assortment of methodologies used to determine the presence and quantity of these emerging pollutants in various biological environments/matrices which have allowed researchers to fully grasp the persistence, quantity and quality of these active agents in natural and manmade systems. Psychotic drugs have been screened from matrices such as blood and urine using GC-MS and LC-MS methods. (Subramanian et al., 2008). Vanderford and Synder (2006) identified the anxiolytic drug, meprobamate in treated and untreated surface water sources by applying LC-MS/Ms. With applied HPLC-MC/MS, Reh et al., (2013) were able to obtain the quantity of forty four organic micro pollutants (OMP) in groundwater in parts of Germany. Some of these trace pollutants tend to be more persistent than others in the environment and may be found in various concentrations depending on the media and other factors.

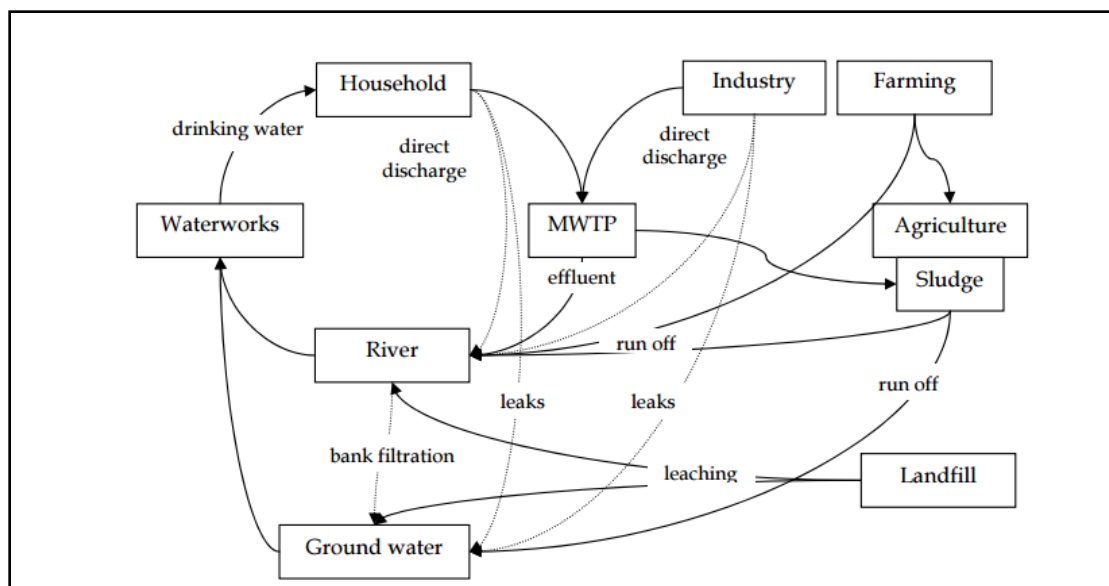


Fig 1: schematic diagram showing the flow of ECs into different system and media.

#### The Effects of Emerging Pollutants:-

The science around the effects of these surreptitious chemical compounds is not as conclusive as one might imagine, as such there is much need for more research geared towards investigating the toxicity of emerging contaminants such as pharmaceuticals and personal care products (PPCPs) in the aquatic environment. Pharmaceuticals, medicinal drugs, are purposefully designed to be effective in target hosts, in relatively small dosage, for human or animal treatment. This may explain largely why these compounds are found in miniscule quantities in various media when compared to other chemical pollutants. The threats of these compounds or rather the threats of their activate ingredients on non-target species still elude scientists and is feared that the possible subtle and gradual effects caused by the contaminants may be misunderstood as natural changes and therefore go undetected or undetectable. The presence of multiple pharmaceuticals in the environment also raises the question of joint toxicity which would result in a high toxic effect (Kortenkamp et al., 2007). The presence of antibiotic compounds in wastewater and water may also give rise to resistant microbes as Guardabassi et al., 2002; Miranda and Castillo, 1998 suggest. Data on the cause of certain cancers have indicated that these kinds of compounds can be assimilated by humans into tissues and can easily pass though cell membranes and avoid detection of the body to carry out designed physiological effects.

Pascoe et al., (2002) in a published study investigated the toxicity of 10 drugs, ibuprofen, paracetamol, acetylsalicylic acid, amoxicillin, bedroflumethiazide, furosemide, atenolol, diazepam, digoxin and amlodipine using cnidarian *Hydra vulgaris*. The investigation revealed that the substances did not have any acute toxicity to the organism at concentration up to  $1.0 \text{ mgL}^{-1}$ , however, three of the drugs did in fact have some retardation effect on polyp regeneration at  $10 \text{ ugL}^{-1}$ . These drugs were diazepam, digoxin and amlodipine. Lange et al., (2001) reported on the adverse effect of EE2 on fish which resulted in a feminizing effect. According to Kidd et al., (2007), an affect like that may result in population crash. Pharmaceuticals and personal care products may affect organisms in various ways, it is therefore the daunting task of figuring out how the compounds individually or jointly may adversely affect the systems of aquatic animals. A widely studied effect is the disruption of the endocrine system where these pollutants interfere the production, transport and balance of hormones necessary for growth, development and species to species interaction, see table 2.

Table 2: EDC and documented effects.

Endocrine Disrupting Compounds	Health effects
Bisphenol A (BPA) — used in epoxy resin and polycarbonate plastics (in food and drink packaging) — used in epoxy resin and	<i>Proven to have estrogenic effects in rats and hormonal effects which increase breast cancer risk in human Reported to act as anti-androgen that causes feminising</i>
Estrone and 17- $\beta$ estradiol (steroidal estrogens) and 17- $\alpha$ ethynylestradiol (synthetic contraceptive) — contained in contraceptive pills	<i>Cause feminization which observed for fish in sewage treatment</i>
Antibiotics (such as penicillin, sulfonamides, tetracyclines)	<i>Shown to cause resistance among bacterial pathogens, that lead to altered microbial community structure in the</i>
Polychlorinated biphenyls (PCBs) — used in electrical equipment (capacitors and transformers)	<i>nature and affect higher food chain The metabolites able to mimic estradiol (female hormone) and cause carcinogenic.</i>

#### **Florfenicol and Thiamphenicol:-**

Florfenicol and Thiamphenicol are anti biotics used commonly to treat animals and used as chemotherapy drugs to control diseases. They are both often used to treat livestock and aquatic species with infections such as pneumonia in cattle, and furunculosis in salmon. These drugs like most emerging contaminants, end up in the environment through excrement, having been metabolized in the animal. Both drugs are a part of a larger group of phenicols called Chloramphenicol which in many countries are banned in agriculture due to its serious side effects on humans. The chemical names for Florfenicol and thiamphenicol are Acetamide, 2,2-dichloro-N-[1-(fluoromethyl)-2-hydroxy-2-[4-(methylsulfonyl)phenyl]ethyl]-[R-(R\*,S\*)]- and 2,2-dichloro-N-[(1R,2R)-1,3-dihydroxy-1-(4-methylsulfonylphenyl)propan-2-yl]acetamide. Lu et al., (2015) discuss the acute toxicity of the pharmaceuticals, Florfenicol (FF) and Thiamphenicol (TAP) and their intermediates, an issue previously seldom addressed. The researchers experimented on the effects of the antibiotics on the marine bacterium *Vibrio fischeri*. The experiment revealed that acute toxicity was slightly increased as a result of the production of the drugs intermediates. This combined effect of parent drug and products generated during degradation was also observed in other studies Bonnemoy et al., 2004; Zhu et al., 2014. The inhibition rate, the measure of the pharmaceuticals toxicity in this case decreased eventually after 60 minutes of the reaction considerably but not substantially below the initial toxicity. The toxicity of FF and TAP was also observed on several species of algae by Lai et al., (2009) and resulted in conclusive evidence to suggest the drugs retarded the growth of the aquatic organisms though in varying degrees.

#### **Primidone:-**

Wastewater in many water scarce countries is being reclaimed and used to augment the lack of access to freshwater in areas of the economy such as agriculture. In those instances treated waste water is used for irrigation of farmlands as seen in countries such as China where established guidelines for the quality of reclaimed water (US EPA, 1992; Chang et al., 1996) do not always consider trace pollutants such as pharmaceuticals and EDCs. As a result the release of these pollutants into the environment has been continuous without a clear understanding of the ecological and health risk associated to their accumulation. The United States Geological Survey has reported the presence of PPCPs in surface and sub terrain waters that are influenced by wastewater in a 2002 nationwide study of emerging pollutants in water. The study found that 80% of the sites investigated tested positive for pharmaceutical compounds (US EPA, 1992; Koplín et al., 2002). Chen et al., (2011) A survey of 43 EDCs and PPCPs in Hebei, China revealed that nine (9) including Primidone was detected in soils irrigated by wastewater. Primidone is increasingly being considered as a good indicator for wastewater influence in surface and groundwater systems Guo and Krasner, (2009).

Primidone is commonly used as antiepileptic drug with an empirical formula of  $C_{12}H_{14}N_2O_2$  and corresponds chemically to 5-ethylidihydro 5-phenyl-4,6(1-H,5H) pyrimidine-dione and has a molecular weight of 218.25. It is metabolized in the livers of animals to form two main metabolites; phenylethylmalonamide (PEMA) and phenobarbital (El-Masri and Portier, 1998). The chemical compound was introduced in clinical use in the 1950 and its metabolite, phenobarbital as early as 1912. Primidone passes through the human system usually 65% unchanged and is released into the environment commonly as urine through wastewater treatment plants. There have been numerous investigations which indicate the occurrence of primidone in surface and groundwater. An investigation by Drewes et al., identified the antiepileptic drugs carbamazepine and primidone as the most dominant in well treated effluents on North American and European treatment plants. Pharmaceutical often finds its way into aquifers and other sub terrain water systems when "treated" effluent is used for irrigation and aquifer recharge in countries

where the commodity is scarce. Outdated practices in the early parts of this century saw much of the developed world treating wastewater by applying it to agricultural lands. Even though over time percolation did treat the wastewater to some extent, organic pollutants persistent in nature found themselves into groundwater systems and eventually drinking water throughout Berlin (Ginzel et al., 1995). Primidone was among the list of psychotic compounds detected in aquifers that are situated below former agriculture/sewage farms. In other instances ground water becomes contaminated by personal care products and pharmaceuticals by landfill leachates (Linde, 1992; Herberer and Stan, 1997; Peschka et al., 2006; Massmann et al., 2008b; Richter et al., 2008b; Hass et al., 2012a) and as farm run offs as these compounds are applied as medicine to farm animals or in the form of pesticides and feed additives.

#### **Advanced Oxidation Processes:-**

Advanced oxidation processes (AOPs) refer to a group of chemical-oxidative methods that have the ability to produce powerful hydroxyl radicals. In this section the processes ozonation, Fenton's Reagent, heterogeneous photo catalysis, ultra-sonic irradiation along with oxidants such a hydrogen peroxide, calcium peroxide will be reviewed as methods used to remove emerging contaminants from water based matrices. Conventional wastewater treatment plants are designed to remove contaminants such as biocidal and or non-biodegradable chemicals, solids and pathogens through chemical and physical processes. Advances over the decades in water treatment technologies have improved physical and chemical processes to adequately remove organic compound that may be dispersed in solution to even combat chemical compounds in trace quantities that were not once considered hazardous, the chemical processes are mostly oxidative chemical processes. Membrane technology, adsorption have also been technically broadened to challenge emerging contaminants. Engineers are now looking towards advanced oxidation processes as a necessary component to the water treatment process if the threat or the fear of the unknown long term impacts of PPCPs may have on humans and the environment. AOPs have been known to improve overall removal efficiencies of contaminants and was previously used as to attain the highest quality of treated water. Advanced oxidation treatment technologies are broadly defined as aqueous phase oxidation methods that are based on the generation of intermediaries of free radicals (Comninellis et al., 2008). Despite the high performance quality and efficiency of these methods be it the use of chemical oxidants such ozone,  $H_2O_2$ , metal catalysts,  $CaO_2$  or a combination of the aforementioned and energy. It is important to note that AOPs are used as enhancers in water treatment rather than a complete replacement of the conventional methods. Photooxidation can be largely considered as the inducing of oxidation by the use of light which commonly occurs by the loss of electrons from a species as a result of photoexcitation or the reaction of other chemical compounds by light. The principle is among the leading degeneration process and happens when organic materials are exposed to air and light (Sai et al., 2014). Chemical oxidation involves the use of oxidants to aqueous waste streams to convert organic pollutants to  $CO_2$  and  $H_2O$  and can be made more efficient if oxidants are applied to waste streams in the presence of UV light. Direct use of oxygen as the oxidizing agent on organic compounds is not practiced as it requires high energy and has a very slow reaction time. In many applications of photo chemical oxidation, hydrogen peroxide, ozone are used as the photoactive oxidants for effective and safe degeneration of contaminants. Fluorine, a known oxidant, despite its high potential is not used during water treatment because of its high toxicity.

#### **Ozonation:-**

Ozonation or ozonisation is the inclusion of Ozone ( $O_3$ ) into water to produce reactive oxygen species which are capable to degrade a wide range of organic compounds and microorganisms (Rice and Netzer, 1982; Masschelein, 1991; Langlais et al., 1991).

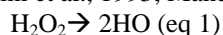
Ozone is prepared by applying energy to oxygen and because of its relative instability is usually generated on site of the treatment plant for immediate use. Exposure to water allows ozone to undergo a decomposition similar to other chemical oxidants to form intermediaries, free radical, which are more powerful in oxidizing (Wang et al., 2004). The combination of Ozone and UV has been technically broaden throughout the years and is even more widely used to remove a wide range of pollutant from water. The degradation of pollutants usually occur directly by ozone or by the radicals it produced during rapid decomposition though the radicals are much more potent (Munter, 2001). This known oxidative ability of ozone and radical generation, makes it among the most widely tested advance processes in research for its capacity and efficiency in removing more persisting compound and pharmaceuticals. Quinones et al., 2015, demonstrated the degradation rate of emerging compounds by ozonation and a combined system of photocatalytic oxidation. The experiment showed the emerging contaminants, acetaminophen, antipyrine, biphenol A, caffeine, metoprolol, and testosterone, to be readily degraded by ozone. Authors, Camel and Bernard give a comprehensive review of the main uses of the oxidation process in treatment of surface and groundwater for consumption (Camel and Bernard, 1998).



**Hydrogen Peroxide:-**

Hydrogen peroxide is a naturally occurring metabolite of many organisms which usually decomposes to form oxygen and water. It is also produced naturally when sunlight interacts with water in the environment. Industrially  $H_2O_2$  is manufactured by the anthraquinone process developed by BASF. The application of the peroxide is numerous. According to Hage et al., 2005, approximately 60% of hydrogen peroxide produced is used in the paper manufacturing industry and it is generally seen as a safe antimicrobial agent and is used in many developing countries for wound treatment (Rahman et al., 2010; Velding et al., 2014). The chemical compound has been studied in combination with UV radiation as an effective method in treating water that has been contaminated by various emerging pollutant that usually go about undetected. This natural occurring combination is among the most powerful photo degradation methods for pollutant removal. It has been used to treat easily oxidized contaminants and much harder oxidized ones such as hydrocarbons and pesticides (Metz et al., 2011a; Metz et al., 2011b).

The application of hydrogen peroxide as a photo oxidant has a number of benefits such as its thermal stability, availability and its ability to be stored on site. The oxidant is able to generate two hydroxyl compounds per molecule as shown in equation 1 (Lengrini et al., 1993; Mandal et al., 2004).

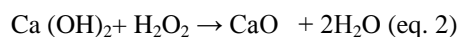


The use of hydrogen peroxide and UV has been the more conventional advanced oxidation processes along with ozone. The use of this process to remove contaminants have been well documented throughout the literature.

**Calcium Peroxide:-**

Though hydrogen peroxide is commonly used to provide oxygen there are a few disadvantage to its used, some of which were outlined by Cassidy and Irvine, (1999). One such disadvantage includes its rapid and uncontrollable release of oxygen. Solid oxygen sources such as calcium peroxide has been found to release oxygen much slower than direct application of  $H_2O_2$ . The oxidative properties of calcium/ magnesium peroxide have exhibited promising degradative potential for the controlled decontamination of soil polluted with pollutants such as hydrocarbons (Bogan et al., 2003; Ndjou' ou and Cassidy, 2006).

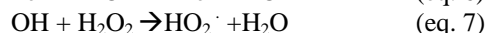
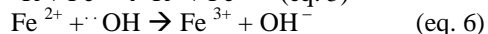
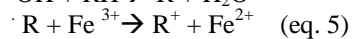
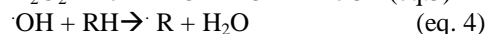
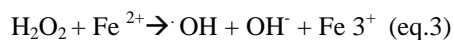
Calcium peroxide is a powerful oxidizer and was investigated to be a potentially efficient oxidizer than the other versatile metabolite,  $H_2O_2$  (Northup and Cassidy, 2008). The efficiency of  $CaO_2$  was demonstrated by researchers to degrade tetrachloroethylene ( $C_2Cl_4$ ) and 2, 4, 6- trinitrotoluene (Arienzo, 2000). Calcium peroxide described by Ma et al., 2007 as a white/yellowish solid peroxide with a high energy covalent bond is made by the addition of hydrogen peroxide to calcium hydroxide and then dried to produce a solid.



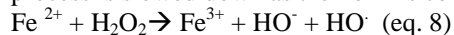
The use of Calcium peroxide as an oxidative agent in waste activated sludge of persistent compounds was investigated by Zhang et al., 2015. The scientists concluded that the release of OH radicals were the dominant forces of degradation. In other studies the solid peroxide is used to treat contaminated soil and groundwater (Goi et al., 2011; Xu et al., 2011). The use of Calcium peroxide and UV as a single treatment process is currently being studied to remove emerging pollutants, Primidone, Cabamazepine, Florfenicol and Thiamphenicol from water on a lab scale by the authors of this review.

**Fenton Reagent:-**

Fenton's reagent ( $H_2O_2/Fe^{2+}$  or  $Fe^{3+}$ ) is an advanced chemical oxidation process used in water treatment. It was discovered by Henry John Horstman Fenton in 1846, (Fenton, 1846) and is acknowledged to be an excellent technology in removing pollutants from waste water efficiently and safely (Lee et al., 2008; Wang et al., 2008). The basis of Fenton's reaction is the production of powerful oxidants; radical species, when ferrous salt and hydrogen peroxide are combined. The ferrous iron ( $Fe^{2+}$ ) generates hydroxyl radical ( $\cdot OH$ ) by catalyzing  $H_2O_2$  as depicted in (equations 3-7).



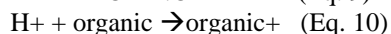
Fenton's reagents have been paired with UV irradiation and found to be more efficient in the degradation of pollutant in solution (Ruppert et al., 1993; Pignatello et al., 1994). This pairing is referred to as photo-Fenton reaction or photo assisted Fenton Reaction. 'Dark' Fenton reaction as referred to by , to imply the application of the Fenton's reagent in the absence of irradiation for removal of contaminants, has a disadvantage in that the oxidation process is slowed down as the Fe<sup>2+</sup> is converted to Fe<sup>3+</sup> (equation 8).



The Fenton Oxidation processes has been exploited for its efficiency in a number of ways since its discovery for degrading organic and some inorganic pollutants. Ma and Zhou, (2009) used the process to reduce organic pollutant in leachate at a landfill site (Ma and Zhou, 2009). The technique has was demonstrated by Rashed et al., 2004, to degrade phenol and formaldehyde in different water matrices. The oxidative process has an overall disadvantage in that its sensitivity to pH change above 4 results in precipitation of ferric hydroxides.

### **Heterogeneous Photocatalysis:-**

Heterogeneous photocatalysis may be defined as the assistance of photoreaction process by a catalyst. This advance process has been applied in the purification of air and water containing persistent organic and inorganic compounds and can be traced back traced back to the 1970s when Fujishima and Honda discovered. One of the most widely used and highly effective catalysts is TiO<sub>2</sub> because of its high potential to oxidize organic and inorganic compounds from solution via redox processes. The metal catalyst is also very stable chemically, nontoxic and relatively affordable. Cesaro et al., described the mechanism of heterogeneous photocatalysis as the transfer of electrons from the valence to the conduction band as a result of light irradiation. Electrons (e<sup>-</sup>) and positive charges or holes (H<sup>+</sup>) are generated. Both these charge carriers are strong oxidants are therefore able to oxidize H<sub>2</sub>O<sub>2</sub> molecule to form hydroxyl radicals (equation 9). Holes can also directly oxidize organics as summarized by equation 10. Photocatalyst such as TiO<sub>2</sub> basically hones UV energy to breakdown contaminants.



Heterogeneous photocatalysis is considered one of the newest advanced oxidation processes and therefore its full scale application is not wide spread due to its technical and economic associations. There have however been increasing scientific work geared towards improving the efficiency of this particular AOP over the years for water treatment. Borges et al., investigated the use of heterogeneous photocatalysis on the removal of emerging pollutants, paracetamol as the model molecule. The authors concluded that TiO<sub>2</sub> resulted in photocatalytic activity for removing the compound from waste water. Forty two per cent of the EC was removed after 8 hours of exposure (Borges et al., 2015)

**Ultrasonic Irradiation:-**

Another advanced oxidation process being exploited and studied for increase efficiency and economical large scale application for removing emerging contaminants from wastewater streams is Ultrasonic Irradiation. The fascination with the catalytic effect of high energy frequencies (15 KHz- 1 MHz) started in 1927 when Richards and Loomis reported on the chemical transformation ultrasound effected. But what are the underlying principles of this technique? Ultrasonic irradiation results in multiple reaction pathways during the degradation of pollutants. These pathways include, pyrolysis, hydroxyl radical reactions (Thompson and Doraiswamy 2000). When applied to liquid an event called electrohydraulic cavitation occurs. This cavitation goes through a series of events which ends with the implosion of microbubbles which then releases large amount of energy (Gogate, 2002). This extreme change in conditions results in direct or indirect chemical alterations.

There have been a number of work which attempted to use the oxidative process in removing emerging contaminants, such as pharmaceuticals from solution. Hoffman et al., demonstrated the efficiency of sonochemical for the degradation of p-nitrophenol, carbon tetrachloride, parathion, p-nitrophenyl acetate and trinitrotoluene. The study concluded that the method is effective for the rapid destruction of the organic compounds due to the extreme temperature and pressure and formation of powerful hydroxyl radicals (Hoffman et al., 1996)

**Comparison:-**

Advanced oxidation processes are grouped on the basis of their aqueous phase oxidation mechanism that results in hydroxyl radicals which then breaks down pollutant into biodegradable intermediaries or completely. An important commonality and drawback to among AOPs is the relatively high cost of reagents and high cost of energy as may be the case with energy intensive processes such as sonochemical irradiation and photocatalytic methods, especially when compared to biological- primary and secondary techniques. The treatment however do have for the most part their individual advantages and disadvantages, some of which will be discussed in this section.

So far the use of AOPs to optimize the removal of pollutants; microorganisms and inorganic micro-pollutants, has proven successful and is used especially in cases where treated water is to meet the highest grade, usually for consumption. Advanced oxidation process have been increasingly being used in streams that have concentrations of ECs and or an assortment of their metabolites. There are a number of challenges AOPs faced on large scale removal of contaminants. Challenges such as matrix composition- natural organic matter, dissolved and suspended solids, temperature and pH (Oppenlander, 2003). These parameters may have restricting effect on the type of AOP used and its efficiency. The Fenton reaction as discussed in earlier sections is very pH specific and is debilitated by conditions above the pH of 4 since iron, an important limiting factor is precipitated as the pH increases. Degradation rates of pollutant is increased when Fe (II) ion is in high concentration. Ultra-violet irradiation aided processes such as UV/H<sub>2</sub>O<sub>2</sub>, UV/CaO<sub>2</sub>, UV/Fenton and heterogeneous photolysis depend on UV transmittance (UVT). The processes efficiency can be hampered significantly if the UVT is not optimum. One of the main disadvantages of UV/H<sub>2</sub>O<sub>2</sub> processes as explained by Naddeo et al., is the small molar extinction coefficient of hydrogen peroxide and the strong dependence of photolysis on the pH conditions of the media (Andreozzi et al., 1999).

The mechanism of generating free radicals is what primarily distinguishes AOPs from other treatment methods. Photocatalyst is the term used to refer to UV or solar aided AOP processes and is often used to optimize the degradation process. In instances where natural solar energy is not used, energy consumption maybe lead to high energy cost. Esplugas et al., presented an energy cost evaluation of UV/H<sub>2</sub>O<sub>2</sub>, O<sub>3</sub> and Fenton and estimates for reagents used in his experiment. The costs were calculated based on the degradation of phenol at two intervals. From the authors estimate, photocatalysts and UV were notably more expensive than the other AOPs evaluated. Sonolysis or ultra-sonar irradiation's major disadvantage is its energy consumption as well and also its limited use for large volume (Naddeo et al., 2013). The processes especially when paired with other methods can be effective in degrading micro pollutants and may reduce cost (Naddeo et al., 2009; De bel et al., 2009; Landi et al., 2010)

**Conclusion:-**

Advanced oxidation process are not intended in any way to replace the conventional water and waste water treatment processes but instead to augment some of the shortfalls and to improve the efficiency of water works. AOPs have a unique ability to remove emerging pollutants by powerful oxidants and can be made economical depending on the methods applied. This versatility continues to allow scientists to improve upon existing knowledge to discover more affordable but effective combinations. Emerging pollutants are an increasing problem in a growing world where water security is crucial to economies and growth. The study of the effect of emerging pollutants are

lacking and therefore provides a myriad of opportunity for future research in terms of identification of new pollutants, their effects and development of economical but effective treatment processes. Advanced oxidation process provides a promising solution to offset the likely effects of emerging contaminants on environment.

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**RESEARCH ARTICLE**

**KNOWLEDGE AND ATTITUDES OF QASSIM UNIVERSITY STUDENTS REGARDING  
 REPRODUCTIVE HEALTH.**

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**Manuscript Info**

**Abstract**

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**Introduction:-**

Knowledge and attitudes surrounding reproductive health carry profound meanings for women and men in every society and affect the quality of life in fundamental ways. Knowledge of sexual attitudes and behaviors is important to family planning researches, policy makers, and service provider.

In our country and many other countries the parents, teachers, Health care workers are unable to provide education about sexual and reproductive health, either because they have no enough information or they feel discomfort about the subject or due to the false belief that providing such information will encourage sexual behavior

The purpose of this study is to explore reproductive health knowledge and attitude among AlQassim University students.

**Methods:-**

A cross sectional study, data was collected through Self administrated structured questioners to a random sample of male students from 3 randomly selected colleges, from which about 300 students will be involved, and data regarding their knowledge and attitude of reproductive health was collected

**Results:-**

288 respondents with a mean age of 21.5 years were enrolled, all of them were male, and 65.5% were from Buraydah, 16.5 from Unizah.44% were from College of English, 55.6 from Pharmacy and Engineering colleges. Regarding the appropriate time of marriage 44% choose to marry after 25 of age, 42.7% between 21 to 25 of age, and 13.2% before the age of 20. About premarriage test 98.3 have good knowledge about its importance, 90% of them think it should be mandatory and 60% of them know it's important in the prevention of Inherited diseases. Asking about contraceptive methods 46.9% think physician consultation is important before the use of any contraceptive methods, 19.1% will use contraceptive pills, 19.6% will use condom and 14.6% don't want to use any contraception.

About Appropriate Number of Children to have 20.5% wish to have 1-3 children, 52.4% to have 3-5 children, and 27 % more than 5 children. 61.5 % think that children care will be affected by increasing number of children, 71.5% by marrying multiple wives and 63 % by wife work.

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About 39% of the students would like to have their first child after one year one marriage, 51.4% after 2 years and 9% after more than 2 years. The space between children 60% chose 2 years as appropriate 25% more than 2 years and 14% one year.

**Conclusion:-**

Reproductive health knowledge and attitudes were different from students to student but in general there were areas of agreement and areas of disagreement. The students have good knowledge regarding reproductive health with some areas which need improvement.



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### RESEARCH ARTICLE

#### STUDY THE EFFECT OF CHEMOTHERAPY ON THE CARDIAC FUNCTION.

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#### Abstract

Advances in cancer therapy have resulted in significant improvement in long-term survival for many types of cancer but have also resulted in untoward side effects associated with treatment. One such complication that has become increasingly recognized is the development of cardiomyopathy and heart failure. The anthracyclines are arguably one of the most active groups of chemotherapy agents in oncology. Echocardiography has been employed to measure left ventricular ejection fraction as chemotherapy progresses, and once decreases in function are identified, chemotherapy dosage or frequency is modified, or the chemotherapy is stopped.

**Purpose:** To detect the side effects of the chemotherapeutic agents on the cardiac function and to estimate the incidence and the features of subclinical cardiotoxicity induced after conventional treatment with doxorubicin-based chemotherapy for lymphoma and breast cancer patients

**Patients and Methods:** This observational non controlled cross sectional study conducted in order to identify the clinical and Echo-Doppler signs of cardiovascular affection induced by Anthracyclines-based chemotherapy in female patients with breast cancer and lymphoma.

Echocardiograms were performed before and 6 cycles after initiation of therapy with anthracyclines. Clinical cardiomyopathy was defined by the presence of clinical signs of congestive heart failure (CHF) and decrease of left ventricular ejection fraction (EF). Cumulative dose of doxorubicin, diabetes, dyslipidemia, older age were evaluated as potential risk factors for the development of cardiac dysfunction.

**Results:** Cardiotoxic side effects developed in about one fourth of cancer breast patients and also lymphoma patients after Doxorubicin therapy. These toxicity were in the form of dilated cardiomyopathy (8.7%) in breast cancer patients and (8%) in lymphoma patients, pulmonary hypertension (7.3%) in breast cancer patients and (4%) in lymphoma patients, diastolic dysfunction (10%) in breast cancer patients and (12%) in lymphoma, mitral regurgitation (12%) in breast cancer patients and (8%) in lymphoma patients and abnormal ECG changes (13%).



The most evident risk factors for the development of cardiotoxicity is the cumulative dose, advanced age, Diabetes Mellitus, Dyslipidemia and hypertension. Anthracycline induced cardiomyopathy is related to number of received cycles of doxorubicin. A change in the left ventricular dimensions and functions (systolic and diastolic) as determined by echocardiography, may be an indicator of developing cardiotoxicity.

**Conclusion:** chemotherapy induced cardiomyopathy is a serious complication of cancer therapy rendering the timely identification of high-risk patients the key to reducing this risk. A unified acceptable definition of chemotherapy induced cardiomyopathy adopted by cardiologists and oncologists must be developed.

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### **Introduction:-**

Advances in cancer therapy have resulted in significant improvement in long-term survival for many types of cancer but have also resulted in untoward side effects associated with treatment. One such complication that has become increasingly recognized is the development of cardiomyopathy and heart failure. Whether a previously healthy person from a cardiovascular perspective develops cancer therapy-related cardiac dysfunction or a high-risk cardiovascular patient requires cancer therapy, the team of oncologists and cardiologists must be better equipped with an evidence-based approach to care for these patients across the spectrum. Although the toxicities associated with various cancer therapies are well recognized, limitations to our understanding of the appropriate course of action remain. ( *bloom et al, 2016* )

The anthracyclines are arguably one of the most active groups of chemotherapy agents in oncology. Commonly used anthracycline antibiotics include doxorubicin, daunorubicin, and epirubicin. They have proven activity against a spectrum of malignancies, including lymphoma,

gastric cancer, small cell lung cancer, sarcomas, and breast cancer to name a few. ( *von hoff et al, 1982* )

Anthracycline are not only some of the most effective, but also the most toxic, chemotherapeutic agents. Their use is associated with a dose-dependent, progressive, dilated cardiomyopathy. To date, there is no specific laboratory or imaging approach to proactively identify patients who will develop anthracycline-induced cardiotoxicity.

Echocardiography has been employed to measure left ventricular ejection fraction as chemotherapy progresses, and once decreases in function are identified, chemotherapy dosage or frequency is modified, or the chemotherapy is stopped ( *Steinherz et al, 1991* )

### **Study design:-**

prospective ,observational cross sectional study

### **Aim of the study:-**

To identify the clinical and Echo-Doppler evidences of cardiovascular toxicity induced by Anthracyclines –based chemotherapy

### **Patients and Methods:-**

This observational non controlled cross sectional study conducted in order to identify the clinical and Echo-Doppler signs of cardiovascular affection induced by Anthracyclines–based chemotherapy in female patients with breast cancer and lymphoma

Patients were selected from those attending National cancer institute and other specialized hospitals during the period from July 2014 to august 2016.

**Inclusion criteria:-**

150 women in different age groups who had breast cancer and 50 patients who had lymphoma. All received Doxorubicin –based chemotherapy, according to the following regimen:

most of breast cancer patients had received **FEC** (fluorouracil 500 mg / m<sup>2</sup>, epirubicin 100 mg /m<sup>2</sup> and cyclophosphamide 500 mg /m<sup>2</sup>), and **FEC -T** regimen and lymphoma patients had received **CHOP** (cyclophosphamide 750 mg /m<sup>2</sup>, doxorubicin 50-100mg /m<sup>2</sup>, vincristin 1.4 mg/m<sup>2</sup>, prednisone) according to type of lymphoma

Their baseline clinical and echocardiographic studies were essentially normal.

**Exclusion criteria:-**

Cardiac diseases: Ischemic heart disease, valvular, congenital heart disease or cardiomyopathy before initiation of chemotherapy.

**Methods:-**

*All patients included in the study were subjected to the following:-*

1. Full history taking: with special interest to determine the risk factors for CAD as hypertension, diabetes mellitus, smoking, dyslipidemia and positive family history of ischemic heart disease.
2. General clinical examination including pulse and blood pressure measurement.
3. Local cardiac examination for assessment of the presence of cardiac murmur, any additional heart sound (e.g. 3rd or 4th heart sound).
4. Echo-Doppler examination using General Electric system Vivid-5 machine with S3 probe. It was done to all patients before starting chemotherapy. The echocardiogram was performed with the patient breathing quietly and lying in the left lateral position. M mode, 2-D and Doppler examinations were done.

**Echo-Doppler evaluation included:-**

Transthoracic conventional echo Doppler was done in all standard views at all accessible windows.

\* 2-D guided M- Mode at the level of the mid left ventricle was obtained and the following measurement was made according to the guideline of the American Society of Echocardiography (*Cheitlin et al., 2003*).

(1) Interventricular septum thickness (IVST), left ventricular posterior wall thickness (LVPWT), end diastolic dimension (EDD), end systolic dimension (ESD), aortic root diameter (AO), and left atrial diameter (LA), Left ventricular function assessment by calculating percent fractional shortening (%FS) and ejection fraction (EF) as follows:

Fractional shortening (FS) was calculated using M-mode LV dimensions in diastole (LVDD) and systole (LVSD):

$FS (\%) = 100 \times (LVDD - LVSD) / LVDD$  (*Cheitlin et al., 2003*).

Ejection fraction (%) was calculated according to the following:

Systolic and diastolic volumes were calculated using the area-length method if the LV is symmetric, but the biplane modified Simpson's rule (4- and 2-chamber views) was used if there is a wall motion abnormality. The ejection fraction (EF%) was calculated according to the following equation:

$EF (\%) = 100 \times \text{diastolic volume} - \text{systolic volume} / \text{diastolic volume}$  (*Cheitlin et al., 2003*).

(2) Wall motion abnormalities (hypokinesia, akinesia, dyskinesia and aneurysm) were searched.

(3) Evaluation of valvular structure and function especially the presence of mitral regurgitation (*Weyman et al., 2007*).

(4) Evidence of pulmonary hypertension (PASP > 30) as estimated through measurement of the tricuspid regurgitant peak velocity (V<sub>max</sub>). If the signal varies, we consider the highest value. In absence of pulmonary stenosis and organic tricuspid regurgitation, the pulmonary artery systolic pressure is equal to: (V<sub>max</sub>)<sup>2</sup> X 4 + right atrial pressure. The right atrial pressure (RAP) was estimated from the diameter and effect of inspiration on the diameter of inferior vena cava as follows:

- Normal diameter (< 2 cm) with collapse or decrease > 50%, the RAP = 5 mmHg.

- Normal diameter (2 cm) with decrease < 50%, the RAP = 10 mmHg.

- Dilated (> 2 cm) with decrease < 50%, the RAP = 15 mmHg.

- Dilated with dilated hepatic veins + no change, the RAP = 20 mmHg. (*Kircher et al., 1990*).

## (5) Doppler assessment of LV diastolic function.

Indices of LV diastolic function obtained from standard transmitral diastolic Doppler signals.

These indices were derived from pulsed Doppler examination guided by color flow with the sample volume placed between the level of the mitral annulus and the tip of the opened mitral leaflets in the apical four chamber view. Measured and calculated Doppler parameters of diastolic function included: early diastolic velocity (E velocity), E-deceleration time, late diastolic velocity (A velocity) and ratio of early to late velocities (E/A) (Nagueh et al., 2009).

**Diastolic function was categorized according to the following:**

- ❖ Normal diastolic function: when the E/ A ratio  $\geq 1$  and E – deceleration time  $< 250$  msec.
- ❖ Grade I diastolic dysfunction ( abnormal relaxation ) when the E / A ratio  $< 1$  and E – deceleration time  $> 250$  msec .
- ❖ Grade II diastolic dysfunction ( pseudo – normal ) when the E / A ratio 1-2 and deceleration time between 150 – 200 msec .
- ❖ Grade III diastolic dysfunction ( Restrictive Pattern ) when the E / A  $\geq 2$  and the deceleration time  $< 150$  msec. (Thomas et al.,2006)

**Follow-up:**

Patients were followed up for 6 cycles with a monthly visit for clinical assessment of the symptoms and signs of cardiac affection.

**Statistical methods:-**

Data was analyzed using IBM SPSS advanced statistics version 22 (SPSS Inc., Chicago, IL). Numerical data were expressed as mean and standard deviation or median and range as appropriate. Qualitative data were expressed as frequency and percentage. Chi-square test or Fisher's exact test was used to examine the relation between qualitative variables. For not normally distributed quantitative data, comparison between two groups was done using Mann-Whitney test (non parametric t-test). Analysis of variance (ANOVA) with repeated measures was used to compare three consecutive measures of numerical variables. While for qualitative data comparison between more than two consecutive measures was done using Cochran test. All tests were two-tailed. A p-value  $< 0.05$  was considered significant. (Bacchieri, Della. 2007).

**Results:-**

This is observational non controlled cross sectional study included 200 patients admitted to National cancer institute and other specialized hospitals for receiving chemotherapy most of patients had breast carcinoma (150 patients ) and the others had lymphoma (50 patients ).

The age ranged between 30 to 60 years with a mean age of  $43 \pm 8.2$  years. forty six patients (23%) were hypertensives , forty patients (20%) had Diabetes Mellitus, eleven patients (5%) had dyslipidemia and twelve patients (6%) had +ve family history cardiac problem

The results of the current study regarding clinical examination before and after chemotherapy showed that the mean HR before chemotherapy was 75 and after 77 , systolic blood pressure before was 121 and after 123 and diastolic blood pressure before was 70 and after 78 as in

**Table (7)** showed that there is no significant difference between the different echocardiographic parameters before and 6 months after chemotherapy except for the incidence of mitral regurgitation in 18 (12%) in patients with breast cancer and 4 (8%) in lymphoma patients , the incidence of diastolic dysfunction which occurred in 15 (10%) in breast cancer patients and 6 (12%) in lymphoma patients , incidence of increased LV dimensions in 13 (8.7%) in breast cancer patients and 4 (8 %) in lymphoma patients ,, incidence of decline in EF is 10(6.7%) in breast cancer patients and 4(8 %) in lymphoma patients incidence of pulmonary HTN in 11( 7.3 %) in breast cancer patients and 2( 4 %) in lymphoma patients.

**Table (7):-** Results of echocardiographic study before and 6 months after chemotherapy

Type of Complication	Complication Rate in BREAST CANCER PATIENTS No ( % )	Complication Rate in In LYMPHOMA PATIENTS No ( % )	COMPLICATION RATE IN ALL CASES
Dilated Cardiomyopathy	13 (8.7%)	4 (8%)	17 ( 8.5 %
Pulmonary hypertension	11 (7.3%)	2 (4%)	13( 6.5% )
Mitral regurgitation	18 (12%)	4 (8%)	22 ( 11 %)
Diastolic Dysfunction	15 (10%)	6 (12%)	21 ( 10.5 %)
Low EF	10 ( 6.7 %)	4 ( 8% )	14 ( 7% )

**Table (8):-** Incidence of Cardiac Complications after chemotherapy

	Before N = 200	After N = 200	P value
EDD (Mean ± SD) (Cm)	4.2 ± 0.3	4.4 ± 0.6	> 0.05
ESD (Mean ± SD) (Cm)	2.9 ± 0.5	3.0 ± 0.6	> 0.05
PWT (Mean ± SD) (Cm)	0.8 ± 0.1	0.9 ± 0.1	> 0.05
SWT (Mean ± SD) (Cm)	0.77 ± 0.1	0.82 ± 0.1	> 0.05
RVDD (Mean ± SD) (Cm)	1.3 ± 0.4	1.34 ± 0.3	> 0.05
LAD (Mean ± SD) (Cm)	3.3 ± 0.5	3.4 ± 0.4	> 0.05
Ao. (Mean ± SD) (Cm)	3.1 ± 0.35	3.3 ± 0.4	> 0.05
EF% (Mean ± SD) (Cm)	64.6% ± 5	63.3 ± 5.9	< 0.05
FS% (Mean ± SD) (Cm)	37.8 ± 7.1	36.0 ± 6.8	< 0.05
Mitral Regurgitation (n (%))*	0	22 (11%)	< 0.05
Diastolic dysfunction (n (%)**)	0	21(10.5%)	< 0.05
Pulmonary hypertesion(n %)		13(6.5 %)	< 0.05

the current study showed that dilated cardiomyopathy developed in 17 patients (8.5%), pulmonary hypertension occurred in 13 patients (6.5%), significant mitral regurgitation in 22 patients (11%), diastolic dysfunction in 21 patients (10.5 %), and low EF in 14 patients (7 %) The total number of patients who developed one or more cardiac complication was 52 (26% ) i . e . about one fourth of cases .

### Discussion:-

Anthracyclines are among the most widely used chemotherapeutic agents ,and have been shown to be effective in a wide range of tumors in particular breast cancer and lymphoma.their clinical effectiveness however may be thwarted by the development of cardiotoxicity that negatively affects patients outcomes,and seriously limits their oncologic therapeutic opportunities ( **Smith et al.,2010 and Vandalen et al .,2007** )

Chemotherapy induced cardiotoxicity in cancer patients may causes serious consequences not only in patients with existing cardiovascular disease but also in patients with good prognosis , this cardiotoxicity may eventually cause severe morbidity leading to premature death (**Svoboda et al .,2012**)

The most clinical presentation of cardiotoxicity is dose dependent cardiomyopathy leading to chronic heart failure , frequently occurring after administration of chemotherapy including anthracyclines (**Yeh et al., 2004** )

Such cardiotoxicity results in a permanent loss of cardiac myocytes and a progressive reduction in cardiac function. Initially, damage to the heart is subclinical; however, increasingly impaired cardiac function can result in clinical heart disease, with serious cardiac injury resulting in congestive heart failure.(**Kilickap et al., 2005** )

Early detection of subclinical anthracycline cardiotoxicity , and ultimately the prevention of clinical congestive heart failure , is a continuing challenge in clinical practice.

This prospective clinical trial aimed at identifying the clinical and echocardiographic signs of cardiovascular toxicity induced by anthracycline containing regimens among patients with breast cancer and lymphoma. For this purpose, one hundred women with breast cancer who underwent mastectomy and fifty patients with Hodgkin and non-Hodgkin subjected to FEC (fluorouracil, epirubicin and cyclophosphamide), CHOP (cyclophosphamide, doxorubicin, vincristin, prednisone) and respectively (anthracycline containing regimens) were used in this study. Their baseline clinical and echocardiographic examinations (before starting chemotherapy) were essentially normal. They were followed-up clinically for 6 months with repeated echocardiographic study done at the end of the follow-up period.

The mean age in our study was  $43 \pm 8.2$  years ranged from 30-60 years this was concordant with **Jensen et al., 2002** who reported that the incidence of congestive heart failure is greater with old patients compared with younger age and discordant with **Peinf et al., 2004** who reported that the incidence of anthracycline induced cardiomyopathy increases with young age.

In our study diabetes is important risk factor associated with chemotherapy, it is present in 20% of patients, this was concordant with **lioyd et al., 2006**, and discordant with **danesi et al., 1999**.

In our study, diastolic blood pressure increased significantly, that was concordant with **Shakir et al., 2009**, and discordant with **Mellstedt et al., 2003**.

In our study the incidence of symptomatic heart failure is 7%, this was concordant with **Keefe et al., 2001** and also von hoff et al., 1979, and discordant with **Borrow et al., 1983**.

The results of the current study regarding clinical examination before and after chemotherapy showed that Dyspnoea and murmur of mitral regurgitation developed in 14 (7%) and 22 (11%) cases respectively after chemotherapy this was concordant with **Shakir et al., 2009** who reported that an incidence of clinical heart failure and cardiomyopathy was 5 to 20% which is nearly similar to that recorded in our study.

In the current study The incidence of abnormal findings in the ECG developed in 26 patients (13%). Consistent with these results, **Dresdal et al., 1983** who reported that the incidence of ECG changes was 12-14%.

Additionally, **Frishman et al., 1997** concluded that the ECG abnormalities due to anthracycline therapy may present as non-specific ST and T wave changes, T wave flattening, decreased QRS voltage and prolongation of Q-T interval. They added that sinus tachycardia is the most common rhythm disturbance. they reported that the incidence of the ECG changes in their study was 20-30% compared to only 14% in the present study.

The results of the present study regarding the echocardiographic findings before and after chemotherapy showed that there is no significant increase in cardiac chambers cavity dimensions and significant decrease in the LV systolic function (EF% and FS%).

twenty two patients (11%) developed mild to moderate mitral regurgitation while twenty one patients (10.5%) developed diastolic dysfunction this was concordant with **Kruiipicke et al., 2002** who did not show significant changes of M-mode derived LV end diastolic and end systolic dimensions, also was concordant with **Gabrielsen et al., 2002** who reported that there was significant decline in mean ejection fraction after chemotherapy, the mean diastolic left ventricular dimension did not significantly change.

This was discordant with **Singal et al., 1998** who reported that end systolic dimension increased significantly after completion of chemotherapy.

In our study the incidence of chemotherapy induced cardiomyopathy was 8.7% in breast cancer patients with cumulative dose of doxorubicin 600-800mg/m<sup>2</sup> and 8% in lymphoma patients with cumulative dose 400-600mg/m<sup>2</sup>. this was concordant with **Salvaterelli et al., 2015** and **Von Hoff et al., 1979**, it was discordant with **Swain et al., 1997** who reported that the incidence of chemotherapy induced cardiomyopathy at dose of 550 mg/m<sup>2</sup> was 26%.

### Conclusions and Recommendations:-

- ❖ Cardiotoxic side effects developed in about one fourth of cancer breast patients and also lymphoma patients after Doxorubicin therapy. These toxicity were in the form of dilated cardiomyopathy (8.7%) in breast cancer patients and (8%) in lymphoma patients, pulmonary hypertension (7.3%) in breast cancer patients and (4%) in lymphoma patients, diastolic dysfunction (10%) in breast cancer patients and (12%) in lymphoma, mitral regurgitation (12%) in breast cancer patients and (8%) in lymphoma patients and abnormal ECG changes (13%).
- ❖ The most evident risk factors for the development of cardiotoxicity is the cumulative dose, advanced age, Diabetes Mellitus, Dyslipidemia and hypertension.
- ❖ anthracycline induced cardiomyopathy is related to number of received cycles of doxorubicin.
- ❖ anthracycline analogues have shown some benefit in reducing cardiotoxicity when compared with doxorubicin alone.
- ❖ A change in the left ventricular dimensions and functions (systolic and diastolic) as determined by echocardiography, may be an indicator of developing cardiotoxicity; So, monitoring such changes should be frequent during treatment and regular thereafter, throughout the patient's lifetime.
- ❖ It is recommended that other studies should be done on a larger scale and for a longer follow up period to shed more light on this important issue.

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### **RESEARCH ARTICLE**

## **IMPACT OF STRATEGIC LEADERSHIP COMPETENCIES ON ENHANCING CORE COMPETENCIES IN ORGANIZATIONS “APPLIED STUDY ON ALMANASEER GROUP”.**

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### **Abstract**

Strategic leadership must have the ability to manage through others and influence them, and the Strategic leadership competencies, through its dimensions (Strategic thinking competencies, leadership competencies), helps the managerial leaders of an organization to perceive and interpret their role in enhancing the organization's core competency. For this reason, we may assume that Strategic leadership competencies have an impact on core competency in an organization. The aim of this study is to explore the impact of Strategic leadership competencies dimensions (Strategic thinking competencies, leadership competencies) on core competency in AlManaseer Group Company. For this purpose, a questionnaire was developed to collect data from the study population which consists of 50 employees. This is aimed at testing the hypotheses and achieving the objectives of the study. The most important results that the study achieved were that there was a statistically significant impact of business intelligence with its dimensions (data warehousing, data mining, and direct analytical processing) in technical creativity. The most important recommendations of the study were the necessity of organizations dependence on modern technology in order to develop their works. Thus, this is because this technology is recognized by its high accuracy on a completion of the work, as well as deepening the concept of technical creativity which gives them a competitive advantage in the market.

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### **Introduction:-**

Business organizations face a challenging future that characterized with uncertainty, high risks, high competitiveness, and speed of technology advents. Markets are becoming more diverse and complex than ever with globalization. Sustain at highly competition, business organizations require not only to possess new talent employees and Intellectual Capital but also to engage them to achieve strategic goals (Irtaimeh, et al., 2016).

Therefore, leaders and managers should be aware and alert if they want to achieve growth and profit targets. As environmental turbulence increases, strategic issues and options become more sensitive to their development. It would enable a better understanding of capability needed to respond to various levels of environmental turbulence.

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In turbulent environments, strategic leadership becomes more important than ever to steering their businesses during the intensified competition and thus the quality of leadership is critical (Joyce, 2012). In the late 1980s, many social science researchers have gone on a debate whether leadership could make a difference in organizations while some others suggested that study of leadership has reached a culminating point. Moreover, leadership plays a pivotal role inside organizations concerning its strategic orientation (and Options).

Nowadays, the study of leadership has been rebranded again as that would make them able to lead and steer the organization during the tough situations. In the era of global markets, organizations start to widening up and diversifying their operations to compete locally, regionally, globally, and internationally for successful growth and survival; therefore, strategic leaders require certain competencies such as strategic thinking, strategic vigilance, change management, and shared values & a clear vision (Norzailan, Yusof, & Othman, 2016).

**Research Problem & Aims:-**

***Problem Statement:-***

Strategic leadership literatures have identified long lists of competencies relating to leadership for effective management. Admittedly, the dynamic and rapidly evolving environment produce increasing uncertainty, complexity, and higher competition, hence, organizations suffer from lacking highly skilled leaderships. As long as complicated situations emerging, leaders should learn effectively how to manage and lead strategic plans that are requiring supplemental critical skills and competencies regardless of the level of leadership involved and thus adding more competencies to their profiles. Notwithstanding, many strategic leadership missed their direction and failed to keep organization on the right path. Therefore, the strategic leadership competencies and the particular core competencies required will be investigated in this study.

***Aims of Study:-***

Smart and professional leaders in all cases require competencies in unique technical and personal skills. An investigation into the nature and impacts of the most critical of these leadership competencies required for strategic leadership is the focus of this study. It will highlight the impact of strategic leadership competencies on core competencies of the organizations which reflect on performance as a whole. This paper also studies strategic leadership competencies in the context of an economic turmoil which has posed great challenges for Jordan's organizations.

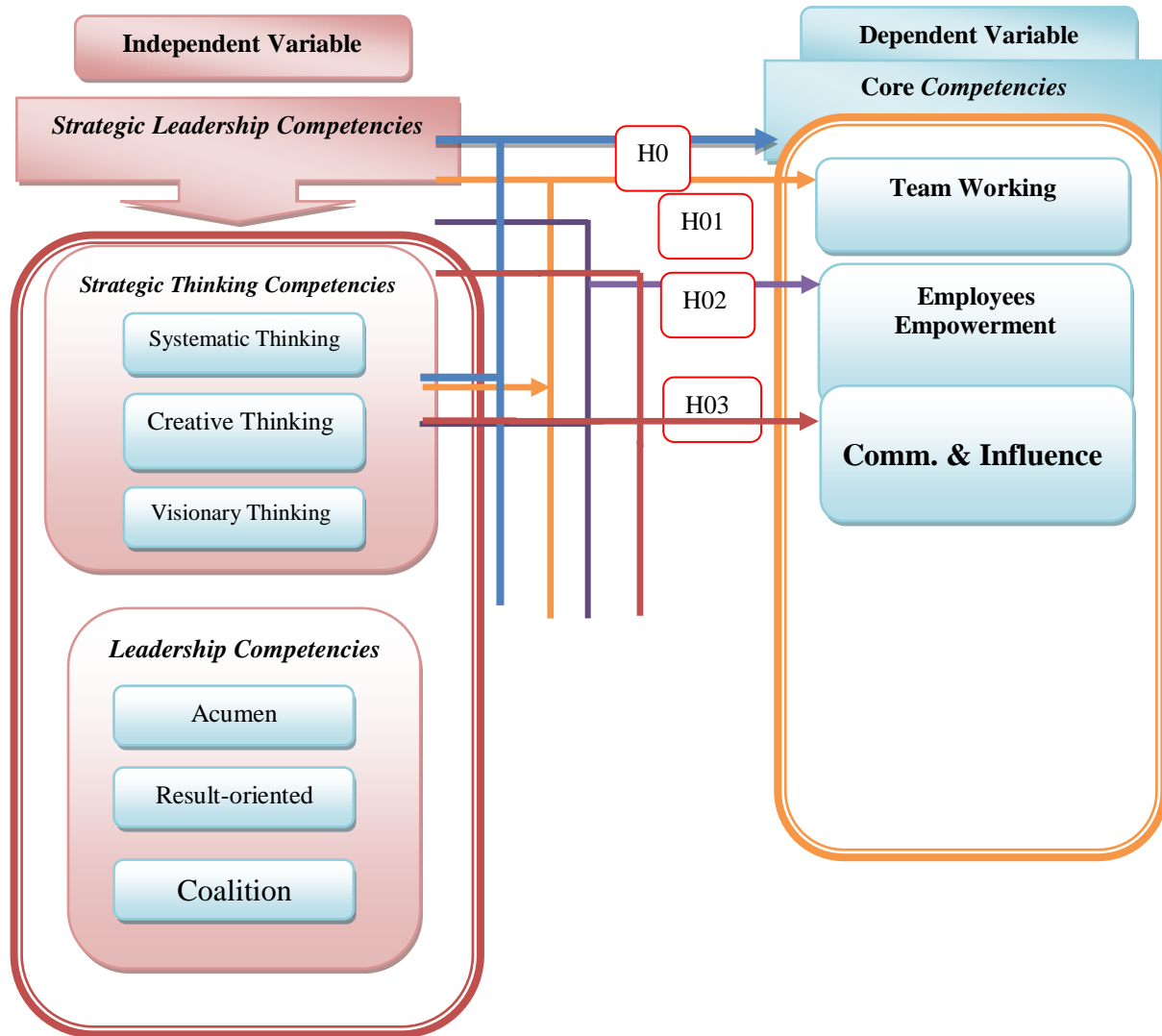
***Research Questions:-***

Towards realizing the broad objective, this study will provide answers to the following questions:

1. What are the competencies required for effective strategic leadership?
2. Which of the competencies required for effective strategic leadership are core?
3. Is level of experience a factor in identifying the core competencies?
4. Are the core competencies identified for traditional leadership adequate for effective strategic leadership?

**Research Model:-**

The study adopted the following study model of the study variables relationships, shown in Figure (1).



**Figure (1):-** the model prepared by the researcher supported in building the following sources: The independent variable (Strategic Leadership Competencies): (Moon, 2013; Overby & Suvanujasiri, 2012; Das et al, 2011). The dependent variable (core competencies): (Shaykhli and Kubaisi, 2011).

**Study Hypothesis:-**

The study has one main hypothesis and three sub hypothesis, as following:

H0: *“The dimension of Strategic Leadership (Strategic Thinking Competencies, Leadership Competencies) doesn’t significantly and positively affect the core competency in AlManaseer Group at  $\alpha \leq 0.05$ ”.*

H01: *“The dimension of Strategic Leadership (Strategic Thinking Competencies, Leadership Competencies) doesn’t significantly and positively affect the Team Working in AlManaseer Group at  $\alpha \leq 0.05$ ”.*

H02: *“The dimension of Strategic Leadership (Strategic Thinking Competencies, Leadership Competencies) doesn’t significantly and positively affect the Employees Empowerment in AlManaseer Group at  $\alpha \leq 0.05$ ”.*

H03: *“The dimension of Strategic Leadership (Strategic Thinking Competencies, Leadership Competencies) doesn’t significantly and positively affect the Comm. & Influence in AlManaseer Group at  $\alpha \leq 0.05$ ”.*

**Literature Review:-****Previous Studies:-**

Mapetere, Mavhiki, Nyamwanza, Sikomwe, & Mhonde (2012) conducted a study to explore the link between active leadership involvement and strategy implementation success in State-Owned-Enterprises in Zimbabwe. The study revealed that a relatively low leadership involvement in strategy implementation leading to partial strategy success. Leadership has been failing to role model the ideal behavior necessary for successful strategy implementation. The absence of a well-crafted strategic vision and the lack of communication were also identified. The study concluded that leadership should be able to craft a vision for any strategic program, design effective communication strategies as well as to role model behavior changes that are consistent with new strategies.

Al-Zoubi (2012) examined the impact of leadership competencies on competitive advantage in the Jordan Telecommunication Industry (JTI). A survey was administered over the middle line managers including supervisors and team leaders. The study found that leadership competencies had a significant impact on Jordanian Telecommunication Companies as well as a strong relationship exists between leadership competencies and competitive advantage.

Moreover, Eldakak (2014) discussed the essential leadership skills and competencies during the crises facing the organizations and how to deal with them effectively. His study consternates on the competencies that should each strategic leadership have them to manage the situations more effectively and achieve the targets.

Hirschi & Jones (2009) demonstrated that strategic leadership has clarity of vision and ability to develop competencies required to attuned organization goals and thus they understand their market and resources well. The results show that the characteristics and skills of strategic leaders play a dominant role in their ability to see the big picture, embedding these into daily business is crucial. Also it found that national culture, competitiveness and market development affect strategic leadership. Eventually, strategic leadership is associated with business success and a lack of strategic leadership may find companies losing focus in the long term.

Maarten & Mikhail (2010) explore the building strategic leadership competencies in global firms working at the Russian business environment after post-communist regime as contributors to successful corporate growth. A serious breakdown faces most companies related to cultural diffusion with visible gaps between typical behaviors and perceived managers' values. They admitted that to achieve strategic success by better understanding the link between strategy and anticipated managers' behaviors, leadership competencies must be considering analysis of Leadership Growth Profile (LGP). Consequently, they observed that leadership competencies are contingent in their nature. Not surprisingly, Wan (2013) agreed with Maarten & Mikhail (2010) point of view about that the context is very important where leaders can enhance and execute their competencies based on their core competencies. Thus, nowadays empowering leaders are more acceptable than ever by their followers to bring greater organizational success.

Norzailan, Yusof, & Othman (2016) proposed that strategic leaders develop three key and distinctive competencies needed to run their duties in the turbulent environment to get competitive advantage, these competencies are strategic thinking, managing policies, and change management. They concluded that these competencies are achievable through a training programs and the training program should accommodate three important elements; deliberate practice, experience density and reflective learning, which are a part of the triangle that supports the development of strategic leadership competencies. As long as these supporting the accumulated competencies of leaders, organizations will obviously possess knowledgeable and professional strategic leaders with core competencies available for more strategic success.

**Leadership & Strategic Leadership:-**

Leadership is an engine for organizations to struggle for growth and survival. Finding good and excellent leaders have always been a crucial issue for all sorts of organizations (Trapp, 2014). Mainly, strategic leadership can be found at all levels of organization, at the top level where business units are formulated, at the middle level where the main strategy top down translated into different business unit strategies (regional, global, and international), and at the departmental level where strategic goals are translated into reality and executing them.

Strategic leadership is a complex form of leadership in organizations. It means that the leader must have the ability to manage through others. Being a strategic leader requires the ability to anticipate, envision, maintain flexibility,

and empower others to create strategic change as necessary. Strategically thinking, a strategic leadership is mandatory to run the ongoing change through continuous improvements to employees and processes used, in other words, their main role is to keep and sustain organizational resources and capabilities while searching for another extended resources that support its strategic goals. Strategic leadership must be alert and carefully make balance between analytics and process development and human dimension.

By and large, the harmonized team leaders and employees that understand common tools, framework, and templates for success, is a very promising future for the organization to start smoothly and grow up very fast. Concretely, the new era of the 21st century requires different leaders to contribute more to their organizations; those leaders face tremendous pressure and challenges such as building peoples' ability to innovate, inspiring others to perform harder, stimulating their high potentials, and understanding of rapidly changing technological advancements. Therefore, leaders require more skills, knowledge, capabilities, abilities, and competencies that would certainly achieve organizational strategic goals.

#### **Competence Vs. Competency :-**

The term of competency has various definitions and it was originated at McClelland works in 1973 used it as replacement to intelligence tests (McClelland, 1973). The term is closely related to ability but there is different between the meanings of synonymous words. Ability usually refers to the able to do something and need special talents while competency refers to the experience or expertise. Noteworthy, competence doesn't equal to competency, the latter is behavioral-based which related to individual characteristics and personality while the first is skill-based that can be trained and practiced. McClelland developed certain competencies for each position based on behavioral interviews with employees and top management (Northouse, 2004).

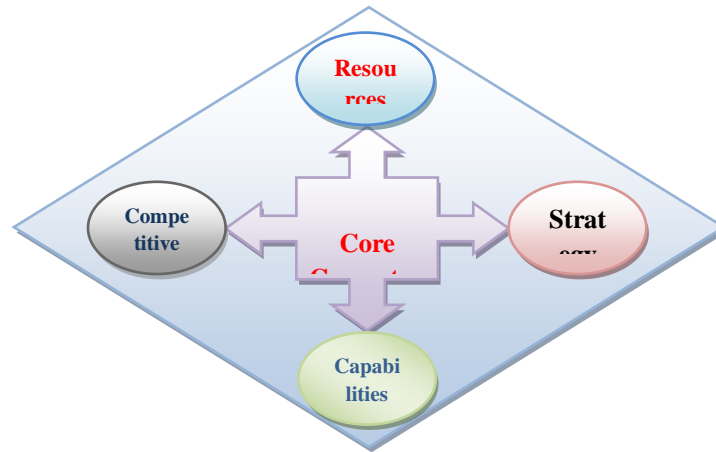
#### **Core Competencies & Leadership Competency:-**

The concept of core competencies was developed by Gary Hamel and C. K. Prahalad (1990) to explain that organizations can easily face the challenges to sustain their strategic position (Prahalad & Hamel, 1994 and 2001; Wikipedia, 2016). It can be defined as "a harmonized combination of multiple resources and skills that distinguish a firm in the marketplace" (Schilling, 2013). Gallon, Stillman, & Coates (1995) defined it as "an aggregates of capabilities, where synergy is created that has sustainable value and broad applicability". Moreover, Coyne, Hall, and Clifford (1997) defined core competencies as "a combination of complementary skills and knowledge bases embedded in a group or team that results in the ability to execute one or more critical processes to a world class standard". Hence, Core competencies are the set of skills which are crucial to a business, for them to gain a competitive advantage in their market.

The term "core competencies" was introduced to Baldrige Glossary Definition on late 2007 which define it as an organization's areas of greatest expertise. An organization's core competencies are those strategically important capabilities that are central to fulfilling its mission or a distinctive competence that provides a firm a competitive advantage in its industry (Baldrige Glossary Definition, 2007). Core competencies frequently are challenging for competitors or suppliers and partners to imitate. Absence of a needed core competency may result in a significant strategic challenge or disadvantage in the marketplace. Core competencies may involve technology expertise, unique service offerings, a marketplace niche, or particular business acumen (e.g., business acquisitions). Core competencies focus on an organization's internal capacities and deep proficiencies that enable a company to deliver unique value to customers. Core competencies also contribute substantially to the benefits a company's products offer customers (Nair, 20104). The distinguishing characteristic of an organization's core competencies are that they develop overtime and represent the continual accomplishment of a firm's critical success factors over time. Another distinguishing characteristic of a core competency is that it's hard for competitors to copy or procure (Rigby, 2015: 24).

By using Hamel and Prahalad core competency model, organizations can capable of developing unexpectedly and surprisingly new products that are matching Porter's cost-leadership strategy and faster than their rivals. Hamel and Prahalad model focuses on a combination of specific, collaboration, integrated and applied knowledge, skills and attitudes (Marino, 1996; Lawson, 1999), it consists of four core competencies (Figure 2); **resources** that requires for developing skills and technologies, **capabilities** the various possibilities to build up core competencies, **competitive advantage** the challenge to acquire and develop largest market share of core products, and **strategy** to develop largest market share of finished products (Van Vliet, 2011).

Figure 2



By researcher depending on Hamel and Prahalad model

A company's competitiveness derives from its core competencies and core products (the tangible results of core competencies). Core competence is the collective learning in the organization, especially the capacity to coordinate diverse production skills and integrate streams of technologies. It is also a commitment to working across organizational boundaries. Organizing around core competencies requires a radical change in corporate organization. The first step requires identifying core competencies, which meet these three requirements: they provide potential access to a wide variety of markets, make a contribution to the customer benefits of the product, and are difficult for competitors to imitate. The next step is to redesign the architecture of the company and provide an impetus for learning from alliances and a focus for internal development (Prahalad & Hamel, 1990).

As a result, effective leaders require competency in core skills. Expertise in core competencies associated with leadership roles typically enable a person to lead others, develop personnel, create a productive environment and get results. Successful organizations develop a competency model that shows the skills, attitudes, behaviors and knowledge required for their leaders and provide training that helps personnel further their careers. Additionally, senior leaders typically provide coaching and mentoring to less-experienced personnel to ensure leadership succession. Therefore, organizations seek to build a leadership competency model which basically divided into three levels:

- 1- Core Competencies at the base level, these are the personal skills required by leadership which is an essential for the foundation of competent leaders. It includes but not limited to basic communications, negotiation, teamwork, creative problem solving, interpersonal skills, manage client relationship, self-direction, flexibility, building necessary relationships, financial skills, business acumen.
- 2- Leadership Competencies at the middle level, grasping these competencies form a basic structure of separating leaders from bosses. Without these competencies, leaders are not any longer leaders. It is cannon in front of new cutting edge of technological menace. Leadership competencies include leadership abilities (role model, stimulating morals, and building trustiness), visioning process, create and lead teams, assess situations accurately and quickly, foster conflict resolutions with win-win situation, project management, employee involvement strategies, coach and train peers and subordinates.
- 3- Professional Competencies at top level, these are the skills and knowledge required by leaders to direct the systems and processes that leader control. These are including adult learning, instructional design, rapid design, and instructions.

### Research Design and Methodology:-

#### Research Design:-

For this study, a descriptive quantitative methodology was chosen to allow us to generate conclusions and results that can be generalized. The methodology is a formal and systematic process that makes use of numerical data in making deductive conclusions. This is achieved with the aid of a structured questionnaire. The questionnaire was drafted to obtain statistically useful information about the strategic leadership competencies required to enhance organization's core and critical competencies across different industries and positions. The questionnaires were administered by distributing and handing out to the respondents to be completed and collected back for subsequent analyses.

**Target Population:-**

The target population for this descriptive study is people occupying top management posts and middle management in AlManaseer for Industrial & Trading Group. The focuses of this study are leaders irrespective of specialization. A well-structured questionnaire was used to obtain data from individuals that fall within the target population in the selected companies.

Cross tabulation and correlations will be used to associate between the variables, which in this case, are the strategic leadership competencies and core competencies required for effective strategic organizational executions.

**Methodology:-****Population and Sample:-**

The population for this study consists of AlManaseer for Industrial & Trading Group chosen because it has a strong brand name and it is implementing accelerated growth strategy in the different companies belongs to this group in Jordan.

AlManaseer Group consists of 27 subsidiaries of the Group parent company, the study sample included all administrative leaders, and thus the size of the sample (180) as director of the occupants of managerial positions in the group AlManaseer companies. **6.3.2 Data Collection and Instrument.**

The study used a questionnaire for collection data of study. A survey instrument that had a (1-5) Likert scale was designed and developed in line with earlier studies to be fitted for Carrefour environment, and it consisted of three main sections; Section 1 focused on Demographical Variables; gender, age, educational background, experiences, and position, while the section 2, focuses on strategic leadership, eventually Section 3

Emphasized on core competencies. 180 questionnaires were distributed on AlManaseer Group director. Only 168 were returned with a ratio of 93.3% and 162 were valid to statistically analysis.

**Instrument Validity and Reliability:-**

The instrument (questionnaire) was sent to a professional as well as specialists in the strategic management and strategy to test the face validity of the instrument; they did small corrections and split some items into two or three items to measure all the variables comprehensively. Other type was to test the internal consistency and stability of questionnaire, is conducting a pilot sample of 20 managers to assess the simplicity and clarity of all items, the results was as simple as clear to understand. Meanwhile, researchers used Cronbach Alpha to test the reliability of the questionnaire, and it is considered adequate if it is exceed 0.70 according to (Sekaran & Bougie, 2010, 290).

However, as depicted in table 1, the results of Alpha coefficients of the concerned variables were registered acceptable where the coefficients are above 0.70. Therefore, the instrument were suitable and consistence for implementing the study.

**Table 1.** Cronbach's Alpha

<i>Variable</i>	<i>No. of Items</i>	<i>Cronbach Alpha</i>	
<b>Strategic Leadership Competencies</b>	<b>30</b>		
<b>Strategic Thinking Competencies</b>	<b>15</b>	<b>0.903</b>	
<b>Systematic Thinking</b>	5	0.837	
<b>Creative Thinking</b>	5	0.794	
<b>Visionary Thinking</b>	5	0.771	
<b>Leadership Competencies</b>	<b>15</b>	<b>0.876</b>	
<b>Acumen</b>	5	0.705	
<b>Result-oriented</b>	5	0.792	
<b>Coalition</b>	5	0.769	
<b>Core Competencies</b>	<b>15</b>	<b>0.905</b>	
<b>Team Working</b>	5	0.766	
<b>Employees Empowerment</b>	5	0.782	
<b>Comm. &amp; Influence</b>	5	0.837	
<b>Total</b>	<b>45</b>		

**Findings:-**

In order to exploring the impact of independent variable(s) on dependent variable(s), a regression analysis was used. The hypothesis testing results are as follow:

**H0:** “The dimension of Strategic Leadership (Strategic Thinking Competencies, Leadership Competencies) doesn’t significantly and positively affect the core competency in AlManaseer Group at  $\alpha \leq 0.05$ ”.

**Table (2).** Regression Results of Strategic Leadership Dimension and ore Competencies

Dependent variable	R	R <sup>2</sup>	Statistic F	Sig F.	Regression coefficients				
					independent variable	$\beta$	Std error	t-statistics	Sig.
Core competencies	0.794	0.626	135,97	0.000	strategic thinking competencies	0.037	0.058	0.629	0.531
					Leadership competencies	0.772	0.064	12.088	0.000

\* The effect is statistically significant at the level of ( $\alpha \leq 0.05$ )

Table (2) explores the regression analysis of hypothesis; results revealed that the Strategic Leadership is significantly affects the Core Competencies at  $P \leq 0.05$ . ( $R^2 = 0.626$ ,  $t = 12.088$ ) which implies that the Strategic Leadership explains 62.6% of the variance of Core Competencies while the rest related to other factors not included in the model. In addition, if the leadership competencies is remarkably nurtured by 1 point, this will lead to effective to follow Core Competencies by 77.2%, in the other hand the result shows that the dimension strategic thinking competencies has not significant effect on the core competencies this shown at the table above, but the total effect the Strategic Leadership is significant, this leads to reject the null hypothesis that saying “The dimension of Strategic Leadership (Strategic Thinking Competencies, Leadership Competencies) doesn’t significantly and positively affect the core competency in AlManaseer Group at  $\alpha \leq 0.05$ ”, and accept the alternative hypothesis of affirming the effect.

**H01:** “The dimensions of Strategic Leadership (Strategic Thinking Competencies, Leadership Competencies) don’t significantly and positively affect the Team Working in AlManaseer Group at  $\alpha \leq 0.05$ ”.

**Table (3).** Strategic Leadership Dimension (Strategic Thinking Competencies, Leadership Competencies) and Core Competencies

Dependent variable	R	R <sup>2</sup>	Statistic F	Sig F.	Regression coefficients				
					independent variable	$\beta$	Std error	t-statistics	Sig.
Team working	0.76	0.571	108.293	0.000	strategic thinking competencies	0.183	0.066	2.694	0.008
					Leadership competencies	0.627	0.073	9.217	0.000

As depicted on the table (3), results revealed that there is a positive correlation between Strategic Leadership and Team Working where the correlation coefficient (R) is equal to 0.76. Additionally, ( $R^2$ ) is explained 57.1% of the variance in Team Working and 42.9% related to other factors not listed in this study.

This confirms that Strategic Leadership with its two dimensions have a positive and significant effects on Team Working where the value of ( $F = 108.293$ , Sig. 0.000).

Regarding the dimensions of Strategic Leadership, strategic thinking competencies, Leadership competencies, table (3) shows that there are a significant and positive correlations with Team Working as the correlation coefficients of ( $R = 0.76$ ) respectively. Notably, the two dimensions of Strategic Leadership explain 18.3%, and 62.7%, of Team Working respectfully, while other factors related to non-listed in this study. Finally, the t-value is showing the significant and positive effect of these dimensions on dependent variable (Team Working). Supporting this is the Beta coefficient ( $\beta = 0.183$ , 0.627) respectfully. By and large, from these results, it can be concluded that Leadership



and its dimensions has a positive and significant relationships and effects on Team Working which are not supported our null hypothesis hence we reject it and accept the alternative hypothesis of affirming the relationships and effects. H02: “The dimension of Strategic Leadership (Strategic Thinking Competencies, Leadership Competencies) doesn't significantly and positively affect the Employees Empowerment in ALmanaseer Group at  $\alpha \leq 0.05$ ”.

**Table (4).** Strategic Leadership Dimension (Strategic Thinking Competencies, Leadership Competencies) and Employees Empowerment

Dependent variable	R	R <sup>2</sup>	f-statistics	Sig F.	Regression coefficients				
					independent variable	$\beta$	Std error	t-statistics	Sig.
Employees Empowerment	0.727	0.522	88.97	0.000	strategic thinking competencies	0.138	0.074	1.919	0.057
					Leadership competencies	0.629	0.081	8.761	0.000

\* The effect is statistically significant at the level of ( $\alpha \leq 0.05$ )

As shown on the table 4, results revealed that there is a relationship between Strategic Leadership and Employees Empowerment where the correlation coefficient (R) is equal to 0.73. Additionally, (R<sup>2</sup>) is explained 52.2% of the variance in Employees Empowerment and 47.8% related to other factors not included in the model.

This confirms that Strategic Leadership with its two dimensions have a positive and significant effects on Employees Empowerment where the value of (F=88.97, Sig. 0.000).

Regarding the dimensions of Strategic Leadership, strategic thinking competencies, Leadership competencies, table (4) shows that there are a significant and positive correlations with Employees Empowerment as the correlation coefficients of (R=0.73) respectively. Notably, the two dimensions of Strategic Leadership explain 7.4%, and 62.9%, of Employees Empowerment respectfully, while other factors related to non-listed in this study model. Finally, the t-value is showing the significant and positive effect of these dimensions on dependent variable (Employees Empowerment). Supporting this is the Beta coefficient ( $\beta=0.138, 0.629$ ) respectfully. By and large, from these results, it can be concluded that Leadership and its dimensions has a positive and significant relationships and effects on Employees Empowerment which are not supported our null hypothesis hence we reject it and accept the alternative hypothesis of affirming the relationships and effects.

H03: “The dimension of Strategic Leadership (Strategic Thinking Competencies, Leadership Competencies) doesn't significantly and positively affect the Comm. & Influence in ALmanaseer Group at  $\alpha \leq 0.05$ ”.

**Table (5).** Strategic Leadership Dimensions (Strategic Thinking Competencies, Leadership Competencies) and Comm. & Influence

Dependent variable	R	R <sup>2</sup>	f-statistics	Sig F.	Regression coefficients				
					independent variable	$\beta$	Std error	t-statistics	Sig.
Comm. & Influence	0.63	0.39	52.395	0.000	strategic thinking competencies	0.182-	0.094	-2.237	0.027
					Leadership competencies	0.733	0.103	9.034	0.000

\* The effect is statistically significant at the level of ( $\alpha \leq 0.05$ )

As shown on the table (5), results revealed that there is a correlation between Strategic Leadership and Comm. & Influence where the correlation coefficient (R) is equal to 0.63. Additionally, (R<sup>2</sup>) is explained 39% of the variance in Comm. & influence and 61% related to other factors not included in the model.

This confirms that Strategic Leadership with its second dimensions Leadership Competencies has a positive and significant effect on Comm. & Influence where the value of ( $F=52.395$ , Sig. 0.000) and instead the strategic thinking competencies has negative significant effect on Comm. & Influence. Regarding the dimensions of Strategic Leadership, table above shows that the Leadership competencies has significant and positive correlations with Comm. & influence as the correlation coefficients of ( $R=0.63$ ) respectively. Notably, the dimensions of strategic thinking competencies has opposite effect (-18.2%) which means 1 point increasing in strategic thinking competencies leads to decreasing 18.2% in Comm. & Influence, and in the other hand Leadership Competencies significant and positive effect on Comm. & Influence ( $\beta=0.733$ ) respectfully. while other factors related to non-listed in this study. Finally, the t-value is showing the significant effect of these dimensions on dependent variable (Comm. & Influence). Supporting this is the Beta coefficient ( $\beta = -0.182, 0.733$ ) respectfully. By and large, from these results, it can be concluded that Leadership and its dimensions has a significant relationships and effects on Comm. & Influence which are not supported our null hypothesis hence we reject it and accept the alternative hypothesis of affirming the relationships and effects.

### Conclusion & Recommendations:-

The results of this study showed a statistically significant impact for strategic leadership (Strategic Thinking Competencies, Leadership Competencies) on core competencies; a statistically significant impact of Leadership Competencies on core competencies; conversely there is not statistically significant impact Strategic Thinking Competencies on core competencies (we can explain this result; that strategic thinking is a process of intellectual and implicit Knowledge which it may not appear in the minds of managers, but appear on their actions and thus can miss the direct impact); a statistically significant impact of Strategic Thinking Competencies on (team working, communication & influence), conversely there is not statistically significant impact Strategic Thinking Competencies on employees empowerment. A statistically significant impact of Leadership Competencies on (team working, employee's empowerment, & communication & influence).

AlManaseer Group should give more importance to core competencies. That's because it is so critical to build the competitive advantage and reinforce and strengthen its competitive position.

AlManaseer Group should evaluate the core competencies; periodically and continuously in order to rebuild the critical resources which are the pillars of core competencies and in line with the requirements and conditions of strategic thinking and leadership competencies, and to ensure the achievement of its competitive advantages, through:

- activate employee's empowerment at different managerial levels, and to consider the ideas provided by employees from the lower level as input to the upper level.
- The diversification of the tools used in the communication between the strategic leadership and employees, and that may have a role in influencing and directing employees to strengthen the competitive advantages and thus achieve the strategic objectives of the organization..
- Activate the cooperation both in problem solving or knowledge sharing across the tangible and moral intensives depending on team working.

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### RESEARCH ARTICLE

#### DNA BARCODES OF THE PLECO (LORICARIIDAE, PTERYGOPLICHTHYS) IN THE CILIWUNG RIVER.

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#### Abstract

Pleco (*Pterygoplichthys sp.*) is an invasive freshwater species belong to Loricariidae Family and comes from Costa Rica, Panama, South America. Distribution of pleco spread throughout the freshwater of the world. One of the habitats in Indonesia is the Ciliwung river and along the river with high abundance. Until now there has been no research results related to molecular identification of the fish especially from Ciliwung river. Therefore, it is necessary to know the molecular analysis of DNA to identify pleco from Ciliwung river by using the technique of DNA barcoding gene CO1. The methodology consisted samples preparation, DNA extraction, DNA quantification, gene CO1 amplification, and DNA base sequence reading. Results identification using gene CO1 barcodes with a length of 650bp fragment showed that pleco from Ciliwung river has a 100% similarity with *Pterygoplichthys pardalis* species. There are transversion substitution nucleotide at nucleotide in positions 306 (C→T), 339 (G→A), 387 (C→T), and 471 (T→C), but this should not affect the amino acid sequence changes in pleco from Ciliwung river.

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#### Introduction:-

##### Background of the Study:-

Pleco (*Pterygoplichthys sp.*) is an invasive freshwater species including Family Loricariidae and comes from Costa Rica, Panama, and South America. Distribution of Pleco spread from the tropic district until to Indo-Pacific (Yu & Quailing 2014). The research result from Wu et al. (2011) states that there are three species of Pleco are most abundant in the world that is *Pterygoplichthys pardalis*, *P. disjunctivus*, *P. multiradiatus*. Two of these species are found in Indonesia, namely the species *P. pardalis* and *P. disjunctivus*.

The originate habitat Pleco are rivers, lakes and creeks (Nice et al. 2012). One river in Indonesia which becomes habitat Pleco is Ciliwung river. According to Ratmini (2009) Pleco found along the Ciliwung river with high abundance.

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The abundance of Pleco in Ciliwung river for Pleco have a high level of adaptation in a polluted environment and the body of Pleco covered with plates of hard scales (Rachmatika & Wahyudewantoro 2006). Therefore, Pleco didn't have predators and be a competitor in obtaining food on the river ecosystem (Haiti 2007), so the species is considered to have contributed to decline in fish endemic ecosystem species Ciliwung river ecosystem (Kusumah 2011).

Results of Hadiaty research (2011) shows the data rate of loss the species endemic from Ciliwung river in 2009 reached 92.5% of the initial number of about 187 species and decreased to 20 species, including five species of which is the introduction of fish species. This type of that fish is lost in the waters of the Ciliwung river is betutu fish and Balidafish (Wowor 2010)

Morphological diversity and genetic information of an organism is very useful for the characterization of the type, the development, distribution by the time and space. Characterization, development and distribution of populations are needed to determine the step of conservation, management and sustainable utilization. The level of diversity among the population, especially genetic diversity can be used as a step to estimate the level of risk of extinction and the abundance of an organism (Singkam et al., 2011). One of the method to analyze the genetic diversity is molecular detection.

Molecular detection method was developed to analyze the genetic diversity of a species. *Polymerase chain reaction* (PCR) is a molecular detection method of *in vitro* without the use of living organisms to amplify a specific territory of a strand DNA. The reaction is limited by the primer pair (short oligonucleotide) using DNA polymerase enzyme and dNTPs as a number (Widowati 2013). The result of PCR is used to stage a reading strand bases in analyzing phylogenetic kinship.

One of the methods in tracing the phylogenetic relationships of a species commonly did is see the resemblance of mitochondrial DNA (mtDNA). Many studies related phylogenetic studies both invertebrate and vertebrate animals used mtDNA CO1 as the gene sign or genetic barcode (Maramis & Warouw 2014). DNA barcoding is a molecular technique to identify species using differences in nucleotide sequence from standardized gene regions (Hubert et al. 2003). DNA *barcoding* is based on fragments of mtDNA gene *Cytochrome Oxidase I* (COI), which serves as a 'barcode' for identifying species (Ward et al., 2005).

CO1 genes of the mitochondrial genome are a gene that is often used as standard sign genes in animal identification. The superiority of CO1 gene is to have a universal primer solid, so as to identify the 5' end from the most groups of animals. CO1 gene also has the highest molecular evolutionary compared with other genes in the mitochondria, thus having a low intraspecific variation and interspecific in height between adjacent taxa (Hajibabaei et al. 2006) Until now there has been no research results related molecular identification of the originate from of Pleco Ciliwung river. Therefore it is necessary for the molecular analysis of DNA Pleco from Ciliwung river originate using DNA *barcoding* techniques.

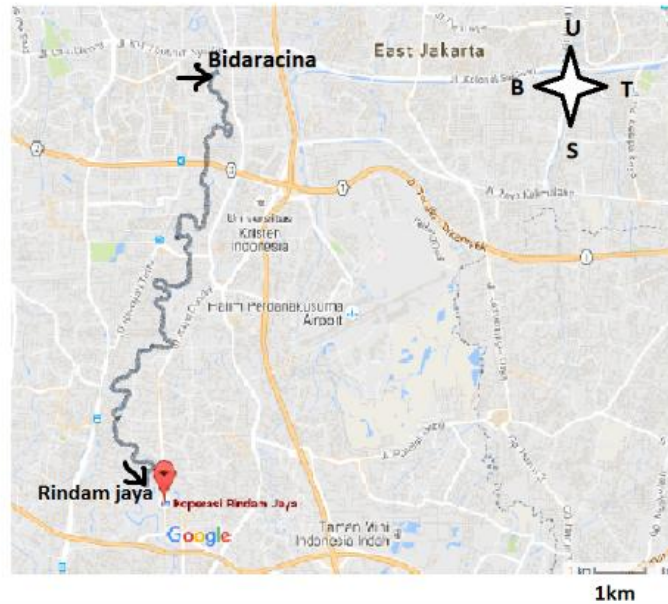
#### **Objectives and Benefits Research:-**

This study was conducted to identify Pleco (*Pterygoplichthys sp.*) As a molecular marker gene CO1, knowing the genetic diversity, and the identification of changes in the nucleotide sequence Pleco in the Ciliwung river Section of South Jakarta. The results are expected to be a source of information and databases for the genetic diversity of Pleco (*Pterygoplichthys sp.*) in the Ciliwung river.

#### **Methodology:-**

##### **The time and place of study:-**

The study was conducted in August 2015-June 2016 include sampling of Pleco and molecular analysis. Sampling of Pleco conducted in August-November 2015 around Ciliwung of Rindam Jaya to Bidaracina (Figure 1). Furthermore, molecular analysis performed in March-June 2016 in the Laboratory of Genetics and Development Research Institute of Ornamental Fish Aquaculture, Ministry of Maritime Affairs and Fisheries, Depok.



**Figure 1.** Location of sampling of Rindam Jaya - Bidaracina

(Source: Google Maps)

#### **Sample Preparation:-**

Decision fin muscle tissue as a source of DNA is done in Laboratory of Biology, University of Al Azhar Indonesia (UAI). The fins are used is the tip of the dorsal fin, pectoral and pelvic fins. Samples were cut using scissors and weighed 5-10 mg, then put into a 1.5  $\mu$ L micro-tubes containing 70% alcohol. Samples were then stored for 1-2 days before being moved into micro-tubes containing 1.5  $\mu$ L of absolute alcohol. Molecular analysis includes extraction, quantification, amplification, visualization, and the reading strand of DNA bases performed in the Laboratory of Genetics and Development Research Institute of Ornamental Fish Aquaculture, Ministry of Maritime Affairs and Fisheries, Depok.

#### **Extraction:-**

DNA extraction performed on 28 samples of fish using DNA *GsyncGeneaideExtraction kit*. The extraction method followed the procedures issued by the company, involves the separation of the network, the destruction of cells, DNA binding, washing, and removal. Phase separation of the network is done by taking about 5-10 mg samples were cut into 1.5  $\mu$ L micro tube and then added 200  $\mu$ L GST Buffer and 20  $\mu$ L proteins K. Further samples of homogenized by vortex and incubated for 24 hours at a temperature of 60<sup>0</sup>C.

Phase cell destruction is done after incubation of samples with the addition of 200  $\mu$ L GSB back Buffer and incubated for 20 minutes at a temperature of 200C. Further samples were centrifuged for 2 min at 15000 g to separate the supernatant with pellets. Supernatant is taken and separated into a new micro tube.

The next stage is the binding of DNA by adding 200  $\mu$ L of absolute alcohol in the supernatant and homogenized. Samples were then transferred on *column tube* 2 mL and the *collecting tube* which then centrifuged at 15 000 g for 1 minute. The liquid solution *column tube* is disposed and then *collecting tube* was transferred to a new tube.

Washing stage by adding 400  $\mu$ L of *Wash Buffer* in *column tube* and centrifuged at 15,000 g for 30 seconds. The solution liquid to the *collecting tube* was removed and reassembled. For the drying process is done centrifugation at 15,000 g for 3 min. Column phase of displacement by moving the tube into a new micro tube and added 100  $\mu$ L *Nuclease Free Water (NFW)* that has been heated at 60 ° C after that silenced for the last 3 minutes and centrifuged at 15,000 g for 30 seconds to get the DNA.

**Quantification of DNA:-**

DNA quantification is done using a spectrophotometer *Gene Quant* with standard volume of 80  $\mu\text{L}$  NFW containing 2  $\mu\text{L}$  of sample DNA extraction results.

**DNA amplification:-**

Fish amplification using the primers F1 (51- TCA - ACC - AAC - CAC - AAA - GAC - ATT - GGC - AC -31) and R1 (51- TAG - ACT - TCT - GGG - TGG - CCA - AAG - AAA - TCA -31) (Ward et al., 2005).

**Table 1:-** The PCR program

Step	Temperature ( $^{\circ}\text{C}$ )	Time
Inisiasi	94	5 second
Denaturasi	94	30 second
Anneling	52	30 second
Elongasi	72	30 second
Post-elongasi	72	5 second

The PCR process is carried out as many as 35 cycles. Components PCR 50  $\mu\text{L}$  consists of nuclease free water (NFW) as much as 11  $\mu\text{L}$ , *forward* primer F1 and *revers* R1 respectively of 2  $\mu\text{L}$ , master mix 25  $\mu\text{L}$  (containing dNTP, buffer and taq polymerase), and the DNA samples of 10  $\mu\text{L}$ ,

**Visualization:-**

Visualization of DNA using agarose gel (1.5%) with *peq green dyes* DNA and *RNA dye*. The result of extraction with the addition of *loading dye* was electrophoreses in 1  $\mu\text{L}$  and a DNA sample as much 5  $\mu\text{L}$ . Electrophoresis was performed on the current strength of 100 volts for 30 minutes and then photographed using a gel doc with UV rays of a wavelength of 302 nm.

**Readings strand bases|:-**

Readings strand bases conducted on 13 samples from 28 samples are amplified namely with sample numbers 6, 7, 9, 13, 15, 17, 20, 21, 22, 24, 25, 26, and 28. Selection of sequencing refers to the pattern of the abdomen. The pattern of abdominal Pleco fish in the study were classified into three (A = black spots, B = lines are not interrupted, and C = a combination of the pattern of black spots and black lines).

Readings base strand done using *ABI'S Sequens Scanner*. Sequencing the form of DNA sequences which are then read and analyzed using MEGA 7.0. Further aligned with the access number listed in the NCBI *GenBank* by BLAST to obtain the identification of the species of the sample (Maramis&Warouw 2014).

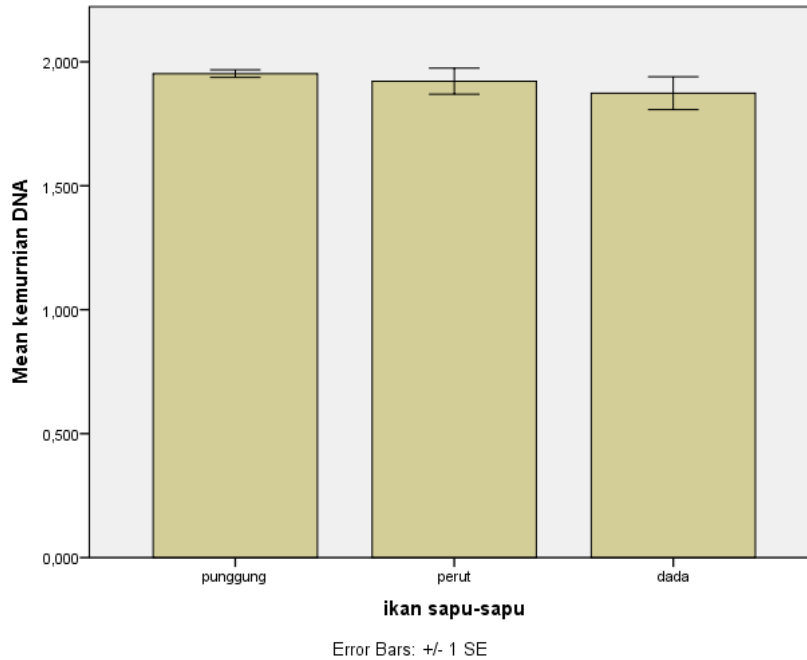
**Results And Discussion:-****The concentration and purity of DNA Fish Pleco fishoriginate from Ciliwung River:-**

The results of the measurement of DNA concentration of fish samples ranged between 36-484 ng /  $\mu\text{L}$  and purity index value (A260 / A280) on average is worth 1.96 (Appendix 1). DNA concentration is the number of DNA (pg) in the sample ( $\mu\text{L}$ ). The number of DNA concentration in a sample is determined by the activity of organ samples and expressing certain genes in an organ (Tiara et al. 2014). DNA purity is a purity level of DNA samples obtained from the A260 / A280 (Sambrook and Russell 2001).

Measurement of DNA concentration using a *Gene-Quant* has a principle wavelength spectrophotometer with 260 $\lambda$ . A beam of UV light passed through a sample of a specific wavelength to see the purity and concentration of DNA. This is done to measure the purity, DNA concentration, protein concentration, and absorbance. Absorbance value is the value measured using a wavelength of 260, so that the absorbance value is the reference number of the DNA concentration (Tiara et al. 2014).

Extraction of DNA can be obtained from muscle tissue and blood. Muscles on the fins are a system of organs that have a central role in the movement of fish. Striated muscle groups are named according to the place of attachment, such as enforcement muscle dorsal fin and pectoral fins towing muscle (Rahardjo et al. 2010). The use of fin muscle tissue as a source of the DNA showed that the muscle tissue of fish fins Pleco fish can be a good source of DNA for molecular analysis.

Based on *one way* ANOVA statistical test showed that the source of the DNA of the dorsal fin, pectoral and pelvic fins have DNA purity values were not significantly different (Figure 2). Significance probability value of 0.541 which means  $> 0.05$  showed no significant difference between types of fins are used as a source of DNA (Appendix 2). According to Newson (2013) if the significance value of  $< 0.05$  means that there are significant differences among the treatments.

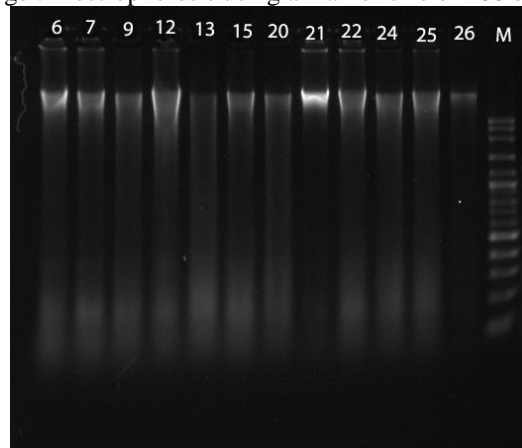


**Figure 2:-** The average value of purity DNA from several types of fins

DNA purity Pleco fish originate from Ciliwung river has a value of purity ( $A_{260} / A_{280}$ ) an average of 1.9 so that it can be expressed as pure DNA. DNA is said to be pure if it has a purity index of 1.8 to 2.2 (Aryahiyah 2014; Wardani & Sari 2015). DNA which has a purity value of less than 1.8 indicate the presence of protein contamination, and if the DNA has a purity value of more than 2.0 indicate contamination of RNA. This can occur because of the absence of additional RNase enzyme that works to degrade RNA. Protein contamination can be caused by lack of protein degradation in the washing step (Aryahiyah 2014). In the process of isolation of DNA, protein is a contaminant that must be degraded (Sambrook & Russel 2001).

#### **Visualization the Results of DNA Extraction Pleco originate from Ciliwung river:-**

Visualization of the extracted DNA Pleco fish on a 1.5% agarose gel shows that DNA can be clearly seen (Figure 3). This is consistent with the concentration and purity of DNA was good so the quality of the electrophoresis results is clearly visible on a 1.5% agarose gel. Electrophoresis using a marker size of 100 bp.

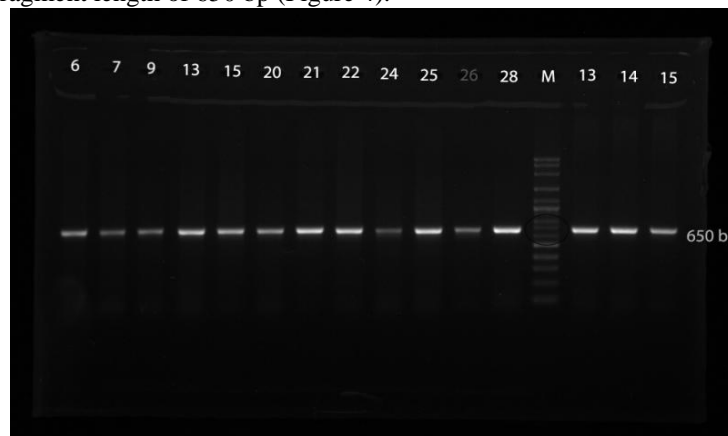




**Figure 3:-** Results of DNA extraction Pleco fish(M = Marker; 6,7,9,12,13,15,20,21,22,24,25,26 = No. Sample fish) Electrophoresis is the movement of electrically charged substances due to the influence of an electric field (Wardani& Sari 2015). DNA molecules including negatively charged compounds so that the process of electrophoresis, DNA migrate toward the positive pole. DNA molecule migration velocity depends on the concentration of the gel used, the size of the molecules being analyzed, as well as the power supply voltage is supplied. Agarose gel used to separate, identify, and purify DNA fragments. The movement of DNA fragments in agarose gels is strongly influenced by the composition and solubility of the ion electrophoresis buffer. If the concentration of ions is very little the electrical conductivity is very small and DNA migration becomes slow. Excessive ion concentration will result in the gel melts and denatured DNA. DNA electrophoresis technique also requires *loading buffer*. This *buffer* works to increase the sample density that is at the bottom well and gives color to the DNA fragment to facilitate observation of the process of electrophoresis (Sambrook&Russel 2001).

#### CO1 gene amplification Fish Pleco fishoriginate fromCiliwungRiver:-

CO1 gene amplification product Pleco fishoriginate fromCiliwungRiver is clearly visible on a 1.5% agarose gel. This indicates that the Primer F1 and R1 successfully amplify the COI gene Pleco fishfishoriginate fromCiliwungRiver in fragment length of 650 bp (Figure 4).

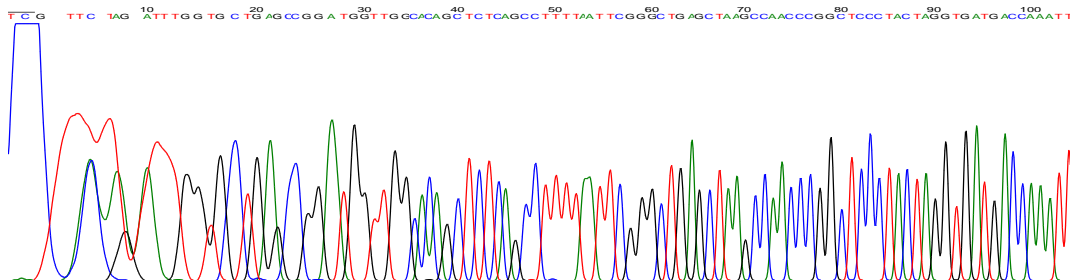


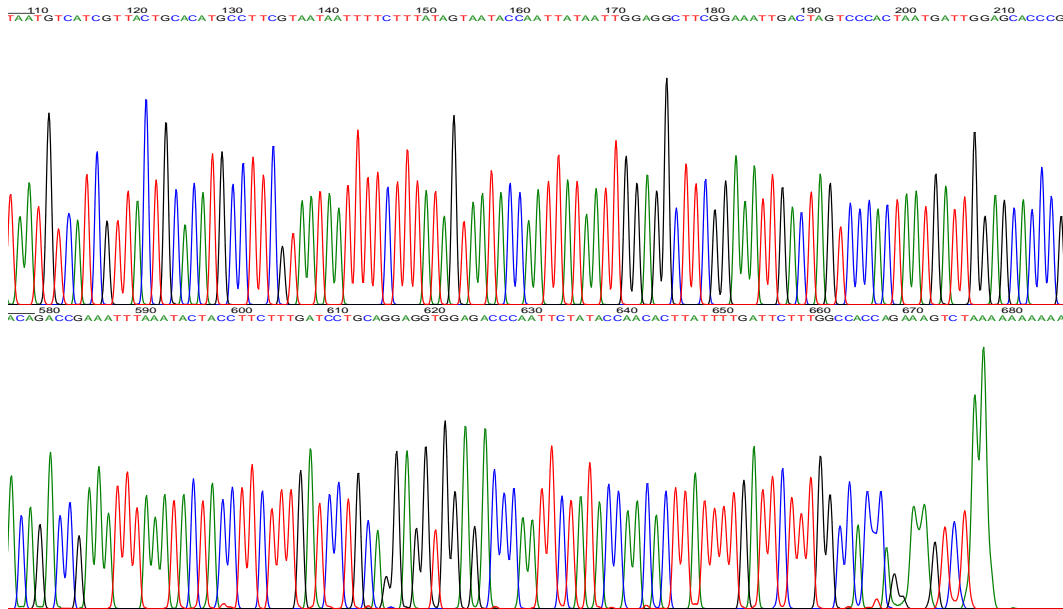
**Figure 4.** Results of CO1 gene amplification Pleco fish(M = Marker; 13,14,15 = positive control; 6,7,9,13,15,20,21,22,24,25,26,28 = No . Samples of Pleco fish fromCiliwungriveroriginate)

F1 primer and R1 have managed to amplify the gene CO1 Pleco fish with long 615 bp fragment (Yu &Quilang 2014). In research Jumawan et al. (2011) F1 primer and R1 succeeded in amplifying the gene CO1 Pleco fish with long fragment of 650 bp. Research Bijukumar et al. (2015) using the primers F1 and R1 CO1 gene amplification produces fish with long Pleco fish 565 bp fragment. Hajibabaei& McKenna (2012) states that the gene CO1 barcodes can be done with a length of 454-650 bp fragment of 650 bp and a total length of CO1 gene fragment for DNA barcoding.

#### CO1 gene readout strand BasaPleco fishoriginate fromCiliwungRiver:-

Based on the reading strand of the COI gene base 13 fish samples Pleco fishCiliwungriveroriginate from obtained sequences with a length of 680 bp fragment (Figure 5). According Hajibabaei et al. (2007) Long sequences are still within the limits of the standard barcode for animals.





**Figure 5:-** Ektogram reading strand of DNA bases Pleco fish originate from Ciliwung river before cutting (680 bp)

The nucleotide sequences of 13 samples of Pleco fish originate from Ciliwung River then compared with the nucleotide sequences in GenBank NCBI (National Center for Biotechnology Information). It aims to determine the similarity of the reading strand fragments to the data base GenBank using BLAST (Basic Local Alignment Search Tool) on megablast-high similarity (Table 3).

**Table 2.** Comparison of similarity between the base strand 13 fish samples Pleco fish originate from Ciliwung river with NCBI GenBank Data

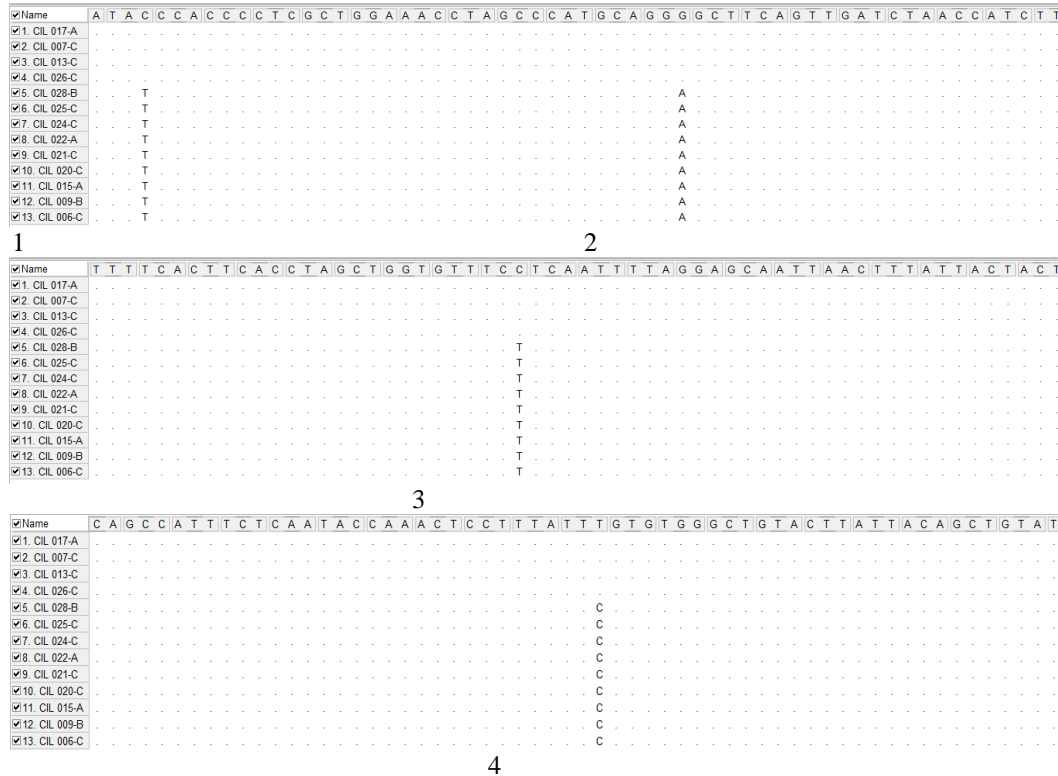
No.	Code Pleco	Identities (%)	Data Base genbank	Code genbank
1	CIL 017-A	100%	<i>Pterygoplichthys pardalis</i>	JF769358.1
2	CIL 007-C	100%	<i>Pterygoplichthys pardalis</i>	JF769358.1
3	CIL 013-C	100%	<i>Pterygoplichthys pardalis</i>	JF769358.1
4	CIL 026 -C	100%	<i>Pterygoplichthys pardalis</i>	JF769358.1
5	CIL 028-B	100%	<i>Pterygoplichthys pardalis</i>	JF769357.1
6	CIL 025-C	100%	<i>Pterygoplichthys pardalis</i>	JF769357.1
7	CIL 024-C	100%	<i>Pterygoplichthys pardalis</i>	JF769357.1
8	CIL 022-A	100%	<i>Pterygoplichthys pardalis</i>	JF769357.1
9	CIL 021-C	100%	<i>Pterygoplichthys pardalis</i>	JF769357.1
10	CIL 020-C	100%	<i>Pterygoplichthys pardalis</i>	JF769357.1
11	CIL 015-A	100%	<i>Pterygoplichthys pardalis</i>	JF769357.1
12	CIL 009-B	100%	<i>Pterygoplichthys pardalis</i>	JF769357.1
13	CIL 006-C	100%	<i>Pterygoplichthys pardalis</i>	JF769357.1

Results blast on NCBI genbank indicates that nucleotide sequence Pleco fish originate from Ciliwung river showed an average value of 100% identification accuracy with *Pterygoplichthys pardalis* species (Table 3). This suggests that the originate from of the Pleco fish from Ciliwung river is one species. Hubert et al. (2003) similarity of identity with an average of 97% shows the same species.

Research Bijukumar et al. (2015), Yu & Quilang (2014) and Jumawan et al. (2011) phylogenetic similarity identity Pleco fish showed the same up to 100%, so that the CO1 gene can produce a high resolution for identification of the species as a standard barcode. According to Yu and Quilang (2014) the species *P. Pardalis* and *P. disjunctivus* is probably the same species or synonyms and have a low genetic diversity. Distinguishing morphological characters are dark lines continuously on *P. disjunctivus*, whereas in *P. pardalis* have dark spots (Chavez et al. 2006). Research Bijukumar et al. (2015) shows the similarity of 100% and 0% genetic distance between species *P. pardalis*, *P. disjunctivus* and *P. ambrosetti*. These results suggest that differences in the pattern of the abdomen is not the main character to identify fish species Pleco fish.

**Variations Nucleotide and Amino Acid Fish Pleco fishoriginate fromCiliwungRiver:-**

The composition of the nucleotide Pleco fishoriginate fromCiliwung river is A = 26.23%, T / U = 30.60%, C = 26.18%, and G = 16.99%. For the process of translation into amino acids ururan cutting 11 bp fragment or to find the start codon AUG (ATG). After cutting with a nucleotide variation obtained nucleotide fragment length 653 bp. Furthermore nucleotide positions can be analyzed to determine the location of the transition and tranversi substitution. There transversion nucleotide substitution in fish samples Pleco fishoriginate fromCiliwung river as much as 4 points namely to nucleotide position 306 (C→T), 339 (G→A), 387 (C→T), and 471 (T→C) ( Figure 6).



**Figure 6-** Variations in the nucleotide composition and changes in nucleotide variations Pleco fish originate fromCiliwung river (1 = position information to the nucleotide-306, 2 = position of nucleotides to 339, 3 = to the nucleotide position 387, 4 = all nucleotide position 471)

The analysis shows that there are different variations of the arrangement of nucleotides in Pleco fishoriginate fromCiliwungriver. Differences in the nucleotide arrangement causes the Pleco fishoriginate fromCiliwung river splits into two on the construction of phylogenetic clade (Figure 7). Therefore, the fourth point of nucleotides serves as the main characteristics of each *clade* and distinguishing nucleotide sequences between individuals. Ubaidillah and Sutrisno (2009) states that if the DNA sequence emerges from a common ancestor sequence, the sequence will gradually separate offspring through nucleotide differences due to mutations or point mutations.

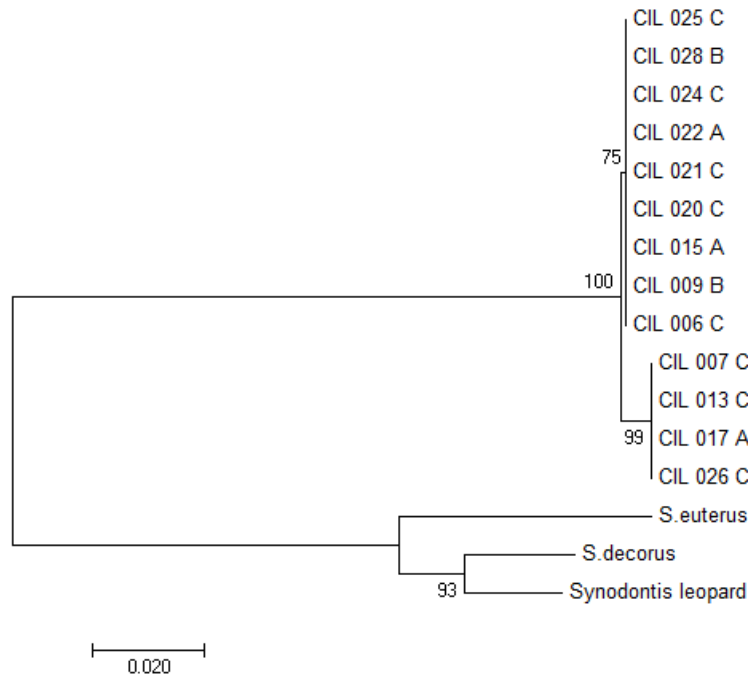
Nucleotide sequence variation along the 653 bpPlecofishoriginate fromCiliwung river ported 217 amino acid sequences. Changes nucleotide variation on four nucleotide positions (306, 339, 387, and 471) did not affect the changes of amino acid variation. Nucleotide variation occurs in nucleotide position to 306 (TAC→TAT) which translations the amino acid position 102 (Y) that is Tyrosine, all nucleotide position 339 (GGG→GGA) translates to the amino acid position 113 (G) is Glycine, to nucleotide position 387 (TCC→TCT) translates to the amino acid position 129 (S) is Serine, and all nucleotide position 471 (TTT→TTC) translations the amino acid position 157 (F) is *Phenylalanine* (Appendix 3).

Changes in the nucleotide variation four positions do not change the amino acid sequence translated. According to Lynch and Jaryl (1993) amino acid sequence changes occur more slowly in CO1 gene so that accuracy in phylogenetic. The substitution of base pairs (*base-pair substitution*) is the turn of one nucleotide and partner with

another pair of nucleotides. Some substitution called silent mutations (*silent mutation*) from an excess of genetic code. That's not influential the amino acid sequence translated. In other words, nucleotide mutations do not change the amino acid translation of the same. Some codons can translate the same amino acids if there is a difference in the third base of the triplet codon (Campbell et al., 2008), as in the TTT and TTC codon that translates the same amino acid that is *Phenilalanine* (F).

#### Construction Phylogenetic Fish Sweep broom:-

The results of phylogenetic construction Pleco fish originate from Ciliwungriver and *out group* genus *Synodontis* (*Synodontisdecoratus*, *S.euterus*, and *S.leopard*) showed genetic distance apart. Plecofish originate from Ciliwungriver is divided into two *clade* this is due to changes in the four nucleotide variations (Figure 7).



**Figure 7.** Construction of phylogenetic Pleco fish originate from Ciliwungriver with NJ-bootstrap 1000x (649 bp) According Mahardika and Parede (2008) the method most commonly used method is the *Neighbor-Joining* (NJ). The branching pattern of phylogenetic tree based on the distance matrix is formed between the pair populations. Long branches of the phylogenetic tree describes the number of nucleotide substitutions in the form of DNA polymorphism. Skala is located under a phylogenetic tree showing the size of the distance between sequences. Numbers located on the branches of the phylogenetic tree shows the value *bootstrap* (Mahardika&Parede 2008). *Bootstrap* value in fish samples Pleco fish showed a value of 100%. Bootstrap analysis was conducted to test the validity of the construction of phylogenetic trees. Phylogenetic trees giving information about the classification of the population based on evolutionary relationships. In the reconstruction of phylogenetic trees, the molecular data more widely used because it is considered more stable in the process of evolution compared with the morphological data (Dharmayanti 2011).

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. CIL 017_A		0.000	0.000	0.000	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.020	0.021	0.022
2. CIL 007_C	-0.000		0.000	0.000	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.020	0.021	0.022
3. CIL 013_C	-0.000	-0.000		0.000	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.020	0.021	0.022
4. CIL 026_C	-0.000	-0.000	-0.000		0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.003	0.020	0.021	0.022
5. CIL 028_B	0.006	0.006	0.006	0.006		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.020	0.022
6. CIL 025_C	0.006	0.006	0.006	0.006	-0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.020	0.022
7. CIL 024_C	0.006	0.006	0.006	0.006	-0.000	-0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.020	0.020	0.022
8. CIL 022_A	0.006	0.006	0.006	0.006	-0.000	-0.000	-0.000		0.000	0.000	0.000	0.000	0.000	0.020	0.020	0.022
9. CIL 021_C	0.006	0.006	0.006	0.006	-0.000	-0.000	-0.000	-0.000		0.000	0.000	0.000	0.000	0.020	0.020	0.022
10. CIL 020_C	0.006	0.006	0.006	0.006	-0.000	-0.000	-0.000	-0.000	-0.000		0.000	0.000	0.000	0.020	0.020	0.022
11. CIL 015_A	0.006	0.006	0.006	0.006	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000		0.000	0.000	0.020	0.020	0.022
12. CIL 009_B	0.006	0.006	0.006	0.006	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000		0.000	0.020	0.020	0.022
13. CIL 006_C	0.006	0.006	0.006	0.006	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000		0.020	0.020	0.022
14. Synodontis leopard	0.214	0.214	0.214	0.214	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208		0.008	0.011
15. S.decorus	0.217	0.217	0.217	0.217	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.210	0.037		0.011
16. S.euterus	0.227	0.227	0.227	0.227	0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.225	0.075	0.076	

[1,1] (CIL 017\_A-CIL 017\_A) / Nucleotide: Kimura 2-parameter

Figure 8. Construction of fish genetic distance Pleco fishoriginate fromCiliwungriver

Fish genetic distance Pleco fishoriginate fromCiliwung river is 0.0-0.03 (Figure 8). This suggests that the genetic distance were lower in Pleco fishoriginate fromCiliwungriver, so the Pleco fishoriginate fromCiliwung river is the same species. According to Hebert et al. (2004) and Ward et al. (2009) said that the genetic distance of more than 0:03 can show different types. This is evident with the genetic distance Pleco fishoriginate fromCiliwung river with out group genus *Synodontis* has a genetic distance of 0:18 to 0:20 (Figure 10).

**Conclusion:-**

Pleco fishoriginate fromCiliwung river had been identified using DNA *barcodes* CO1 on a fragment length of 650 bp. The nucleotide sequences Pleco fish aligned on NCBI genbank showed an average value of 100% identification accuracy with *Pterygoplichthyspardalis* species. There transversion nucleotide substitution at nucleotide position to 306 (C→T), 339 (G→A), 387 (C→T), and 471 (T→C), but this should not affect the amino acid sequence changes in Pleco-baby fish originate fromCiliwung river.

**Appendix 1.** The concentration and purity of the fish DNA Pleco fishoriginate fromCiliwung River.

Sample Concentration of DNA purity (A260 / A280)

Sample	Contretation of DNA	Purity (A260/A280)
1	54	1,929
2	274	2,015
3	480	1,9
4	246	1,952
5	398	1,932
6	168	2,049
7	228	1,966
8	484	1,906
9	164	2,05
10	160	1,633
11	268	1,971
12	320	2
13	228	2
14	374	1,928
15	190	1,979
16	190	1,9
17	308	1,901
18	170	1,809
19	210	1,842
20	154	2,026
21	114	1,9
22	236	2
23	68	2

24	152	2
25	210	1,981
26	36	2,25
27	206	1,981
28	176	2,095
<b>Rata-rata</b>		<b>1,960535714</b>

**Appendix 2:-** The results of the analysis of DNA purity Plecofishorinate from Ciliwung River

**ANOVA**

kemurnian DNA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,022	2	,011	,636	,541
Within Groups	,311	18	,017		
Total	,333	20			

**Appendix 3:-** Variations in the nucleotide and amino acid Plecooriginiate from Ciliwung

✓Name	T	G	A	T	A	C	C	C	A	C	C	C
✓1. CIL 017-A	.	.	.	.	.	.	.	.	.	.	.	.
✓2. CIL 007-C	.	.	.	.	.	.	.	.	.	.	.	.
✓3. CIL 013-C	.	.	.	.	.	.	.	.	.	.	.	.
✓4. CIL 026-C	.	.	.	.	.	.	.	.	.	.	.	.
✓5. CIL 028-B	.	.	.	.	T	.	.	.	.	.	.	.
✓6. CIL 025-C	.	.	.	.	T	.	.	.	.	.	.	.
✓7. CIL 024-C	.	.	.	.	T	.	.	.	.	.	.	.
✓8. CIL 022-A	.	.	.	.	T	.	.	.	.	.	.	.
✓9. CIL 021-C	.	.	.	.	T	.	.	.	.	.	.	.
✓10. CIL 020-C	.	.	.	.	T	.	.	.	.	.	.	.
✓11. CIL 015-A	.	.	.	.	T	.	.	.	.	.	.	.
✓12. CIL 009-B	.	.	.	.	T	.	.	.	.	.	.	.
✓13. CIL 006-C	.	.	.	.	T	.	.	.	.	.	.	.

306/653 Highlighted: None Data

✓Name	T	V	Y	P	P	L	A	G	N	L
✓1. CIL 017-A	T	V	Y	P	P	L	A	G	N	L
✓2. CIL 007-C	T	V	Y	P	P	L	A	G	N	L
✓3. CIL 013-C	T	V	Y	P	P	L	A	G	N	L
✓4. CIL 026-C	T	V	Y	P	P	L	A	G	N	L
✓5. CIL 028-B	T	V	Y	P	P	L	A	G	N	L
✓6. CIL 025-C	T	V	Y	P	P	L	A	G	N	L
✓7. CIL 024-C	T	V	Y	P	P	L	A	G	N	L
✓8. CIL 022-A	T	V	Y	P	P	L	A	G	N	L
✓9. CIL 021-C	T	V	Y	P	P	L	A	G	N	L
✓10. CIL 020-C	T	V	Y	P	P	L	A	G	N	L
✓11. CIL 015-A	T	V	Y	P	P	L	A	G	N	L
✓12. CIL 009-B	T	V	Y	P	P	L	A	G	N	L
✓13. CIL 006-C	T	V	Y	P	P	L	A	G	N	L

304,305,306 [102/217] Highlighted: None

✓Name	G	C	A	G	G	G	G	C	T	T	C	A
✓1. CIL 017-A	.	.	.	.	.	.	.	.	.	.	.	.
✓2. CIL 007-C	.	.	.	.	.	.	.	.	.	.	.	.
✓3. CIL 013-C	.	.	.	.	.	.	.	.	.	.	.	.
✓4. CIL 026-C	.	.	.	.	.	.	.	.	.	.	.	.
✓5. CIL 028-B	.	.	.	.	.	.	.	.	.	.	.	A
✓6. CIL 025-C	.	.	.	.	.	.	.	.	.	.	.	A
✓7. CIL 024-C	.	.	.	.	.	.	.	.	.	.	.	A
✓8. CIL 022-A	.	.	.	.	.	.	.	.	.	.	.	A
✓9. CIL 021-C	.	.	.	.	.	.	.	.	.	.	.	A
✓10. CIL 020-C	.	.	.	.	.	.	.	.	.	.	.	A
✓11. CIL 015-A	.	.	.	.	.	.	.	.	.	.	.	A
✓12. CIL 009-B	.	.	.	.	.	.	.	.	.	.	.	A
✓13. CIL 006-C	.	.	.	.	.	.	.	.	.	.	.	A

339/653 Highlighted: None

✓Name	H	A	G	A	S	V	D	L
✓1. CIL 017-A	H	A	G	A	S	V	D	L
✓2. CIL 007-C	H	A	G	A	S	V	D	L
✓3. CIL 013-C	H	A	G	A	S	V	D	L
✓4. CIL 026-C	H	A	G	A	S	V	D	L
✓5. CIL 028-B	H	A	G	A	S	V	D	L
✓6. CIL 025-C	H	A	G	A	S	V	D	L
✓7. CIL 024-C	H	A	G	A	S	V	D	L
✓8. CIL 022-A	H	A	G	A	S	V	D	L
✓9. CIL 021-C	H	A	G	A	S	V	D	L
✓10. CIL 020-C	H	A	G	A	S	V	D	L
✓11. CIL 015-A	H	A	G	A	S	V	D	L
✓12. CIL 009-B	H	A	G	A	S	V	D	L
✓13. CIL 006-C	H	A	G	A	S	V	D	L

337,338,339 [113/217] Highlighted: None

✓Name	G	T	T	T	C	C	T	C	A	A	T	T
✓1. CIL 017-A	.	.	.	.	.	.	.	.	.	.	.	.
✓2. CIL 007-C	.	.	.	.	.	.	.	.	.	.	.	.
✓3. CIL 013-C	.	.	.	.	.	.	.	.	.	.	.	.
✓4. CIL 026-C	.	.	.	.	.	.	.	.	.	.	.	.
✓5. CIL 028-B	.	.	.	.	.	.	.	.	.	.	.	T
✓6. CIL 025-C	.	.	.	.	.	.	.	.	.	.	.	T
✓7. CIL 024-C	.	.	.	.	.	.	.	.	.	.	.	T
✓8. CIL 022-A	.	.	.	.	.	.	.	.	.	.	.	T
✓9. CIL 021-C	.	.	.	.	.	.	.	.	.	.	.	T
✓10. CIL 020-C	.	.	.	.	.	.	.	.	.	.	.	T
✓11. CIL 015-A	.	.	.	.	.	.	.	.	.	.	.	T
✓12. CIL 009-B	.	.	.	.	.	.	.	.	.	.	.	T
✓13. CIL 006-C	.	.	.	.	.	.	.	.	.	.	.	T

387/653 Highlighted: None

✓Name	A	G	V	S	S	I	L	G	A	I
✓1. CIL 017-A	A	G	V	S	S	I	L	G	A	I
✓2. CIL 007-C	A	G	V	S	S	I	L	G	A	I
✓3. CIL 013-C	A	G	V	S	S	I	L	G	A	I
✓4. CIL 026-C	A	G	V	S	S	I	L	G	A	I
✓5. CIL 028-B	A	G	V	S	S	I	L	G	A	I
✓6. CIL 025-C	A	G	V	S	S	I	L	G	A	I
✓7. CIL 024-C	A	G	V	S	S	I	L	G	A	I
✓8. CIL 022-A	A	G	V	S	S	I	L	G	A	I
✓9. CIL 021-C	A	G	V	S	S	I	L	G	A	I
✓10. CIL 020-C	A	G	V	S	S	I	L	G	A	I
✓11. CIL 015-A	A	G	V	S	S	I	L	G	A	I
✓12. CIL 009-B	A	G	V	S	S	I	L	G	A	I
✓13. CIL 006-C	A	G	V	S	S	I	L	G	A	I

385,386,387 [129/217] Highlighted: None

✓Name	A	T	T	T	G	T	G	G	G	C
✓1. CIL 017-A	.	.	.	.	.	.	.	.	.	.
✓2. CIL 007-C	.	.	.	.	.	.	.	.	.	.
✓3. CIL 013-C	.	.	.	.	.	.	.	.	.	.
✓4. CIL 026-C	.	.	.	.	.	.	.	.	.	.
✓5. CIL 028-B	.	.	.	.	.	.	.	.	.	C
✓6. CIL 025-C	.	.	.	.	.	.	.	.	.	C
✓7. CIL 024-C	.	.	.	.	.	.	.	.	.	C
✓8. CIL 022-A	.	.	.	.	.	.	.	.	.	C
✓9. CIL 021-C	.	.	.	.	.	.	.	.	.	C
✓10. CIL 020-C	.	.	.	.	.	.	.	.	.	C
✓11. CIL 015-A	.	.	.	.	.	.	.	.	.	C
✓12. CIL 009-B	.	.	.	.	.	.	.	.	.	C
✓13. CIL 006-C	.	.	.	.	.	.	.	.	.	C

471/653 Highlighted: None

✓Name	T	P	L	F	V	W	A	V	L	I
✓1. CIL 017-A	T	P	L	F	V	W	A	V	L	I
✓2. CIL 007-C	T	P	L	F	V	W	A	V	L	I
✓3. CIL 013-C	T	P	L	F	V	W	A	V	L	I
✓4. CIL 026-C	T	P	L	F	V	W	A	V	L	I
✓5. CIL 028-B	T	P	L	F	V	W	A	V	L	I
✓6. CIL 025-C	T	P	L	F	V	W	A	V	L	I
✓7. CIL 024-C	T	P	L	F	V	W	A	V	L	I
✓8. CIL 022-A	T	P	L	F	V	W	A	V	L	I
✓9. CIL 021-C	T	P	L	F	V	W	A	V	L	I
✓10. CIL 020-C	T	P	L	F	V	W	A	V	L	I
✓11. CIL 015-A	T	P	L	F	V	W	A	V	L	I
✓12. CIL 009-B	T	P	L	F	V	W	A	V	L	I
✓13. CIL 006-C	T	P	L	F	V	W	A	V	L	I

469,470,471 [157/217] Highlighted: None

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### RESEARCH ARTICLE

#### TOTAL KNEE ARTHROPLASTY IN OSTEOARTHRITIC PATIENTS WITH SEVER VARUS DEFORMITY.

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Total Knee Arthroplasty, osteoarthritis, varus.

#### Abstract

**Objective:**The aim of this study is to evaluate the results of knee arthroplasty in cases of osteoarthritis with sever varus deformity.

**Subjects and Methods:**This study is prospective study was conducted involving 20 patients who underwent primary posterior stabilized total knee arthroplasty due to osteoarthritis with sever varus deformity.

**Results:**Using Knee Society Scoring(KSC) system reveals that, the average post-operative score was 94.3 (range from 80 to 97 ) compared with average pre-operative score 17.5(range from 0 to 22).

**Conclusion:**Total knee arthroplasty in osteoarthritic patients with sever varus deformity gives the best solution in managing pain, deformity, improve walking and improve range of motion.

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#### Introduction:-

Knee replacement surgery is one of the most successful surgeries in orthopedics. Hundreds of thousands of these operations are now carried out every year worldwide with excellent results. Knee replacement becomes necessary when the knee joint has been damaged from any cause and the resulting pain cannot be satisfactorily be controlled by other means. The usual problem that can end up in the need for total knee replacement is chronic arthritis (Sandesh et al., 2015).

Varus deformity is predominantly the commonest deformity in candidates for total knee arthroplasty. This deformity possibly underlies pathomechanics that led to the progression of the arthritic process, and may compromise the outcome of the arthroplasty itself. Obtaining a well positioned and stable prosthetic construct with restoration of the normal mechanical axes of the limb and joint line have been shown to have an important bearing on the final outcome of knee replacement operations (Elsebaei, 2001)

Varus deformity is defined by any preoperativetibiofemoral angle less than naturally occurring anatomic valgus (Laskin, 1996).

#### Patient And Methods:-

This study was carried out in Orthopedic Surgery Departments, Faculty of Medicine, Zagazig and Ain Shams University in the period between April 2014 and October 2016, a prospective study was conducted involving 15 patients with 20 knees who underwent primary total knee arthroplasty due to sever varus osteoarthritis.

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We included patients with primary degenerative varus osteoarthritis with tibio-femoral angle more than 15 degrees (more than 20 degrees varus malalignment) with average preoperative tibio-femoral angle of 26.2 degrees (range from 22 to 41 varus), aged above 50 years with the mean age at time of surgery is 65.4 (ranging from 58 to 74 years) and their deformities are totally articular i.e. wear and erosion of the medial compartment of the joint.

The group of patients included 1 male (7%) and 14 females (93%). Five patients had the right knee replaced, five patients had the left one, while five patients had bilateral total knee replacement 2 of them were done bilateral simultaneous at the same setting. All patients had flexion knee deformity. Fifteen (75%) knees had mild flexion deformity (less than 15°) while five (25%) knees had moderate flexion deformity (15° - 30°).

The diagnosis was primary varus osteoarthritis in all the cases (100%) and any patient with knee arthritis rather than primary severe varus osteoarthritis with deformity more than 20 degrees varus malalignment, inflammatory arthritis (e.g. Rheumatoid arthritis), post-traumatic O.A. knee, extra-articular deformity, and other general contraindications of arthroplasty was excluded.

Pre-operative clinical, laboratory and radiological assessment of the patients was done. Knee Society Scoring (KSS) system was taken to each patient pre and post-operative. Follow up for two years was done.

Prophylaxis against D.V.T., proper antibiotic coverage must be taken in consideration.

#### **Operative Technique:-**

In our study 13 patients were given epidural anesthesia, 2 patients spinal anesthesia. Tourniquet was applied in all patients.

Midline skin incision was used with avoidance of skin undermining (Belleman et al, 2008).

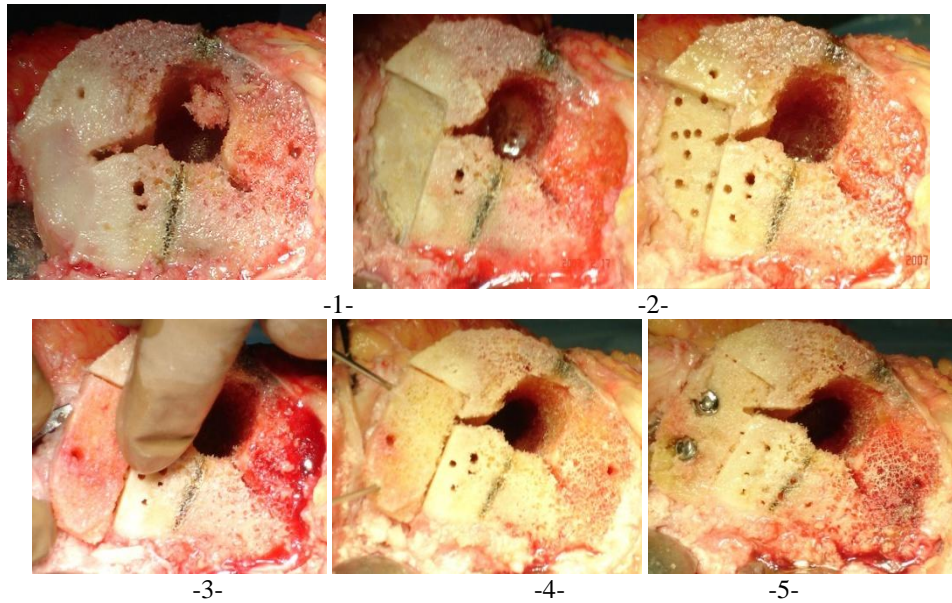
The main approach which was performed in the present study was the medial para-patellar approach in seventeen knees (85%). While three knees (15%) were done by the subvastus approach.

We used the sequential medial release, after initial dissection of the soft tissues along the medial joint line, including the deep medial collateral ligament, osteophytes were removed from the medial distal femur and proximal tibia.

The distal femur was cut at 5-7° valgus to the femoral shaft axis using intramedullary instrumentation (perpendicular to the mechanical axis of the femur). Like the femoral resection, resection of the proximal tibial surface is based on the height of the intact lateral bone surface. A maximum thickness of 8-10 mm cut is removed from the medial tibial plateau perpendicular to the mechanical axis of the tibia, which often leaves a large bony defect on the medial side of the tibia that was reconstructed either by bone graft or metal augmentation with or without use of long stem tibial component.

Metal augments were done in uncontained (steeply defects) defects more than 10 mm (done in 7 cases). They are either ½ wedges (3 cases) or ½ blocks (4 cases) (according to the geometry of the defect). In cases of complex reconstruction of tibial defects, long stem tibial component was used to unload the deficient metaphyseal bone (12 cases).

Bone grafts were used in reconstruction of contained defects usually without fixation (done in 3 cases). Or uncontained defects 5- 10 mm using special technique for its fixation (done in 3 cases).



-1- -2-  
-3- -4- -5-  
Technique of bone grafting in management of the tibial defect.

## Results:-

### Clinical results:-

#### Knee Society Score:-

At last follow up, the average **Knee Society Score (KSS)** was 94.3 (range from 80 to 97) compared with average pre-operative KSS of 17.5 (range from 0 to 22). Seventeen (85%) knees had excellent results (85 to 100 points), three (15%) knees had good results (70 to 84 points), No knees had fair results (range 60 to 69 points) or poor results (<60 points).

#### Knee Function Score:-

At the last follow up, the average **Knee Function Score (KFS)** was 88.5 (range from 83 to 94) compared with average preoperative knee function score of 17.8 (range from zero to 26). Three (15%) knees had excellent results (85 to 100 points), twelve (60%) knees had good results (70 to 84 points) and four knees (13.33%), two (10%) knees had fair results (range 60 to 69 points) and one (5%) knee had poor result (less than 60).

#### Post-operative range of motion:-

At last follow up, the average post-operative range of motion was 100.4° (range from 0-120°). There was one knee (5%) with maximum range of above 110, eighteen knees (90%) flexion between 80 and 110 degrees, and one knee (5%) with range below 80 degrees. In comparison to the pre-operative range of motion the average was 87.3°. Fifteen knees (75%) were in the range between 80-110 degrees, zero knees with range above 110 degrees and 5 knees (25%) were below range of motion of 80 degrees.

#### Pain score:-

At last follow up, fifteen knees out of twenty (75%) had no pain (score 50). Five knees (25%) had very mild or occasional pain (score 45), No other knees in the study had pain on stairs or walking.

## Radiological results:-

### Limb alignment (Tibio-femoral Angle):-

The average post-operative tibio-femoral valgus angle was 6.8 degrees (range from 4 to 11 valgus), compared with average pre-operative tibio-femoral angle of 26.2 degrees (range from 22 to 41 varus). Eighteen knees (90%) had a valgus angle within 5-10 degrees, while one knee (5%) had excessive valgus angle of more than 10 degrees and one knee (5%) had valgus angle less than 5 degrees.

**Complication:-**

In this study, three knees had complications (15%).

**Complications and its ratio:-**

Complication	Case No.	Number	%
Superficial skin infection	5	1	5%
Partial patellar tendon rupture	12	1	5%
Fissure fracture of med. tibial condyle	2	1	5%



AP & Lat. views of both knees: **A:** pre-operative **B:** immediate post-operative.

**Discussion:-**

Varus deformity is predominantly the commonest deformity in candidates for total knee arthroplasty. Obtaining a well positioned and stable prosthetic construct with restoration of the normal mechanical axes of the limb and joint line have been shown to have an important bearing on the final outcome of knee replacement operations.

At last follow up, the average **Knee Society Score (KSS)** was 94.3 (range from 80 to 97) compared with average pre-operative KSS of 17.5 (range from 0 to 22).

**Sandesh et al,(2015)**reported in their study improvement of the mean preoperative knee society score i.e. knee and function scores were 29.45(range:15-52) and 26.50(range: 10-40) respectively to 84(range: 60-92) and 79.5(range: 70-90) respectively.Their results were coincided with the present study results.

**Mullaji et al,(2005)**reported in their series improvement of the mean knee society score from 22.8 preoperatively to 99.1 postoperatively and the function knee score from 22.8 to 72.1. Their results were coincided with the present study results.

**Dixon et al,(2004)**also reported that the KSS increased from a mean of 24 (range from 0 to 43) to a mean of 94 (range from 78 to 100). The FS improved from a mean of 34 (range, 0 to 70) to a mean of 85 (range, 45 to 100).With their results were highly coincided with the present study results.

**Merrill et al, (2004)**reported improvement of the preoperative knee score for the severe deformity from 44.5 to 87.8 with significant improvement.

**Tenny et al(1991)**reported that in their study the mean post-operative knee society score was 89. Sixteen knees (59%) in the varus deformity group were rated excellent and 11 knees (41%) good. There were no fair or poor results. Their results were also go hand in hand with the results of the current study.

There is marked improvement of deformity either in coronal plane or in sagittal plane.The average post-operative tibio-femoral valgus angle was 6.8 degrees (range from 4 to 11 valgus), compared with average pre-operative tibio-femoral angle of 26.2 degrees (range from 22 to 41 varus) . Eighteen knees (90%) had a valgus angle within 5-10 degrees, while one knee (5%) had excessive valgus angle of more than 10 degrees and one knee (5%) had valgus angle less than 5 degrees.

There is marked improvement in pain sensation either at rest or during work.Improvement of walking distance post-operatively occurs.

**Conclusion:-**

Proper pre-operative evaluation of the patients clinically and roentgenographically is mandatory.

There was no statistically difference in the mean KSS and FKSS post operatively between age groups.

Epidural or Spinal anesthetics(unless contraindicated) are the better options to avoid the risk of general anesthesia and maximize the period of analgesia, so faster regain of ROM postoperatively.

Subvastus approach is better than medial para-patellar approach as it gives the chance for early post-operative rehabilitation as well as it minimize patellar complication. On the other hand, it is better to be avoided in obese patients with short patellar tendon and also in patients with severe fixed varus deformity especially is accompanied by flexion deformity.

Referencing distal femoral resection and proximal tibial cut (measured resection technique) from the intact lateral surfaces has the advantage of restoration of the normal joint line, preserving bone stock for future revisions and avoiding the increase in lateral laxity.

Sequential medial soft tissue release must be performed to provide adequate stability without over releasing.

PCL must be released in severe fixed varus deformity especially if accompanied by flexion deformity.

Patients with severe degrees of varus OA are more likely to have medial tibial bone defects and must be reconstructed by either bone grafts or metal augments and in the same time uploading the tibial surface by long stem to distribute about 1/3 of the load stresses to the diaphysis.

Meticulous closure of the arthrotomy and preservation of part of the medial meniscus remnant attached to the medial capsular sleeve for adequate closure of the medial structures, proper determination of the joint level for future revisions.

Patients with mild degrees of flexion deformity show much improvement in the KSS compared to those with severe degrees of flexion deformity.

Locked long tibial stems could be used in managing concomitant tibial fractures.

Postoperative maintenance of full extension is the first priority. Strengthening exercise, and increase range of movement is started as rapid as possible. In non complicated cases, walking using a walker from second day post-operative can be started. Walker must be used for one month. Proper anticoagulant, antibiotic, and analgesics must be given to patient.

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### RESEARCH ARTICLE

## STRUCTURAL, ELECTRICAL AND THERMAL ANALYSIS OF $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$ SUPERCONDUCTORS.

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$Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  Superconductor,  
 Thermal Analysis DTA and TG,  
 X-ray Diffraction XRD

#### Abstract

(Y,Eu)-Ba-Cu-O samples were prepared by solid state method of heat treatment for obtaining single phase materials. The relationship between Y-Eu substitution and the superconducting properties of  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  ( $0.0 \leq x \leq 0.9$ ) solid solution have been studied. DC resistance measurements showed that Eu substitution was affected the normalized resistance and  $T_c$  values. X-ray diffraction analysis showed that the main phase in the prepared (Y-Eu)-Ba-Cu-O samples was the orthorhombic phase. The samples were tended to form plate type of single crystals with preferential orientation in c-direction. The crystallite size of the prepared samples was calculated from X-ray diffraction patterns using Scherer's equation and has a value of 21nm for pure YBCO and that of Eu content up to 0.9 samples. Thermal analysis of (Y,Eu)-Ba-Cu-O system were performed by means of TG and DTA. The oxygen content was estimated from TG-analysis and it was found to decrease with increasing Eu-content. DTA showed three-regions which were classified as follows:

- (1) Exothermic peak as a result of chemically bonded dehydration temperature.
- (2) Endothermic peak due to tetragonal orthorhombic transformation temperature.
- (3) Exothermic peak which was related to melting temperature.

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#### Introduction:-

Since the discovery of YBCO, a high temperature superconductor (HTS) has gathered a lot of attention because of its potential in many applications such as levitated systems, magnetic shields, electronics and communications [1]. It is known that the properties of YBCO superconductors are improving by replacing Y with other light rare earth elements [2]. Recently, considerable attention has been devoted to the superconducting properties of LRE123 systems [3-6], (where LRE: light rare earth elements like Nd,Sm,Eu and Gd). Generally unlike Y123 which forms only a stoichiometric compound, light-rate-earth elements form a solid solution in LRE123 systems and this solid solution leads to a variation in superconducting properties.

(LRE)Ba-Cu-O superconductors have revealed promising performance, such as high  $T_c$ ,  $J_c$  and irreversible magnetic fields than in Y-Ba-Cu-O [7-8].

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$Y_{1-x}Sm_xBa_2Cu_3O_{7-\delta}$  and  $Y_{1-x}Nd_xBa_2Cu_3O_{7-\delta}$  solid solution superconductors have been reported [9]. In the present work a detailed study has been performed for the  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  system. The crystal growth and the superconductivity of the prepared samples are studied by DC resistance, thermal analysis (TG-DTA) and X-ray diffraction (XRD) techniques.

### Experimental Work:-

#### Samples Preparation

Samples with nominal composition of  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  ( $x = 0.0, 0.1, 0.3, 0.5, 0.7$  and  $0.9$ ) were prepared through a solid state heat treatment method using high purity powders ( $\geq 99.99\%$ ) of  $Y_2O_3$ ,  $Eu_2O_3$ ,  $BaCO_3$  and  $CuO$ . The mixture of starting materials was calcined in alumina crucibles, firstly at  $900^\circ C$  for 24hr, secondly at  $920^\circ C$  for 60hr, then grounded, pressed into pellets and finally treated by a heat cycle as follows:

- Heated from room temperature to  $920^\circ C$  and kept at this temperature for 12hr in air.
- Cooled from  $920^\circ C$  to  $680^\circ C$  in 4hr with following  $O_2$ .
- Kept at  $680^\circ C$  for 10hr with  $O_2$  flowing.
- Cooled from  $680^\circ C$  to  $400^\circ C$  in 4h in air.
- Kept at  $400^\circ C$  for 10hr in air.
- Cooled from  $400^\circ C$  to room temperature in the furnace.

The preliminary test of Meissner effect showed that all samples are superconductors at liquid nitrogen temperature (77K).

#### Samples Characterization:-

The characterization of the prepared samples was carried out by:

- 1- Electrical DC resistance measurements for  $T_c$  determination by the standard 4-probe method with silver contacts.
- 2- X-ray diffraction (XRD) for phase identification by X'pert type Philips Diffractometer2000 with a wavelength of ( $Cu - K\alpha$ ,  $\lambda = 1.54056 \text{ \AA}$ ).
- 3- Thermo-Gravimetric technique (TG): the temperature variation of weight loss was measured by TGA-50H, detector by using about 11-15mg of samples of  $YEu(x)Ba-Cu-O$  in a Pt-cell and the atmosphere was air. The cooling rate was  $20^\circ C/min$  in the temperature range from  $800^\circ C$  to  $25^\circ C$ .
- 4- Differential thermal analysis (DTA): A Shimadzu DTA-50 was used for DTA measurements with a cooling rate of  $20^\circ C/min$  for all samples with mass 0.01mg, the atmosphere is nitrogen with rate flow 20 ml/min in the temperature range from  $1200^\circ C$  to  $25^\circ C$ .

### Results and Discussion:-

The normalized resistance to the value at 300K were recorded for  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  samples. All samples have superconducting behavior as shown in Fig (1). The transition temperature  $T_c$  at zero resistance was evaluated for the prepared samples and was varied from 92K to 84K depending on Eu content.

Eu ions are in a trivalent state  $Eu^{3+}$  at regular occupying  $Y^{3+}$  sites and also can substituted at  $Ba^{2+}$  sites [10]. The variation in  $T_c$  was attributed to the double substitution of  $Eu^{3+}$  at both  $Y^{3+}$  and  $Ba^{2+}$  sites with different probabilities. X-ray diffraction (XRD) patterns of the prepared samples were illustrated in Figs (2,3). The pure YBCO has orthorhombic 1-2-3 structure which is responsible for superconducting phase. The characteristic peaks of this phase were indexed and it was obtained that the strongest peaks are (013) and (103). The relative intensities of (001) and (hkl) planes were affected due to Eu substitution in YBCO as shown in Figs (2,3) and table (1). This was due to the preferential orientation in c-direction. The (003), (005) and (006) planes were grown due to the fast growth rate in a, b directions and slow growth rate along c-direction. In the Y(Eu)BCO samples, the resulting X-ray patterns were affected for instance, the lines (003), (005) and (006) were amplified while the lines (013) and (103) were depressed. The samples of Y(Eu)BCO system were tended to form plate type of single crystals with orthorhombic phase. X-ray diffraction analysis was confirmed that the main phase in  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  samples was the orthorhombic structure.

The unit cell parameters were affected as indicated in table (2) due to Eu substitution in Y-sites and explained as follows:

- 1-For Eu contents in the range ( $0.1 \leq x \leq 0.5$ ), the unit cell volume was decreased.

**Note:** ionic radius of  $Ba^{2+}$  equals  $1.42\text{ \AA}$ , for  $Y^{3+}$  equals  $1.019\text{ \AA}$ , and that of  $Eu^{3+}$  equals  $1.066\text{ \AA}$  [10]. The decrease in the unit cell volume was due to  $Eu^{3+}$  substitution at  $Ba^{2+}$  sites in addition to original  $Eu^{3+}$  substitution at  $Y^{3+}$  sites.



2-In the range ( $0.5 \leq x \leq 0.9$ ) for the  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  samples, the lattice parameters a, b and c were increased and so the unit cell volume was increased for these samples. This result was due to  $Eu^{3+}$  substitution at  $Y^{3+}$  sites were more probable and  $Eu^{3+}$  substitution at  $Ba^{2+}$  sites was minimized in this range of Eu contents.

The crystallite size (t) of the prepared samples was calculated from X-ray analysis using Scherer's equation [11]:-  
 $t = (0.9\lambda / \beta \cos \theta)$

Where  $\lambda$  is the X-ray wavelength,  $\beta$  is the peak width at half maximum and  $\theta$  corresponds to the peak position. The calculated crystallite size (t) value of 21nm for pure YBCO and samples of Eu content up to 0.9.

Fig (4) showed TGA curves recorded in the temperature range from 25°C to 800°C in air for  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  samples with x values ranging from x =0.0 to x = 0.9.

The initial weight was taken as a standard value. The variation of initial weight value was plotted as a function of temperature. It was noted that the oxygen content of the  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  samples were decreased with increasing Eu content (x). The oxygen content was decreased from 6.95 for x =0. 0 to 6.83 for x = 0.9.

The differential thermal analysis DTA for the prepared samples were recorded with a cooling rate 20°C/ min. Figs (5,6) showed DTA for  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  samples which can be classified into three-regions:

1-First region: Exothermic process at temperature  $T_1$  ranging from 200°C to 280°C as a result of loss of chemically bonded water dehydration and dissociation of hydroxides.

2-Second region: Endothermic process at temperature  $T_{t \rightarrow 0}$  and was varied from 570°C to 800°C. This is due to tetragonal orthorhombic transformation for  $Y_{1-x}Eu_x$ 123 superconductors.

3-Third region: Exothermic process at  $T_m$  related to the melting temperature and have values ranging from 975°C to 1025°C. The results of DTA were summarized in table (3).

**Table (1):-** Relative intensities of important peaks in the orthorhombic system of  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$

Plane (hkl)	$I_r$ for $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$					
	x = 0.0	x = 0.1	x = 0.3	x = 0.5	x = 0.7	x = 0.9
003	16.99	49.06	37.59	36.79	42.59	54.25
013	50.53	32.94	25.83	19.71	32.59	55.56
103	100	43.26	33.11	29.59	56.37	88.03
005	22.27	71.58	60.39	51.68	47.31	43.33
006	31.16	100	100	100	100	100

**Table(2):-** The unit cell parameters and its volume of  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  samples from X-ray diffraction analysis.

Eu content (x)	Unit cell parameters			Volume ( $\text{\AA}^3$ )
	a ( $\text{\AA}$ )	b ( $\text{\AA}$ )	c ( $\text{\AA}$ )	
0.0	3.821	3.890	11.689	173.741
0.1	3.820	3.880	11.689	173.250
0.3	3.818	3.877	11.689	173.025
0.5	3.823	3.883	11.694	173.594
0.7	3.832	3.899	11.712	174.988
0.9	3.835	3.894	11.712	174.901

**Table(3):** Summarizing of the DTA results for the three regions and the corresponding temperatures  $T_1$ ,  $T_{t \rightarrow 0}$  and  $T_m$  as a function of Eu content (x) in  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$ .

Eu Content (x)	$T_1$ (°C)	$T_{t \rightarrow 0}$ (°C)	$T_m$ (°C)
0.0	250	600	975
0.3	260	780	1025
0.5	280	800	1020
0.9	200	570	1010

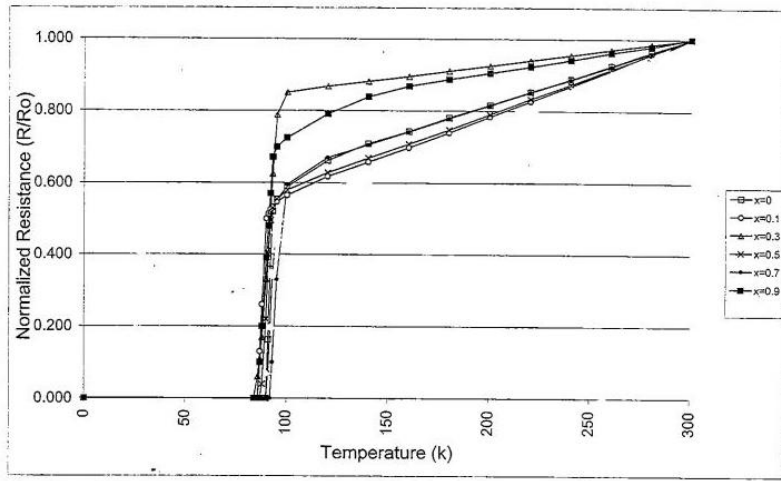


Fig 1

Fig (1) : The normalized resistance ( $R/R_0$ ) as a function of temperature  $T(K)$  of  $Y_{1-x}Eu_x Ba_2Cu_3O_{7-\delta}$  superconductors for  $x=0.0,0.1,0.3,0.5,0.7$ , and  $0.9$

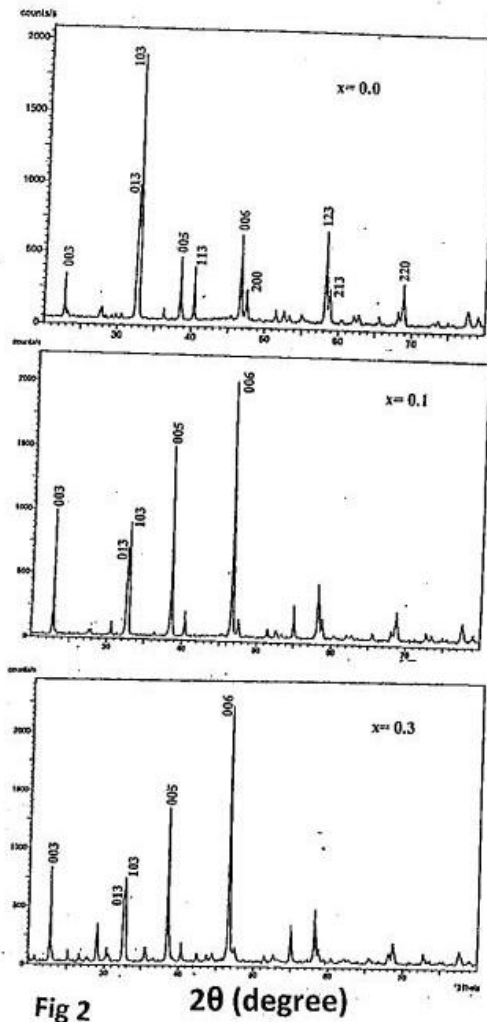
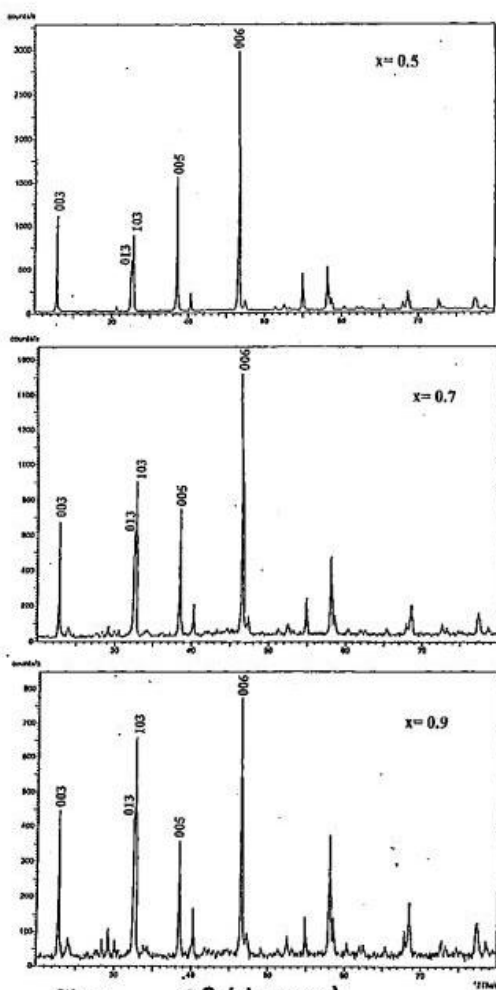


Fig 2

2θ (degree)

Fig (2) : X-ray diffraction XRD patterns for  $Y_{1-x}Eu_xBa_2Cu_3O_{7-8}$  samples with  $x=0.0,0.1,$ and  $0.3$ Fig 3  $2\theta$  (degree)Fig (3) : X-ray diffraction XRD patterns for  $Y_{1-x}Eu_xBa_2Cu_3O_{7-8}$  samples with  $x=0.5,0.7,$ and  $0.9$

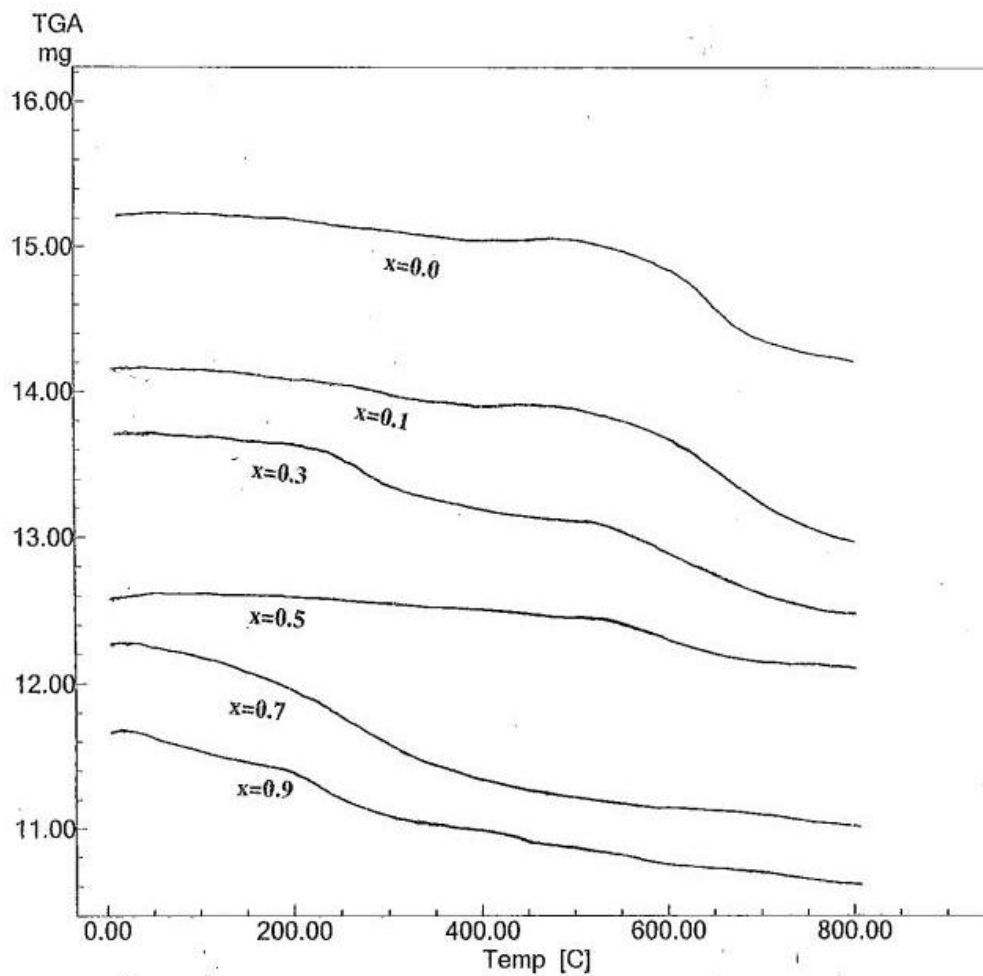


Fig 4

Fig (4) : Thermo-gravimetric analysis TGA, the mass percentage change as a function of temperature for  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  samples.

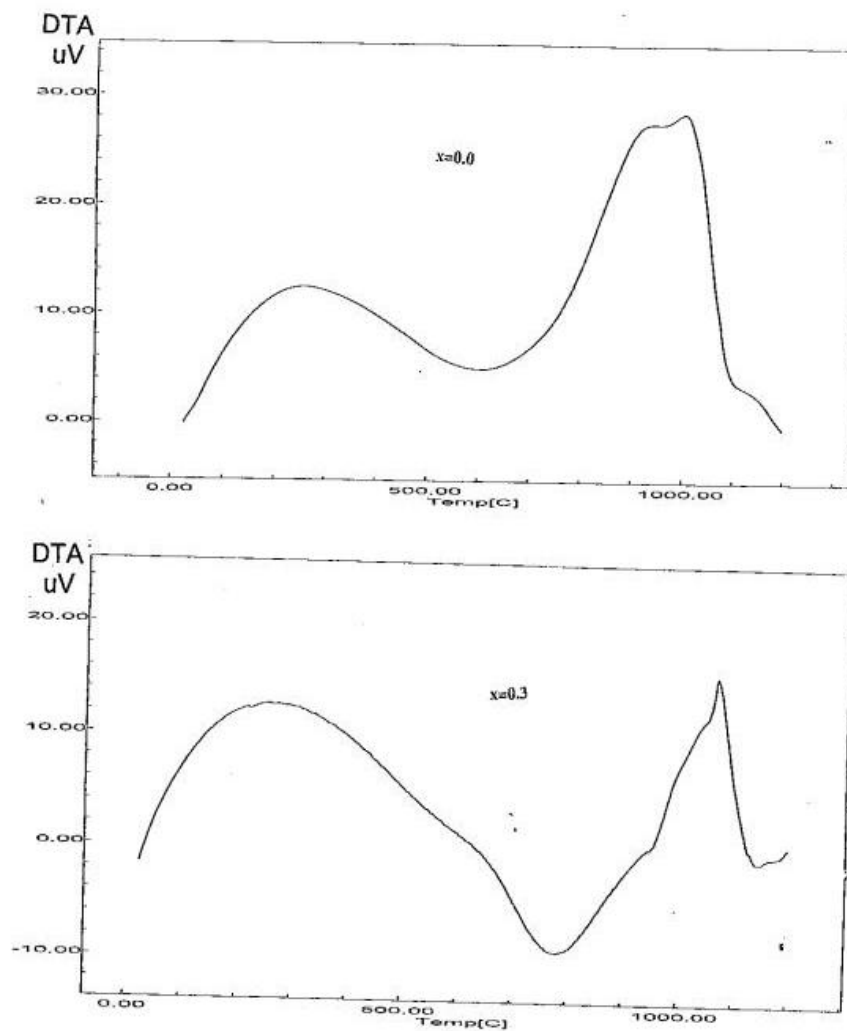


Fig 5

Fig (5) : Differential thermal analysis of  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  for samples (  $x=0.0$  and  $x=0.3$ ).

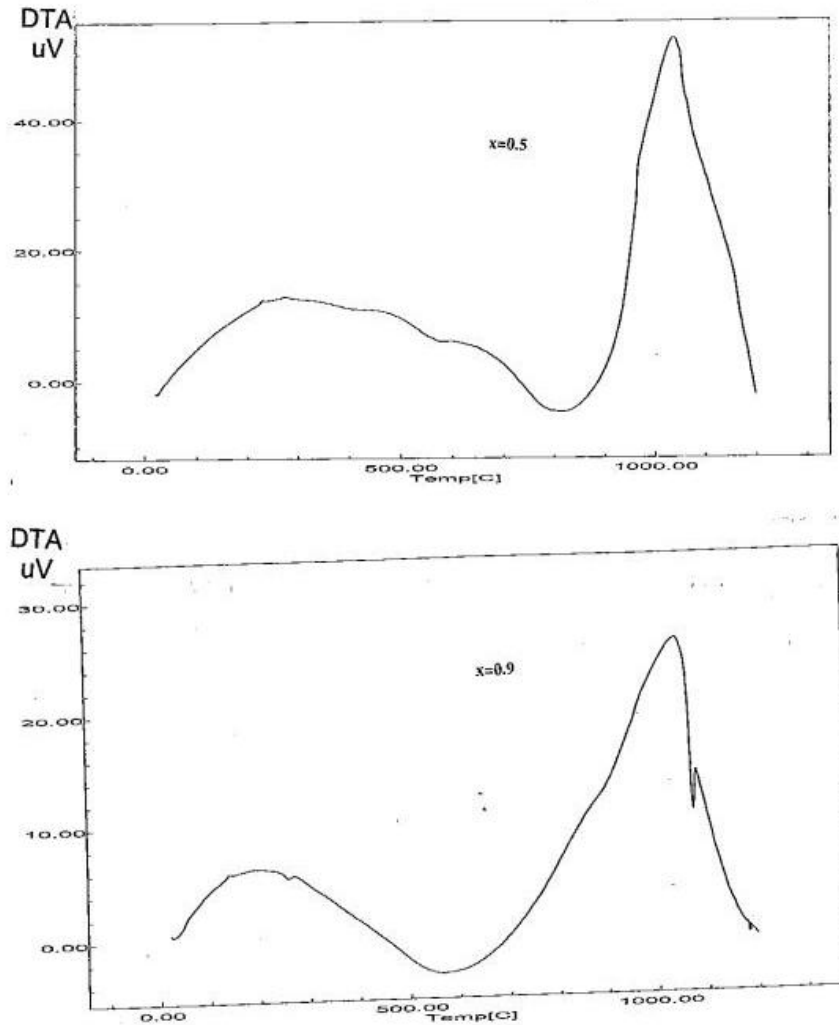


Fig 6

Fig (6) : Differential thermal analysis of  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  for samples ( $x=0.5$  and  $x=0.9$ ).

### Conclusion:-

- 1-  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  samples tending to form plate type of single phase with preferential orientation in c-direction and the crystallite size of these samples equal to 21nm.
- 2- The oxygen content was estimated from TG analysis and it was found to decrease with increasing Eu content.
- 3- Unlike Y123 which forms only one a stoichiometric compound, the light rare earth element like Eu substitution in Y sites form a solid solution of  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  and each sample has a unique superconducting transition and also has a unique TG and DTA thermal behavior.
- 4- It was found that the melting temperature ( $T_m$ ) of the  $Y_{1-x}Eu_xBa_2Cu_3O_{7-\delta}$  composites was increased in samples contained the two different rare earth elements Y and Eu.
- 5- The mixture of the two different rare elements Y-Eu was very uniform and all samples showed a superconducting phase with a sharp transition and orthorhombic structure which is necessary for the presence of superconducting phase.

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### RESEARCH ARTICLE

#### Postnatal developmental Histomorphological and histochemical study of the pancreas in the domestic cat (*Felis Catus*).

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#### Abstract

**Objective:** The present study was conducted to investigate the histomorphological and histochemical postnatal developmental changes established in the pancreas of the domestic cats. **Methodology:** the study conducted on three different postnatal ages that were one week (suckling kittens), 4-6 weeks (weaned immature cats) and adult of one year and up cats. Macromorphometric measurements of pancreas were conducted and listed in tables. Histological sections prepared and stained by general and special stains. **Results:** Gross findings revealed that the pancreas of cat was of compact type, of two lobes connected by small central part. Critical macromorphometric changes observed at 4 weeks aged cats. The organ drains the pancreatic secretion toward the duodenum via main pancreatic duct.

Exocrine portion more developed after birth than the endocrine portion; however both were faced developmental changes. The parenchyma provided with well duct system even in kitten. Ducts were surrounded by smooth muscle fibers invested in the connective tissue. Endocrine portion showed in kittens predominant  $\alpha$  cells. Critical changes occurred at 4 weeks of age caused an increase of the number of  $\beta$  cells so that the ratio of  $\alpha / \beta$  was changed. In adult cats the percentage of  $\beta$  was predominant. In all studied ages of cats, the findings revealed the presence of well developed autonomic innervations represented by the presence of large autonomic ganglion, intramural ganglia and large sized Pacinian corpuscles. **Conclusions:** It could be concluded that pancreas was not fully developed at birth and weaning period caused critical development.

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#### Significance of the study:

The significance of the current findings can be categorized into two criteria. First of all, it was first investigation focused on the development of the pancreas postnatally of the domestic cats in veterinary field. The second criteria, as the pancreas of the cats showed morphological similarities to those of human especially the presence of Pacinian

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corpules, presence and distribution of  $\alpha$  and  $\beta$  cells in the islets of Langerhans, such findings will be beneficial for public health and animal health and welfare.

## Introduction

The pancreas is considered an organ associated with digestive tract. It is responsible to produce enzymes conveyed into the lumen of the duodenum to aid the digestion. The organ also considered endocrine organ because it produces some metabolizing hormones. It is considered mixed gland which have the capacity to produce enzymes and hormones aid in the digestion. The function of both exocrine and endocrine portions of pancreas is therefore controlled and coordinated through both neural and hormonal regulators<sup>1</sup>.

Histologically, it is constructed from compound, tubuloacinar acini forming exocrine portion as well as endocrine part represented by the Islets of Langerhans. The pancreatic islet produces mainly insulin, glucagon hormones which play role in glucose metabolism<sup>2</sup>.

Cats are commonly suffered pancreatitis and tumors in both pancreas and duodenum. They were usually affected by obstruction of the pancreatic duct in the exocrine portion associated with the inflammation of bile duct and adenocarcinoma of the duodenum. The obstruction of the duodenum cause subsequently crohn's disease in the animal. The latter characterized by dehydration, loss of appetite, loss of body weight, abdominal pain, vomiting and diarrhea<sup>3-4</sup>.

In cats, pancreatitis recorded as a common disease in this animal species in which statistically significant higher prevalence of chronic pancreatitis observed in the left lobe of pancreas in cats severed gastrointestinal disease<sup>3</sup>.

There is paucity of work on the histomorphological study of pancreas in the domestic cat and to our knowledge there is no local study up to date investigated the postnatal developmental histomorphological changes of the pancreas in the local domestic cats. According to the above reasons the current study was conducted to study the histomorphological and Histochemistry of the pancreas of the domestic cats at three different postnatal ages, that were one week (suckling kittens), 4-6 weeks (weaned immature cats) and adult of one year and up cats.

## Materials and Methods:

### Cat's collection and study design:

Clinically healthy pregnant queens were collected by hunting method and caged in the animal house till their delivery to obtain at least twelve kittens from them. Six kittens of one week of age were removed from their mothers and euthanized and these considered the first group representing suckling kittens. Other six kittens were left for not less than four weeks. These cats were euthanized and considered the second group as they represent post-weaned premature group. Six adult healthy cats of one year and up were hunted and kept under supervision in cages for one week and then euthanized as they were considered the third adult group.

### Preparation of specimens

Each of the selected kitten, premature or adult cats were euthanized prior to its dissection by intra-cardiac injection of over dose of sodium pentobarbital (100 mg/kg)<sup>5</sup>. After that, the animal was fixed to be dissected on a dissecting board. The abdominal wall opened to view the abdominal viscera, then the duodenal loop was pointed out and the organ location and relationship with other digestive organs was photographed in situ. The topography and shape of the organs was studied and documented with aid of digital camera.

### Histological procedures

The pancreas glands were removed post dissection and washed by normal saline. They were cleaned from debris and fat tissues each was divided into three anatomical parts, body (very small area), right and left lobes. Halves of these parts were fixed in 10% buffered formalin for 72 hrs, each part was trimmed and cut into slices of 1 cm thickness and the other halves were fixed in Bouin's solution for subsequent histochemical staining. Subsequent to fixation, serial sections were prepared in 6 micron thickness and were stained with Hematoxylin and eosin (H&E), Masson trichrome (MTC) and Gomori's method for pancreatic Islet cells<sup>6</sup>.

### Micromorphometric measurements:

The tissue sections were analyzed using Olympus light microscope. Sections were photographed and analyzed by Dino-eye piece camera provided with Image software.

Micromorphometric data collect on the pancreatic tissue in which the following analysis were conducted such as percentage of parenchyma tissue to whole pancreatic tissue per 1 mm<sup>2</sup> at different post-natal ages, densities of islets per each mm<sup>2</sup> to whole pancreatic tissue at different post-natal ages and percentages of  $\alpha$ ,  $\beta$  and  $\delta$  to the sum of Islet's cells at different post-natal ages. Size of islet's of Langerhans were considered small if less than 50  $\mu$ m, medium if between 50 to 75  $\mu$ m and large if more than 75  $\mu$ m<sup>7</sup>. The data on macromorphometric and micromorphometric were presented in tables.

### **Statistical analysis:**

Statistical calculations were carried out with the SPSS 15.0 for windows software package. All numerical values were expressed as the mean  $\pm$  standard error (SE). For comparisons of developmental parametric changes for all ages the statistical significance was assessed by ANOVA. The significance level was set at  $p < 0.05$ .

### **Gross Findings:**

Gross examination showed that pancreas of cats was formed of three parts that were right lobe, body and left lobe (Fig. 1). The organ was of compact type of pancreas with gross obvious lobulation (Fig. 2B). The body was very small nearly square-shaped part (cm in adult) situated beside the first duodenal flexure where it form a notch traversed by the portal vein (Fig. 1). In fact the entrance of this vein considered good demarcation to the body part of the pancreas. The body connected to both right and left lobes without distinct demarcation. The right lobe of pancreas extended as ribbon shaped thin compact structure downward from the body adjacently to the mesenteric border of the descending duodenum and shortly continues with the ascending duodenum. It was adherent at its distal end to prominent regional lymph node (Fig. 1). Both right lobe and duodenum were held together by the duodenal mesentery in the abdominal cavity. The left lobe of pancreas extended from the body to the left side of abdominal cavity till the spleen and left kidney. The lobe was held by the mesentery and enforced toward the stomach by the third duodenal flexure, beginning part of the jejunum and the distal colon.

The gross findings revealed the presence of one main duct in the cat. Fine dissection revealed the presence of large branch centrally located in the core of each lobe of the organ (Fig. 3). Both branches were joined at the body just beside the first duodenal flexure to form the main pancreatic duct. Shortly this duct (2-3 cm) united with the common bile duct before it open into the lumen of the duodenum through the duodenal papilla. This papilla was situated nearly 4 to 5 cm away distal to the duodeno-pyloric junction (Fig. 2A).

Macromorphometric data of the pancreas such as length, weight of lobes was listed in table 1. The measurements of kitten's pancreas revealed that both length and weight of the right lobe were higher than those of the left lobe. The relative lengths of the left and right lobes were 40.79% and 59.21%, respectively. Whereas the relative weights of the left and right lobes were 33.33% and 66.67%, respectively.

These measurements were critically changed post 4 weeks of age in the pancreas of post weaned cats in which the relative lengths of the left and right lobes were 44.32% and 55.68%, respectively. Whereas the relative weights of the left and right lobes were 40.71% and 59.29%, respectively. The data showed marked changes in the left lobe measurements compared to those of the right one.

In the adult cats, the measurements of relative length and weight were not significantly changed when compared with the 4 weeks aged cats, as they were 43.21% and 56.78% for lengths of the left and right lobes, respectively and 40.26%, 59.73% for weights of the left and right lobes, respectively.

### **Microscopic findings:**

#### **Capsule:**

Light microscopic findings revealed that the pancreas in cat at different postnatal ages was suspended together with the duodenum by the duodenal mesentery (Fig. 4). The latter was found microscopically formed of loose connective tissue richly supplied by blood vessels. In fact, absence of true connective tissue capsule and the organ was enclosed by very thin membrane from which many septae were formed and separating the different sized lobules of the organ. The density of the connective tissue fibers was observed surrounding the blood vessels and branches of duct system such as small and large interlobular duct as well as the main duct (Fig. 5, 6 and 7).

### **Exocrine portion:**

#### **A. Parenchyma:**

This part was found constructed by numerous small and nearly rounded functional secretory units which may be called acini. These units were collected together forming numerous lobules which were separated from each other by very thin interlobular spaces filled with sparse and fine connective tissue fibers (Fig. 5). The connective tissue fibers

were observed in those areas which enclosed the running intercalated ducts, small intra-lobular ducts, small and large interlobular ducts (Fig. 6). Each of the secretory acini was constructed of several pyramidal-shaped cells characterized by rounded basally located nuclei and acidophilic cytoplasm filled with zymogene granules. Their nuclei were possessed small darkly stained nucleoli (Fig. 8A). Myoepithelial cells were detected adjacent to the periphery of these acini which were characterized by their flattened shape and darkly stained cells (Fig. 8B). Most of the acini were showed prominent lumen and the light microscopic examination revealed in some of them a group of cells arranged around their lumina. The latter cells are called centroacinar cells (Fig. 8). In fact, these cells are considered the first part of the duct system to carry out the products of these functional secretory units. The zymogene granules which filled the apical part of the cytoplasm were stained red post staining with H&E. Post-staining with Masson's Trichrome stain the surrounding stromal connective tissue was stained blue, characteristically those regions around blood vessels and running ducts (Fig. 5, 7). All the above stains were showed post staining of the pancreatic sections the presence of different size of structures called Islet's of Langerhans (Fig. 6). Some of these islets were just few cells gathered and embedded between the acini.

In age of one week, micromorphometric measurements showed that the ratio of parenchyma tissue (exocrine tissue) to whole tissue was 54.26 %. The data revealed that the interlobular stroma and spaces were obviously largest in the pancreas of one week kittens compared to those recorded at 4 weeks of age and adult cats. The interlobular stroma and spaces were decreased by age progress. As a result the ratio of parenchyma tissue / whole tissue of the pancreas was increased significantly into 78.67% and 81.37% at 4 weeks and adult cats, respectively. In another speaking, the density of acini was increased into 81.37% in adult cats, whereas, the interalobular and interlobular connective tissue stroma were diminished by age progress (Table 2).

In age of 4 weeks, critical changes were recorded in the exocrine pancreatic tissue ended with numerous acini and well developed duct system represented by intra-lobular and interlobular duct branches as well as increased the ratio of acini / whole tissue. The acini were characterized by well stained zymogene granules. In fact, according to such changes, the pancreas is not fully developed in the newly born kitten at the first week of age.

Changes in adult cats were indicated densely packed lobules of acini units associated with well developed duct system accompanied with well developed endocrine part represented by Islet's of Langerhans. The histological data of exocrine portion showed no different features between right and left lobes of pancreas.

### **B. Stroma:**

The stroma of the pancreas was constructed by the presence of loose connective tissue which was initiated from the thin capsule and extended into the interior of parenchyma, separating it into many lobules. The connective tissue that found around ducts and blood vessels was prominently thickened and condensed. At one week aged kittens, the stroma between lobules was loose and of extensive distances between pancreatic lobules. In the next ages, 4 weeks aged weaned cats and adult cats, these spaces between lobules were decreased due to extensive increase of acini and in another aspect it showed the presence of dense irregular connective tissue (Fig. 5).

### **C. Duct system:**

Microscopic findings revealed the presence of prominently developed duct system in the pancreas even at one week aged kittens. It initiated by the formation of centroacinar cells. The latter were group of cells existed around the lumina of the secretory acini of the exocrine portion. The convey secretions toward other small canals to which they were connected called interalobular intercalated ducts. These ducts were small and lined by somewhat flattened simple cuboidal epithelial cells surrounded by many secretory acini. The intercalated ducts were converged together with other similar ducts forming ducts with larger diameters that were observed interalobular ducts running in the thin connective tissue separating the acini (Fig. 6). They were lined by simple cuboidal epithelial cells with rounded centrally located nuclei. In turn, these small ducts were converged together to form different sized interlobular ducts lined by low columnar to typical simple columnar epithelial cells (Fig. 15).

Large interlobular ducts (Fig. 7, 9, 10) from different parts were collected together to form larger ducts and subsequently the main duct of pancreas. The larger and main ducts were characteristically showed folds extended into the interior of their lumina. In fact, these features were absolutely specific to the main duct of the cat's pancreas. The simple columnar epithelium remains lining these latter branches of the duct system. At age of one week kittens and subsequent ages, most of these ducts were filled with secretory substances in their lumina. Post applying MTC, ages of 4 weeks and adulthood, the light microscopic examination to sections stained by MTC stain, revealed well

developed connective tissue supported the interlobular ducts, larger ducts as well as the main duct. The stain significantly stained the undulating smooth muscle fibers found intermingled between collagen fibers of the surrounding connective tissue. The blood vessels were numerous and accompanied the duct system at all studied ages of cats (Fig. 9, 10).

#### **D. Pacinian corpuscles:**

Prominently, pancreases of kittens and subsequent ages revealed the presence of Pacinian corpuscles distributed in different sites of the organ. They were lamellar corpuscles with oval-cylindrical in shape and have different sizes, but most of them were large considerably in size. They possessed one axon and they were entirely wrapped by a layer of connective tissue forming concentric lamellae including fibroblasts and fibrous connective tissue (Fig. 11).

#### **E. Ganglion of pancreas:**

Pancreas of one week kittens and those of subsequent ages were showed the presence of large parasympathetic ganglion. It was found adherent to the left lobe of the pancreas. The ganglion cells were large in size with rounded nuclei and small nucleoli. Their cytoplasm showed prominent missal granules. The ganglion cells were surrounded with many small darkly stained glial cells. Many small intramural parasympathetic ganglia were also detected positioned between acini and some were found in the interlobular septa surrounded with numerous blood vessels (Fig. 12).

#### **Endocrine portion:**

Endocrine portion which was resided by the presence of Islet's of Langerhans in the pancreas was developed in two directions that were enlargement of each developed Islet and by the increase of their cellular constituent. The number of the existed  $\alpha$ ,  $\beta$  and  $\delta$  was changed and their ratio inside each Islet was changed with the progress of age.

In the pancreas of kittens, few medium sized Islet's of Langerhans were identified, whereas there was large number of very small sized islets which were constructed by a collection of few cells (6-15 cells) intermingled between acini units of the pancreas parenchyma. Mean of islet number /mm<sup>2</sup> of whole pancreas was 0.35 (Table 3). Post staining with Gomori's trichrome stain, cells of Islets were stained faint blue and other red in color. Those of blue color were representing  $\beta$  cells which were larger in size with prominent nucleus and nucleoli. They were existed mostly in the periphery of the Islet's of Langerhans. Those cells of red color representing the  $\alpha$  cells which were smaller in size and distributed mostly in the interior of Islets (Fig. 13). At this age, pancreatic Islets comprised nearly equal number of these two types of cells but the number of  $\alpha$  cell was slightly higher than that of  $\beta$  cells (Table 3). Accordingly, the percentage of  $\alpha$  to the sum of Islet's cells was 59% and the percentage of  $\beta$  to the sum of Islet's cells was 40%, whereas the percentage of  $\delta$  to the sum of Islet's cells was 1% (Table 4).

In pancreas of 4 week aged weaned cats, microscopic examination revealed the presence of large number of both medium sized and large Islet's of Langerhans. The existence of small sized Islets was also detected. Mean of islet number /mm<sup>2</sup> of whole pancreas was 2.30. The percentage of  $\alpha$  to the sum of Islet's cells was decreased to 51.78 (Table 3) but the percentage of  $\beta$  to the sum of Islet's cells was increased up to 47.62%, whereas the percentage of  $\delta$  to the sum of Islet's cells was 0.60% (Table 4).

The number of cellular types was changed with no changes in their interior distribution as described in the previous age of cats (Fig. 13). The shapes of large Islets were mostly irregular, whereas, the medium sized and small Islets tend to be rounded or oval in shape. The large Islets tend to be positioned at the periphery of pancreatic lobules, whereas, the medium sized one were positioned in the interior of lobules. The small Islets were located between group of acini and some of them were just few cells approximately less than 10 cells.

In pancreas of adult cats, the microscopic findings revealed numerous Islet's of Langerhans with different sizes. Numerous small Islets were observed embedded between acini and few medium and large sized Islets (Fig. 14). The distribution of Islets was still as same as those observed in the previous mentioned ages. Mean of islet number /mm<sup>2</sup> of whole pancreas was 2.52 (Table 3). However, number of  $\beta$  cell was elevated causing critical change of ratio between it and the  $\alpha$  cell. The percentages of  $\alpha$ ,  $\beta$ ,  $\delta$  to the sum of Islet's cells was 26.88%, 72.72 % and 0.40%, respectively (Table 4).

## Discussion:

The pancreas of cat was found one of solid compact type compared to other animal species where it was found of diffused or mesenteric type of pancreas. In fact such compact type also recorded previously in some animal such as hamster, dogs, monkeys and humans<sup>8</sup>. Whereas, differently was found diffused in animals such as rabbit<sup>7</sup>, mouse<sup>8</sup>, Wister rats and Sprague–Dawley rats<sup>9</sup>.

Current remarks coincided with previous findings mentioned before as the gross anatomy of the cat's pancreas was similar to those of other commonly used laboratory and animal species such as rat, mouse, guinea pig and dog by exhibiting clearly defined right, body and left lobes<sup>10-11</sup>.

Similarly to some species such as pig and ox the right pancreatic lobe was found closely related to the wall of the descending duodenum<sup>12</sup>, whereas, differently to the rabbit's pancreas in which the right lobe found related to the ascending duodenum<sup>7</sup>.

The body part of the cat's pancreas was well characterized by the passage of the portal vein through it which was considered previously in some references as a good vessel marker to this part of the organ<sup>13</sup>.

Present findings revealed the presence of main pancreatic duct and absence of the accessory pancreatic duct in the domestic cats. The duct runs towards the proximal part of the descending duodenum and opened into duodenal lumen commonly with the bile duct. These findings were parallel with those found previously in different species of rabbit<sup>7, 10, 14</sup>. The presence of main pancreatic duct in domestic cats was similarly recorded in the other laboratory species such as mice, rats, guinea pigs and hamster<sup>9, 15-17</sup>. Similarly to the cat pancreas, the main duct was recorded in sheep and goats but differently these animals have also accessory duct<sup>18</sup>.

Macromorphometric data revealed critical changes at 4 weeks of age. In fact, this age represent critical period in the life of animal in which fed changes post weaning time was made which required parallel changes in the digestive function of these animals. Actually, previous references postulated that the weaning is a critical period for the young mammals, because the digestive processes are maturated intensively in association with change of the feeding manners<sup>19-21</sup>.

Microscopic findings were showed the presence of myoepithelial cells surrounding the acinar units of the pancreas. They appeared adherent to the basement membrane of the acini. These cells were found in the kittens and subsequent older ages. They were not observed around the intercalated and interlobular ducts. Similarly, in other animal species such as local rabbits these cells were found also around the acini<sup>7</sup>.

Critical morphological changes were detected in the pancreas of 4 weeks aged cats which was currently fixed as post weaning period of life of this animal species. This period was very important during which the animal started mixed feeding. Similarly, in the local rabbits,<sup>7</sup> recorded critical developmental changes in the exocrine and endocrine portions of the pancreas during post weaning period of the animal.

Findings related to the duct system showed characteristic histological construction. The data revealed the presence of well developed duct branches even in one week aged kittens. Noticeably, the interlobular ducts, larger ducts and main duct were showed the presence of smooth muscle fibers running in the surrounding connective tissue of these ducts. The presence of such feature appeared prominent in the pancreas of all studied ages of cats in the present study. Previous records<sup>22</sup> mentioned also in ox pancreas that the interlobular ducts and the main duct were surrounded by lamina propria which contains smooth muscle fibers.

The current data recorded that the duct system in cat was started by simple epithelium which was simple squamous and ended at the main excretory duct with simple epithelium i.e. simple columnar epithelium columnar. The lining epithelium of all branches of duct system revealed absence of goblet cells which was recorded in many animal species other than cats.

The presence of such muscle fibers indicated heavy exocrine production in this animal so the contraction of these muscle fibers tends to assist rapid conveyance of substances to their target organ which is the proximal part of the duodenum.

The interlobular ducts, larger ducts were showed characteristic feature which was the extended folds of epithelium into the lumina of these ducts. Moreover, in the main duct, the folds were protruded into the lumen of the duct. Current study believed that such feature aid to provide extensive surface epithelium and so subsequently increase the alkaline production which may act to decline the acidity of digested food in the duodenum caused by the stomach acidity. The presence of such morphological adaptation may be due to the feed behavior of animal as a carnivorous species.

The global changes in the size and number of Islet's of Langerhans at both 4 weeks aged cats and adult cats as well as the changes in the ratio of beta and alpha cells indicated not fully developed endocrine portion of the pancreas at birth of these animal species. The data showed critical changes at 4 weeks of age which representing the period of food intake changes by the animal.

However, recorded data indicated delayed development of endocrine portion compared to the exocrine portion of the pancreas, because at one week aged kittens, observations showed more developed exocrine portion than the endocrine one. In fact, exocrine portion revealed the formation of well developed duct system associated with the acinar units, whereas, only small group of cells were embedded in between acini were recorded as a cells of endocrine portion of the pancreas in kittens.

Characteristically, all parts of duct system were lack to goblet cells in their lining epithelium in all studied ages of cat's pancreas. It was different feature from those present in other mammalian pancreas. Noticeably, the lining epithelium remains simple in nature from first initiated part till the end of main duct. It was also different from those recorded in pancreatic ducts of other species such as the rabbit in which the main duct possess simple columnar epithelium with goblet cells.

The presence of autonomic ganglia inside and outside pancreatic tissue was also documented recently in the pancreas of the rats <sup>23</sup>. These ganglia were detected as a group of cells between acini of the parenchymal tissue and interlobular connective tissue or as large ganglion adjacent to pancreatic lobule.

Prominently, pancreases of kittens and subsequent ages revealed the presence of Pacinian corpuscles that were distributed in different sites of the pancreas and such feature was not present in some mammalian species. They were noticeably observed in the pancreas of all studied ages of cats. Their sizes sometime appeared equal to pancreatic lobules or even larger. The presence of these structures was also documented previously in the pancreas of human <sup>24</sup>.

Figures:

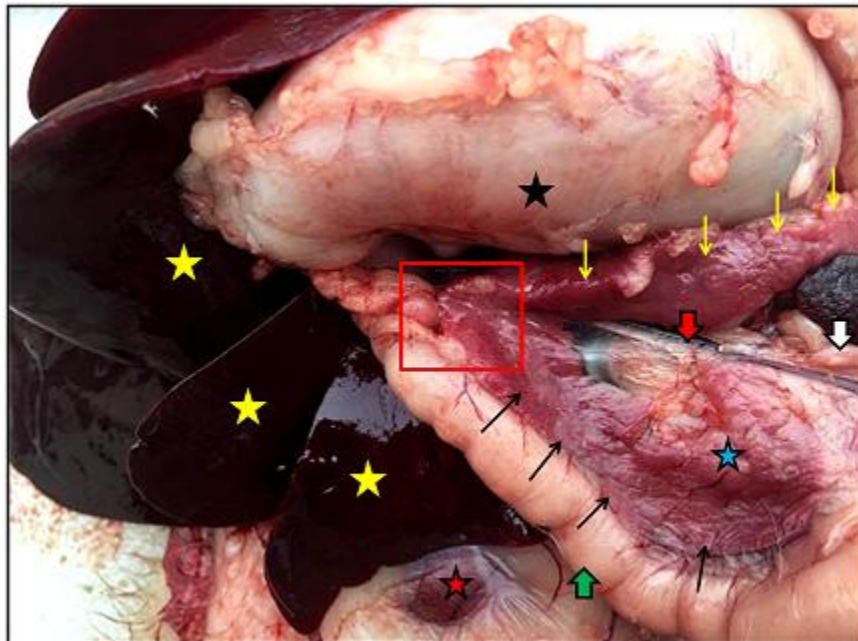


Fig. 1. Pancreas and duodenum of adult cat in situ. It showed the followings: left lobe (yellow arrows) , right lobe (black arrows), body (red rectangle) of pancreas traversed by portal vein (red arrow), descending (green arrow) and ascending duodenum (white arrow), right kidney (red star), hepatic lobes (yellow stars), stomach (black arrow).

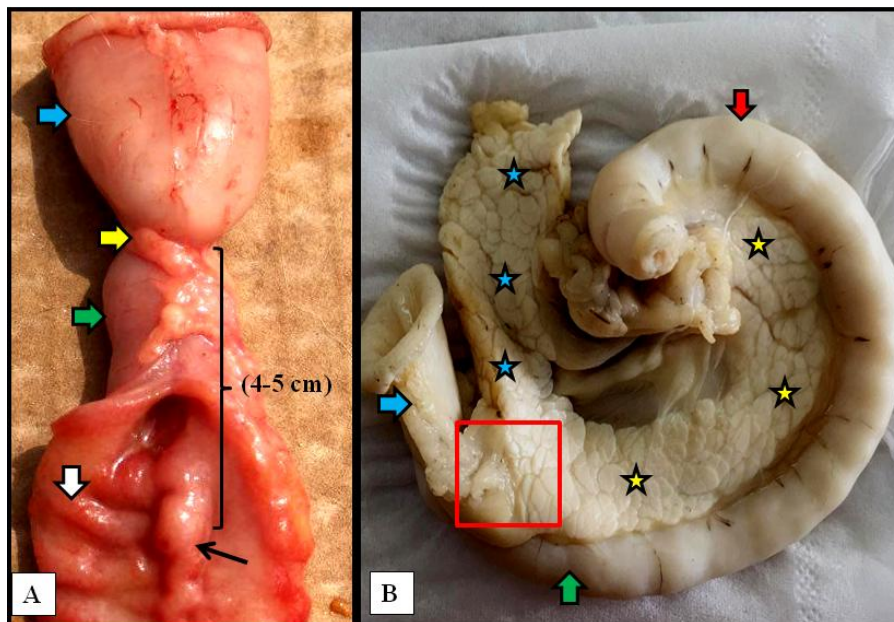


Fig. 2. A: Duodenal papilla (black arrow) inside the lumen of proximal part of the duodenum (green arrow). It showed its orifice (white arrow) around 4 to 5 cm distally to the duodeno-pyloric junction (yellow arrow), circular folds (red arrows). Blue arrow represents the pylorus. B: Dissected pancreas and duodenum of cat. It showed descending duodenum (green arrows), ascending duodenum (red arrows), left lobe (blue stars) and right lobe (yellow stars) of pancreas, pylorus (Blue arrow).



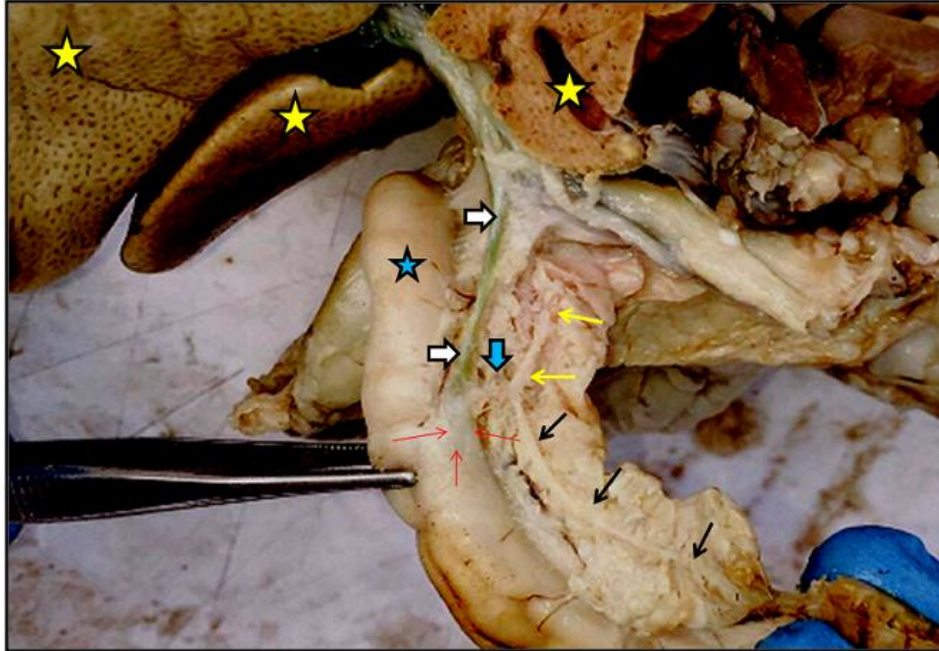


Fig. 3. Main pancreatic duct of the cat in situ. left (yellow arrows) and right (black arrows) branches of the main duct (blue arrow) were united just parallel to the proximal part of duodenum distally to duodeno-pyloric junction (blue star), for short distance it joined the bile duct (white arrows) before its entrance into the duodenum. Yellow stars represent hepatic lobes.

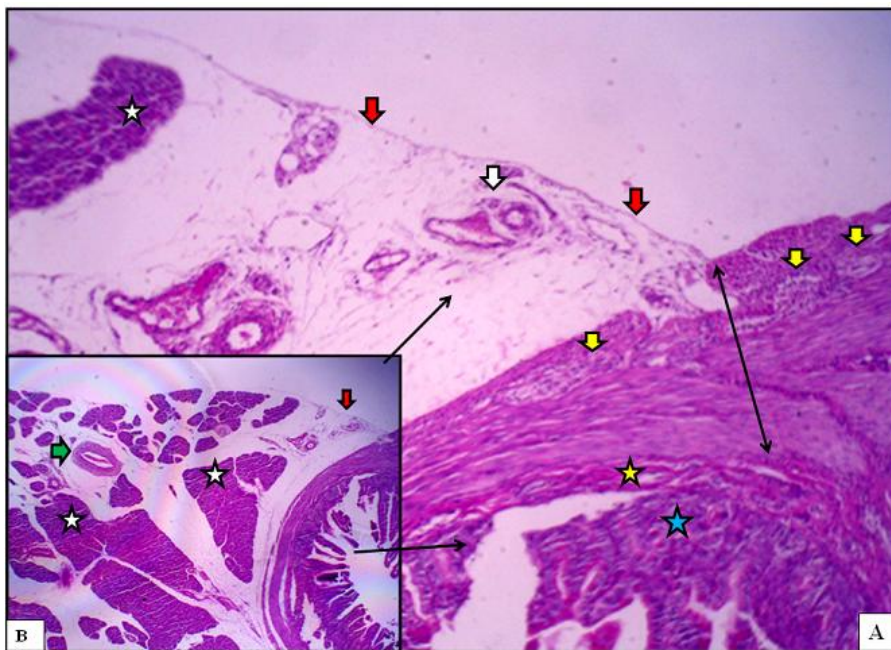


Fig. 4. Descending duodenum (A) and adjacent right lobe (B) of pancreas in one week aged kitten carried together by the mesentery (red arrow). Duodenum showed mucosa (blue star), submucosa (yellow star), Auerbach's plexuses (yellow arrows) between inner and outer layers of tunica muscularis (double head arrow). Pancreas showed lobules (white stars), interlobular duct (green arrow) and blood vessels (white arrow). H&E, X40 (A), X100 (B).



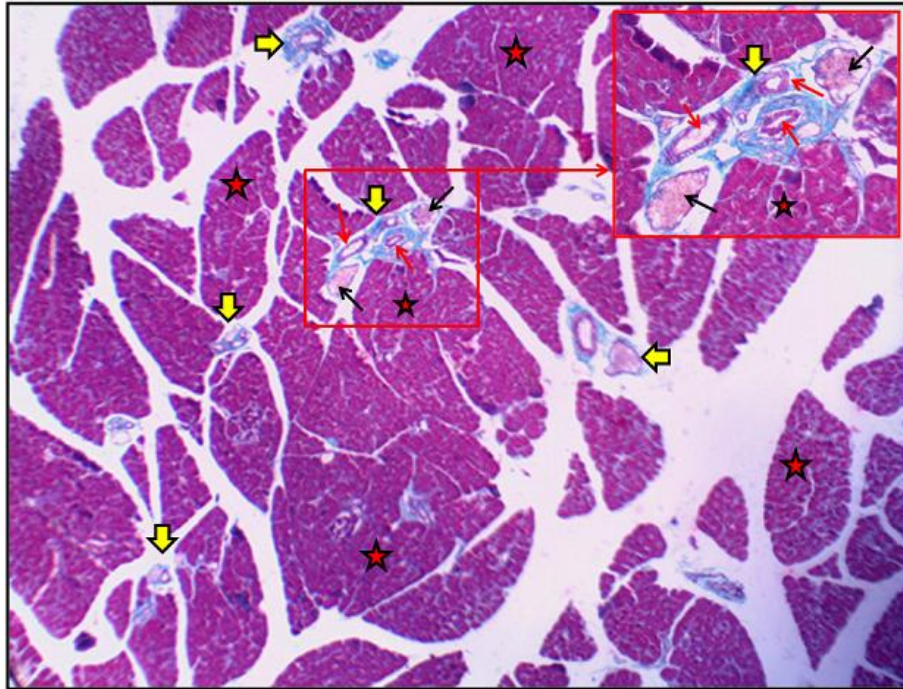


Fig. 5. Left lobe of pancreas of adult cat. It showed dense interlobular connective tissue stained blue (yellow arrows) around blood vessels (black arrows) and interlobular ducts (red arrows) as well as fine intralobular connective tissue fibers intervening between acini (red stars). Masson's Trichrome stain, X40, X100 (magnified rectangle)

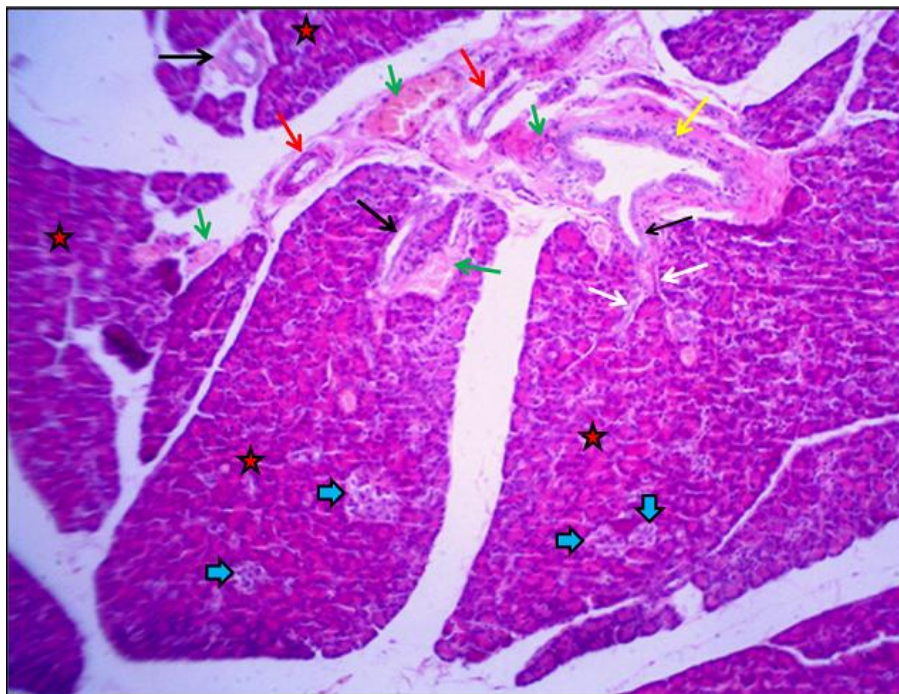


Fig. 6. Right lobe of pancreas of adult cat. It showed intercalated duct (white arrows), intralobular ducts (black arrows), small (red arrows) and large interlobular ducts (yellow arrow), blood vessels (green arrows) and Islet's of Langerhans (blue arrows) embedded in the pancreatic lobes (yellow stars). H&E, X100

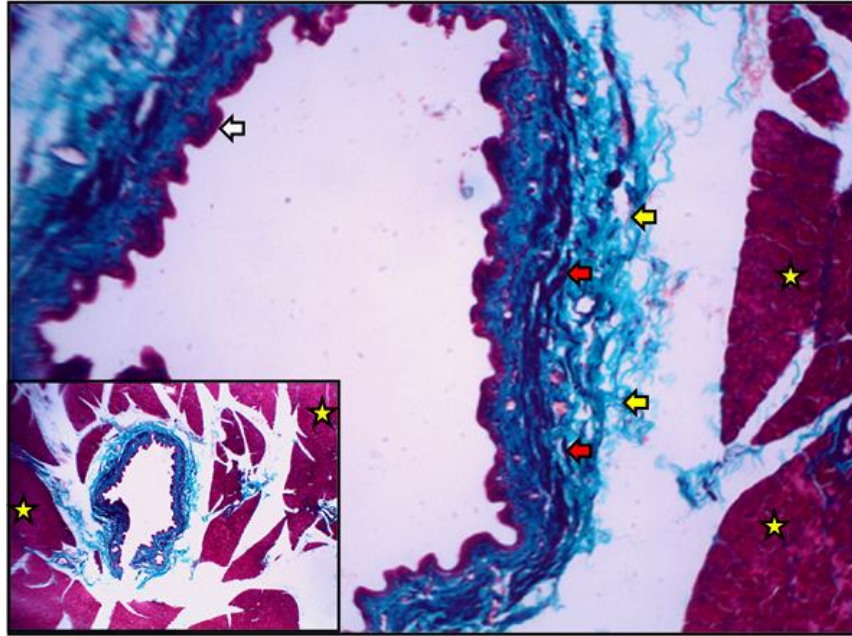


Fig. 7. Left lobe of pancreas of 4 weeks weaned cat. It showed main pancreatic duct lined by simple epithelium (white arrow), surrounded by connective tissue (yellow arrows), smooth muscle fibers (red arrows) and pancreatic lobules (yellow stars). Masson's Trichrome, X100 (small rectangle), X400

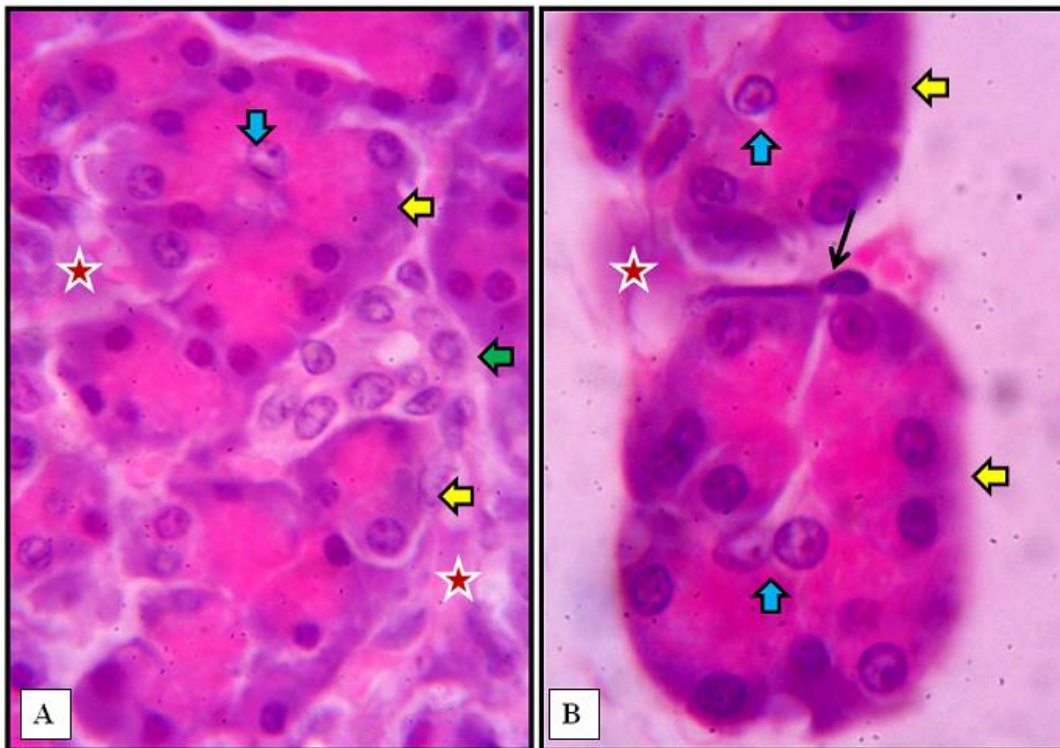


Fig. 8. A: Right lobe of pancreas of 4 weeks weaned cats. It showed acini (yellow arrows) with centroacinar cells in the lumen (blue arrow), intralobular connective tissue surrounding acini (red star) and intercalated duct (green arrow) lined with simple cuboidal epithelium. B: Pancreas of adult cat showed myoepithelial cell (black arrow) around an acinus (yellow arrows), centroacinar cells (blue). H&E, 1000



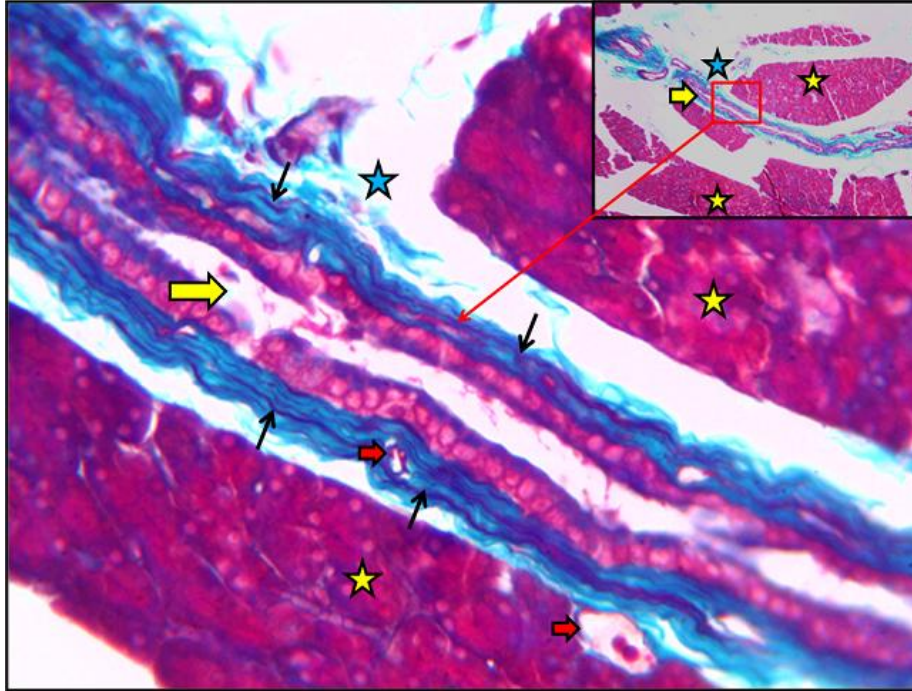


Fig. 9. Pancreas of adult cat. It showed large interlobular duct (yellow arrow) intervening between acini (yellow stars). The duct is surrounded by connective tissue (blue star) in which undulating smooth muscle fibers are found (black arrows) and blood vessels (red arrows). Masson's Trichrome, X400, X100 (small rectangle).

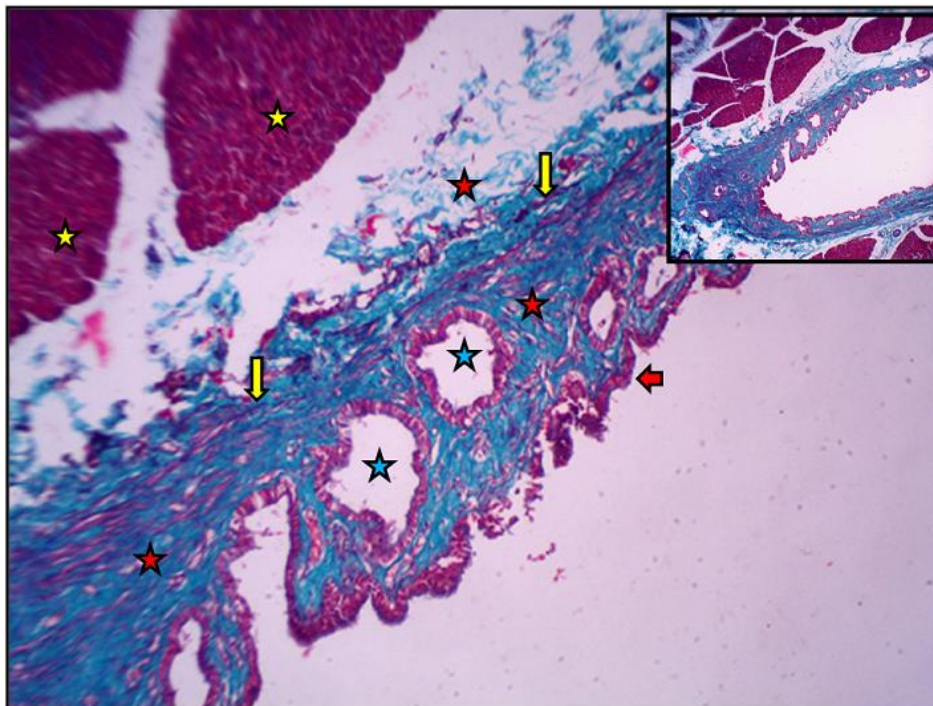


Fig. 10. Right lobe of pancreas of adult cat. It showed the right branch of the main duct into which opened many large interlobular ducts (blue stars). It is lined by simple columnar epithelium (red arrow) with the underneath connective tissue (red stars) which showed smooth muscle fibers (yellow arrows). Yellow stars represent the pancreatic acini. Masson's Trichrome, X100, X40 (small rectangle).

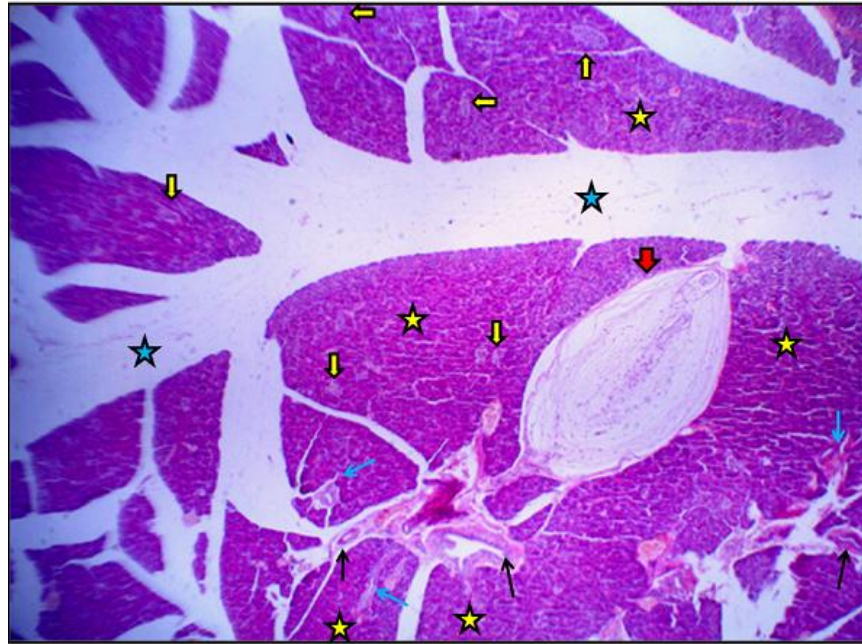


Fig. 11. Right lobe of pancreas of adult cat. It showed Pacinian corpuscle inside pancreatic lobules (red arrow). Isle's of Langerhans (yellow arrows) are present inside the lobules (yellow stars). Interlobular connective tissue (blue stars) and many intralobular (blue arrow) and interlobular (Black arrows) ducts are present. H&E, X40

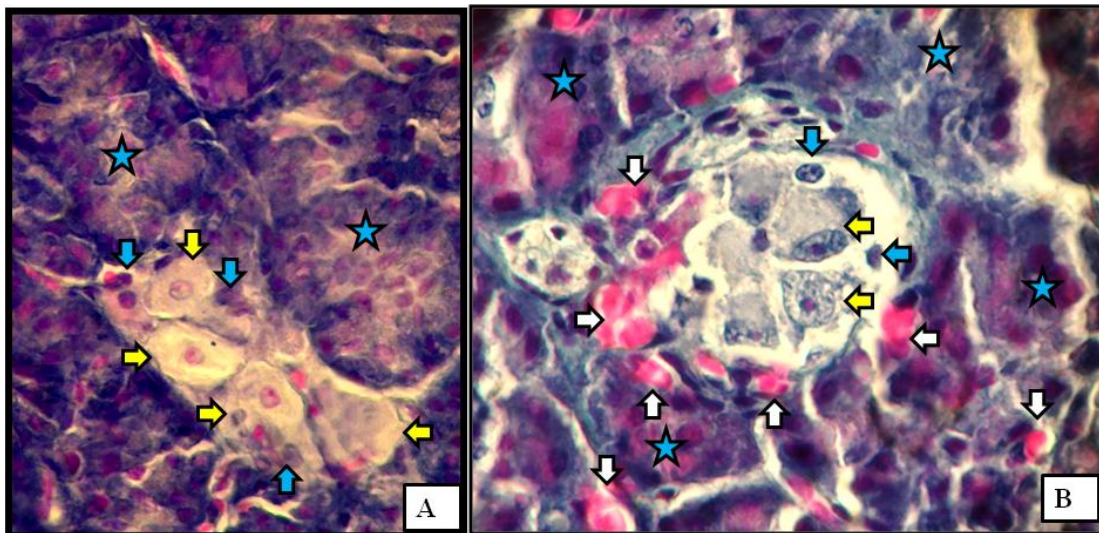


Fig. 12. Intramural ganglia in pancreas of one week (A) and 4 weeks (B) cats. It showed ganglion cells with large nuclei and nucleoli (yellow arrows) surrounded by small neuralgia cells (blue arrows). Many blood capillaries present (white arrows) and acini (blue stars). Gomori's Aldehyde trichrome, X400



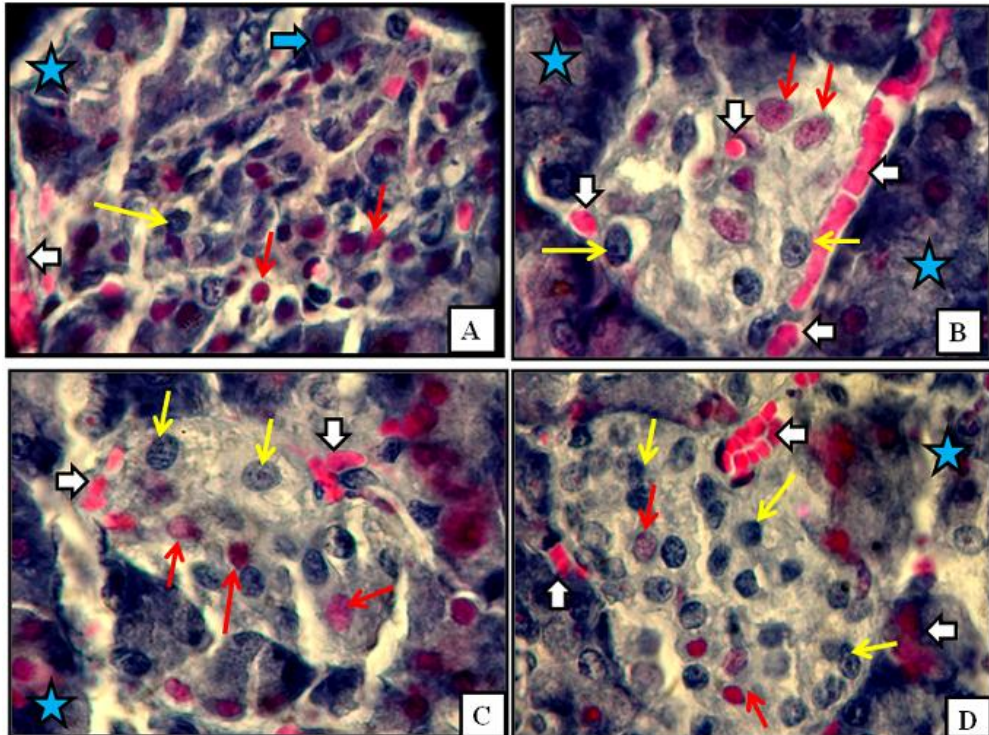


Fig. 13. Islet's of Langerhans of one week aged kitten (A), 4 weeks aged weaned cat (B), medium sized islet of adult cat (C), large sized islet of adult cat (D). It showed  $\alpha$  (red arrows),  $\beta$  (yellow arrows) and  $\delta$  (blue arrow). Many blood vessels present inside and outside the islet (white arrows), and acini (blue stars). Gomori's Aldehyde trichrome, X1000

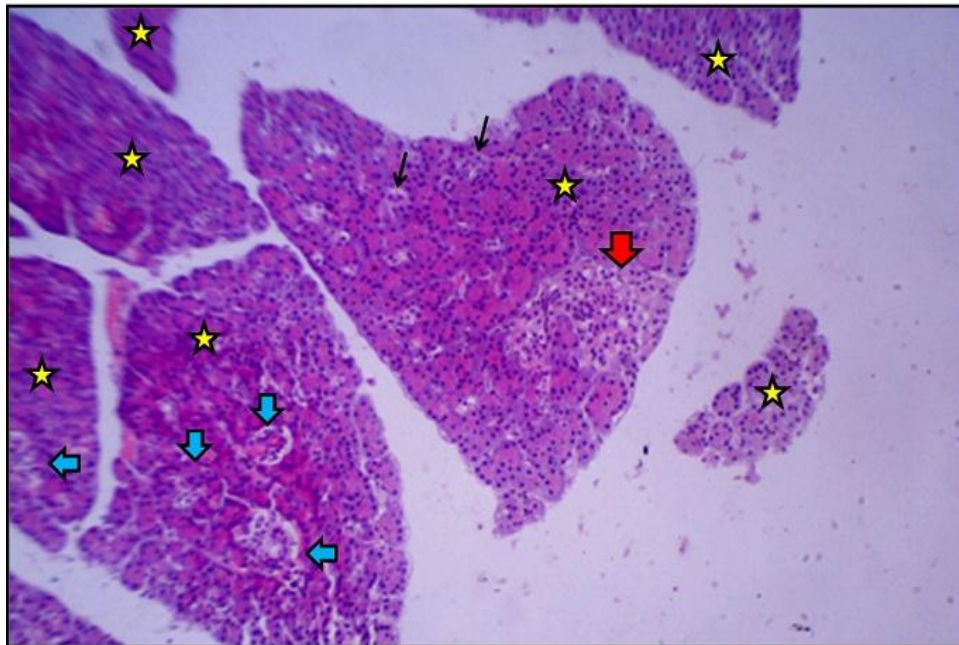


Fig. 14. Left lobe of pancreas of adult cat. It showed large (red arrow), medium (blue arrows) and small (black arrows) Islet's of Langerhans present in pancreatic lobules (yellow stars). H&E, X100

**Table 1. Macromorphometric measurements (Mean  $\pm$  SE) of pancreas of domestic cats at different postnatal ages.**

Age of Animal	Parameters	Left Lobe	Right Lobe
One week	Length (cm)	3.1 $\pm$ 0.02 SE	4.5 $\pm$ 0.11SE
	Relative length	40.79%	59.21%
	Weight (gm)	0.02 $\pm$ 0.32 SE	0.04 $\pm$ 0.03 SE
	Relative weight	33.33%	66.67%
4 weeks	Length (cm)	8.2 $\pm$ 0.03 SE	10.3 $\pm$ 0.07 SE
	Relative length	44.32%	55.68%
	Weight (gm)	4.6 $\pm$ 0.01 SE	6.7 $\pm$ 0.04 SE
	Relative weight	40.71%	59.29%
Adult	Length (cm)	8.6 $\pm$ 0.01 SE	11.3 $\pm$ 0.023 SE
	Relative length	43.21%	56.78%
	Weight (gm)	8.13 $\pm$ 0.07 SE	12.06 $\pm$ 0.22 SE
	Relative weight	40.26%	59.73%

SE: slandered error

**Table 2. Percentage of parenchyma tissue to whole pancreatic tissue per 1 mm<sup>2</sup> at different post-natal ages.**

Ages	percentage of parenchyma tissue / Whole tissue of right lobe	percentage of parenchyma tissue / Whole tissue of left lobe	percentage of parenchyma tissue / Whole tissue of body	percentage of parenchyma tissue / Whole tissue of pancreas
One week	52.33%	55.21%	55.25%	54.26 %
4 weeks	78.01%	79.13%	78.87%	78.67% *
Adult	80.84%	82.26%	81.01%	81.37% *#

\* Significantly ( $P < 0.05$ ) different compared to those of one week of age# Not significant ( $P > 0.05$ ) differences between 4 weeks and adult ages**Table 3. Densities of islets per each mm<sup>2</sup> to whole pancreatic tissue at different post-natal ages**

Ages	Mean of islets number /mm <sup>2</sup> right lobe	Mean of islets number /mm <sup>2</sup> Left lobe	Mean of islet number /mm <sup>2</sup> body	Means of islet number /mm <sup>2</sup> of whole pancreas
One week	0.34	0.36	0.35	0.35
4 weeks	2.10	2.48	2.32	2.30*
Adult	2.38	2.79	2.39	2.52*#

\* Significantly ( $P < 0.05$ ) higher density compared with the one week of age# Not significantly ( $P > 0.05$ ) higher density of 4 weeks compared with the adult**Table 4. Percentages of  $\alpha$ ,  $\beta$  and  $\delta$  to the sum of Islet's cells at different post-natal ages**

ages	Percentage of $\alpha$ to sum of $\beta$ , $\alpha$ & $\delta$	Percentage of $\beta$ to sum of $\beta$ , $\alpha$ & $\delta$	Percentage of $\delta$ to sum of $\beta$ , $\alpha$ & $\delta$
One week	59% *	40%	1%
4 weeks	51.78	47.62%	0.60%
Adult	26.88%	72.72 % #	0.40%

\* Significantly ( $P < 0.05$ ) higher percentage of  $\alpha$  at one week compared to 4 weeks and adult# Significantly ( $P < 0.05$ ) higher percentage of  $\beta$  at adult compared to 1 week and 4 weeks

## Conclusions:

It could be concluded that pancreas in domestic cat was not fully developed at birth and the organ showed developmental morphological changes promptly post 4 weeks of age. The current findings can be categorized into two criteria. First of all, attention should be taken by both owners of cats and veterinarians on the management and feeding program particularly post weaning period of the animals to avoid nutritional diseases and insure their vaccine programs and subsequently caused animals raised with well health condition. The second criteria, as the

pancreas of the cats showed morphological similarities to those of human so that we can consider cats a good model or voluntaries to conduct pharmaco-physiological attempts against some diseases such as diabetes mellitus.

#### Contributions:-

1. Both authors conducted all practical portion of the article.
2. Corresponding author examined the slides, wrote the findings and conducted the statistical aspect of the article.
3. Both authors conducted the gross and microscopic photography.

#### Conflict of Interests:-

The authors have not declared any conflict of interests.

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### RESEARCH ARTICLE

#### HISTOLOGICAL EVALUATION OF RESPONSE TO DIRECT PULP CAPPING WITH PROPOLIS: EXPERIMENTAL STUDY IN RABBIT.

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propolis, calcium hydroxide, pulp capping, rabbits.

#### Abstract

Herbals have been used for centuries to prevent and control disease. Herbal extracts are effective because they interact with specific chemical receptors within the body and are in a pharmacodynamic sense than drugs themselves so usage of herbal extract averts many patients from many side effects that generally come with traditional medicines. Propolis gained a popularity in the field of Dentistry because of its antimicrobial, anti-inflammatory, healing, anesthetic and cariostatic properties. The aim of the current study was to evaluate the histological response of a healthy rabbit pulp to direct pulp capping with propolis compared to calcium hydroxide. Twelve male rabbits were selected, their dental pulps were intentionally exposed by using low speed round bur on labial surfaces of permanent central incisors. Split mouth technique was used for applying the capping material to control and experimental groups. Each group was subdivided into three subgroups, four rabbits for each, where rabbits were sacrificed after 1, 2 and 4 weeks from capping time respectively. Teeth were dissected after animal scarification and prepared for histopathologic and histochemical evaluation using Hematoxylin\_ Eosin (HE) and Trichrome stains. The results showed that 25%, 50% and 25% of dental pulps capped with calcium hydroxide showed mild, moderate and severe inflammatory response respectively, while in propolis group 75% and 25% showed slight to moderate inflammatory response respectively. As regard hard tissue formation in response to capping materials, in calcium hydroxide group half of the cases showed moderate deposition and other half showed marked hard tissue deposited at fourth week of follow up period. While in propolis group there was a marked deposition in 75% of cases and moderate deposition in 25% in the other. Conclusion propolis proved to have less intense inflammatory response and better quality dentin bridge formation.

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**Introduction:-**

Protection of the dentin-pulp complex consists of the application of one or more layers of specific material between the restorative material and dental tissue to avoid additional challenge to the pulp tissue caused by operative procedures, toxicity of restorative materials and bacteria penetration due to microleakage. Protection of the dentin pulp complex has also the function to recover pulp vitality (Briso et al., 2006).

Several materials have been suggested for capping dental pulps, however calcium hydroxide is the gold standard for pulp capping (Accornite et al., 2005), the hydroxyl group is considered to be the most important component of Ca (OH)<sub>2</sub> as it provides an alkaline environment, which encourages repair and active calcification. The alkaline pH induced not only neutralizes lactic acid from osteoclasts, thus preventing dissolution of the mineral components of dentine, but could also activate alkaline phosphatase that plays an important role in hard-tissue formation. The pH necessary for the activation of this enzyme varies from 8.6 to 10.3. Alkaline phosphatase separate phosphoric esters, freeing phosphate ions, which then react with calcium ions to form a precipitate, calcium phosphate, in the organic matrix. This precipitate is the molecular unit of hydroxyl apatite which is believed to be intimately related to the process of mineralization (Estrela et al., 1999).

Calcium hydroxide initially bactericidal then bacteriostatic, promotes healing and repair, stimulates fibroblasts, neutralizes low pH of acids, stops internal resorption, inexpensive and easy to use, but also has some disadvantages as does not exclusively stimulate dentinogenesis, associated with primary tooth resorption, may dissolve after one year with cavosurface dissolution, may degrade during acid etching, degrades upon tooth flexure, marginal failure with amalgam condensation and does not adhere to dentin or resin restoration (Mustafa et al., 2012).

Mineral Trioxide Aggregate (MTA) is similar to calcium hydroxide, including its antibacterial and biocompatibility properties, high pH, radiopacity and its ability to aid in the release of bioactive dentin matrix proteins. There are some differences between MTA and calcium hydroxide, first, MTA comes in two colors, white and grey. The grey version is due to the addition of iron. Another significant difference is the fact that MTA provides some seal to tooth structure (Luketic et al., 2008).

However there are several disadvantages with MTA, it has shown high solubility, demonstrating 24% loss after 78 days of storage in water, and prolonged setting time of approximately 2 hours and 45 minutes so pulp capping with MTA should be done in a two-step procedure, placing a temporary restoration to allow the MTA to set before placing the permanent restoration. One gram of MTA powder costs approximately the same as 24 grams of calcium hydroxide base/catalyst paste, making MTA much more cost (Fridland and Rosado, 2005).

Glass ionomer has the ability to bond chemically with tooth structure, so it can prevent the diffusion of potentially toxic materials through dentin to the pulp. Glass ionomer also provides an excellent bacterial seal and shows good biocompatibility when used in close approximation but not in direct contact with the pulp (Costa et al., 2003).

Glass ionomer was also tested as dental pulp capping material. Nascimento et al., (2000) evaluated the response of human pulps after capping with calcium hydroxide and resin modified glass ionomer. It was found that resin modified glass ionomer caused a moderate to intense inflammatory reaction with a large area of necrotic zone and lack of dentin bridge formation, while calcium hydroxide allowed pulp repair and complete dentin bridging around the pulp exposure. These results suggested that resin modified glass ionomer is not suitable to be used in direct pulp capping for mechanically exposed human pulps.

Propolis has antibacterial, antifungal, antioxidant and anti-inflammatory properties (Koru et al., 2007), these biological properties are related to its chemical composition of flavonoids, phenolics, and aromatic compounds (Park et al., 1998).

The method of extraction and type of solvent can change the chemical composition of propolis extract. Commercial products such as tablets, capsules, ampoules, and syrups are prepared with ethanolic extract of propolis. Methanol is only used for research purposes (Xu et al., 2009).

Therefore, the aim of this study was to evaluate the histological response of a healthy rabbit pulp to direct pulp capping with propolis compared to calcium hydroxide.

**Materials and method:-**

Twelve male rabbits weighed 2.5 Kg were selected for this study. Pulp capping procedure were performed, in which two opposing quadrant in each rabbit were assigned for each medicament (split mouth technique). Pulp were capped either with propolis (control group) or calcium hydroxide (experimental group).

**Ethical regulation:-**

The research was approved by the research ethics committee, Faculty of Dentistry, Minia University.

**Experimental procedures:-**

Animals were anesthetized by intra-muscular injection in the quadriceps femora muscle using 3.3cm of Xyla-ject solution, and then the working field was disinfected by 2% chlorohexidine solution and dried by cotton rolls. Dental pulps were intentionally exposed by using low speed round bur and coolant on labial surfaces of permanent central incisors. One central incisor was capped with calcium hydroxide and the other with propolis.

**Capping materials:-**

1- Calcium hydroxid (Dycal, Dentsply).

2- Propolis (Imtenan): the powder was mixed with 70% ethyl alcohol to a thick consistency on a paper pad with the aid of plastic spatula, the mix was placed on the exposure site by means of small ball burnisher and was allowed to set (setting time 3 min.)

Cavities were sealed with glass ionomer cement (Riva) after setting of capping materials.

**Animal care:-**

After completion of dental procedure, the animals were taken care of according to the protocol of Canadian Council on Animal Care and in coherence with the Three Rs (replacement, reduction, reinforcement) of animal ethics (Fenwick et al., 2011).

**Animal scarification:-**

Four rabbits in each group were sacrificed at 1, 2, 4 weeks respectively. Then the upper jaw was removed and the capped teeth were dissected.

**Histological evaluation** (Passcoe and Gatehouse, 1986):

- ❖ *Fixation of the tissue:* The specimens were put immediately in fixative 10% formalin for 48- 72 hours.
- ❖ *Washing:* After adequate fixation in 10% formalin solution, the specimens were washed under running tap water overnight to remove the excess of the fixative.
- ❖ *Decalcification :*Decalcifications of the specimens were carried out using 20% formic acid buffered with sodium citrate for 10 weeks.
- ❖ *Dehydration:* Water was removed from the tissue gradually by putting it in ascending grades of Ethyl alcohol; 50%, 70%, and 90% then in absolute alcohol.
- ❖ *Clearing:* Since paraffin and alcohol are not miscible, the tissue was put in xylene (clearing agent) which is miscible with both alcohol, and paraffin. It also made the tissue translucent.
- ❖ *Infiltration and embedding :*When xylene was completely replaced the alcohol in the tissue, the specimens became clear, they were embedded in dish filled with melted paraffin then removed from the dishes with a warm forceps and placed in the a box of melted hard paraffin, the bottom of which was the surface of cutting.
- ❖ *Cutting:* The paraffin embedded specimens were serially cut with microtone in a buccolingual plane parallel to the tooth vertical axis through the cavity preparation and the pulp into sections of 5 microns thickness showing the deepest part of the cavity and the underlying pulp .
- ❖ *Mounting:* A short length of paraffin ribbon was floated in a pan of warm water (about 20°C). The prepared slide was slipped under the ribbon and then lifted from the water with the ribbon, which contained the tissue sections arranged on its upper surface. The slide was placed on a constant temperature drying table which was regulated to about 37-42°C, so that the sections adhered to the slide. The slide was then allowed to dry on this table.

**The staining technique:-**

- A) **Haematoxylin and eosin staining:** to evaluate inflammatory response according to the following scores:
- B) **Trichrome stain :**to evaluate and score tissue fibrosis

**Statistical method:** Data entry and analysis were done with I.B.M. compatible computer using the software SPSS for windows version 13. The significance level was set at  $P < 0.05$

**Table 1:-** Scoring system of inflammatory cell response.

Characterization	Grade
Absence of inflammation or mild inflammatory response limited to the capping site.	0
Slight to moderate inflammation below the capping site but limited to the coronal portion of the radicular pulp.	1
Moderate inflammation evident below the capping site and extended to the middle one third of the pulp.	2
Severe inflammation affecting the whole pulp (including partial necrosis)	3
Pulp necrosis	4

**Table 2:-** Scoring system of tissue fibrosis

Characterization	Grade
Normal collagen fibers distribution	0
Mild fibrosis	1
Moderate fibrosis	2
Sever fibrosis	3

**Table 3:-** Scoring system of hard tissue formation; dentin bridge (Parolia, et al 2010)

Characterization	Grade
Absent	0
Mild hard tissue deposition beneath the exposed area or partially formed hard tissue	1
Moderate hard tissue deposition beneath the exposed area	2
Heavy hard tissue deposition beneath the exposed area	3

## Results:-

### I- Histopathological evaluation of specimens:

#### 1- Calcium hydroxide: (Control group)

##### 1. a - After one week of application of its application:

The initial reaction of the pulp to the capping material in most of specimens was a superficial layer of necrosis just beneath the material. This necrosis was followed by a weak inflammatory reaction [grade (0)] in 25% of specimens, which is characterized by the presence of dilated blood vessels and few inflammatory cells, and slight inflammation limited to coronal portion beneath the capped site grade (1) inflammatory cell response in 75% of specimens.

##### 1. b- After two weeks of application:-

25% of specimens showed grade (1) inflammatory response, 25% had moderate inflammation extended to the middle third of the pulp; grade (2) inflammatory response and the other 50% showed severe inflammation extended along the pulp tissue with partial necrosis; grade (3) inflammatory response.

##### 1. c- After four weeks of application:-

25%, 50% and 25% of specimens showed grade 1, 2 and 3 inflammatory responses respectively.

#### 2- Propolis group: (Experimental group)

##### 2. a- After one week of application:-

There was a mild inflammatory reaction grade (0) inflammatory cell response in 75% of specimens, and the other 25% showed grade (2) inflammatory cell response.

##### 2. b- After two weeks of application:-

There were 50% of specimens showed grade (1) and the other 50% had grade (2) inflammatory cell response.

##### 2. c- After four weeks of application:-

Grade (1) and grade (2) inflammatory tissue response respectively were evident in 75% and 25% of specimens respectively.

### Histochemical evaluation of specimens:-

#### 1- Calcium hydroxide: (Control group)

##### 1.a) After one week of application.

All pulps (100% of specimens) had no fibrosis grade (0) tissue fibrosis.

**1.b) After two weeks of application:**

50% of specimens showed mild fibrosis grade (1), while 25% had moderate fibrosis grade (2) and the other 25% showed severe fibrosis grade (3) tissue fibrosis.

**1.c) After four weeks of application of capping material:**

75% of specimens showed grade (1) and 25% of specimens had grade (2) tissue fibrosis.

**2- Propolis (experimental group):**

**2.a) After one week of application :**

100% of specimens had grade (0) tissue fibrosis.

**2.b) After two weeks of application:**

Half of the specimens showed grade (1) tissue fibrosis and the other half exhibited grade (2) tissue fibrosis.

**1.c) After four weeks of application:**

50% of specimens showed grade (1) and the other 50 % grade (0).

**Evaluation of hard tissue formation (dentin bridge):**

**1-Calcium hydroxide (control group):**

**1.a) After one week of application.**

25% of specimens showed a thin layer of partially calcified dentin matrix, grade (1) hard tissue formation, just beneath a superficial layer of necrosis formed below the applied material and the other 75% had no evidence of hard tissue formation, grade (0).

**1.b) After two weeks of application:**

75% of specimens showed grade (1) and 25% had moderate hard tissue deposition beneath the capping material, grade (2).

**1.c) After four weeks of application:**

50% of specimens showed grade (2) and 50% revealed heavy hard tissue deposition beneath the capping site, grade (3).

**2- Propolis group (experimental group)**

**2.a) After one week of application.**

Thin layer of partially calcified dentin matrix, grade (1) was seen in only 50% of specimens, other specimens showed no evidence of hard tissue formation.

**2.b) After two weeks of application.**

50% of specimens showed grade (1), while the other 50% had grade (2).

**2.c) After four weeks of application.**

25% of specimens showed grade (2) and 75% showed grade (3).

**Discussion:-**

The clinical criterion is inadequate for evaluation of the long-term prognosis for teeth treated by pulp capping. It is impossible to clinically diagnose teeth in which healing is complicated by inflammation. Therefore, a critical evaluation of pulp capping results can only be made histologically (Woehrlen, 1997).

Many studies have indicated that calcium hydroxide compounds are the gold standard for pulp capping in human teeth, despite its limitations (Accornite et al., 2005), propolis have antibacterial, antifungal, antiviral, antioxidant and anti-inflammatory properties, Therefore the current study aimed to compare one of natural product "propolis" to gold standard "calcium hydroxide" as pulp capping of rabbit teeth.

The animal model selected in the present study was rabbits because their pulp tissues are comparable with that of human (Belduz et al., 2010), using split mouth technique so that both medicaments tested in the same animal in alternate sides of the mouth.

The follow up period was short term extended only 4 weeks this because rabbit teeth grow or erupt continuously, these growth or eruption is held in balance by dental abrasion from chewing a diet high in fiber (Konigswald and Golenishev, 1979). Several previous studies used comparable follow up periods (Haddad et al., 2003 and Sabir et al., 2005).

Results of the current study revealed that, specimens capped with propolis exhibited less inflammatory reaction compared to calcium hydroxide at all follow up periods. This finding goes in accordance with Sabir et al, (2005), Parolia et al, (2010), Ozorio et al, (2012), Ahangari et al., (2012) who found that propolis delay the inflammatory response. The delay of inflammatory response with propolis could be related to its anti-inflammatory property. Flavonoids and caffeic acid present in propolis are known to play an important role in reducing the inflammatory response by inhibiting the lipoxygenase pathway of arachidonic acid. Also, propolis as an antimicrobial agent could break down bacterial cell wall, cytoplasm and prevent bacterial cell division (Khayyal et al., 1993).

On the other hand study of Esmeraldo et al., (2013) found that green propolis extract produced intense inflammatory infiltrate and necrosis in root canal pulp tissue after 24, 72 hours and 7 days compared to calcium hydroxide. Difference may be attributed to difference in the studied animal, the current study was on rabbits while study was on rat, also within the second study, teeth were protected with a fragment of absorbent paper soaked with the solution so this inflammation may be stemmed from a reaction to the foreign body (absorbent paper) rather than propolis itself.

As regard to fibrosis, after one week of capping procedure, both groups did not show any signs of fibrosis [grade (0)], while after two weeks of capping procedure in calcium hydroxide group there were varies degree of tissue fibrosis 50%, 25% and 25% of specimens showed grades (1), (2) and (3) tissue fibrosis respectively, compared to 50% grade (1) and 50% grade (2) tissue fibrosis in propolis group. After four weeks of application, 75% of specimens in calcium hydroxide group showed grade (1) fibrosis and the other 25% showed grade (2) fibrosis , while in propolis group half of specimens had grade (0) and the other half had grade (1, denoting a better recovery in propolis group.

When hard tissue formation was evaluated, the results supported by previous study conducted by Paloria et al., (2010) who found percentage of specimens exhibited hard tissue bridges after 15 days are equal in calcium hydroxide and propolis group, while after 45 days 100% of specimens capped with propolis showed dentine bridge formation compared to 83% of specimens capped with calcium hydroxide. The dentin bridge formed in response to propolis was better in quality than calcium hydroxide, it was thicker and continuous. The same finding was reported by Ahangari et al., (2012) who stated that propolis not only stops inflammatory reaction, infection and pulp necrosis but also induce formation of high quality tubular dentin through stimulation of stem cells.

Dentin formation following pulp capping is known to involve differentiation of odontoblast-like cells that form reparative dentin and biosynthetic activity by surrounding primary odontoblasts. Both phenomena require interaction between extracellular matrix molecules and growth factors such as transforming growth factor (TGF)- $\beta$ 1, a growth known to be important for odontoblasts-like cell differentiation (Tziafas et al., 2000). Indeed, propolis is capable of stimulating the production of (TGF)- $\beta$ 1 (Ansoerge et al., 2003).and synthesis of collagen by dental pulp cells (Scheller et al., 1978).

Therefore, within the limitation of the current study propolis showed less intense inflammatory reaction and better dentin bridge formation compared to calcium hydroxide, suggesting its use as a possible alternative to calcium hydroxide.

### **Conclusion:-**

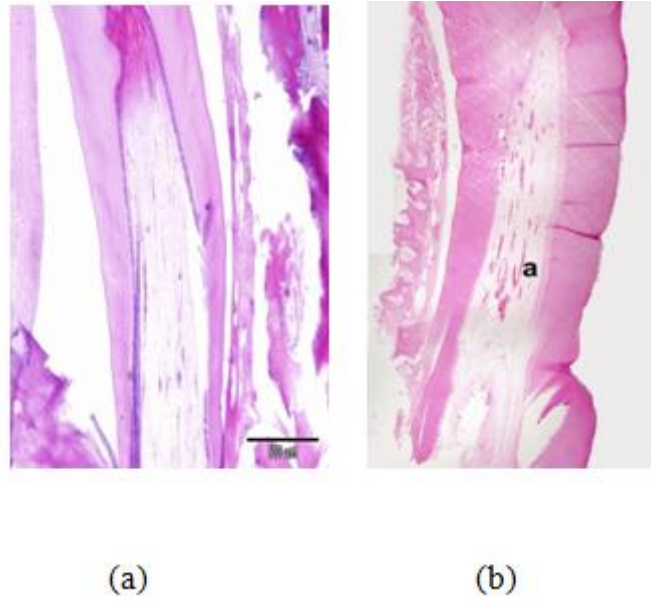
Propolis was superior to calcium hydroxide in terms of less intense inflammatory response and better quality dentin bridge formation.

### **Recommendations:-**

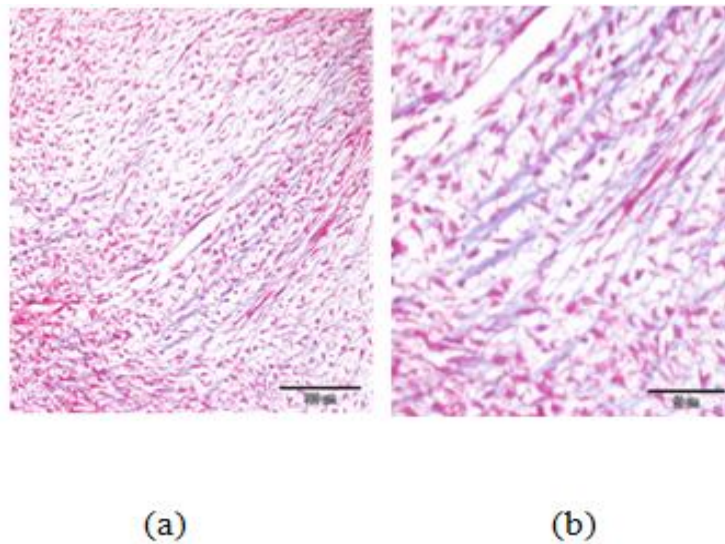
1-Propolis can be suggested as a possible alternative to calcium hydroxide as pulp capping material.

2- Further studies are required to

- a) Evaluate an alcohol free Propolis mix.
- b) Compare Propolis with other pulp capping materials.
- c) Evaluate ability of Propolis for hard tissue formation (dentinogenesis) in vivo.

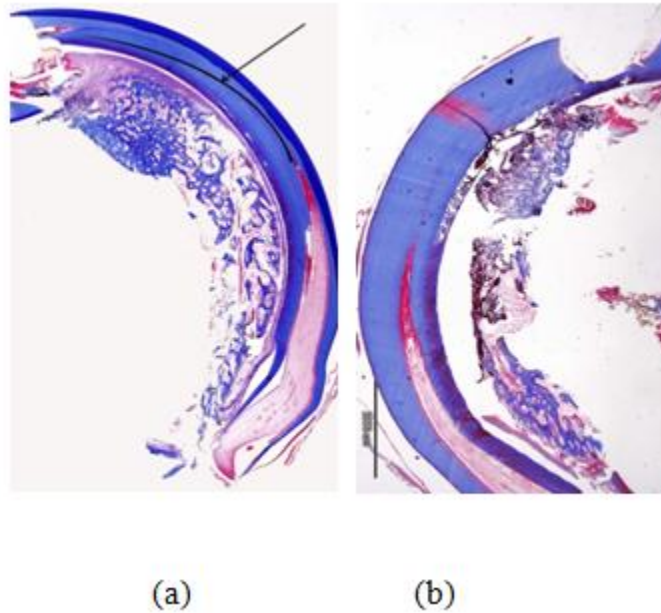


**Fig 1:** A photomicrograph of rabbit dental pulp after four weeks of application of capping materials:  
a) Propolis group: showing slight dilatation of blood vessels in the coronal portion of the pulp.  
b) Calcium hydroxide group: showing moderate dilatation of blood vessels in coronal and middle thirds



**Fig 2:** Photomicrograph of rabbit dental pulp after four weeks of application of capping materials:  
a) Propolis group: showing mild fibrosis.  
b) Calcium hydroxide: showing moderate fibrosis.





**Fig3:** Photomicrograph of rabbit dental pulp after four weeks of application of capping materials:

- a) Propolis group: showing heavy hard tissue deposition beneath the capping material.  
 b) Calcium hydroxide group: showing moderate hard tissue deposition beneath the capping material.

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### RESEARCH ARTICLE

**Development and evaluation of physico-chemical quality markers of opuntia and pineapple squash.**

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 Chemical components, blended.

#### Abstract

Fruits and vegetables are important constituents of the diet and provide significant quantities of nutrients, especially vitamins, sugars, minerals and fiber. The fruit and cladodes of prickly pear provide interesting sources of functional compounds, such as fiber, hydrocolloids, pigments, minerals, and vitamins with antioxidant properties, such as vitamin C. Ananas comosus (pineapple) is a tropical plant with edible multiple fruit consisting of coalesced berries, also called pineapples, and the most economically significant plant in the Bromeliaceae family. The squash was developed with the optimization of the concentrations of prickly pear (5-25 %) and pineapple (0-25 %) juice. The developed fruit squash was subjected for evaluation of physico-chemical markers. Results showed significant differences ( $p < 0.05$ ) among the treatments for all the chemical components of the squash blends analyzed except for titrable acidity, TSS and SO<sub>2</sub> which did not show significant differences between the treatments on total soluble solids (TSS) in the range of 45 - 460 brix, pH 3.8 to 4.1, titrable acidity (% citric acid) 1.45 to 1.49, total sugars 35.3 to 37%, reducing sugars 15.2 to 16.8%, ascorbic acid 6.5 to 10.5 mg/100g and SO<sub>2</sub> 348 to 350 ppm were observed in different juice blended squash treatments. The highest TSS (460Brix), total sugars (37%), reducing sugars (16.8%) was observed in T3 prickly pear and pineapple juice blended ratio (15:10). The high acidity (1.48%) and ascorbic acid (10.9 mg/100g) were witnessed in T5 prickly pear : pineapple (5:20%) fruit juice blended squash; whereas high SO<sub>2</sub> content was seen in pure prickly pear squash (T1) and lowest pH (3.8) was seen with the squash blended prickly pear: pineapple (15:10%) fruit juices i.e T3. The study concludes that, prickly pear and pineapple facilitates in the development of functional fruit squash with minor changes in physico-chemical markers and superior sensory attributes.

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#### Introduction:-

Fruits and vegetables are important constituents of the diet and provide significant quantities of nutrients, especially vitamins, sugars, minerals and fiber. Daily consumption of fruits and vegetables reduce the risk of cancer, heart disease, premature aging, stress and fatigue primarily due to the integrated action of oxygen radical scavengers such as  $\beta$ - carotene and ascorbic acid plus calcium and dietary fiber (Sáenz, et al., 2000).Pimienta, et al., (1990) reported

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that due to the perishable nature of the fruits and vegetables they require immediate processing to avoid post-harvest losses (20-25%)

*The Opuntia ficusindica (L) Mill* is a xerophyte popularly known as prickly pear plant in English. Prickly pear fruit has a similar nutritional value like other fruits, although it has much higher soluble solids content than many popular fruits such as apple, apricot, cherry, melon, peach and plum (Pimienta, 1990; Sepúlveda and Sáenz, 2000). This characteristic makes prickly pear fruit suitable for processing by concentration or dehydration, taking advantage of the reduced water activity and increased sugar content as a means of preservation.

Most of the sugars present in the prickly pear fruit are reducing types, with around 53 % glucose and the remaining is fructose (Rodríguez *Et al.*, 1997). The contents of protein (0.21–1.6 g [100 g]<sup>-1</sup>), fat (0.09–0.7 g [100 g]<sup>-1</sup>), fibre (0.02–3.15 g [100 g]<sup>-1</sup>) and ash (0.4–1.0 g [100 g]<sup>-1</sup>) are similar to other fruits (Pimienta, 1990; Sepúlveda and Sáenz, 2000; Rodríguez *et al.*, 1997; Muñoz de Chávez *et al.*, 1995). The calorific value of prickly pear fruit pulp varies between 31 and 50 kcal (100 g)<sup>-1</sup>, which is comparable with other fruits such as apples, oranges, peaches and pears.

The fruit and cladodes of prickly pear provide interesting sources of functional compounds, including fiber, hydrocolloids (mucilage), pigments (betalains and carotenoids), minerals, (calcium and potassium) and vitamins with antioxidant properties, such as vitamin C. These compounds are valued for their contribution to a healthy diet and also as ingredients for designing new foods (Sáenz, 2004). These compounds can be included in a new range of foods known as functional foods, which are as foods or beverages that provide physiological benefits. They enhance health, help to prevent or treat disease and/or improve physical or mental performance with the addition of one or more functional ingredients or using appropriate biotechnologies (Sloan, 2000).

The pineapple (*Ananas comosus*) is a tropical plant with edible multiple fruit consisting of coalesced berries, also called pineapples, and the most economically significant plant in the Bromeliaceous family. In a 100 gram serving, raw pineapple is an excellent source of manganese (44% Daily value (DV)) and vitamin C (58% DV), but otherwise contains no essential nutrients in significant content. It is an excellent source of antioxidant, vitamin C which is required for the collagen synthesis in the body. It contains micronutrients and it protects against cancer and this micro-nutrient break up blood clots is beneficial to the heart.

There are various methods of preservation of food including thermal processing, fermentation, pickling, dehydration, freezing etc. The technology for preservation also varies with type of products and targeted market. The processing of fruit as squash enhances the raw edible quality of fruit as well as its shelf life by the selection of appropriate fruit drink processing conditions.

Squashes are sweetened juice of fruits containing minimum prescribed quantity of pulp. As per Indian Standards, squash should contain at least 25 per cent (by volume) of fruit juice. The squashes are consumed after dilution by drinking water in 1:3 ratio. These beverages contain added flavors and permitted class II preservatives. Since preservatives are added in adequate quantities, the shelf life of squashes is fairly longer at room temperature.

The present study was carried out for the development of fruit squash with prickly pear and pine apple fruits. The standardized and development of squash with different concentrations of pear and pine apple fruits and evaluation of the physico-chemical and sensory attributes.

## **Materials & Methods:-**

### **Prickly pear juice:-**

Mature ripe fruits were collected from the experimental plot during April-May. Spines over the surface of the fruit were picked, peeled washed cut into slices and seeds were removed. The slices are crushed with an electric blender/mixer to get pulp. The pulp was heated up to 80°C and passed through a 1/32 inch nylon sieve to remove excess fiber and coarse pulp particles. Finally obtained juice was analyzed for TSS, PH, Titrable acidity, ascorbic acid and was used for preparation of blended fruit squash.

### **Pineapple juice:-**

Mature ripe fruits purchased from the local market were peeled, washed, cut into slices and crushed into pulp with electric blender/mixer. The crushed pulp was heated to 80°C and passed through a passed through a 1/32 inch nylon

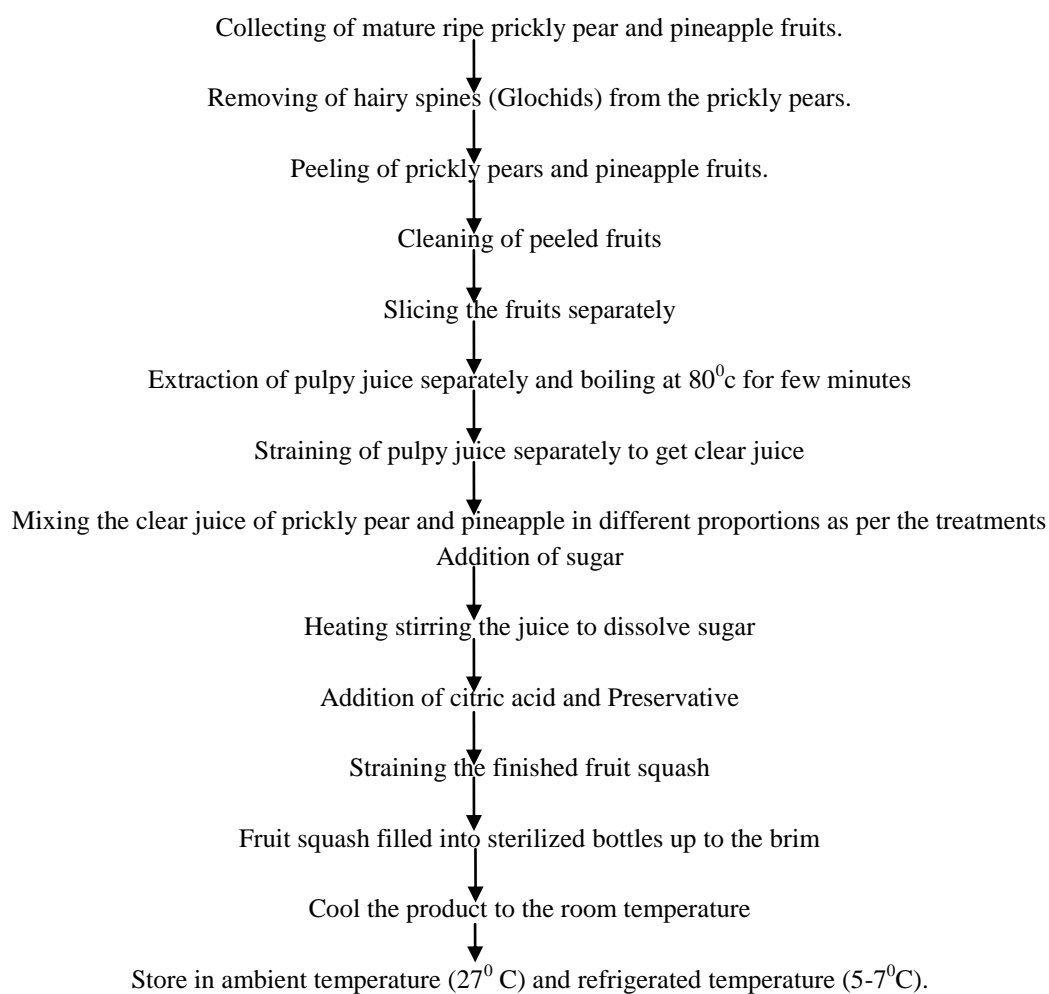
sieve so as to remove excess fiber and coarse pulp particles finally obtained juice was analyzed for TSS, PH, Titrable acidity, ascorbic acid and was used for preparation of blended fruit squash.

#### Optimization and preparation of Squash:-

The clarified fruit juices of prickly pear and pineapple were mixed in different proportions and sample codes are represented in below Table 1.

**Table:-1** Sample codes for the optimization of prickly pear and pine apple fruit squash.

Treatment	Prickly pear juice (%)	Pineapple juice (%)
T1	25	0
T2	20	5
T3	15	10
T4	10	15
T5	5	20



**Fig: 1:- Flow chart for preparation of prickly pear fruit squash**



**Fig: 2** Images of fruit squash developed with prickly pear and pine apple

### Analytical methods:-

#### Moisture:-

Estimation of moisture content and total solids was carried out five times. Fruit pulp (10 g) placed in an evaporating dish and dried at 105 °C in an oven at constant weight. The moisture content was determined using following equation.(Askar 1981).

$$\% \text{ moisture content} = [(\text{initial weight} - \text{dried weight})/\text{initial weight}] \times 100.$$

#### TSS:

Total soluble solids (TSS) of different pulp, juice and products was measured with hand refractometer (ERMA, Japan) and expressed as °Brix at room temperature. Before taking the reading the refractometer was tested for error with distilled water (Ranganna, 1994).

#### pH:

P<sup>H</sup> of juices and products was determined by using Digital pH meter (model-EQ-610, Equip-Tronics, Ahmedabad, India) (Anonymous, 1996).

#### Titration acidity:

Titration acidity was determined by diluting 5-10g of sample with distilled water then 10 ml of sample was taken in a 100ml volumetric flask and the volume was made up with distilled water. From this 10ml of aliquot was taken in a 100ml conical flask and titrated against 0.1N sodium Hydroxide (NaOH) solution using one (or) two drops of phenolphthalein indicator. Total titration acidity was expressed as percent citric acid (g/100ml of sample) (AOAC 2005)

$$\text{Acidity \% (As citric acid)} = \frac{\text{Titer value} \times \text{Normality of NaOH} \times 64 \times 100}{\text{Volume of Sample taken} \times 1000}$$

#### Total sugars:

The total sugar content was determined by the anthrone reagent method (Plummer, 2006). The fruit juice was prepared as described in 3.3.3.2 and transferred 1.0 ml of filtered juice to the 10 ml volumetric flask, and diluted to 10.0 ml with distilled water, having strength 100µl/ml, labelled as stock solution. Stock solution (0.1 ml) was transferred into 10 ml volumetric flask, and diluted to 10 ml with distilled water, having strength 10µl/ml. The anthrone reagent was prepared right before analysis by dissolving 0.2 g of anthrone (0.2%) in 100 ml of concentrated sulfuric acid, protected from light and used within 12 h. Anthrone reagent (4.0 ml) was added

cautiously to each tube containing 1.0 ml of standard solutions of glucose (10 – 100 µg/ml) and test solution (10µl/ml).

Tubes were then placed 10 min at 5 °C. Subsequently, tubes were boiled 5 min on constant boiling water bath. After heating, allowed to cool at room temperature for 15 min. The absorbance of the colored solution was measured at 620 nm against reagent blank. Readings were taken in triplicate. Spectrophotometric response was compared to a standard calibration curve of glucose, and total sugar content was expressed as g/100 ml of glucose. (AOAC 2005).

#### **Reducing sugars:-**

Weigh accurately an amount of sample such that after dilution the solution contains about 0.6% reducing sugars. Transfer the sample quantitatively to a 500 ml volumetric flask with the aid of hot water, cool to room temperature, dilute to volume and mix thoroughly. Pipette 25.0 ml of standardized mixed Fehling's Solution into a 200 ml Erlenmeyer flask and add a few glass beads. Add the sample solution by means of the burette to within 0.5 ml of the anticipated end point (determined by preliminary titration). Immediately place the flask on the wire gauze of the titration assembly, and adjust the burner so that the boiling point will be reached in about 2 min. Bring to boil and boil gently for 2 min. As boiling continues, add 2 drops of methylene blue indicator and complete the titration within 1 min. by adding sample solution drop wise or in small increments until the blue color disappears when approaching the end point, allow about 5 sec, reaction time between additions of sample solution. (AOAC 2005).

$$\% \text{ Reducing Sugars} = (500 \text{ ml}) (0.1200)(100) / (\text{Sample Titer, ml})(\text{Sample Wt., g})$$

#### **Ascorbic acid (Vitamin C):-**

Vitamin C was determined by using the procedure as outlined by Food Analysis Laboratory Manual Chapter 7 Vitamin C Determination by Indophenol Method-9 and (AOAC2005).

10 g of each of the samples with the exception of fruits was accurately weighed and ground using mortar and pestle with an additional of 20 ml of metaphosphoric acid and acetic acid. The mixture was further ground and strained through muslin and the extract was made up to 100 ml with the metaphosphoric-acetic acid mixture. 5 ml of the metaphosphoric acid-acetic acid solution was pipetted into three of the 50 ml Erlenmeyer flask followed by 2 ml of the samples extract. The samples were titrated separately with the indophenol dye solution until a light rose pink persisted for 5s. The amount of dye used in the titration were determined and used in the calculation of vitamin C content.

#### **Sulphur dioxide (So<sub>2</sub>):**

Sulphur dioxide content of the sample was distilled in the presence of acid in an inert atmosphere and absorbed by iodine which converts sulphurous acid to sulphuric acid and titrated against standard thiosulfate solution. The free and combined So<sub>2</sub> expressed in parts per million (PPM). (Askar 1981).

#### **Sensory evaluation:**

Sensory evaluation test carried out according to Nadir et al., (2005).Taste, color, texture, odor and overall acceptability of prickly pear fruit products of squash were assessed using ten panelists of Department of Home science, S.V University, Tirupati, India.

#### **Statistical analysis:**

Obtained data was subjected for statistical analysis by Duncan multiple range test (DMRT) for testing the significance, described by Dhamu and Ramamoorthy (2012).

#### **Results & Discussion:-**

The *Opuntia ficus indica* or prickly pears are spiny and pear shaped fruits. These fruits are emerging nutraceutical fruits with high therapeutic values. These xerophyte can be an alternative crop for drought prone areas.

#### **Formulation and development of prickly pear fruit products:**

The one of the main objective of the study was development of fruit products with prickly pear (PP). The quality of fruit products depends on the pulp quality. Prickly pear pulp contains less solids and more moisture. Hence the pulp is watery which will not suitable for the quality standards of the products like squash and bar. Blending of other

fruits will be desirable, for prickly pear squash preparation. A fruit with no colour and pleasant aroma is required, so that it will not interfere into the colour of prickly pear. Pineapple was selected to blend with prickly pear, because it has no colour and have pleasant aroma.

Fresh prickly pear fruits obtained from experimental plot and fresh fruits of pineapple obtained from local markets were utilized for preparation of blended fruit products squash. These fresh fruits pulp were analyzed for physico-chemical parameters.

**Table: 2** Physico-chemical parameters of prickly pear and pineapple fruit pulp.

Fruit pulp	Moisture (%)	TSS ( <sup>o</sup> Brix)	P <sup>H</sup>	Acidity (% Citric acid)	Total Sugars (%)	Reducing sugars (%)	Ascorbic acid (mg/100g)
Prickly pear	86.0±1.00	13±1.00	6.2±0.10	0.12±0.01	11.7±0.10	9.2±0.12	26.0±1.18
Pineapple	87.0±1.00	15±0.95	5.0±0.15	0.40±0.01	13.5±0.15	10.1±0.06	38.0±1.00

All values means± Standard deviation of data

The mean percent of moisture content of prickly pear and pineapple pulp was 86.0 and 87.0%, the mean TSS – 13 & 15<sup>o</sup>Brix, the mean P<sup>H</sup>-6.0 and 5.0 the mean acidity (TA)-0.12 & 0.40%, the mean total sugars (TS)-11.7 & 13.5, the mean reducing sugars (RS)-9.0 & 10.1% and the mean ascorbic acid content was 26.0 & 38.0mg/100g respectively (Table 2).

Pineapple fruit contain high amount of TSS (15<sup>o</sup> brix), total sugars (13.5%), reducing sugars (10.1%) and acidity 0.40% while P<sup>H</sup> being low (5.0). This is followed by prickly pear TSS (13<sup>o</sup>brix), total sugars (11.7%), reducing sugars (9.2%), ascorbic acid (26.0 mg/100g). Bose et al; (1986) reported that papaya pulp contains 90.7 % moisture 9.5 % carbohydrates, 10 mg ascorbic acid per 100 g pulp and 0.5% protein, and the pineapple pulp contains 84.4% moisture, 15.7 % carbohydrates, 0.6 % protein and 63mg ascorbic acid per 100 g pulp.

Wide range of chemical constituents in prickly pear fruit pulp has been reported by several authors. Samahy et al (2007) reported the chemical characteristics of both orange yellow and red prickly pear pulp. Both have high P<sup>H</sup> (6.2, 6.14), TSS (13.5, 11.25 <sup>o</sup> Brix), total sugars (8.5%, 8.7%) reducing sugars (8.5%, 8.3%) on fresh weight basis, crude protein (4.6%, 5.3%), crude dietary fibre (1.40%, 1.44%), pectin (2.4%, 2.44%) and ash (2.39%, 2.27%) on dry weight basis.

Similar chemical parameters of prickly pear fruit pulp were also recorded by Askar and EL-Samahy (1981). Saenz and Sepulveda (1995) reported higher TSS of 17.0% constituted 53% glucose and fructose, ascorbic acid (40mg/100g), P<sup>H</sup> (5.3 -7.1), proteins (0.21-1.6%) fat (0.09-0.7%), fibre (0.02-3.15%) and ash (0.4-1%). Sepulveda and Saenz (1990), reported the technological characteristics of prickly pear fruit pulp for TSS (12-17%), pectin (0.17-0.19 mg/100g), Vitamin -C (4.6-41.0 mg/100g as ascorbic acid) and moderate colour values. Whereas Saenz, Sepulveda and Moreno (1995), Saenz and Sepulveda (1999) reported technological characteristics of green cactus pear (prickly pear) pulp for P<sup>H</sup> (5.9 -6.2), acidity as % citric acid (0.03 -0.04), TSS (12.8-14.5%), Vit.C (20.0-31 mg/100g), viscosity (119.2m Pa°s) and higher colour values. Sepulveda and Saenz (1999) also reported the technological characteristics of orange cactus pear fruit pulp for P<sup>H</sup>-6.1, TSS (<sup>o</sup>Brix)-14.8%, very low acidity (0.043%), reducing sugars (13.2%), total sugars (14.8%), pectin (0.04%), Vit-C (24 mg/100g) ash (0.26%, viscosity 45.0 mPa°s and moderate colour value whereas orange cactus pear pulp containing comparatively high TSS and low pectin and viscosity than green cactus pear and purple cactus pear pulp. The TSS, acidity, reducing sugars of the present study is along with them. The ascorbic acid content of the three fruit pulp is also in agreement with above studies.

#### Physico-chemical quality characteristics of squash:-

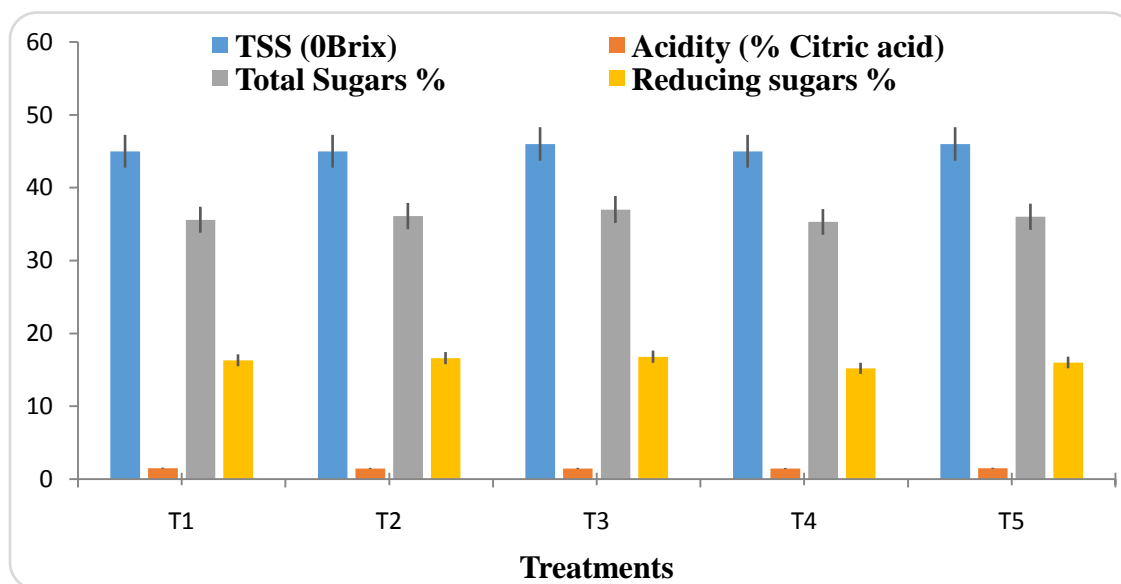
The fruit squash is a non-alcoholic concentrated syrup used in beverage making. It is usually fruit-flavored, made from fruit juice, water, and sugar or a sugar substitute. To standardize the prickly pear and pineapple squash, five different variations of blending of prickly pear and pineapple treatments i.e T1 (25:0%), T2 (20:5%), T3 (15:10%), T4 (10:15%) and T5 (5:20%) in the ratios respectively, to standardize the best composition. The five samples were

analyzed for physico-chemical parameters and subjected to subjective evaluation to know the acceptance. The results are presented in Fig. 2, 3, 4 & 5.

The mean TSS of five treatments i.e T1, T2, T3, T4 and T5 was 45.0, 45.0, 46.0, 45.0 and 46.0<sup>0</sup>Brix, the mean P<sup>H</sup> values is 4.0, 4.1, 3.9, 3.8 and 4.0, the mean acidity is 1.49, 1.47, 1.46, 1.45 and 1.48 %, the mean total sugars values are 35.6, 36.0, 37.0, 35.3 and 36.0 %, the mean reducing sugars values are 16.3, 16.6, 16.8, 15.2 and 16.0%, the mean ascorbic acid values are 6.5, 7.6, 8.6, 9.4 and 10.5 mg/100g respectively.

Potassium metabisulphate (stock solution 200g KMS dissolved in 1 ltr of distilled water = 1 ml of KMS stock solution will give 10 ppm of sulphur dioxide (So<sub>2</sub>) to 10 ltrs of juice solution) were added as preservative to increase the shelf life of the squash. The quality parameter So<sub>2</sub> (Sulphur dioxide) can be maintained up to 500 ppm (as per FSSAI standards). In the present samples the So<sub>2</sub> was analyzed, the T1, T2, T3, T4 and T5 contain 350, 348, 349, 350 and 348 ppm respectively, which is within the permitted levels of the FSSAI (Food Safety Standards Authority of India).

Results showed significant differences among the treatments for all the chemical components of the squash blends analyzed except for titrable acidity, TSS and So<sub>2</sub> which did not show significant differences between the treatments on 'Initial' days of storage. TSS in the range of 45 to 46<sup>0</sup> brix, P<sup>H</sup> 3.8 to 4.1, titrable acidity (% citric acid) 1.45 to 1.49, total sugars 35.3 to 37%, reducing sugars 15.2 to 16.8%, ascorbic acid 6.5 to 10.5 mg/100g and So<sub>2</sub> 348 to 350 ppm were observed in different juice blended squash treatments. The highest TSS (46<sup>0</sup>Brix), Total sugars (37%), reducing sugars (16.8%) was observed in T3 prickly pear and pineapple juice blended ratio (15:10). The high acidity (1.48%) and ascorbic acid (10.9 mg/100g) were witnessed in T5 prickly pear : pineapple (5:20%) fruit juice blended squash; whereas high So<sub>2</sub> content was seen in pure prickly pear squash (T1) and lowest P<sup>H</sup>(3.8) was seen with the squash blended prickly pear: pineapple (15:10%) fruit juices i.e T3. The ascorbic acid content was however found to be high in squash blends with increase in the proportion of pineapple juice from 5 to 20% in the present study. This may be due to high ascorbic acid content of pineapple juice (38 mg/100g) comparatively than prickly pear juice (26 mg/100g).



**Fig:2:-** Physico-chemical analyses- TSS, TS, Acidity and reducing sugars of prickly pear squash



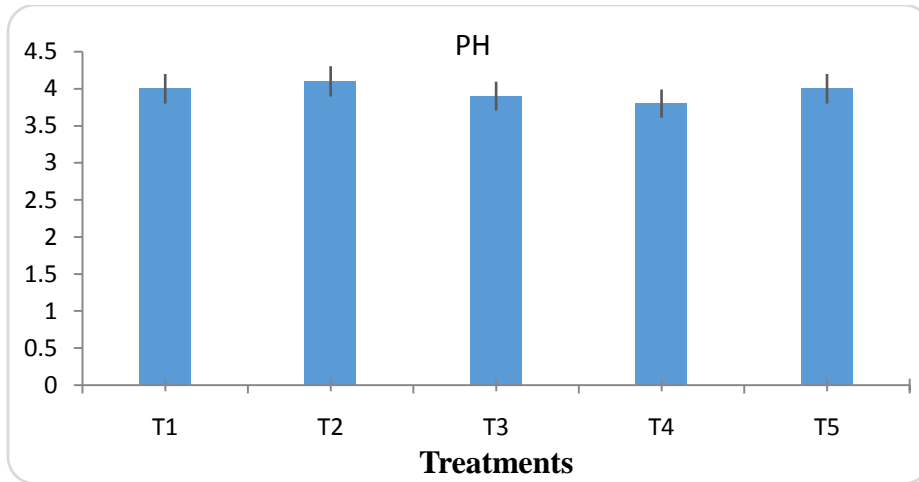


Fig:3:- Physico-chemical analyses-P<sup>H</sup> of prickly pear squash.

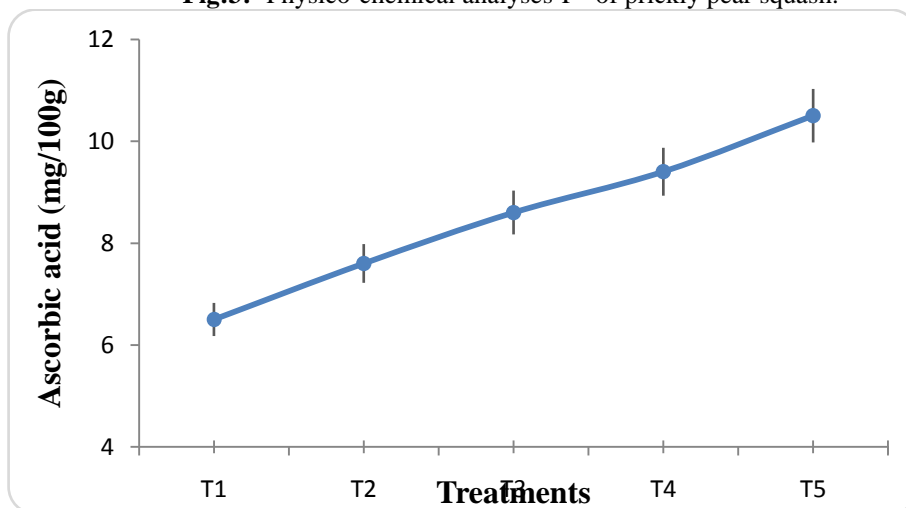


Fig:4:- Physico-chemical analyses-Ascorbic acid of prickly pear squash.

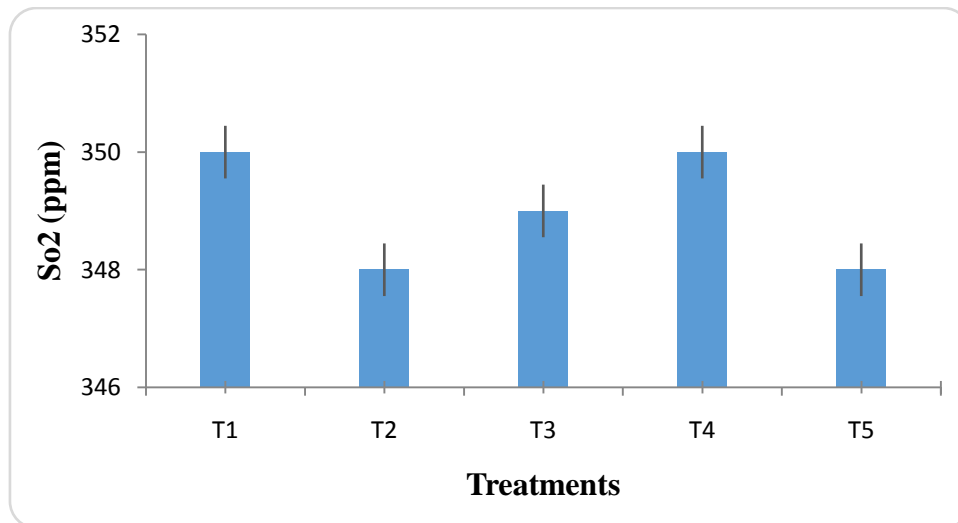


Fig:5:- Physico-chemical analyses-Sulphur dioxide (So<sub>2</sub>) of prickly pear squash.

**Sensory evaluation of prickly pear squash:**

Sensory evaluation was carried out by a panel of 10 judges for appearance, taste, flavor, colour, consistency (mouth feel) and appearance on a 10 point scale where 1-2 poor, 3-4 fair, 5-6 good, 7-8 very good and 9-10 excellent (Askar 1981). The mean for each sensory attribute was computed for comparison and the overall acceptability scores were obtained by the summation individual sensory scores and means were computed for comparison.

The sensory characteristics taste, consistency (mouth feel) and appearance did not exhibit significant differences between the juice blends of the fresh squash tried, whereas the sensory parameters flavor, color and overall acceptability showed significant differences between the different juice blended fresh squash treatments (Table 3)

**Table: 3:-Sensory characteristic evaluation of prickly pear squash**

	% of fruit juice blends		Sensory characteristics					
	Prickly pear	Pineapple	Taste	Flavor	Colour	Mouth feel	Appearance	OAA (50)
<b>T1</b>	25	0	8.3±0.30 <sup>a</sup>	8.2±0.20 <sup>ab</sup>	9.2±0.10 <sup>a</sup>	8.2±0.40 <sup>a</sup>	8.0±0.30 <sup>a</sup>	8.36±0.08 <sup>ab</sup>
<b>T2</b>	20	5	8.3±0.10 <sup>a</sup>	8.6±0.30 <sup>ab</sup>	8.6±0.30 <sup>ab</sup>	8.4±0.30 <sup>a</sup>	8.2±0.30 <sup>a</sup>	8.42±0.08 <sup>ab</sup>
<b>T3</b>	15	10	8.6±0.20 <sup>a</sup>	8.8±0.40 <sup>a</sup>	8.4±0.20 <sup>b</sup>	8.8±0.20 <sup>a</sup>	8.5±0.50 <sup>a</sup>	8.62±0.07 <sup>a</sup>
<b>T4</b>	10	15	8.1±0.10 <sup>a</sup>	8.0±0.20 <sup>b</sup>	8.3±0.20 <sup>b</sup>	8.6±0.40 <sup>a</sup>	8.4±0.50 <sup>a</sup>	8.28±0.07 <sup>b</sup>
<b>T5</b>	5	20	8.0±0.20 <sup>a</sup>	8.0±0.30 <sup>b</sup>	8.1±0.20 <sup>b</sup>	8.5±0.30 <sup>a</sup>	8.3±0.20 <sup>a</sup>	8.11±0.01 <sup>b</sup>

- Each value is a mean of three replicates.
- Means were tested for significance following Duncan's multiple range test (DMRT) described by Dhamu and Ramamoorthy (2012).
- Means having same letter within the each property are not significantly different at  $P \leq 0.05$  (n=3).
- Means having different letters within the each property are significantly different at  $P \leq 0.05$  (n=3).

Results of the sensory characteristics evaluation of fresh prickly pear squash and its blends with pineapple juice revealed that the squash blend T3-15:10% prickly pear and pineapple juice scored high sensory values for taste (8.6), flavor (8.8), consistency (mouth feel) (8.8) and appearance (8.5) and overall acceptability score (8.62) and followed by T2-20:5% prickly pear and pineapple juice blended squash and pure prickly pear squash T1-25% juice and T2-20:5% prickly pear and pineapple juice with overall acceptability scores of 8.36 and 8.42 respectively (table-23). The other squash blends T4-10:15% and T5-5:20% prickly pear and pineapple juice blends had comparatively low scores for all the sensory characteristics including the overall acceptability 8.28 and 8.11 respectively (Table 3).

**Conclusion:-**

Fruits and vegetables are important constituents of the diet and provide significant quantities of nutrients, especially vitamins, sugars, minerals and fiber. Results showed significant differences ( $p < 0.05$ ) among the treatments for all the chemical components of the squash blends analyzed. The highest TSS (46°Brix), Total sugars (37%), reducing sugars (16.8%) was observed in T3 prickly pear and pineapple juice blended ratio (15:10). The high acidity (1.48%) and ascorbic acid (10.9 mg/100g) were witnessed in T5 prickly pear : pineapple (5:20%) fruit juice blended squash; whereas high So<sub>2</sub> content was seen in pure prickly pear squash (T1) and lowest P<sup>H</sup>(3.8) was seen with the squash blended prickly pear: pineapple (15:10%) fruit juices i.e T3. The study concludes that, prickly pear and pineapple facilitates in the development of functional fruit squash with minor changes in physico-chemical markers and superior sensory attributes.

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### **RESEARCH ARTICLE**

#### **THE IMPLICATIONS OF SUSTAINABLE DEVELOPMENT PROGRAMMES ON ENVIRONMENTAL SUSTAINABILITY IN NIGERIA.**

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#### **Abstract**

Human security and sustainable development all over the world hinges on successful environmental sustainability. Nigeria was a signatory to Agenda 21 in 1992 and has been introducing policies in its systems which include laws that serve the three tier governments (Federal, States and Local Governments) in its bid to achieve environmental sustainability. These laws and policies serves as instruments for environmental protection, planning, prevention and pollution control.

This study analyses the state of Nigeria environment before the inception of the Millennium Development Goal MDG 7 which was to ensure environmental sustainability and examines what happens after the programmes took off and ended. It examines sustainable practices in Nigeria that supports and encourages environmental sustainability. It identifies challenges to the achievement of environmental sustainability in the MDG 7 programmes. It also classifies the emerging environmental issues in the country. At the end, it advocates forward strategies in the achievement of environmental security in Nigeria.

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#### **Introduction:-**

The discussion of environmental sustainability filters through nearly all political, social and economic discusses world over because of its importance to sustainable development and human security. The importance of the discussions and its processes is assumable essential and agreeable all over the world through different world bound programmes and agencies since the boarders of nations could not hold globally for environmental change. Therefore, workable and achievable sustainable development programmes are imperative for environmental sustainability in every society.

Since man will continue to depend on its environment for consumption, utilization and socioeconomic relationships makes the processes of environmental sustainability for every society vital for the preservation of the entire world and its life components. Therefore the achievement of environmental sustainability is paramount to environmental security, economic development and human advancement.

Environmental sustainability involves making decisions that will be of interests to the universe by protecting and preserving the environment so that the nature will continue to support human life and other living organisms. The processes of environmental sustainability thrive mainly on workable sustainable policies that are globally advocated and supported and midwife by nations. Nigeria as a nation since the 1980's has consciously in diverse ways

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supported global environmental sustainability with the adoption of policy framework for environmental sustainability at different times.

#### LEGAL AND POLICY FRAMEWORK FOR ENVIRONMENTAL POLICIES:-

The sustainable development deliberations and agendas of the 1990s, including the 1992 Earth Summit<sup>1</sup> is prime to the current direction for environmental sustainability. Agenda 21 (a product of the Earth Summit) is essential in encouraging environmental sustainability. Agenda 21 emphasizes the existence of synergies between the principles of environmental security and sustainable development to foster environmental sustainability

Thereby, the endorsement of eight MDG (Millennium Development Goal) goals in the year 2000 was in the aftermath of the Earth summit in 1992 held at Rio, Brazil (Nigeria was a signatory to Agenda 21). The kick off of MDG 7 programmes afterward encouraged and influenced the initiations and further adoptions of sustainable environmental policies in Nigeria and other nations of the world with the aim of ensuring and achieving environmental sustainability focusing on the targeted year 2015.

Earlier in 1989, Nigeria enacted its own National Policy on Environment. The Federal Republic of Nigeria and some of its state governments also promulgated some national environmental laws to encourage environmental sustainability prior to the kick of MDG 7 programmes. These laws serve as instrument for environmental protection, planning, prevention and pollution control. Such includes

- i. Federal Environmental Protection Agency act, Cap 131, Vol. IX p.6303, 1988
- ii. National Environmental Protection (Management of Solid Hazardous Wastes): Regulations, 1991.
- iii. National Environmental Protection (Effluent Limitation): Regulations, 1991.
- iv. National Environmental Protection (pollution and Abatement in Industries and Facilities Producing Waste) Regulations, 1991.

#### NIGERIA ENVIRONMENT AT A GLANCE:-

The table 1 below depicts MDG 7 targets, indicators, what was on ground before the inception of MDG 7 in 2000 and what happens after the programme took-off.

**Table 1:- Nigeria Environment at a Glance**

Targets	Indicators	Before MDG (i.e. year 2000)	After year 2000
<b>Integrate the principles of sustainable development into country policies and programs and reverse the loss of environmental resources</b>	<b>1.</b> Proportion of land area covered by forest (FAO)	Forested area was 14 per cent of the land area in 2000 (MDG Nigeria, 2010).	1. The current forested area in Nigeria is 9.5 percent of the percentage of land (UN Data, 2014).
	<b>2.</b> Ratio of area protected to maintain biological diversity to surface area (UNEP-WCMC)	Conservation area was about 2,155,740 ha while the Games and Wildlife sanctuaries is made up of 1,030,621ha (Olufemi and Ameh, 1999)	Conservation areas, Game and Wild life sanctuaries are still retained.
	<b>3.</b> Energy use (kg oil equivalent) per \$1 GDP (PPP) (IEA, World Bank)	Energy use (kg oil equivalent) per \$1 GDP (PPP) 2000-2004 was 721 (The World Bank, 2014)	Energy use (kg oil equivalent) per \$1 GDP (PPP) 2000-2009 was 721(The World Bank, 2014)
	<b>4.</b> Carbon dioxide	Carbon dioxide emissions	Carbon dioxide emissions

<sup>1</sup>Dankelman, I. (2013). On the Road to Sustainable Development: Promoting Gender Equality and Achieving Climate Change. In UNDP (2013). Powerful Synergies: Gender Equality, Economic Development and Environmental Sustainability. United Nations Development Programmes (UNDP).

	emissions per capita (UNFCCC, UNSD) and consumption of ozone-depleting CFCs (ODP tons) (UNEP-Ozone Secretariat)	metric tons per capita in 2000 is 0.6 (Trading Economics, 2014 citing World Bank Indicators)	metric tons per capita in 2010 is 0.5 (World Bank, 2014) while Nigeria achieved the Montreal Protocol for the phase out of CFC in 2010 (Daily Independent, 2014).
	5. Proportion of population using solid fuels (WHO)		117.8 million people uses non-solid fuel which include firewood, charcoal and other such cooking sources (PM News Nigeria, 2013) citing World Bank Report
<b>Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation</b>	1. Proportion of population with sustainable access to an improved water source, urban and rural (UNICEF-WHO)	50 percent of the population has access to improved drinking water (WSMP Nigeria, 2008).	57percentpopulation has access to improved drinking water in 2012 (OSSAP/MDG, 2014).
	2. Proportion of population with access to improved sanitation, urban and rural (UNICEF-WHO)	26 percent of the population used improved sanitation facilities in 1990 and 30% in 2006 (WSMP Nigeria, 2008).	33.7 percent in 2012 of the population used improved sanitation facilities in 2012
<b>Have achieved by 2020 a significant improvement in the lives of at least 100 million slum dwellers</b>	Proportion of households with access to secure tenure (UN-HABITAT)	69.6% Nigerians lives in Slums in 2000 (UN-Habitat, 2014)	62.7% lives in slums in 2009(UN-Habitat, 2014)

#### **SUSTAINABLE ENVIRONMENTAL PRACTICES IN NIGERIA:-**

Nigeria still maintains its Conservation areas and Games reserves in different parts of the country to protect its biologically diverse environments. This includes National Parks such as Kanji Lake, Old Oyo, Cross River, Gashaka-Gumti, Yankari and Chad Basin. It also has Games and wildlife sanctuaries which include Alawa, Dagida, Kwale, Ologbo, Sambisa, Udi-Nsukka etc. The conservation area is about 2,155,740 ha while the Games and Wildlife sanctuaries is made up of 1,030,621ha<sup>2</sup>

The MDG programmes serve as major interventions in areas of safe drinking water and sanitation in urban and rural areas all over the nation. These were done with constructions of dams, water schemes by providing safe water through borehole (hand pumps and solar panels water schemes boreholes) and constructions of VIP toilets in urban and rural areas in different parts of Nigeria.

In 2010 through Resolution 64/292, the United Nations General Assembly declared access to safe and clean drinking water and sanitation as a fundamental human right<sup>3</sup>. This is on the basis that access to safe and clean drinking water and sanitation is essential for human dignity.

MDG 7 programmes progress reports showed increased in the population of people that have access to safe and drinking water and sanitation in Nigeria but the increments witnessed seems slow but encouraging. The report of WHO/UNICEF in 2008 which was a Joint Monitoring Program for water supply and sanitation in Nigeria shows that only 50 percent of the population has access to improved drinking water whose sources included household connections, public stand pipes, boreholes, protected wells and springs in 1990 (WSMP Nigeria, 2008). This report

<sup>2</sup>Olufemi A.O. and Ameh C.E (1999). Forest Resource Situation Assesment of Nigeria. EC-FAO Partnership Programme(1998-2002)

<sup>3</sup> The human right to water and sanitation. <http://www.un.org/waterforlife> assessed online November 29, 2014

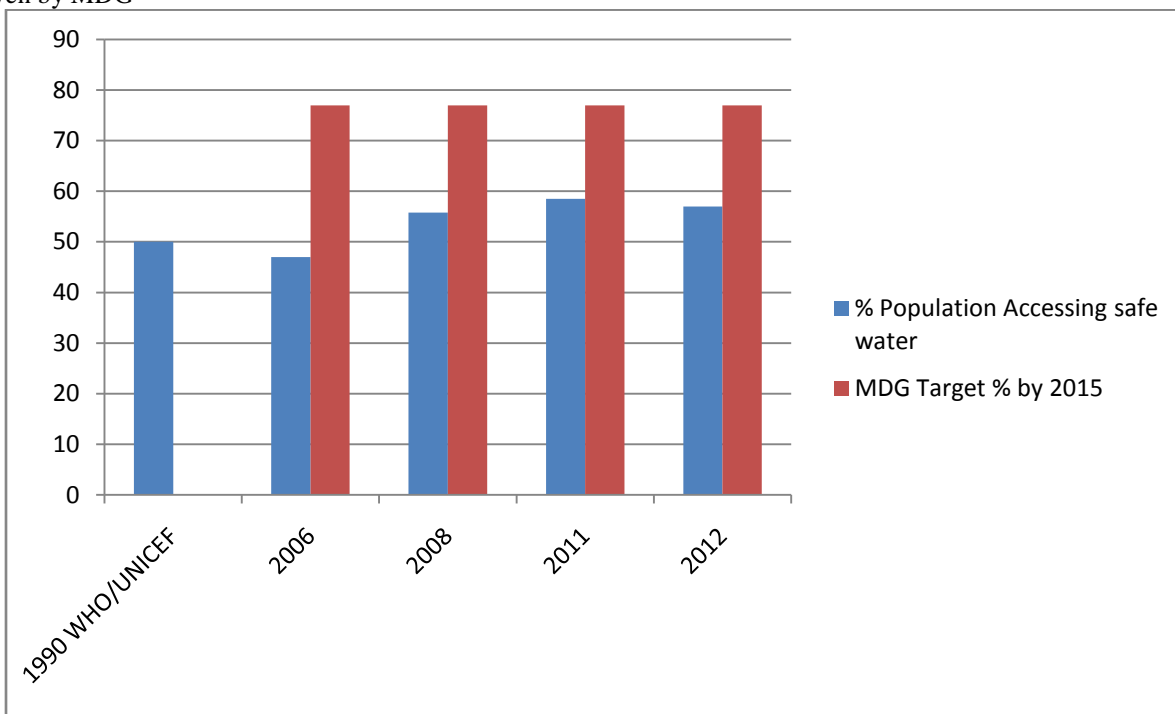
showed that as at 2006 the population of people that has access to improved-drinking water was 47 percent. While the OSSAP/MDG (Office of the Senior Special Assistance to the President on Millennium Development Goals) data of 2014 gave the population of people in Nigeria that had access to safe drinking water in 2008 as 55.8 percent, while it was 58.5 percent in 2011 and 57 percent in 2012. This is against the expected target of 77 percent by 2015<sup>4</sup>. The table 2 below extrapolated from the WHO/UNICEF Joint Monitoring Program for Water Supply and Sanitation report of 2008 (WSMP Nigeria, 2008) and OSSAP/MDG data to show the percentages of people in Nigeria having access to drinkable water between the year 1990 and 2012.

**Table 2:-** Percentage of Population having Access to Drinkable Water in Nigeria between 1990 and 2012

Year	1990	2006	2008	2011	2012
% of Population drinkable water	50%	47%	55.8%	58.5%	57%

(Source: OSSAP/MDG, 2014 and WSMP, Nigeria, 2008)

The diagram below compares the percentage of population of Nigeria having access to drinkable water to the target given by MDG



**Figure 1:-** Percentages of Population Accessing Safe Drinking Water (WHO/UNICEF Joint Monitoring Programmes for Water Supply for 1990 and 2006 and OSSAP/MDG DATA-2008, 2011 and 2012) Compared with 2015 expected MDG Target

There has also been progress though slow in the percentage of population that has access to improved sanitation. The 2008 WHO/UNICEF report of a Joint Monitoring Program for water supply and sanitation in Nigeria reported that 26 percent of the population used improved sanitation facilities in 1990 and 30% in 2006 (WSMP Nigeria,2008). While the OSSAP/MDG reported that 31.2 percent of the population used improved sanitation in 2008, while 33.7 percent in 2012 as against the expected 69.5 percent target of 2015<sup>5</sup>. This is represented in a table 3 below.

**Table 3:-** Percentage of Population Using Improved Sanitation between 1990 and 2012

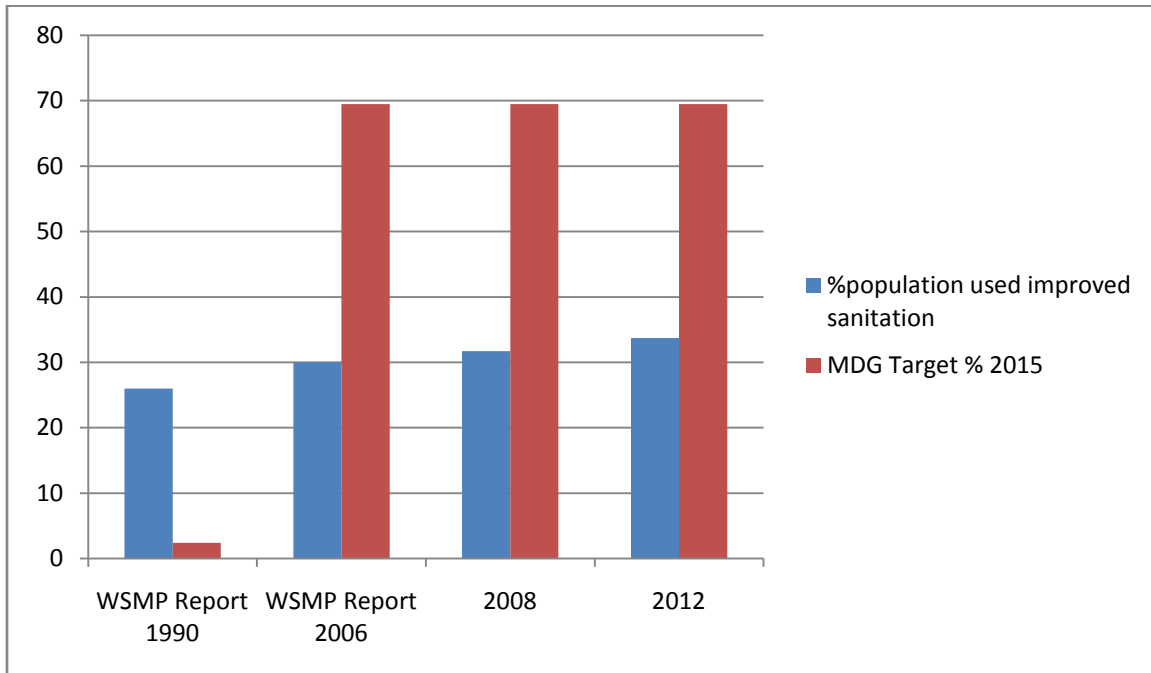
<sup>4</sup> The source of the Data is OSSAP-MDG in UNDP in Nigeria. Retrieved online <http://www.ng.undp.org>

<sup>5</sup> ibid

Year	1990	2006	2008	2012
% Population with improved sanitation	30	36	31.2	33.7

(Source: OSSAP/MDG, 2014 and WSMP Nigeria, 2008)

The Figure 2 below compares the percentage of population with improved sanitation with the expected MDG target of 2015



**Figure 2.** Percentages of Population that Used Improved Sanitation (WHO/UNICEF/WSMP Joint Monitoring Programmes data for 1990 and 2006 and OSSAP/MDG DATA-2008 and 2012) compared with 2015 expected MDG Target.

When safe water delivery and sanitation were enhanced, there must have been corresponding enhancements of some other MDG goals that lean on them. Therefore, poverty reduction will be enhanced (MDG goal 1), school enrolment will be increased (MDG goal 2), women and girls dignity enhanced (MDG goal 3), child mortality will be reduced (MDG goal 4), pregnant mothers will be prevented from diseases (MDG goal 5) and HIV/Aids patients will be prevented from being susceptible to opportunistic diseases such as water borne diseases (MDG goal 6).

## CHALLENGES TO THE ACHIEVEMENTS OF ENVIRONMENTAL SUSTAINABILITY IN NIGERIA

### Inability to Enforce Environmental Laws:-

The inability of the Federal Government of Nigeria to enforce its environmental laws is a bane to the achievement of environmental sustainability in the country. For example, there have been enabling laws and policies guiding against gas flaring, the Federal Government of Nigeria has not the political will to end gas flaring (flaring of gas started since the discovery of oil about fifty years ago) even with its negative environmental consequences.

The Minister of Environment of Nigeria, Laurentia Laraba Mallam said if the gas that is being flared is annexed it could meet 40 percent of Nigeria energy needs (ThisDay Live, 2014). Gas flaring contributes to global warming (i.e. climate change), causes environmental pollution and ecological disturbances and destructions. Environmental pollution due to gas flaring may lead to health challenges of residents around the flaring spots. It affects the growth of vegetation around flaring spots and leads to contaminations of surrounding water bodies thereby affecting the survival of fishes and other aquatic life (Ubani and Onyejekwe, 2013). The Niger Delta women of Nigeria still lament for the environmental degradations that is due to gas flaring and other unsustainable practices. This could be viewed in line with the following quotation

“We are farmers, fisherwomen and hunters. With all the flaming and pumping of oil into our swamp areas, the oil companies have denied us every living thing. Today, we have no hope, while they are making billions of naira with



our gifts from God. They don't care or hear our cry; they only throw tear gas on us, beat us, and drive us out of our land" (Ihayere, Ogeleka and Ataine (2014 p.17 citing Singh et al., 1995; Sagay, 2001; Akpan, 2003).

The government of Nigeria gave a deadline of the year 2008 for gas flaring. Though, Nigeria now piped liquefied natural gas from its petroleum to some industrial estates in Lagos, Ota and Agbara for electric power supply from its oil installations. Nevertheless, there has not been an end to this environmentally unsustainable practice of the petroleum industries

#### **Project Duplication and Site:-**

Politician interference in identification of project site and location has affected the placement of project in appropriate site/location where it will have more impact on its community. This hijack or influence of project to the political leaders in government preferred site or location instead of considering the peoples need is a gimmick used by the politicians to attract political patronages or gains. This makes the projects at times not to be assessable to the expected users. Projects such as water and VIP (Ventilated Improved Pit) toilets were sometimes sited and located in places without consideration of its community's choice for location and site. At the end the project were many times located and sited far from its expected users. For example, water borehole project that is sited far from the expected users will increase the travel time of women and girls whose cultural roles are always to fetch water for the family. There were communities where the projects allocated to their communities by the MDG program had been in existence through other national or state partnership programmes such as European Union, other agencies or one of the three tiers of government. This duplication of project robs other areas in the same community that may have needs for the project thereby hindering the focus of MDG.

#### **Project maintenance:-**

Lack of maintenance of some of the existing projects such as water boreholes in mostly rural areas was a hindrance in the achievements of MDG 7 programmes. For instance, water bore holes constructed by the MDG in some areas that developed faults or malfunctioned after put to use for sometimes by the people were later abandoned due to the need of minor repairs.

#### **Conflicts and Security issues:-**

The Security situation of the North Eastern parts of the country affected the implementation of the MDG 7 programmes in the Nigeria North Eastern States.

### **EMERGING ISSUES IN NIGERIA ENVIRONMENT:-**

#### **Climate Change, Natural Resources and Biodiversity:-**

Nigeria natural resources have been threatened by climate change and unsustainable approach to its management. Thereby, biodiversity loss being witnessed in different areas could be adduced to global change and over use of the nature resources. Women in most parts of the world especially in the third world could be seen as being closer to nature and its resources than its male counterparts.

Thereby, harm to nature may equals harm to women, because of this pervasive perception that women are closer to nature<sup>6</sup>. Even though this report agrees with Jackson (1993), that the closeness to nature by women may not be inherent but a socially constructed relationship with natural resources which varies for different groups and for individual women during the course of a lifetime. Even though women are close and at most times responsible for the use of the nature resources but in practicality most of them have no control over it because of culture and traditions of their societies.

Most of the culture and traditions in many parts of Nigeria makes women to be closer to the environment than their male counterpart. The cultures and traditions at most times delineate care giving responsibilities to the female than the male. Women manage natural resources daily in their roles as farmers and household providers<sup>7</sup>. Thereby, they have direct contact with the natural environment as they collect essential items like fruits, vegetables, medicinal

<sup>6</sup> See Beauvoir (1988), Brown and Jordanova (1982), MacCormack (1980) and Othner (1974) cited by Jackson C (1993). *Doing What Comes Naturally? Women and Environment in Development*. World Development, Vol. 21, No12 pp. 1947-1963

<sup>7</sup> FAO (2014). *Understanding the Gender Dimensions of Natural Resources Managemnt is a Starting Point for Reversing Environmental Degradation*. [Http://www.fao.org/gender](http://www.fao.org/gender)

herbs, fuel wood, fodder, water etc. for their every day and family needs<sup>8</sup>. Hence, negative impacts on the environment may affect them than their male counterparts.

#### **Nigeria Forests and Women:-**

Record is showing that desertification is spreading and the forested area is falling in Nigeria. The area of forest fell from 14 per cent of the land area in 2000 to 12.6 per cent in 2007, against the target of 20 per cent by 2015 (MDG Nigeria, 2010). The current forested area in Nigeria is 9.5 percent of the percentage of land (UN Data, 2014).

Forest is important for environmental sustainability because of its huge ability as carbon sink and unique water shedding properties while deforestation contributes to global greenhouse gas emission. The existing gender roles that exists in societies reflects in different ways men and women use forests such that forests meet women livelihood and cultural needs of their families and communities through gathering of forests products such as fuel wood, folder for animals<sup>9</sup>. It has other very important cultural and traditional role to Nigeria women. The women activities in the forest include trading in herbal medicine (Fasola, 2003). Thereby, the reduction in the percentages of forest to land will affects the activities of women their by impacting negatively on their livelihood.

#### **Slums Development in Nigeria and Women/Girl Child:-**

Increase in the numbers of shanties and slums in Nigeria are slowing down the processes of achievement of environmental sustainability in the country. In the developing world, 33 percent of the urban population lives in slums, with sub-Saharan Africa having 62 per cent of its urban population living in slums (UN-Habitat, 2013). 90% of the entire global population growth between 2000 and 2025 of 1.7 billion people is expected to take place in urban areas of developing countries<sup>10</sup>.

Urban society is expected to be a decent society with improved livelihood. Nigeria has been witnessing unprecedented rapid urbanization for some time now. The urban population growth rate of Nigeria is estimated as 3.8 percent between 2010 and 2015 while the urban population as at 2013 is 50.9 percent (UN Data, 2014). As in most global south nations, Nigeria rapid urbanization is accompanied slums development. Residents of the slums are mostly poor and deprived as compared to other residents in an urban society.

The UN-Habitat in the “2013 State of the World Cities” document enumerated the urban slum population at mid-year by major area in Nigeria as 26,549,000 in 1990, 31,538,000 in 1995, 36,951,000 in 2000, 42, 783,000 in 2005, 45,195,000 in 2007 and 47,612,000 in 2009. The data shows that the urban population at mid-year continually increased from the 1990 to 2009. While, the data of UN-Habitat (2013) also shows that the proportion of urban population living in slum area is decreasing in Nigeria. The following table depicts the UN-Habitat (2013) data

**Table 4:- UN-Habitat (2013) Proportion of Urban Population Living in Slum Area**

<b>Year</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>	<b>2005</b>	<b>2007</b>	<b>2009</b>
<b>Proportion%</b>	77.3	73.5	69.6	65.8	64.2	62.7

The problems of most slums settlement in Nigeria is the lack of governmental presences (basic life improving amenities are not provided in several slums). Such include the non availability of safe water for consumption and sanitation and health facilities. Other environmental components that have been put in place to propelled sustainable development parameters are mostly not seen in slums and squatters where they are essential in increasing the level of their livelihood.

The number of slums increased in Lagos mega-city, the Nigeria economic hub from 40 to 100 (Akiyode citing UNDP, 2003 and Adelakan, 2009). Most slums in the highly urbanized coastal towns like Lagos mega-city are situated in flood prone environment. Water security is not adequate in most of the slums when they are mostly not connected to government pipe borne water. Government health facilities including hospitals and primary health care centers (PHC) are mostly not found in slums and squatters. Thereby, residents of slums are predisposed to health challenges.

<sup>8</sup> There is resemblance in Nigeria and Bangladesh experiences as highlighted by Jahan M (2008). The Impact of Environmental Degradation on Women in Bangladesh: An Overview. Asian Affairs, Vol. 30, No. 2: 5-15, April-June, 2008

<sup>9</sup> Gender@UNFCC (undated). Preservation of Tropical forests. Retrieved from <http://www.gendercc.net> on December 5, 2014

<sup>10</sup> According to Brockerhoff, cited in Lundqvist, J., Appasamy, P. and Nellyyat, P. (2003). Dimension and approaches for third World city water security. *Phi. Trans. R. Soc Lond doi: 1098/rstb.2003:1382*

There is a relationship between gender and inhabitation. The women and girls are cultural constructed to care for the family. Thereby, hindrances to decent living affect the female folks than its male counterparts. Water insecurity or lack of to safe water and sanitation which is common to the slums as mentioned earlier has more impacts on the women folks. Health implications or challenges in home that may be caused by negative environmental consequences in slums are affective to the female folks than their male counterparts because the female folks have been placed by the culture as society care giver.

#### **Water Shortage and Inadequate Sanitation in Nigeria and Women/Girl Child:-**

Shortage of drinkable water and sanitation may engender public health challenges which at many times have gender implications. Consumption of unsafe water may leads to diseases which include diarrhea and typhoid fever. Safe water is essential for the survival of young children. The achievement of MDG goal 4 which emphasised the reduction in child's mortality was not achievable because of the inadequacy of safe water and sanitation in some places. For instance, 97,000 mothers lose a child yearly to diarrhoea caused by lack of unsafe water and poor sanitation (WaterAid, 2013). Thereby about 18% of deaths of children under five years old are linked to diarrhea<sup>11</sup> which could be avoided with safe supply and improved sanitation.

WaterAid (2013) in its document *"Keep your promises on sanitation and water"* reported that 68 percent of women in Nigeria lacked safe toilets thereby increasing the risks of illness, shame, harassment and violence. In its survey across five slums in Lagos, Nigeria, it realized that one in five had first or second hand experience of verbal harassment and intimidations, or had been threatened or physically assaulted in 2012 when going to toilet.

Traditionally and culturally, household chores relating to fetching of water for the family are assigned to women and the girls. The National Gender Policy of the Federal Republic of Nigeria (2006) lamented that daily, women must travel long distances (as far as 2 km in many rural areas in Nigeria), facing hot and dusty weather conditions, to gather water while additional time is expended as women must often wait in queues at wells and other water gathering sites in order to gain access to water. "Women and girls who must spend hours a day seeking water cannot spend that time at school or in income-generating activities"<sup>12</sup> For example, in Billeri, Bauchi State of Nigeria where it takes so long to draw water from the 150 metre deep thereby making children to have little time to go to school that is located far from the community (BNRCC, 2011).

#### **Global Environmental Change in Nigeria and Women:-**

Nigeria like every other nation in the world is in the riddle of global environmental change and environmental degradations. Nigeria was ranked sixth among the countries (193 countries were rated) that are most vulnerable to the effects of climate change in a 2013 Climate Change Index<sup>13</sup>. Its natural resources are being threatened and distorted by global climate change. "It is increasingly evident that women are at the centre of the climate change challenge. Women are disproportionately affected by climate change impacts, such as droughts, floods and other extreme weather events, but they also have critical role in combating climate change" (Daily Trust, 2013 citing UNFCC).

While there have been unsustainable managements of its nature capitals and environmental components. The unsustainable approaches coupled with global environmental change which include climate change have sometimes initiated negative environmental conditions in different parts of the country. These included flooding, erosion, biodiversity loss and water insecurity.

Excessive flood is becoming normal occurrences in some parts of Nigeria during the yearly raining season. It has in many times affected lives and properties in different parts of the country. For example, flooding caused by the

<sup>11</sup> Vanguard 2014, Vanguard Nigeria Newspaper. Nigeria May Miss MDG Target for Water, Sanitation –UNICEF on July 08, 2014. <http://www.vanguardngr.com> assessed 25, November 2014

<sup>12</sup> This statement was in the press releas by Mr. Oluseyi Abdulmalik on behalf of WaterAid Nigeria and titled International Women's Day , WaterAid Working to Inspire Change on Water Sanitation for the 2014 International Women's Day (It can be seen in ThisDay Nigeria Newspaer, March 13, 2014.

<sup>13</sup> This report is by the British Risk Consultancy Maplecroft. Its evaluation included exposure to extreme climate-related events; the sensitivity of populations in terms of health, education, agriculture dependence and available infrastructure and adaptive capacity of the countries to combat the impacts of climate change. Punch (2013). Nigeria Ranks Sixth in the Climate Change Index. Punch Nigeria Newspaper, November 4, 2013. Retrieved online <http://www.punchng.com> on November 27, 2014.

overflowing of Goronyo dam in Sokoto State in the North western Nigeria led to the displacement of people from their home in Sokoto, Kebbi and Jigawa states between June and August 2010 while Ibadan city in the South Western part of Nigeria witnessed a disaster through flooding due to torrential rains in few hours which led to submerging of many houses with more than fifty people unaccounted for and several families loses both in human and material (Akiyode, 2013 citing Fagboun, 2011).

International Panel on Climate Change (IPCC) identified Nigeria Coastline as low lying coast that is susceptible to flooding (Adelakun, 2009). Flooding may be exacerbated by climate change. Thereby, there has been risk of flooding and erosion around the highly populated southern coast. For example, in the recent years, there has been recurrence flooding in the metropolitan Lagos city which is a lagoon corridor in the coastal area of Nigeria especially during the yearly raining seasons.

Ugwu and Ugwu (2013) in a paper on “*Gender, Flood and Mental Health*” surmised that performing reproductive responsibilities in a flood disaster camps and keeping a continual vigilant eye on young children, even as they cry for food in such helpless situations, are emotion- provoking and stress- laden. In this research paper the writers quoting flood victims at Igga Camp-Enugu State, Nigeria where some of the women have this to say:

“Since we came here (flood camp) we are faced with myriad of problems; such as looking after our children, lack of clean water, poor toilet facilities as we have to use „bush system“; no drugs or mosquito nets to shield us from mosquito bite, and above all, one of us delivered of a baby boy without the assistance of any midwife or traditional birth attendant.”

#### **Conflicts, Insecurity in Nigeria and Girl Child”:-**

The entire north eastern section of Nigeria has been in crisis for some time now which has made development impossible. Thus, programmes designed to ensure environmental sustainability in this region are hampered. A reserved forest which supposedly a plus to environmental sustainability in the North Eastern region, the Sambisa Forest has been the abode or enclave of Boko Haram insurgency. Over 100 Chibok school girls in Borno State in the North East of Nigeria kidnapped by the Boko Haram terrorist group in the night of April 14, 2014 were taken to the Sambisa forest by their abductors.

#### **Conclusion:-**

Environmental degradation and poverty are intrinsically related. Therefore poverty reduction and pro-poor growth will encourage environmental sustainability and sustainable development.

Local action should be encouraged through building of local capacity on the importance of environmental policies and concerns in order to ensure environmental sustainability. This could be done through regular environmental education in every locality and media broadcast. Also, non-governmental organizations (NGO) should initiate environmental sustainability sensitization projects and programmes that are grassroots oriented in different parts of the nation intimating the populace with the importance of sustainable environment to human and its society.

There is need for enforcement of sustainable environmental policies. Climate change is a threat multiplier. Thus, it is important that Nigeria government ends gas flaring in the Niger Delta region (gas flaring contributes to greenhouse gases and global warming). Thereby, aligning with environmentally sustainable policies will show the nations full commitment to the principle of environmental sustainability and sustainable development.

In order to have an inclusive programme, there should always be a gender consciousness stakeholders need assessments in every locality before projects and programmes are sited. This will encourage the engendering of the projects and programmes which supports its sustainability.

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### RESEARCH ARTICLE

#### EFFECT OF SOIL AMENDMENTS ON NI, CD AND PB DYNAMIC UNDER PADDY FIELD IRRIGATED WITH LOW WATER QUALITY.

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#### Abstract

The experiment was conducted to see the hypothesis of reducing the impact of irrigation water contaminated with heavy metals using some soil amendments and its effect on rice yield. A site was selected near kafr El sheikh governorate, Egypt. Due to water shortage in this area farmers are forced to use low water quality for irrigating his paddy field. This experiment investigated the effect of six soil amendments { rice straw (RS), rice straw compost (RSC), rice husk (RH), rice husk compost (RHC), rice husk biochar (RHB) and wood-dust biochar (WDB)} in addition to control on the growth of rice (cv. Giza 178) and heavy metals dynamic in paddy soil that was irrigated with low water quality. The best results were from the application of RHB that increased grain yield, and decreased Ni, Cd and Pb concentrations in straw and grain. The other soil amendments under study also increased the grain yield, and effectively decreased the Ni, Cd and Pb concentrations in straw and grain. Concentrations of Ni, Cd and Pb in grain and straw were dependent on the available of them in soil. The mean value of CEC of soil under RHB was highest. Among the soil amendments the heavy metals concentration in straw and grain were ranged as follow; RHB < WDB < RH < RHC < RSC < RS < control. Finally RHB or WDB can be considered as a by-product material for application under paddy field irrigated with low water quality.

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#### Introduction:-

Conventional water resources in Egypt are limited to the Nile River; groundwater in the deserts and Sinai, and precipitation. Each resource has its limitations on use. These limitations relate to quantity, quality, space, time, and/or use cost. The Nile is the main and almost exclusive source of fresh water in Egypt. Egypt relies on the available water stored in Lake Nasser to meet needs within its annual share of water, which is fixed at 55.5 Billion Cubic Meters (BCM) annually by agreement with Sudan in 1959 that is not sufficient to meet the water requirements of the agricultural land in Egypt. In Egypt, the total agriculture land amounts to 8 million feddan (1 feddan = 1.04 acre), which represents 3.8% of the whole area of the country. The most important crops are wheat and berseem in winter, cotton, rice and maize in summer. Water is becoming an increasingly scarce resource and planners are forced to consider any sources of water which might be used economically and effectively to promote

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further development. The potential for irrigation to raise both agricultural productivity and the living standards of the rural poor has long been recognized. This potential is even more pronounced in the north part of Egypt, such as Kafe El Shiekh, El Behera, Dakhliya and Domiata regions where there is fresh water shortage for agricultural production. Also, more than 70 percent of the total rice cultivation area is found in these regions (Rice National Campaign, 2012). Rice is an important cash crop of these regions. Its water requirement is more than any other crop. However, due to the shortage of canal water, the farmers use underground as well as surface water. Therefore, the urban soils of the country are often irrigated with treated wastewater for growing crops to compensate the Nile water shortage. As a result of the use of wastewater for irrigation, trace metals have accumulated in agricultural soils. The connection between soil and water contamination and metal uptake by plants is determined by many chemical and physical soil factors as well as the physiological properties of the crops. Soils contaminated with trace metals may pose both direct and indirect threats to plants: Direct, through negative effects of metals on crop growth and yield, and indirect, by entering the human food chain with a potentially negative impact on human health. Even a reduction of crop yield by a few percent could lead to a significant long-term loss in production and income. Some food importers are now specifying acceptable maximum contents of metals in food, which might limit the possibility for the farmers to export their contaminated crops. Therefore the protection of soils from trace metal pollution is essential for maintaining a good soil and food quality. Once soil is contaminated, it is difficult and expensive to decontaminate it (Bjuhr, 2007). Heavy metals are terribly released into the environment because of the rapid industrial growth in various sectors and have created a major global threat. The industrial wastewaters originated from metal plating, mining activities, smelting, battery manufacture, tanneries, petroleum refining, paint manufacture, pesticides, dye manufacture, printing and photographic industries etc. are often detected with the heavy metals like cadmium, zinc, copper, nickel, lead, mercury and chromium (Rangab hashiyam *et al.*, 2013; Kadirvelu *et al.*, 2001; Williams *et al.*, 1998). The management of heavy metals is of special concern due to its recalcitrance and persistence nature of existence in the environment (Fenglian and Wang, 2011). Wastewater use in irrigated crop production is a highly complex issue, with opportunities and risks and agronomic, economic, ethical and human and ecosystem health dimensions. Wastewater influenced production systems are characterized by an enormous variability in bio-physical and socio-economic conditions and the true complexity is generally poorly understood except for a few reported case studies (Scott *et al.* 2003). Recognizing as a preamble that the agronomic dimension of soil, water and crop management is crucial for understanding and optimizing wastewater irrigation, this study focuses on agronomic aspects of wastewater influenced irrigated rice production systems in Egypt where wastewater influenced irrigation is common in some cultivated rice areas. Although some of them, such as Fe, Zn, Mn and Cu etc., are essential at the low level, other metals, like Cd, Cr, Pb and Ni, are toxic and may pose a great threat to plants, animals and humans through the food chain (Costa, 2000). High contents of heavy metals in soils would increase the potential uptake of these metals by plants. Therefore, a detailed risk assessment of heavy metal accumulation in agricultural lands is required for application of inorganic fertilizers, organic wastes and byproduct materials to soils in order to ensure the safe crop production (Papafilippaki *et al.*, 2007). Heavy metals in soils may be present in several forms with different levels of solubility as follows: (i) dissolved (in soil solution), (ii) exchangeable (in organic and inorganic components), (iii) structural components of the lattices in soils and (iv) insolubly precipitated with other soil components (Zalidis *et al.*, 1999; Aydinalp and Marinova, 2003). Usually, only the first two forms are able to be absorbed and utilized by plants. Therefore, plant uptake of a metal is mainly dependent on the metal mobility and availability in soils. The application of material substances such as soil amendments (EPA, 2011), Biochar (Zhang, 2009), calcium carbonate, and manganese oxide (Chen *et al.*, 2009) has successfully mitigated soil heavy metal contamination, and significantly reduced the contents of available heavy metals in soils, as well as the uptake by plants, mostly due to the adsorption phenomena by some soil amendment. Organic materials such as green manure, animal excrement, Biochar and peat can also actively remedy heavy metal contaminated soil by transforming heavy metals from soluble and exchangeable fractions to fraction associated with organic matter (OM), carbonates fraction, and residual fraction, which are unavailable to plants (Shuman, 1999; Walker *et al.*, 2003). Soil amendments can be used to address two primary categories of problems at contaminated sites: (1) contaminant bioavailability and phytoavailability; and (2) poor soil health and ecosystem function (EPA, 2011). The objective of this study was to investigate the effects of some by-product materials such as Biochar, rice husk and rice straw on the bioavailability and the uptake of Ni, Cd and Pb by rice in a paddy soil that was irrigated with low water quality.

## **Materials and methods:-**

### **Soil amendments preparation**

Biochars used for this experiment were produced by pyrolysis the rice husk and wood dust at 420 °C with the absence of oxygen in International Trade and Marketing Company, Kaha, Al kaliobia governorate. The production

information of the biochar was given in detail by Pan et al. (2011). In brief, rice husk and wood dust were collected and air-dried. Pyrolysis process was performed in a vertical kiln at 400–450 °C, converting 35% of the biomass to biochar with the absence of oxygen. Compost was prepared at the Central Laboratory for Agriculture Climate through mixing both rice straw and husk by cow manure for 120 days up to maturity. Rice straw was chopped up to 2-3 cm before application either for composting or for direct soil application. The basic properties of all soil amendments in this experiment were given in Table 1.

**Table 1:** The characteristics of the soil amendments

Soil amendments	Unit	RH	RHC	RS	RSC	RHB	WDB
pH	--	6.41	7.6	6.87	7.8	8.72	9.04
N	%	0.32	1.2	0.64	1.5	0.1	0.2
C	%	43.4	20	36.56	25	28.72	29.87
CEC	( cmol kg <sup>-1</sup> )	--	39.74	-	38.12	44.57	45.12
Ca	//	1.2	22.5	-	21.5	34.2	35.01
K	//	1.6	24.00	-	22.1	32.6	31.54
Mg	//	1.5	7.50	-	8.67	14.2	15.50

*Rice husk(RH); Rice husk compost (RHC); Rice straw(RS); Rice straw compost(RSC); Rice husk biochar(RHB); Wood-dust biochar(WDB)*

#### Experimental setup:-

The experiment was carried out during the year 2015 and 2016 at the farm of at farm of Sakha Agricultural Research Station, Kafr el sheikh city (31o N, 31.1o E). The study area is located at the north pat of Egypt. Due to fresh water shortage in this region, most of the agricultural lands are using drainage water for irrigation. six soil amendments { rice straw (RS), rice straw compost (RSC), rice husk (RH), rice husk compost (RHC), rice husk biochar (RHB) and wood-dust biochar ( WDB)} in addition to control. The amount of soil amendment applied (Chun et al., 2004; Yuan et al., 2011) was calculated based on the plot area (as shown in table 2), and the amendments were incorporated into a 20 cm depth of soil. All plots were irrigated from Drainage Canal Eight located at Sakha Research station, Kafr El Shiekh, the canal water usually derived from both industrial and Sewage water as characterized in table 3.

Rice cultivar Giza 178 (*Oryza sativa*) was cultivated under the six treatments as mentioned above. The treatments were arranged in to strip plot design with four replications. Each plot about 50m<sup>2</sup> area. A basal dose of phosphorus was applied at the rate of 36 Kg P h<sup>-1</sup> and zinc was added at the rate of 24 Kg Zn ha<sup>-1</sup> as ZnSO<sub>4</sub> in dry soil. Nitrogen fertilizer was split-applied as a Urea at the rate of 150 Kg ha<sup>-1</sup>; 2/3 of N dose was incorporated before flooding and 1/3 was applied at the panicle initiation stage. The rice seeds were sown in the last week of April for the nursery. After 25 days, 4-6 plants per hill were transplanted at a spacing of 20x20 cm. Crop was harvested, in the last week of September, from each treatment within an area of 5 m<sup>2</sup> to determine the yield (ton ha<sup>-1</sup>).

#### Sampling and chemical analysis:-

Soil texture was determined by the pipette method (Soil Survey Laboratory Staff, 1992). Soil organic matter was measured by the modified Walkley and Black method as described by Allison. Total N was measured using Kjeldahl method (Bremner and Mulvaney (1982). Water-soluble phosphorus was determined colorimetrically by a spectrophotometer and the contents of water-soluble Ca, Mg, Na, and K were determined using an atomic absorption spectrophotometer (AAS). The pH was measured in a saturation paste, and the electrical conductivity of the saturation extract ( ECE) was measured using an electrical conductivity meter (Page et al., 1982). The CEC was extracted with 1M NH<sub>4</sub>OAC (buffered at pH 7.0), and exchangeable base concentrations were measured using AAS (Shimatzu). Irrigation water samples were collected through the growing season to determine the chemical analysis as shown in Table 4. Samples of shoot and grain of rice plant were selected for determining heavy metals concentration. At harvest time, Five hills of mature rice



**Table 2:** Experimental design for the soil amendments

No.	Treatments	Symbol	Amount (t/ha)
1	control	Co	--
2	Rice husk	RH	10
3	Rice husk compost	RHC	8
4	Rice straw	RS	10
5	Rice straw compost	RSC	8
6	Rice husk biochar	RHB	8
7	Wood-dust biochar	WDB	8

Application rate according to Masulili and Utomo, 2010

**Table 3:** Chemical analysis of soil and the irrigation water

Table 3: Chemical analysis of soil and the irrigation water				
Items	unit	Soil	Irrigation water	
			2015	2016
Sand	%	11.52	--	--
Silt	%	30.93	--	--
Clay	%	58.50	--	--
Texture class	-	clayey	--	--
EC	dSm <sup>-1</sup>	1.8	2.26 8.05	2.51
pH	--	7.68	--	7.10
Total N	mg kg <sup>-1</sup>	4516	--	--
Soluble P (Olsen)*	mg kg <sup>-1</sup>	18.6	--	--
Water-soluble K	meq kg <sup>-1</sup>	1.39	Total 0.28	--
heavy metals	--	Available	0.15 0.34	Total 0.27
Nickel (Ni)	mg kg <sup>-1</sup>	0.13		0.17 0.36
Cadmium (Cd)	mg kg <sup>-1</sup>	0.03		
Lead (Pb)	mg kg <sup>-1</sup>	0.18		

\*Olsen et al., 1954

plants from each plot were also sampled. The sampled plants were washed with tap water and deionized water in the order, then separated into straw and grains, oven-dried in an oven at 80 C° to constant weight and the grains were milled into powder for measurement of heavy metal content. Thereafter, the samples were ground into powder form to pass a 1mm-sieve and digested with a mixture of sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) and hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>) at 240 to 260 C° for 5 hours. The concentrations of heavy metals (Ni, Cd and Pb) were determined using the AAS. Soil samples also were taken from paddy soil (0-30 cm) for determining available Nickel (Ni), Cadmium (Cd) and Lead (Pb) according to methods given in Handbook by Soltanpour (1985) and Page et al. (1982). The same procedure without samples was used as blank. Three replications were conducted for each sample. Plant metals uptakes were calculated based on biomass and metals contents in plants.

For analysis of available heavy metals in soil, air-dried soils were extracted by a die thylene-triamine-penta acetic acid (DTPA) extract using an AAS. A hundred ml of 0.05m DDTPA per 10 g of soil was shaken for 3 hours at room temperature, and then the solution was filtered (14) (Page et al., 1982). Metal contents in the supernatant liquid were measured with a flame atomic absorption spectrometry (FAAS). The same procedure without samples (blank) was used as control. The bioaccumulation factors were calculated as the ratios of metals concentrations in brown grain to the concentration in 0-20 cm paddy soils (Rezvani and Zaefarian, 2011).

The plant's ability to accumulate metals from soils can be estimated by the following equation (Modified from Manahan 1992):

$$FB = \frac{CP}{CS}$$

Where: FB = bioaccumulation factor;

CP = metal's concentration in plant organs (grain);

CS = metal content in soil

### Statistical analysis

Data were statistically analyzed by ANOVA test and L.S.D using a statistical analysis GenStat program and the soil amendments were compared for heavy metals concentration in straw, grain and soil using the least significant difference (LSD) test at 5% level of significance.

**Table 4:** Soil pH, Eh, EC under different soil amendments

### Results and discussion:-

#### Effects of amendments on soil pH, CEC, Eh

The results of soil analysis of some soil chemical properties after harvest are shown in Table 4. The soil properties increased significantly with the application of soil amendments. There is no significant difference between RHB and WDB for soil pH, Eh, and CEC. The increase in soil CEC showed that fairly large amounts of exchangeable cations

Soil amendments	pH		CEC meq 100g <sup>-1</sup>		Eh mV	
	2015	2016	2015	2016	2015	2016
	CO	7.22	7.32	17.25	18.5	-24
RH	7.52	7.55	24.89	25.45	-25	-26
RHC	7.65	7.60	25.04	28.02	-35	-38
RS	7.10	7.15	21.58	22.87	-44	-48
RSC	7.51	7.52	22.75	23.74	-38	-40
RHB	7.95	8.02	35.40	36.54	-23	-24
WDB	7.92	7.89	36.54	36.45	-23	-23
LSD 0.05	0.10	0.20	9.64	10.23	5.21	5.87

*Rice husk(RH); Rice husk compost (RHC); Rice straw(RS); Rice straw compost(RSC); Rice husk biochar(RHB); Wood-dust biochar(WDB)*

were introduced by soil amendments application. Also the increase of soil pH under pots amended with RHB or WDB could be due to the higher pH in Biochar itself in addition to slow discharge of NH<sub>4</sub> which was stored in porous of Biochar from fertilizer application during the season. The Lowest soil Eh under pot amendment with RSC, RS may be attributed to the low oxidation condition compared to the other soil amendment under study. A chain of reactions is initiated upon soil flooding leading to reduced (low) soil redox potential (Eh, mV) conditions. These reactions include physical, chemical and biological processes that have significant implications for wetland plants (Gambrell and Patrick, 1978; Gambrell et al., 1991). Physical processes include restriction of atmospheric gas diffusion in the soil leading to the depletion of soil oxygen and the accumulation of carbon dioxide due to accumulation of organic matter (Jackson and Miller, 2000, Greenway, 2006). Shortly after flooding, with organic matter application the limited supply of oxygen in soil pore spaces is depleted rapidly by roots, microorganisms, and soil reductants (Ponnamperuma, 1972). This process leads to oxygen depletion and reduction in soil oxidation reduction potential (Eh) followed by a chain of soil chemical changes. The processes that follow include denitrification, reduction of iron, manganese and sulfate, and changing soil pH and Eh (Gambrell et al., 1991).

For the soil amendments of RSC, RHC and RS, the soil pH was increased in both seasons. This may be attributed to the release of NH<sub>4</sub> in the process of decomposition of organic matter during the growing season; Therefore, biochar as a soil amendment can improve soil quality by increasing soil Eh, pH, and CEC, under flooding condition. The soil pH and CEC values of different soil amendments followed the order: RHB>WDB>RHC>RH>RSC>RS. Regarding to soil Eh the order; RHB>WDB>RH>RHC>RSC>RS. The concentrations of available Cd, Ni and Pb in the soil decreased consistently with the application of soil amendments (Table 4), suggesting that these amendments reduced the bioavailability of the three heavy metals under study. Compared with the control, the application of RHB, WDB, RHC and RH significantly lowered the concentrations of available Cd, Ni and Pb in both seasons. However, only slight decreases in the concentrations of available Cd, Ni and Pb in both seasons were observed in the treatments of RS and RSC. In general, the concentrations of available Cd, Ni and Pb in both seasons of different amendments followed the common order: RHB>WDB>RHC>RH>RSC>RS>CO which reversed the order of the soil pH except for RS treatment. It can also be concluded that with the application of soil amendment usually resulted in a significant lower concentration of available Cd, Ni and Pb than with no soil amendment application. Soil available Cd, Ni and Pb in both seasons were significantly affected by the soil pH (Fig.1), and the correlation between them can be described by the following regression equations (Eq.(1))

*For Cd*

$$y = -17.404x + 10.888 \quad (R^2 = 0.9296 \quad P < 0:01)$$

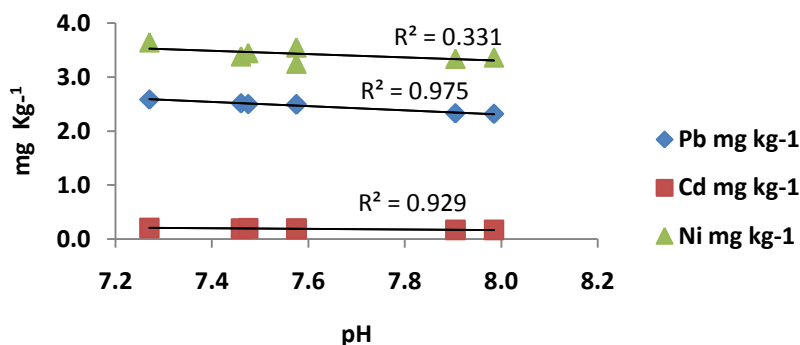
**For Ni**

$$y = -1.0915x + 11.34 \quad (R^2 = 0.3314 \quad P < 0:01) \quad (1)$$

**For Pb**

$$y = -2.5236x + 13.809 \quad R^2 = 0.9758 \quad P < 0:01$$

Where,  $Y$  represents the concentration of available Cd, Ni or Pb in soil ( $\text{mg kg}^{-1}$ ),  $X$  represents the soil pH. Several studies have proved that the soil pH is an important



**Figure 1:-** Correlation between soil pH and the heavy metal under study ( the data is average of two years).

factor controlling the mobility of heavy metals in soils (Wallace *et al.*, 1974; Jackson and Miller, 2000). Besides the soil pH, there are other factors such as CEC and Eh that may also affect the bioavailability of heavy metals particularly under flooding soil condition. The properties of the soil amendments as well as the undergoing cations exchange were related to the decrease in the available Cd, Ni or Pb in the soil. For example, Biochar can release OH<sup>-</sup> and consequently able to hydrolyze heavy metals cations ( $\text{Cd}^{2+}$ ,  $\text{Ni}^{+}$  and  $\text{Pb}^{2+}$ ) to Cd-OH<sup>+</sup>, Ni-OH or Pb-OH which can be adsorbed tightly by soil or Biochar itself, and can thus decrease the availability of these heavy metals (Prasad, 1995). On the other hand, organic amendments such as RSC and RHC enhance the adsorption of heavy metal by soil through forming stable complexes with heavy metal ions, and then decrease their mobility and extractability (Piccolo, 1996; Naidu *et al.*, 1997; Chen, 2000). In this study, the soil pH and the concentrations of available Cd, Ni or Pb in the soil in the Biochar treatments were all lower than the other soil amendments under study. This may be attributed to the enhanced heavy metal adsorption and sorption owing to the large specific surface areas, rich with fiber carboxyl acids groups, and strong ion exchange capacity in Biochar treatment (Wang *et al.*, 2007).

In general, the mobility and availability of heavy metals are controlled by adsorption and desorption characteristics of soils (Krishnamurti *et al.*, 1999). The adsorption and desorption of heavy metals have been demonstrated to be associated with soil properties, including pH, organic matter content, CEC, oxidation reduction status, the contents of clay minerals, calcium carbonate, Fe and Mn oxides (Kashem and Singh, 2001; Antoniadis *et al.*, 2008; Usman *et al.*, 2008). Although the Eh values under biochar treatments are not the main significant factor affecting the heavy metal availability compared with other soil amendments under study, the availability of heavy under study decreased under biochar application. A high proportion of carboxyl acids as well as other acidic oxygen groups may also provide biochar many of the desirable properties of humic acid which is an important component of soil organic matter. The relatively high concentration of acidic groups can allow the formation of chelates with metal ions and help to bind positively charged ions to the surface of the carbon. When the surface density of carboxylic acid groups is very high, chelates with metal ions can almost completely immobilize potentially toxic metal compounds. The results obtained by Valdes (2002) indicate that total acidic groups on carbonaceous material can reach at least 2 meq  $\text{g}^{-1}$  with half the acidic groups being carboxyl groups. The acidic nature of oxidized biochars means that they may be well suited for retention of basic ions such as ammonium or other cation compounds (Kastner, 2009).

**Effects of soil amendments on Ni, Pb and Cd dynamic:-**

Metal uptakes in total and the aboveground plant biomass were calculated and listed in Figure 2. As a result of increased metals concentrations in the aboveground, metals uptakes in rice plant were mostly higher in RS treatment compared with other soil amendments under study. For the uptakes in aboveground organ of rice, uptakes of Cd, Ni and Pb were almost the same under both RHB and WDB in both seasons. From Table 5 also, it can be estimated that the reduction of heavy metal concentrations in straw compared to the control are as follows ; Cd ranged from 16.70 to 33.00 % and 12.40 to 35.30 % and Ni ranged from 6.21 to 44.20% and 8.13 to 31.5% and Pb ranged from 7.00 to 16.40% and 12.6 to 14.30 % in both years respectively. On the other hand, there is no significant different between the concentrations of the heavy metals in rice straw amended with RHB and WDB which are also recorded the lowest values of concentration compared with other soil amendments under study, implying that the application of RHB or WDB may result in higher effect on reducing Ni, Cu and Cd uptake by rice plant. The decrease of Ni, Cd and Pb concentrations in grain and straw of rice was related to the change of Ni, Cd and Pb fractions in soil. Castaldi et al. (2005) found significant decrease of Cd concentrations in root and shoot of white lupine after the addition of compost and

**Table 6:** The DTPA extractable Cd, Ni and Pb in soil as affected by different soil amendments

Soil amendments	Cd		Ni		Pb	
	mg Kg <sup>-1</sup>		mg Kg <sup>-1</sup>		mg Kg <sup>-1</sup>	
	2015	2016	2015	2016	2015	2016
CO	0.27	0.23	4.11	3.92	3.5	2.95
RH	0.19	0.19	3.55	3.31	2.64	2.36
RHC	0.17	0.18	3.42	3.24	2.40	2.22
RS	0.23	0.21	3.78	3.53	2.88	2.56
RSC	0.20	0.19	3.69	3.40	2.68	2.40
RHB	0.12	0.16	3.15	2.82	2.31	2.20
WDB	0.12	0.17	3.12	3.00	2.33	2.25
LSD 0.05	0.05	0.02	0.30	0.22	0.21	0.20

*Rice husk(RH); Rice husk compost (RHC); Rice straw(RS); Rice straw compost(RSC); Rice husk biochar(RHB); Wood-dust biochar(WDB)*

**Table 5:-** Concentration of Cd, Ni and Pb in rice straw under different soil amendments

lime; they also found that compost and lime decreased the Cd fraction extracted with H<sub>2</sub>O and Ca(NO<sub>3</sub>)<sub>2</sub> and increased the residual fraction of Cd. Narwal and Singh (1998) also reported that pig manure and peat decreased the concentration of DTPA extractable Cd (available) in soil, but increased Cd in residual fraction. In the present study as shown in Table 6, the concentrations of available Ni, Cd and Pb under the soil amendments decreased by 14.45-55.50 % and 17.39-30.43% for Cd and 8.03-24.08% and 9.94-28.06% for Ni, and 17.71-34.00% and 13.22-25.42% for Pb in both years respectively. Furthermore, soil adsorption capacity also affected the uptake of heavy

Soil amendments	Cd		Ni		Pb	
	mg Kg <sup>-1</sup>		mg Kg <sup>-1</sup>		mg Kg <sup>-1</sup>	
	2015	2016	2015	2016	2015	2016
CO	15.97	13.97	63.06	61.32	131.54	122.80
RH	11.90	11.25	51.89	50.14	121.85	117.20
RHC	10.25	10.72	78.55	46.97	119.52	115.24
RS	13.30	12.30	59.21	55.96	122.04	119.96
RSC	12.06	12.06	44.84	48.51	120.74	119.00
RHB	9.85	9.04	41.25	42.20	110.21	105.30
WDB	10.02	9.06	41.55	43.05	111.45	105.41
LSD 0.05	2.05	1.62	3.66	3.59	10.55	9.02

*Rice husk(RH); Rice husk compost (RHC); Rice straw(RS); Rice straw compost(RSC); Rice husk biochar(RHB); Wood-dust biochar(WDB)*

metals by plants. For example, organic amendments can increase the absorption and immobilization of these metals in soil, and therefore decrease the uptake of these metals by rice (He and Singh, 1993).

Table 7 shows that the RHB and WDB treatments decreased the concentration of the heavy metals in grain in both years. However, the heavy metals concentrations in rice grain recorded the highest values under RHC, RSC, Rh and

RS. This may be because either the adsorption more of some available heavy metals on RHB and WDB than other the soil amendments or due to their function group or specific surface area. In addition, the decrease of Ni, Cd and Pb concentrations in grain and straw of rice in the treatments of amendments application may be partially attributed to the dilution effect caused by the significant increase of rice yield. The heavy metals concentration in rice grain under the soil amendments followed the same order: RHB < WDB < RH < RHC < RSC < RS < control. The concentrations of the heavy metals in rice grain were lower than those in straw regardless of the sources of amendments.

Bioaccumulation factors of metals under different soil amendments were listed in Table 8. It indicated that grain accumulated more metals under RSC, RHC and RS and accumulated fewer metals under RHB and WDB. Compared with control, there are high significant different between soil amendments for bioaccumulation in rice grain in both years, although there is no significant different found between RHB and WDB in both years.

Heavy metals in soils affect yield after their uptake and accumulation in tissues. Moreover, the accumulated heavy metals could severely harm human health through the food chain (Sorrell, 1999; Pezeshki, 2001). International Agency for Research on Cancer (IARC) has reported that Cd and Pb were believed to be carcinogens for humans (Van Wijck et al., 1992; Laskov, 2006). In the present study,

**Table 8:-** Bioaccumulation factors of Cd, Ni and Pb in rice grain as affected by different soil amendments.

Soil amendments	Cd		Ni		Pb	
	2015	2016	2015	2016	2015	2016
CO	0.96	1.09	0.08	0.07	0.08	0.06
RH	0.74	0.74	0.07	0.07	0.07	0.07
RHC	0.88	0.72	0.07	0.06	0.08	0.07
RS	0.70	0.71	0.07	0.07	0.07	0.07
RSC	0.75	0.74	0.06	0.07	0.07	0.07
RHB	1.00	0.75	0.05	0.06	0.06	0.06
WDB	1.00	0.76	0.06	0.06	0.06	0.07
LSD 0.05	0.13	0.18	0.01	0.01	0.01	0.01

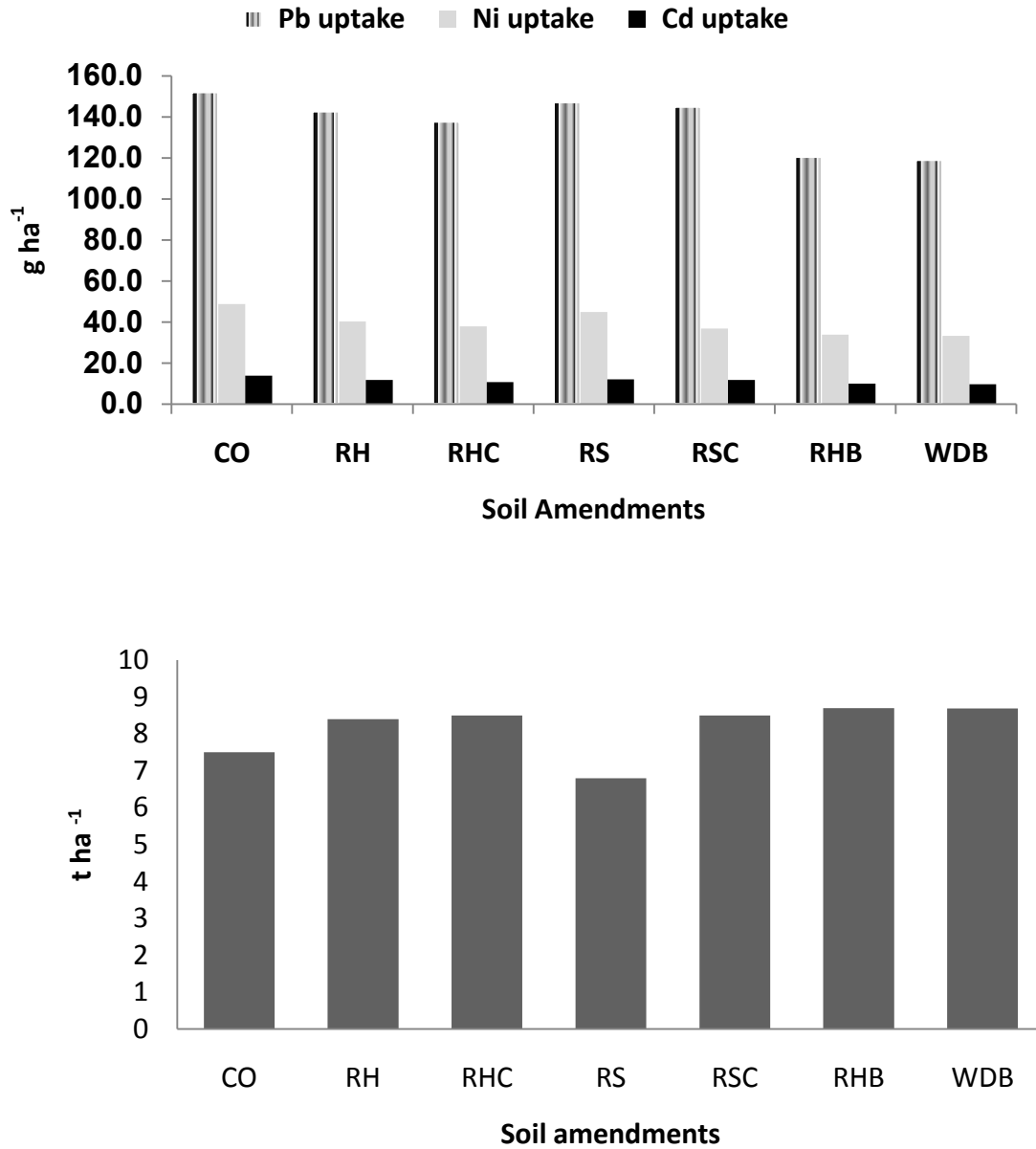
*Rice husk(RH); Rice husk compost (RHC); Rice straw(RS); Rice straw compost(RSC); Rice husk biochar(RHB); Wood-dust biochar(WDB)*

$LSD_{0.05}=3.60$

**Fig. 2:** Uptake of Cd, Ni and Pb in rice plant under different soil amendments

( the data is average of two years).

*Rice husk(RH); Rice husk compost (RHC); Rice straw(RS); Rice straw compost(RSC); Rice husk biochar(RHB); Wood-dust biochar(WDB)*



$LSD_{0.05}=0.30$

**Fig. 3:** Grain yield as affected by soil amendments ( the data is average of two years).

grain yield of rice had no differences between all soil amendments under study except RS treatment (figure 3). the grain yield of rice under the soil amendments followed the order: RHB > WDB > RHC > RSC > RH > RS > control. these results mean that soil amendments were able to promote grain yield obviously except RS.

It is concluded that the application of amendments induced rice growth, and significantly increased the yield of rice grain. Soil pH was increased and the bioavailability of Ni, Pb and Cd was decreased significantly consistent with amendments application. The availability of Ni, Cd and Pb were significantly affected by the soil pH, and the soil adsorption capacity also affected the bioavailability of the heavy metals under study. The available Ni, Cd and Pb in soil were significantly correlated to the soil pH. Rice husk biochar demonstrated the best efficiency among all the

amendments in this study; it increased grain yield and decreased the concentrations of Ni, Pb and Cd in rice straw and grain. Application of these amendments also increased the grain yield, yet reduced the heavy metals concentrations in rice straw and grain below the tolerance limits of Ni, Pb and Cd in foods. However, the heavy metals concentrations in rice grain under soil amendments are not exceeded the limit. It is mentioning here the concentration of the studied heavy metals in straw or grain of rice is less the permissible limits as reported by El Sharkawi, et al., 2012. Based on these results, either RHB or WDB could be recommended to remediate the contaminated soil irrigated with low water quality.

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### RESEARCH ARTICLE

#### EFFECTS OF INVESTOR BASE ON VALUE OF STOCK OF CROSS LISTED FIRMS: A CASE OF CROSS LISTED KENYAN FIRMS LISTED IN THE NSE.

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#### Abstract

This paper sought to investigate the effect of investor base on the value of stock of Cross-Listed Firms in the NSE. The study used an explanatory survey design. The target population comprised of all the seven cross listed Kenyan firms listed in the NSE namely: Equity bank, KCB, Kenya airways, Jubilee insurance, Centum Investment Ltd, Nation Media Company and the EABL. A census sampling technique was employed in selecting the companies from which the data was collected from in an effort to ensure that all the companies targeted were used to form the sample size. The researcher used documentary analysis as the main data collection method. The data was obtained through analysis from company's annual reports, internet and NSE journals. The data collected was analyzed using descriptive methods and inferential statistics. The study found out that an increase in the investor base (trading volume) and a decrease in price noisiness could have had an effect on stock value positively. It was concluded that cross listed firms acquired a considerable amount of assets after cross listing an aspect attributed to the increase in operations as a result of the popularity and an increase in market share acquired by the company.

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#### Introduction:-

A stock that tends to trade at a lower price relative to its fundamentals (i.e. dividends, earnings, sales, etc.) is considered undervalued by a value investor. Common characteristics of such stocks include a high dividend yield, low price-to-book ratio and/or low price-to-earnings ratio. Firm value refers to the total economic value of a company, reflecting the value to be allocated to the company's shareholders and debt holders. It is calculated by adding the company's Equity Value and total net debt, (Dickinson, 2004).

Globally with the advent of globalization initiatives and deregulation of the financial landscape in the past decade, there has been a surge in cross-border listings by firms. In 2006, nearly 4700 firms cross listed on overseas exchanges globally, with the number of new foreign listings of around 1000 for that year (Hargis, 2008). Popular locations for foreign listing included the UK, the US and Japan. A decade later, the number of cross-listed firms had declined to 2837 firms in 2006, while the number of new foreign listings fell to 299, nearly a third of the 1997 levels. The financial performances of these companies have been able to improve as a result of cross listing. These

companies have been able to improve and broaden their shareholders base and gained a greater financial strength that has made them to increase their capital (January, 2003).

Regional cross-listings in sub-Saharan Africa have been associated with expansion and the setting-up of operations in the host countries. In almost all cases, firms are large with a strong base in their home countries, and they first established operations in their host countries before deciding to cross-list. Many cross-listings are undertaken to expand operations in the host countries. Almost all the firms that are cross-listed (about 98 percent or 42 out of 43) have set up operations in the host countries. For example, Ecobank Transnational has operations in the Cote D'Ivoire the home country and in Ghana and Nigeria, the host countries; Investec and Pelerin have operations in South Africa and Botswana; and the 28 firms that are cross-listed in South Africa and Namibia have an operational base in both countries. Cross-listing in sub-Saharan Africa has been generally accompanied by an initial public offering and/or secondary market listing. These cross listed firms have enjoyed reduced cost of capital through an improvement of the firm's information environment. Some of these firms like Investec have been able to cross-list on markets with stringent disclosure requirements such as the New York Stock Exchange and have signaled their quality to outside investors. For the years that these firms have cross listed there has been improved available information to potential customers and suppliers due to an increased media attention and higher quality of accounting information. As a result of the foregoing, there has been an improved financial performance in these companies, (Patel, 2006).

Kenyan firms that have cross listed have been able to bring foreign investors nearer to potential investors. These investors include those from the East African community and other African countries and elsewhere in the rest of the world. For example, East African Breweries, with Kenya as the home country, has a subsidiary Uganda Breweries Ltd in Uganda, its host country of cross-listing. Jubilee Insurance of Kenya has subsidiaries in Uganda and Tanzania; Kenya Airways owns 49 percent of Precision Air of Tanzania. Through cross listing the Kenya Airways and Jubilee Insurance have been able to gain more liquidity and greater ability to raise capital. However, many investors have complained of poor investor protection coupled with high cost of investment and some investors have been reluctant to further investment the country, (Bonnier, 2009). This paper therefore sought to study the effects of investor base on the value of stock of a firm.

#### **Literature review:-**

Although managers may be motivated by such considerations as the improved prestige, image and visibility of their company to customers and investors (Mittoo, 2001), the primary financial objective of a foreign listing is a reduction in the company's costs of capital and, accordingly, improved corporate valuation. Existing empirical evidence on this issue is provided by three groups of studies that use different methodologies: 1) studies that explicitly examine the changes in the cost of capital after cross-listing, 2) studies that examine the valuation multiples of cross listed firms relative to those of firms that do not cross-list using cross-sectional analysis, and 3) studies that examine changes in stock price around the announcement of cross-listings and/or around the cross-listing event using the time-series framework, (Mittoo, 2001).

Studies from the first group report that cross-listing in the US by non-US firms is associated with a significant reduction in the cost of equity capital (Abee, 2006). In addition, Aggarwal, (2002) shows the reduction in the cost of equity is sustained over a long period of time following the cross-listing event. At the same time, there is no evidence on the changes in the cost of capital after cross-listing in host markets other than the US.

The second group of studies, the cross-sectional studies, estimate the valuation premium of cross-listed firms using valuation multiples, most often Tobin's Q17, and report that non-US firms that cross-list in the US experience significantly higher valuations compared to firms that do not cross-list (Aggarwal, 2005). However, Bayar (2005) shows that corporate valuation increases significantly before and during the year of cross-listing and declines afterwards. Such evidence questions the causality of the relationship between cross listing and firm valuation. Several studies also compare the valuation premium from cross listing in the US and in the UK. However, the findings are conflicting. Thus, Huang (2001) find significant valuation premiums for US cross-listings that are persistent over time, while they find no premiums in valuation for UK cross-listings. The authors interpret these findings as consistent with the theory that a stock exchange listing in the US 'has unique governance benefits for foreign firms' (Huang, 2001).

Finally, the third group of empirical studies, the event studies, focuses on the impact of cross-listing on shareholders' wealth and report that, on average, cross-listing in the US results in significant positive abnormal

returns both around the announcement of the decision to cross-list and around the cross listing event itself, (Salva, 2003).

However, such evidence primarily concerns cross-listings in the US, while the market reaction to cross-listing on a foreign market other than the US has received significantly less attention in the literature. Concerning cross-listing in the UK, prior studies find positive abnormal returns (Aggarwal, 2005). In addition, Huang (2001) reports permanent valuation gains from cross-listing on various host markets and suggest that cross-listing in the US does not offer unique valuation benefits.

Overall, empirical evidence on the effects of international cross-listings arrive at the general consensus that cross-listing in the US has a positive impact on shareholders' wealth. Evidence on the wealth effects of foreign listings in other markets is limited and inconclusive. In addition, significant changes in international capital markets discussed above have potentially altered the net benefits of cross-listings in different markets. Moreover, there is an ongoing debate in the literature on the sources of value creation around cross-listings. Conventional wisdom has been that cross-listing is a way to overcome investment barriers and make shares accessible to foreign investors (Mittoo, 2001). Accordingly, the reduction in the cost of capital is the result of the increased shareholder base and wider risk sharing (Miller, 2000). In the late 1990s, however, despite the increased integration of national capital markets, the number of cross-listings continued to grow and the valuation benefits from cross-listing continued to be significant.

### Methodology:-

The paper used an explanatory survey design. Explanatory research design helps to explain the cause and effect relationship of the study, data collection method and selection of subjects, (Patton, 2000). The target population comprised all the seven cross listed Kenyan firms listed in the NSE namely: Equity bank, KCB, Kenya airways, Jubileeinsurance, Centum Investment Ltd, Nation Media Company and the EABL. The study employed census sampling technique in order to come up with the companies to be studied since it was only cross listed companies required. The researcher used documentary analysis. The data was obtained through analysis from company's annual reports, internet and NSE journals.

A secondary source of data was employed in the data collection process; a documentary analysis guided the researcher obtain information from NSE reports from 2001 to 2010. Secondary data is mainly gathered from existing literature (reports, seminar papers, books, research journals, magazines, publication among others), the internet and past research information.

The data collected was analyzed using descriptive methods and inferential statistics. Descriptive methods were used to analyze the data where frequencies and proportions were used in interpreting the results. Inferential methods such as Pearson test of association was used to show the relationship between cross listing and value of stock. The regression model was used to compute the overall effect of the changes in the value of stock for the cross listed firm. ANOVA and correlation were used to indicate the effect of the factors hypothesized to influence the value of stock.

### Results and Discussion:-

The paper sought to establish how investor base affected the value of stock for the 7 cross listed companies before and after cross listing. This was in an effort to determine the companies that had cross listed.

#### Effect of Investor base on the value of Stock

One-Sample Test							
Test Value = 7.5211							
		T	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
						Lower	Upper
EABL	Before	14.572	2	.202	1.91509	1.6545	2.1757
	After	17.679	2	.110	2.07547	1.8427	2.3082
EQTY	Before	12.072	2	.125	1.11321	.9304	1.2960
	After	35.203	2	.001	1.97170	1.8606	2.0828
KCB	Before	35.968	3	.124	1.81132	1.7115	1.9112
	After	14.735	3	.254	2.00943	1.7390	2.2798

KQ	Before	20.402	3	.124	2.08491	1.8823	2.2875
	After	34.709	3	.003	3.16038	2.9798	3.3409
NMG	Before	40.527	3	.254	3.14151	2.9878	3.2952
	After	29.533	3	.874	2.61321	2.4378	2.7887
JUBILEE	Before	23.686	2	.125	2.08491	1.9104	2.2594
	After	44.652	2	.354	3.20755	3.0651	3.3500
Centum	Before	52.222	1	.254	3.99057	3.8390	4.1421
	After	25.967	1	.321	2.85849	2.6402	3.0768

Among the data sets that were collected only two companies' indicated a significant effect after they had been cross listed on the stock exchange. This companies were the Equity bank  $p = 0.001$  and the KQ airline ( $p = 0.003$ ).

This significances after the cross listed companies were considered outliers in relation to the industry values and as such the study did not take much significances to the changes in the investor bases in this two companies.

This was interpreted to mean that there were insignificant changes in the investor bases both before and after the cross listing process. This could have been attributed to the company principles on the acquisition of more capital for operation.

### Regression Model:-

Coefficients					
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		Std. Error	Beta		
1	3.201	0.213	0.003	3.389	0.001
0.254					
Investor base	0.123	0.108	- 0.001	0.259	0.054

a. Dependent Variable: Value of Stock

Further testing on the regression model indicated there exists no significant relationship between the investor base of a cross listed firm and the value of stock. Research results accept the hypothesis. ( $\beta = - 0.001$ ,  $p < 0.054$ ). The regression results showed the effect of the investor base of a cross listed firm with a beta coefficient of -0.001, the effect is not significant at ( $p=0.054$ ).

### Conclusion and Recommendation:-

The study found out that investor base has no direct relationship with the value of stock. A cross listed company will only will only attract more investors if the company it reduces its stock minimum trading unit. A reduction in the minimum trading unit greatly increases a firm's base of individual investors and its stock liquidity, and is associated with a significant increase in the stock price. Companies that cross list therefore need to reduce their stock minimum trading units if they are to positively influence the value of their stocks. A decrease in price noisiness affect stock value positively through an increase in the investor base (trading volume). It is therefore recommended that Cross listed company's should ensure their financial statement reflect a strong financial position and good performances to influence investor decisions.

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### RESEARCH ARTICLE

#### ADSORPTION OF AMMONIA ONTO ACTIVATED CARBON PREPARED FROM RICE STRAW.

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##### Key words:-

Adsorption isotherm; ammonia; rice straw; modeling.

#### Abstract

Many techniques were proposed for removal of ammonia as hazardous pollutant. Adsorption of ammonia from aqueous solutions onto activated carbon (prepared from rice straw as agricultural waste by calcination then activation with sodium hydroxide) was studied in batch reactor. Comparison of linear least-squares and trial-and-error non-linear methods of widely used isotherms (Langmuir, Freundlich, and Redlich-Peterson) was examined.

Results manifest that adsorption rate increases with temperature for calcination and activation. Maximum adsorption capacity of prepared activated carbon is  $96.4 \text{ mg.g}^{-1}$ . Langmuir and Freundlich models provide a good fitting of data, with  $R^2$  range 0.7:0.98. Non-linear Freundlich model is the best representation.

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#### Introduction:-

Different governments adopted new regulations in order to control pollutant emissions. Among them, ammonia is considered an important health hazard because it is poisonous if inhaled in great quantities (breathing levels above 50-100 ppm) while it can cause eyes, throat and nose irritation in lesser concentrations. Actual ammonia emissions are generated mainly from the fertilizer manufacture industry, coke manufacture, fossil fuel combustion, livestock and poultry management, and refrigeration methods. Among all these sources, fertilizers production accounts for about 90% of total ammonia emissions (Gonçalves et al., 2011).

Many techniques have been proposed in the literature for the removal of  $\text{NH}_3$  in industrial effluents. These include absorption by solution, reaction with other gases, ion exchange using polymeric resins, separation using membranes, thermal treatment, catalytic decomposition and adsorption by porous solids which are economically convenient for high concentration pollutants (Pezet et al., 1988; Blonigen, et al., 2003; Blonigen et al., 2005; Yunlong et al., 2015; Jared et al., 2016).

Some of these techniques (e.g. thermal combustion) are they become economically unviable for diluted waste streams. For these special cases adsorption on porous solids (e.g. activated carbons, zeolites, and so on) can be an excellent approach (Huang et al., 2008; Kim, and Park, 2007; Le Leuch, and Bandosz, 2007; Park and Jin, 2005; Petit and Bandosz, 2009; Zawadzki et al., 2003; Bernal, et al., 1993; Bandosz and Petit, 2009; Grant et al., 2012).

Among the different porous solids described in the literature, activated carbons exhibit certain advantages such as a high "apparent" surface area, a highly developed porous structure in order to adapt it for a special application, in addition to its simplicity and economy in configuration and operation.

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Ammonia removal has been also described in the literature for metal-modified (Fe, Co, Cr, Mo and W) activated carbons (Le Leuchet al., 2007; Petit, and Bandosz, 2009; Bandosz, and Petit, 2009).

Le Leuch and Bandosz at 2007 reported that activated carbons with supported metals on the surface can be used for the removal of ammonia pollution and their capacity depends on the nature of the metal deposit and its acidity. Activated carbons usually exhibit non-polar surfaces adsorb polar compounds (e.g.  $\text{NH}_3$ ), and the amount and the nature of the oxygen surface groups present on the carbon surface, i.e. acidic groups, are responsible for the total amount adsorbed of a basic molecule such as ammonia (Kim and Park, 2007).

Rice is the world's second largest cereal crop after wheat, however, it produces large amounts of crop residues. Only about 20% of rice straw was used for purposes such as ethanol, paper, fertilizers and fodders and the remaining amount is either removed from the field, in situ burned, piled or spread in the field, incorporated in the soil, or used as mulch for the following crop. In Egypt, burning of rice straw causes air pollution called the "Black Cloud". Rice straw is unique relative to other cereal straws in being high in silica and lignin (Ementanet al., 2012)

It has been reported that it is inappropriate to use the coefficient of determination of a linear regression analysis for comparing the best-fitting solution of different isotherms. As linear regression has produced very different outcomes so non-linear method may be a better way to obtain the parameters (Yuh-Shan, 2006; Xunjun, 2015)

In this study, adsorption of ammonia on activated carbon (prepared from rice straw as agricultural waste) from aqueous solutions has been studied in a batch reactor and a comparison of the linear least-squares method and a trial-and-error non-linear method of three widely used isotherms (the Langmuir, Freundlich, and Redlich-Peterson) were examined.

### Materials:-

Nessler reagent, Ammonium chloride ( $\text{NH}_4\text{Cl}$ ), Sodium hydroxide (NaOH 96%) and Hydrochloric acid (HCl - 36%) were purchased from (El-Nasr pharmaceutical chemicals, co).

### Adsorbent:

In the present work the rice straw was used as adsorbent and collected from the byproduct of rice industry.

### Adsorbate:

The adsorbate used in this study was a synthesized solution from ammonium chloride using distilled water as a solvent to prepare different concentrations of ammonia solution ranging from 10 to 350 mg/l.

The ammonia solution was prepared by the standard Nesslerization method ("APHA; 1989). In this method we add two droplets of Rochelle salt solution until the ammonium solution becomes clear. Then 1 ml of Nessler reagent is added to the ammonium chloride solution to obtain a yellow colored ammonia solution.

### Apparatus:

The prepared concentrations of ammonia were measured using a spectrophotometer (shimadzu, inc. Kyoto, Japan model UV-1601).

Drying furnace (Tecnimedia Italy) and a shaker (Julabo labor tech GMBH-7633 steel batch/west Germany) were used.

### Experimental:-

All experiments were carried out at room temperature ( $25 \pm 2^\circ\text{C}$ ) unless otherwise stated in the study of thermodynamic properties of the adsorption process.

Two series of batch experiments were performed to study adsorption isotherm in agitated glass bottles of 50 ml. The first was to investigate the ammonia adsorption on rice straw from aqueous solutions at different calcination temperatures  $400^\circ\text{C}$  and  $700^\circ\text{C}$  compared to raw rice straw and the second used calcinated rice straw treated with sodium hydroxide at different temperatures 25, 40, 50, and  $60^\circ\text{C}$ .



Preliminary experiments using fixed amounts of adsorbent (0.1 g) were added to the bottles containing adsorbate of the same concentrations, shaken in a reciprocating shaker and centrifuged to remove the adsorbent showed that such equilibrium was established within about 3h contact time (Figure (1)).

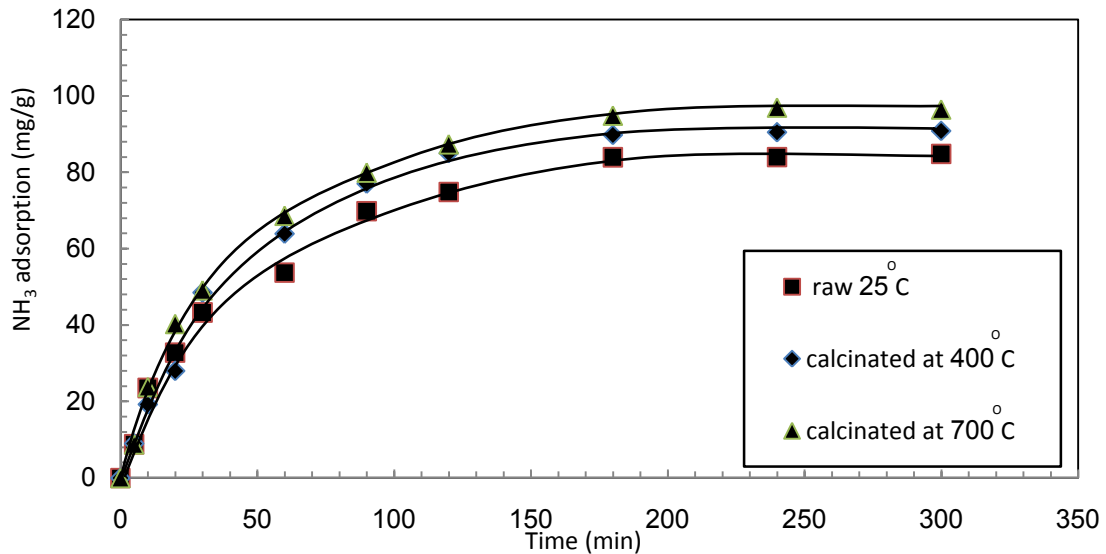


Fig.1:-Effect of temperature on equilibrium time for ammonia adsorption using rice straw.

Ammonia adsorption  $q$  ( $\text{mg.g}^{-1}$ ) was calculated by using the following equation:

$$q = \frac{(C_o - C_t) \times V \times 17 \times 1000}{m} \quad (1)$$

Where  $m$  is the mass of rice straw (g),  $C_o$  is the initial ammonia concentration and  $C_t$  is the ammonia concentration ( $\text{mol. L}^{-1}$ ) at time  $t$ , 17 is the molecular weight of ammonia, and  $V$  is the volume of aqueous ammonia solution (L).

**Results and Discussions:-**

4.1. Effect of rice straw calcination temperature on ammonia adsorption

Experiments were carried out using the same initial ammonia concentrations from 10 to 350 ( $\text{mg.dm}^{-3}$ ), rice straw dose of 0.1(g) to investigate the effect of calcination temperature on ammonia adsorption.

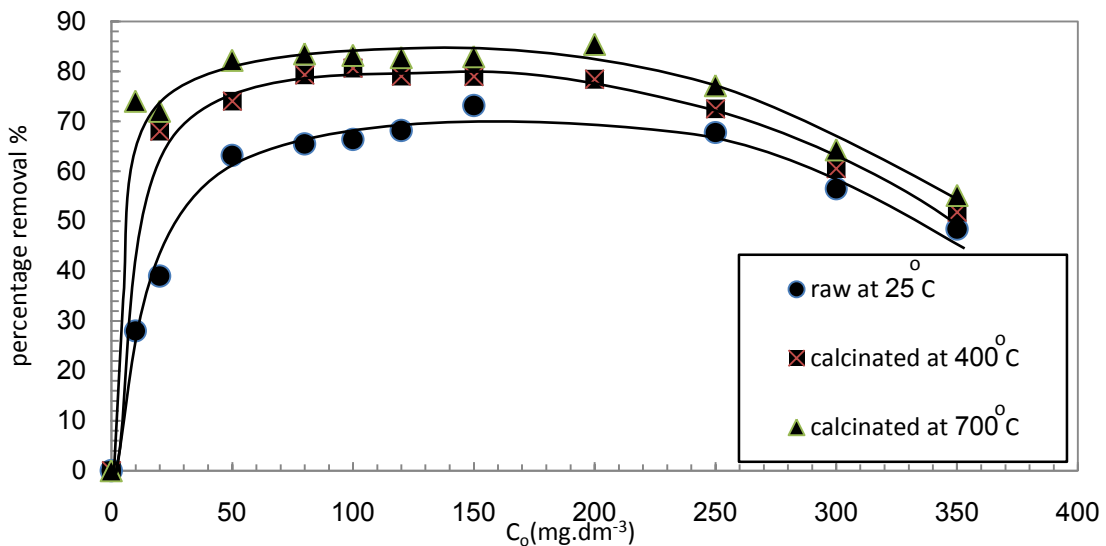
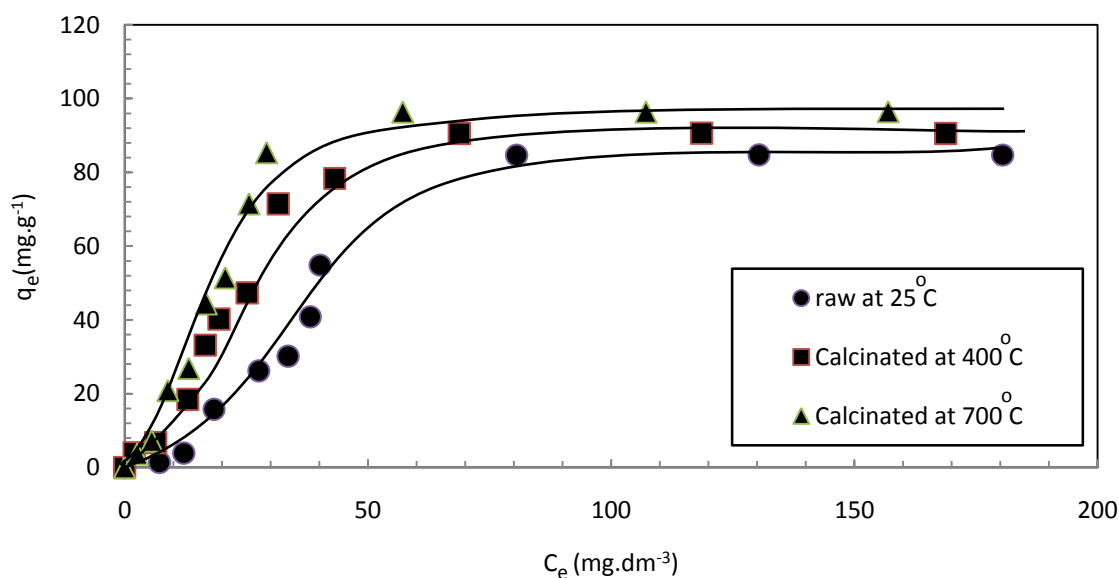


Fig.2:- Percentage removal of ammonia by adsorption onto raw and calcinated rice straw at different temperatures.

The results shown in Figure (2) depicts that the rate of uptake of ammonia is rapid in the beginning and that over 80, and 70 of ultimate adsorption are completed within 60 min for the 700 and 400°C calcination temperature, respectively compared to 60% for the raw rice straw at room temperature.

Figure (3) also demonstrates that ammonia adsorption increases with calcination temperature. After 60(min) operation, the ammonia adsorption increases from 84 for raw rice straw to 90.6 and 98( $\text{mg.g}^{-1}$ ) as the temperature of calcination of rice straw reached 400 and 700°C, respectively. The increase in uptake with rise in temperature of calcination is due to the fact that the reaction rate between ammonia and the surface oxygen functional groups on the calcinated rice straw increases with temperature.



**Fig.3:-**Experimental isotherm of ammonia onto raw and calcinated rice straw at different temperatures.

Furthermore, the diffusivity of adsorbate through the external laminar layer into the micropores of the adsorbent also increases with temperature as diffusion is an endothermic process.

Also it can be suggested that some water molecules (bonded by strong hydrogen bonds with surface groups located at entrances to pores) can desorb from rice straw calcination temperature increases, which results in more pores open to  $\text{NH}_3$ .

#### 4.2. Effect of treatment of calcinatedrice straw with sodium hydroxide at different temperatures on ammonia adsorption.

The explanation can be expressed as follows:

Firstly, the mass-transfer between the liquid bulk and the surface of rice straw increases with the temperature in the aqueous solution. Secondly, the diffusivity of ammonia also increases with temperature. Thirdly, the ammonia on the surface of rice straw in equilibrium with the ammonia in the solution may increase with its temperature in the solution.

In Figure (5), it is very clear that with increase in temperature the actual number of active sites or adsorption sites per gram of adsorbent increase proportionately with adsorbate uptake.

This can be attributed to increased total adsorbent surface area due to availability of more adsorption sites.

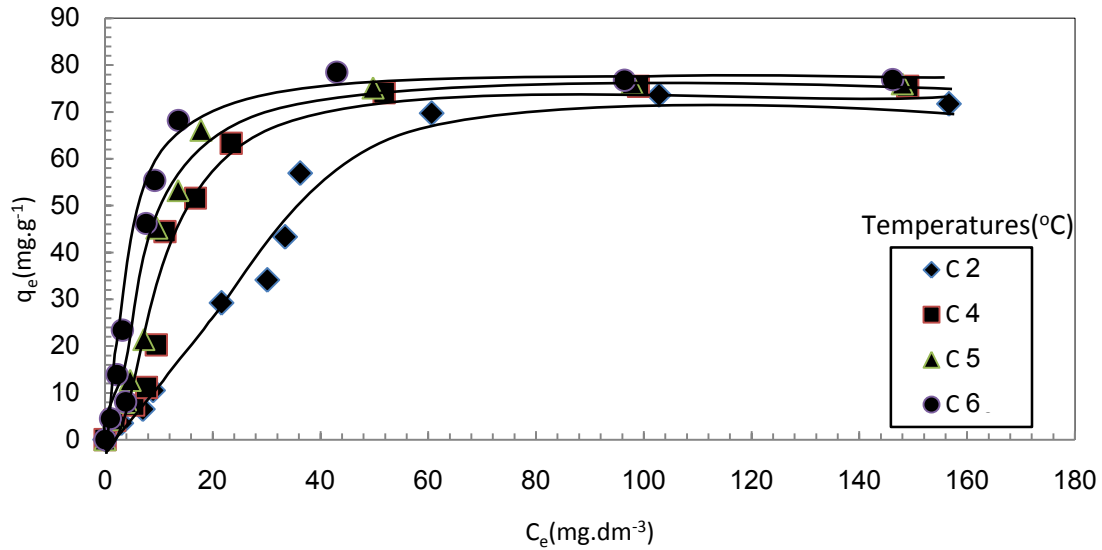


Fig.4:-Adsorption isotherm of ammonia onto prepared activated carbon at different temperatures.

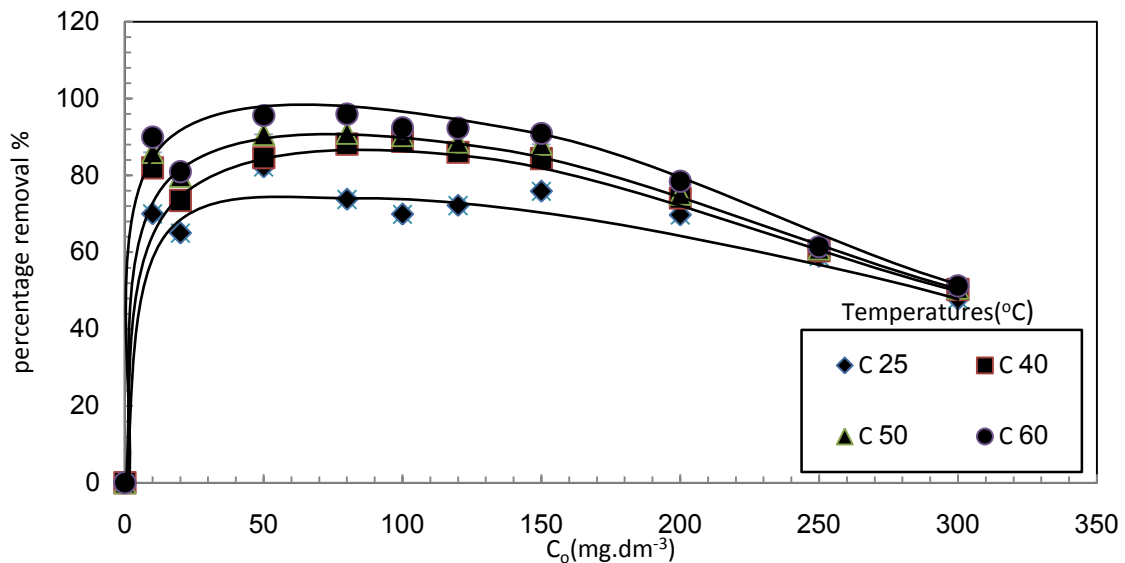


Fig.5:-Percentage removal of adsorption of ammonia onto prepared activated carbon at different temperatures.

4.3. Adsorption Isotherm Models  
 4.3.1. Langmuir Isotherm

Langmuir equation is based on a theoretical model and assumes that the maximum adsorption corresponds to a monolayer saturated with adsorbate molecules on the adsorbent surface that is energetically homogeneous(Langmuir,1916). Langmuir isotherm constants are calculated from the following linearized form:

$$C_e/q_e = 1/ K_L + (a_L/K_L)*C_e \quad (2)$$

where  $a_L$  and  $K_L$  are Langmuir constants determined from the slope ( $a_L/K_L$ ) and intercept ( $1/ K_L$ ) of the plot, where ( $K_L/a_L$ ) and  $a_L$  are indicative of maximum adsorption capacity ( $mg.g^{-1}$ ) of adsorbent and energy of adsorption, respectively, while  $C_e$  is the remaining concentration of adsorbate after equilibrium ( $mg.dm^{-3}$ ) and  $q_e$  is the amount adsorbed at equilibrium ( $mg.g^{-1}$ ).

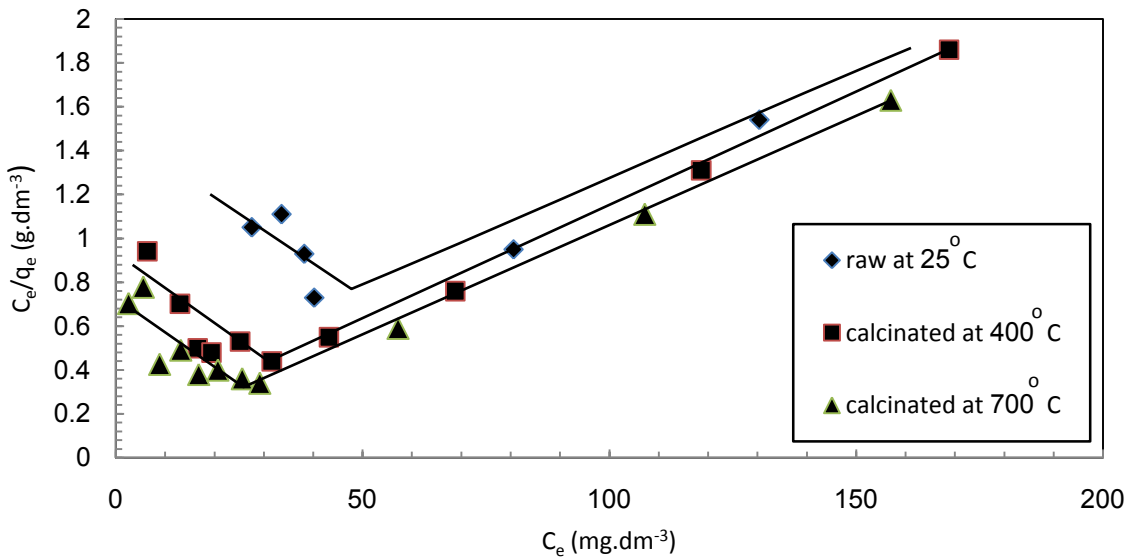
From the data shown in Tables(1) and (2), Langmuir isotherm curves can be given by plotting  $C_e/q_e$  against  $C_e$  (Figures(6) and (7)).

**Table 1:-** Langmuir constants for the adsorption of ammonia onto rice straw calcinated at different temperatures.

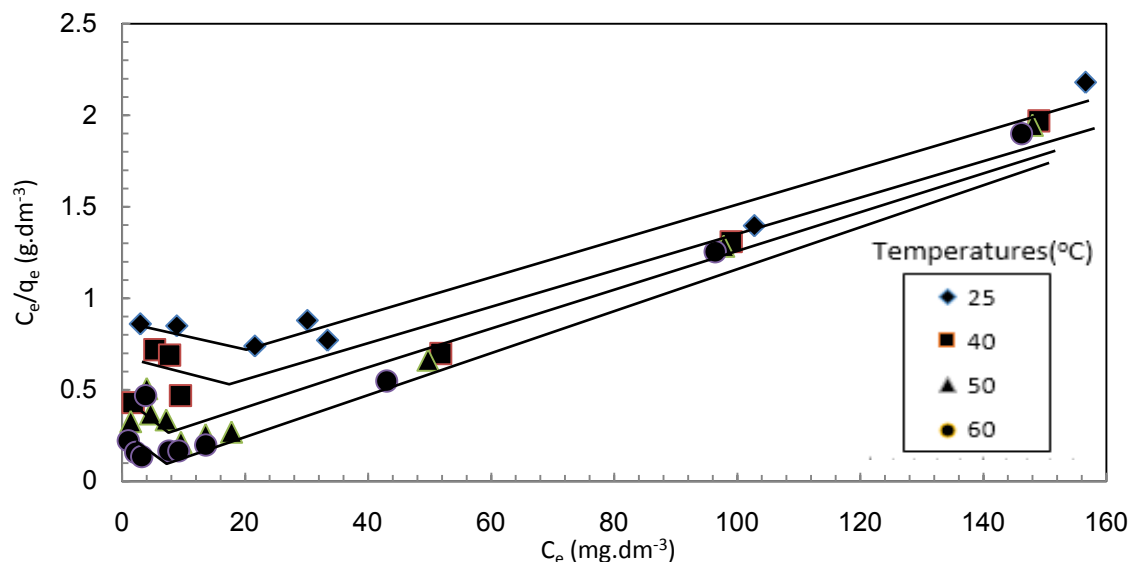
Rice straw (ammonia Conc. $C_0=0-200 \text{ mg.dm}^{-3}$ )	slope	intercept	$K_{L1}$	$a_{L1}$	$r^2$	$K_L/a_L$
raw	-0.1196	5.1869	0.1928	-0.023	0.8749	-8.3826
calcinated at 400	-0.018	0.9366	1.068	-0.019	0.713	-56.2105
calcinated at 700	-0.0145	0.7071	1.414	-0.0205	0.694	-68.9756
Rice straw (ammonia Conc. $C_0 =200-350 \text{ mg.dm}^{-3}$ )	slope	intercept	$K_{L2}$	$a_{L2}$	$r^2$	$K_L/a_L$
raw	0.0102	0.2316	4.18	0.044	0.9813	95.2272
calcinated at 400	0.0104	0.088	11.36	0.118	0.9979	96.2711
calcinated at 700	0.0102	0.0268	37.31	0.381	0.9993	97.9265

**Table 2:-** Langmuir constants for the adsorption of ammonia onto prepared activated carbon at different temperatures.

Temperature (ammonia conc.= $0:100 \text{ mg.dm}^{-3}$ )	slope	intercept	$K_{L1}$	$a_{L1}$	$r^2$	$k_L/a_L$
25	0.068	0.8926	1.1203	0.0761	0.9433	14.7058
40	0.0572	1.0555	0.9474	0.0541	0.773	17.4825
50	0.0437	0.6343	1.5765	0.0688	0.8507	22.8833
60	0.0396	0.2564	3.9001	0.1544	0.9514	5.25253
Temperature (ammonia conc.= $100:300 \text{ mg.dm}^{-3}$ )	slope	intercept	$K_{L2}$	$a_{L2}$	$r^2$	$k_L/a_L$
25	0.0127	0.0394	25.3807	0.3223	0.999	78.7401
40	0.0126	0.0651	15.3609	0.1935	0.9989	79.3651
50	0.011	0.2579	3.8774	0.0426	0.9746	90.9091
60	0.0104	0.4645	2.1528	0.0223	0.969	96.1538



**Fig.6:-**Langmuir plots for the adsorption of ammonia onto rice straw calcinated at different temperatures.



**Fig.7:-**Langmuir plots for adsorption of ammonia onto prepared activated carbon at different temperatures.

“S” type of adsorption isotherm is sigmoidal-shaped and thus has got a point of inflection. It is always a result of at least two opposite mechanisms. Compared to the “L” and “H” isotherms, the “S” class occurs less frequently (Dana et al., 2014).

Figure (6) demonstrates that the adsorption isotherm is in good agreement with the Langmuir adsorption equation however it has S-shape type of isotherm so the Langmuir plot is better represented by two consecutive straight lines. The highest value of  $97.93(\text{mg.g}^{-1})$  is obtained for  $(K_L/a_L)$  and a value of 0.38 is obtained for  $a_L$  (correlation coefficient 0.99) for the adsorption of ammonia onto rice straw calcinated at  $700^\circ\text{C}$  in the ammonia initial concentration range of  $(150-350) (\text{mg.dm}^{-3})$ .

The Langmuir plots in Figure (7) are represented by two consecutive straight lines with good correlation coefficients between 0.77 and 0.99. The highest value of maximum adsorption capacity in the ammonia initial concentration range of  $(10-80(\text{mg.dm}^{-3}))$   $25.25 (\text{mg.g}^{-1})$  is obtained with (correlation coefficient 0.95) for the adsorption of ammonia onto rice straw treated with NaOH at  $60^\circ\text{C}$ .

However, for the ammonia initial concentration range  $(100-300(\text{mg.dm}^{-3}))$ , the highest adsorption capacity is  $96.15 (\text{mg.g}^{-1})$  obtained for the adsorption of ammonia onto rice straw treated with NaOH at  $25^\circ\text{C}$ .

The Langmuir constant,  $a_L$ , is related with the affinity of the adsorbent for the adsorbate. Low values of  $a_L$  suggest a high affinity of rice straw for the ammonia.

#### 4.3.2. Freundlich Isotherm

Freundlich isotherm assumes that the uptakes of adsorbate occur on a heterogeneous surface by multilayer adsorption and that the amount of adsorbate adsorbed increases infinitely with an increase in concentration (Freundlich, 1906).

The Freundlich isotherm is expressed as:

$$q_e = K_F * C_e^{(1/n)} \quad (3)$$

where  $K_F$  and  $n$  are constants of Freundlich isotherm incorporating adsorption capacity  $(\text{mg.g}^{-1})$  and intensity, while  $C_e$  and  $q_e$  are the remaining concentrations of adsorbate after equilibrium  $(\text{mg.dm}^{-3})$  and the amount adsorbed at equilibrium  $(\text{mg.g}^{-1})$ , respectively. Taking logarithm from the Eq. (3), a linearized form of Freundlich isotherm can be represented as follow:

$$\log q_e = \log K_F + (1/n) \log C_e \quad (4)$$

A Freundlich isotherm curve for the adsorption of ammonia on rice straw calcinated at different temperatures can be given by plotting  $\log(q_e)$  against  $\log(C_e)$  (Figure (8) and (9)). It can be noticed that the plots can be better fitted by two consecutive lines, this is in correspondence with the S-isotherm shape.

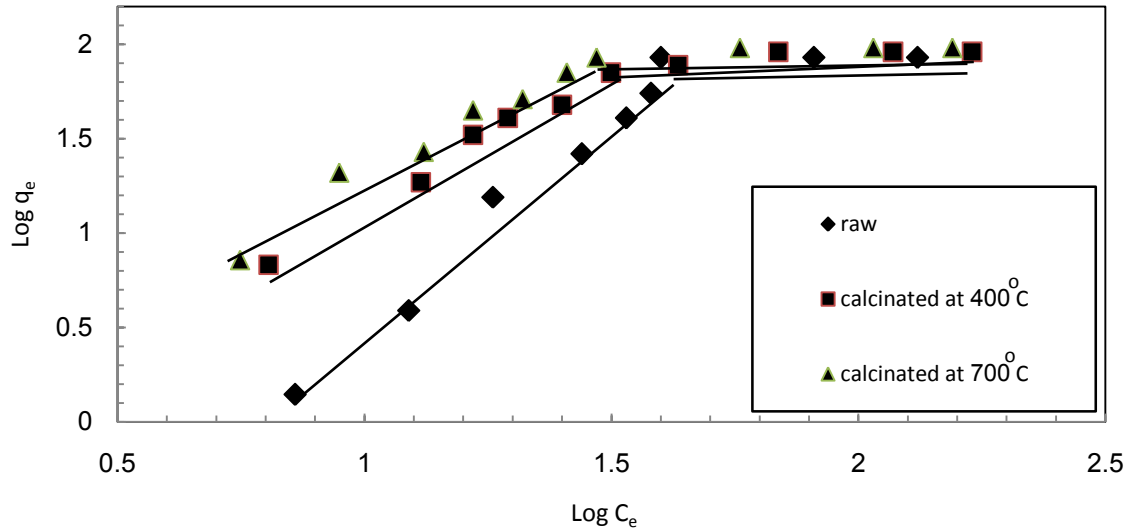


Fig .8:-Freundlich plots for adsorption of ammonia onto raw and calcinated rice straw at different temperatures.

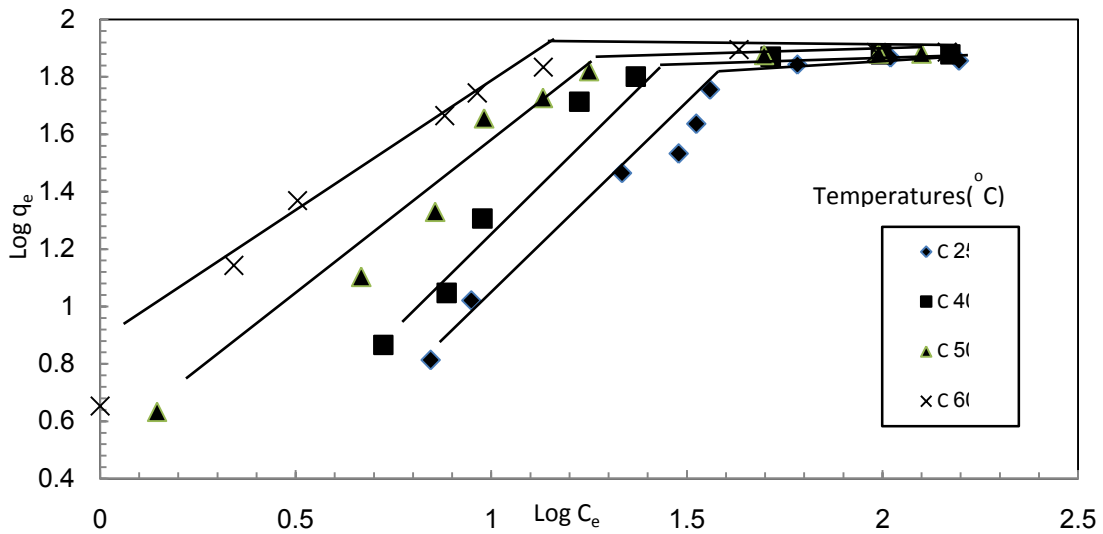


Fig.9:-Freundlich plots for adsorption of ammonia onto prepared activated carbon at different temperatures.

From the data shown in Table (3), the Freundlich isotherm constants give the highest value for adsorption at calcination temperature 700°C.

However, for the adsorption of ammonia onto prepared activated carbon at different temperatures, the high values of  $K_F$  showed a high feasibility of adsorption and  $n$  (intensity of adsorption) values between 1 and 7.4 represent a favorable adsorption. So adsorption is favorable in the ammonia initial concentration range (200-350) ( $\text{mg}\cdot\text{dm}^{-3}$ ) (Table (4)).

**Table 3:-**Freundlich constants for the adsorption of ammonia onto rice straw calcinated at different temperatures.

Rice straw (ammonia Conc. C <sub>0</sub> =0-200 mg.dm <sup>-3</sup> )	K <sub>F1</sub>	n <sub>1</sub>	r <sup>2</sup>
Raw	0.018	0.451	0.985
Calcinated at 400 °C	1.415	0.918	0.944
Calcinated at 700°C	0.946	0.752	0.984
Rice straw (ammonia Conc.=(200-350 mg.dm <sup>-3</sup> )	K <sub>F2</sub>	n <sub>2</sub>	r <sup>2</sup>
Raw	20.96	3.522	0.75
Calcinated at 400 °C	44.19	6.653	0.778
Calcinated at 700°C	70.08	7.457	0.685

**Table 4:-**Freundlich constants for the adsorption of ammonia onto prepared activated carbon at different temperatures.

Temperature(°C) (ammonia Conc. C <sub>0</sub> =10-100 mg.dm <sup>-3</sup> )	k <sub>F1</sub>	n <sub>1</sub>	r <sup>2</sup>
25	0.7096	0.844	0.9803
40	1.808	0.646	0.9754
50	2.662	0.878	0.9528
60	5.128	0.868	0.9738
Temperature(°C) (ammonia Conc. C <sub>0</sub> =100-300 mg.dm <sup>-3</sup> )	k <sub>F2</sub>	n <sub>2</sub>	r <sup>2</sup>
25	34.25	6.394	0.7217
40	36.22	6.301	0.7858
50	40.37	6.882	0.7117
60	41.33	7.407	0.7563

#### 4.3.3. Redlich-Peterson isotherm

The Redlich-Peterson isotherm contains three parameters and is a hybrid of the Langmuir and Freundlich isotherms (Redlich and Peterson, 1959). The numerator is from the Langmuir isotherm and has the benefit of approaching the Henry region at infinite dilution.

$$q_e = (K_{RP} * C_e) / (1 + B * C_e^a) \quad (5)$$

The Redlich-Peterson isotherm may be rearranged to a linear form.

$$\log [(K_{RP} * C_e / q_e) - 1] = \log B + a_{RP} \log C_e \quad (6)$$

It has three isotherm constants namely  $K_{RP}$ ,  $\beta$  and  $a_{RP}$  ( $0 < a_{RP} < 1$ ) which characterize the isotherm. Its limiting behavior is summarized as follows:

When  $a_{RP} = 1$ , the Langmuir form results. On the other hand when ( $K_{RP}$  and  $a_{RP}$ ) are much greater than unity, the Freundlich isotherm results. And when  $a = 0$ , the Henry's law results.

The three isotherm constants were determined by using trial and errors method to obtain the best value of  $K_{RP}$  which yields the maximum value of the coefficient of determination,  $r^2$  using the solver add in the Microsoft excel sheet.

Table (5) represents the Redlich-Peterson constants for the adsorption of ammonia onto rice straw calcinated at different temperatures. However the best values of constants gave very low correlation coefficients  $r^2$  between 0.3 and 0.7 so we cannot take this form in our consideration.

**Table5:-** Redlich-Peterson constants for the adsorption of ammonia onto rice straw calculated at different temperatures.

Temp.(°C)	B	A <sub>RP</sub>	r <sup>2</sup>	K <sub>RP</sub>
25	0.0317	0.6117	0.3227	1.2
400	1.04	0.2667	0.304	5.11
700	0.233	0.639	0.686	6

#### 4.4. Selection of optimum adsorption isotherm

The analysis of the isotherm data is important to develop an equation which accurately represents the results and which could be used for design purposes. The most common isotherms applied in solid/liquid systems are the theoretical equilibrium isotherm, Langmuir (Langmuir, 1916), the best known and most often used isotherm for the adsorption of a solute from a liquid solution; the Freundlich (Freundlich, 1906), the earliest known relationship describing the adsorption equation and the Redlich–Peterson (Redlich and Peterson, 1959), the earlier presented, containing three parameters isotherm.

#### Linear Method:-

Linear regression was frequently used to determine the most fitted model throughout the years and the method of least squares has been frequently used for finding the parameters of the models. However, transformations of non-linear isotherm equations to linear forms implicitly alter their error structure (Jared et al., 2016).

In recent years, several error analysis methods, such as the coefficient of determination, the sum of the errors squared, a hybrid error function, Marquardt's percent standard deviation, the average relative error and the sum of absolute errors, have been used to determine the best-fitting isotherm (Ratkowsky, 1990; Ho YS., et al., 2002; Allen et al., 2003; Zvezdelina et al., 2013; Srivastava and Syed, 2011; Foo and Hameed, 2010).

In addition to this, the better fit of model was checked by coefficient of determination ( $r^2$ ), residual root mean square error (RMSE), and Chi square ( $x^2$ ) values were evaluated through the following equations:

$$\text{RMSE} = \sqrt{\frac{1}{N-p} \sum_{i=1}^m (q_{\text{exp}} - q_{\text{mod}})^2} \quad (7)$$

$$X^2 = \sum [(q_{\text{exp}} - q_{\text{mod}})^2 / q_{\text{mod}}] \quad (8)$$

Where  $q_{\text{exp}}$  is the experimental concentration of adsorbate on adsorbent,  $q_{\text{mod}}$  is the calculated concentration of adsorbate on adsorbent obtained from model,  $N$  is the number of points in the experimental design, and  $p$  is the number of parameters to be determined.

The value of coefficient of determination,  $r^2$ , represents the percentage of the variability of the regression line between the predicted values and the actual values and may vary from 0 to 1; a perfect fit gives a coefficient of 1.

On the other hand,  $x^2$  is basically the sum of the squares of the differences between the experimental data and the data obtained from the models divided by the corresponding data obtained from the models (Eq. (8)).

Smaller values of RMSE and  $x^2$  and high values of correlation indicate a better fit of model (Srivastava and Syed, 2011) (Tables (6); and (7)).

Table (6) indicated that the theoretical Langmuir presentation gives the lowest values of the error tests;  $x^2$  and RMSE and highest value of Correlation coefficient  $r^2$  so it gives the best fit of isotherm data for the adsorption of ammonia onto rice straw calculated at 700°C.



**Table 6:-** Isotherm constants of different isotherm models for the adsorption of ammonia onto rice straw calcinated at 700°C. (hint: the best numbers are highlighted).

Isotherm	$r^2$	$\chi^2$	RMSE
Freundlich at $C_o$ (0-200 mg.dm <sup>-3</sup> ) $K_F = 0.95$ , $n = 0.75$	0.98	21.58	16.49
Freundlich at $C_o$ (200-350 mg.dm <sup>-3</sup> ) $K_F = 70.08$ , $n = 7.46$	0.67		
Freundlich non linear $K_F = 13.8$ , $n = 2.39$	0.82	66.12	17.32
Langmuir at $C_o$ (0-200 mg.dm <sup>-3</sup> ) $K_L = 1.414$ , $a_L = -0.0205$	0.69	<b>4.83</b>	<b>4.11</b>
Langmuir at $C_o$ (200-350 mg.dm <sup>-3</sup> ) $K_L = 37.31$ , $a_L = 0.381$	<b>0.99</b>		
Langmuir non linear $K_L = 4.53$ , $a_L = 0.036$	0.82	33.32	12.27
Redlich-Peterson $K_{RP} = 6$ , $B = 0.233$ , $a = 0.639$	0.69	52.06	19.71
Redlich-peterson non linear $K_{RP} = 7$ , $B = 0.7$ , $a = 0.5$	0.97	109.38	23

**Table 7:-** Isotherm constants of different isotherm models for the adsorption of ammonia onto rice straw activated with NaOH at 60°C. (hint: the best numbers are highlighted)

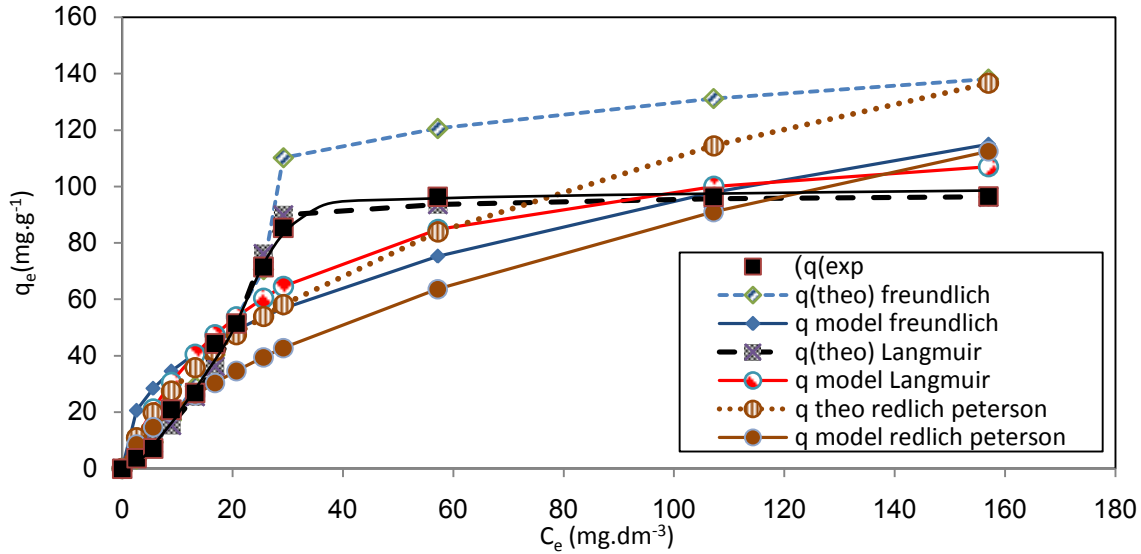
Isotherm	$r^2$	$\chi^2$	RMSE
Freundlich at $C_o$ (0-100 mg.dm <sup>-3</sup> ) $K_F = 5.13$ , $n = 0.87$	<b>0.97</b>	<b>15.26</b>	<b>7.52</b>
Freundlich at $C_o$ (100-300 mg.dm <sup>-3</sup> ) $K_F = 41.33$ , $n = 7.41$	0.76		
Freundlich non linear $K_F = 20.77$ , $n = 3.4$	0.82	62.44	15.81
Langmuir at $C_o$ (10-100 mg.dm <sup>-3</sup> ) $K_L = 3.9$ , $a_L = 0.154$	0.95	320.81	25.86
Langmuir at $C_o$ (100-300 mg.dm <sup>-3</sup> ) $K_L = 2.15$ , $a_L = 0.022$	0.97		
Langmuir non linear $K_L = 10.93$ , $a_L = 0.125$	0.82	24.43	9.37
Redlich-Peterson $K_{RP} = 6.03$ , $B = 0.6$ , $a_{RP} = 0.5$	0.3	235.74	26.95
Redlich-peterson nonlinear $K_{RP} = 13.7$ , $B = 0.25$ , $a_{RP} = 0.9$	0.56	31.41	11.74

However according to Table (7) for the adsorption of ammonia onto rice straw activated with NaOH at 60°C, the theoretical Freundlich presentation gives the lowest values of the error tests;  $\chi^2$  and RMSE and highest value of Correlation coefficient  $r^2$  so it gives the best fit of this isotherm data.

#### 4.4.2. Non-linear Method

In the case of the non-linear method, a trial-and-error procedure, which is applicable to computer operation, was developed to determine the isotherm parameters using an optimization routine to maximize the coefficient of determination between the experimental data and isotherms in the solver add-in with Microsoft's spreadsheet, Microsoft Excel. The abilities of three widely used isotherms, the Freundlich, Langmuir, and Redlich-Peterson isotherms to model the equilibrium sorption data were examined (Foo and Hameed, 2010).

From Figure (10) it seems that the best fit was obtained by Langmuir as compared with other isotherms because the Langmuir theoretical isotherm obtained from linear calculations and Langmuir model isotherm obtained from non-linear method were both closer to the experimental isotherm.



**Fig. 10:-** Plot of theoretical and non-linear isotherms for the adsorption of ammonia onto rice straw calcinated at 700°C.

Also the Langmuir constants obtained by non linear method were closer to those obtained from theoretical linear calculations, (Table (6)).

So the predicted equations that can best fit this isotherm according to Langmuir theoretical calculations are:

$$q_e = \frac{1.41 C_e}{1 - 0.021 C_e} \quad (9)$$

For the initial ammonia concentration ranges [(10-200)( mg.dm<sup>-3</sup>)].

$$q_e = \frac{37.31 C_e}{1 + 0.38 C_e} \quad (10)$$

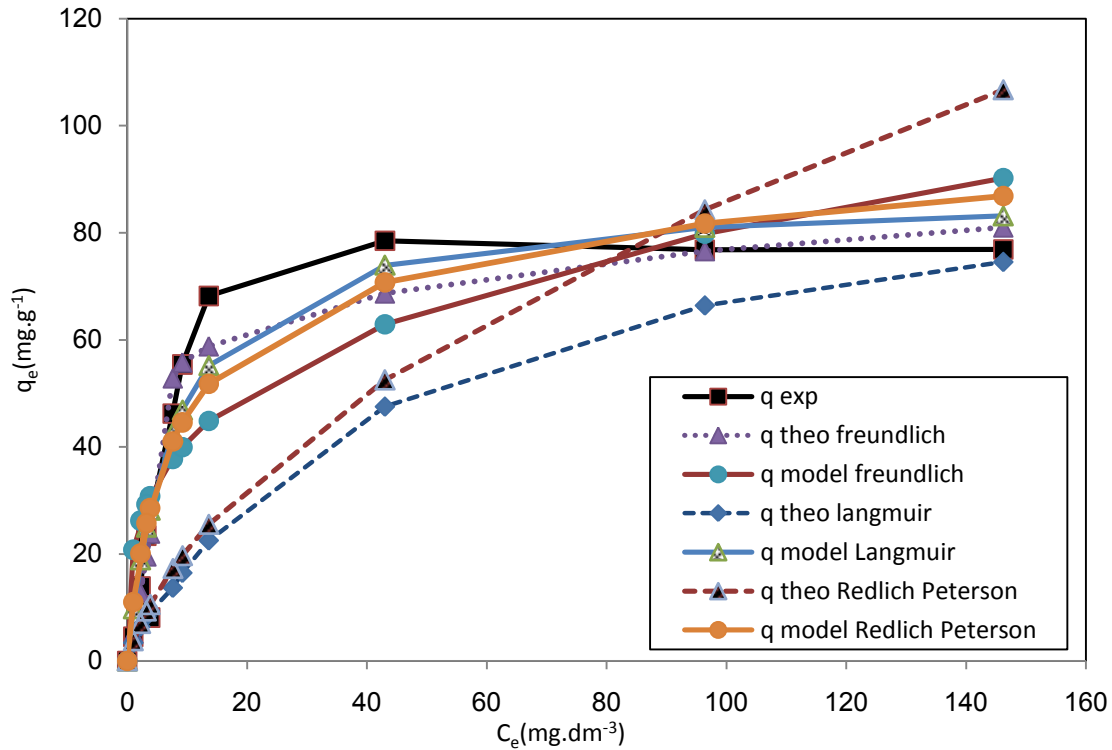
For the initial ammonia concentration ranges (200-350(mg.dm<sup>-3</sup>)).

And the predicted equation that can best fit this isotherm according to Langmuir non linear modelis:

$$q_e = \frac{4.53 C_e}{1 + 0.036 C_e} \quad (11)$$

This equation is applied for the initial ammonia concentration ranges (10-350(mg.dm<sup>-3</sup>)).

Figure (11) shows the adsorption of ammonia onto rice straw activated with NaOH at 60°C, the best fit was obtained by the Freundlich theoretical isotherm obtained from linear calculations as it is the closest plot of the experimental data.



**Fig.11:-**Plot of theoretical and non-linear isotherms for the adsorption of ammonia onto rice straw activated with NaOH (prepared activated carbon) at 60°C.

So the predicted equations that can best fit this isotherm according to Freundlich theoretical calculations are:

$$q_e = 5.13 C_e^{1/0.87} \quad (12)$$

For the initial ammonia concentration ranges (0-100 (mg.dm<sup>-3</sup>)).

$$q_e = 41.33 C_e^{1/7.41} \quad (13)$$

For the initial ammonia concentration ranges (100-300 (mg.dm<sup>-3</sup>)).

And the predicted equation that can best fit this isotherm according to Freundlichnon linear modelis:

$$q_e = 20.77 C_e^{3.4} \quad (14)$$

#### 4.5. Thermodynamic Parameters

Thermodynamic parameters, such as change infree energy ( $\Delta G$ ), enthalpy ( $\Delta H$ ), and entropy( $\Delta S$ ) that describe ammonia uptake by rice straw can be estimated by considering the equilibrium constants under the several experimental conditions<sup>30</sup>.Equilibrium constant for the adsorption reactionof ammonia on rice straw,  $K_c$ , is defined asfollows:

$$K_c = \frac{C_{AE}}{C_e} = \frac{(C_o - C_o)}{C_e} = \frac{(C_o)}{C_e} - 1 \quad (15)$$

Where  $C_{AE}$  is the adsorbed amount of adsorbate atequilibrium,  $C_o$  the initial concentration of adsorbate(mg/dm<sup>3</sup>),  $C_e$ the equilibrium concentration of adsorbate(mg/dm<sup>3</sup>).

The change in the Gibbs free energy for a reactionis expressed as:

$$\Delta G^\circ = -RT \ln K_c \quad (16)$$

Where R is the gas constant (8.314 J/mol.K) and T is temperature (K).

Moreover, using the relationship,

$$\Delta G^\circ = \Delta H^\circ - T\Delta S^\circ \quad (17)$$

$\ln K_c$  can be expressed in Eq. (18).

$$\ln K_c = \frac{\Delta S^\circ}{R} - \frac{\Delta H^\circ}{RT} \quad (18)$$

Thus, if the equilibrium constants for an adsorption reaction at different temperatures are known, the standard enthalpy and entropic changes for adsorption can also be estimated from the slope and intercept of a linear plot of  $\ln K_c$  versus  $1/T$  (Figures (12; 13)).

$\Delta H^\circ$  and  $\Delta S^\circ$  are obtained from the slope and intercept of van't Hoff plot of  $\ln K_c$  versus  $1/T$ .

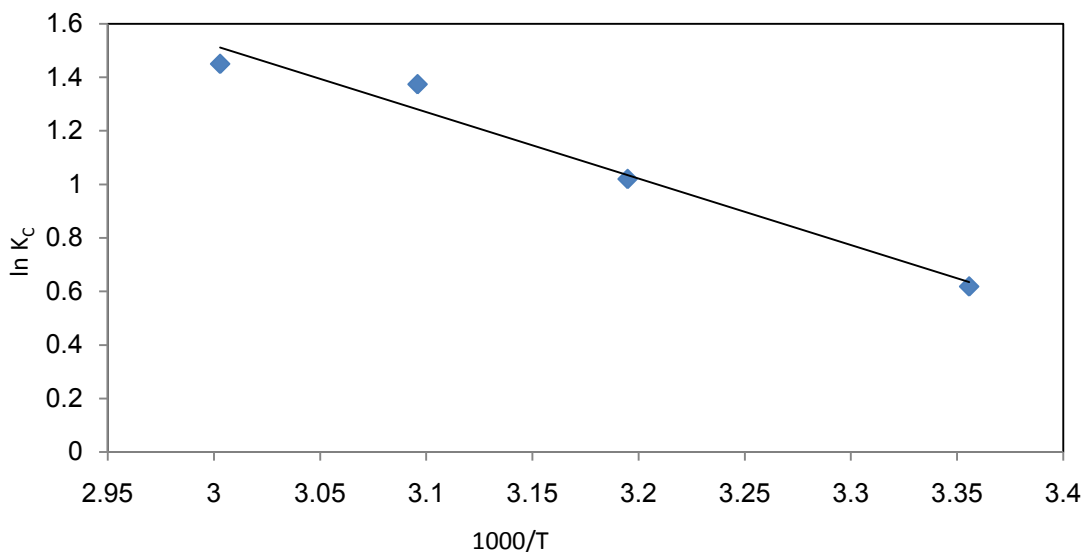
**Table 8:-** Thermodynamic parameters for the adsorption of ammonia onto rice straw calculated at different temperatures.

Temperature(°C)	T	$K_c$	$\Delta H$ (KJ.mol <sup>-1</sup> )	$\Delta S$ (J.K <sup>-1</sup> .mol <sup>-1</sup> )	$-\Delta G$ (KJ.mol <sup>-1</sup> )
25	298	0.639			3.98812
40	673	2.125	5.08	13.4	9.01312
700	973	2.57			13.03312

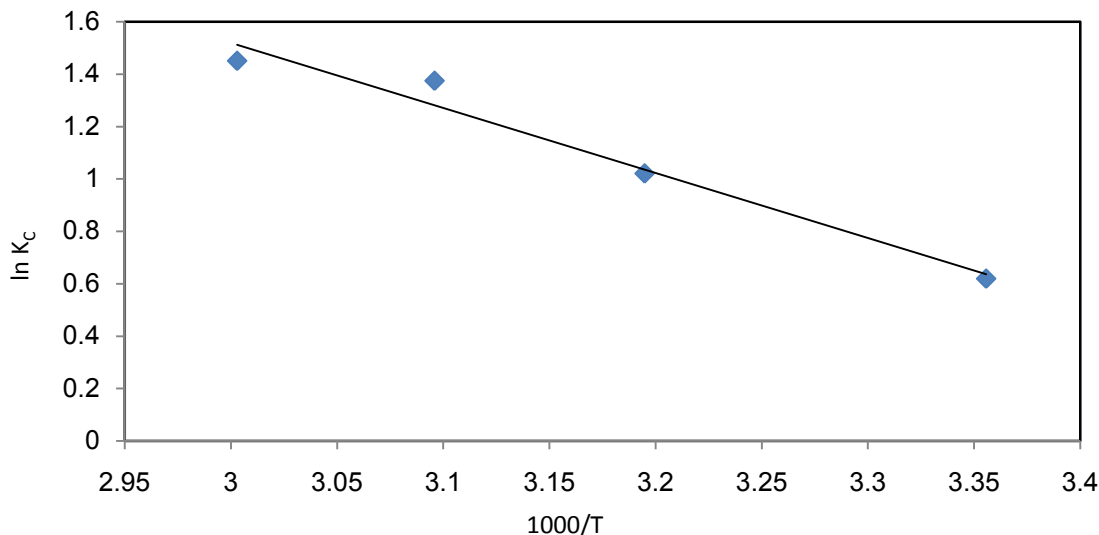
**Table 9:-** Thermodynamic parameters for the adsorption of ammonia onto prepared activated carbon at different temperatures.

Temperature(°C)	T	$K_c$	$\Delta H$ (KJ.mol <sup>-1</sup> )	$\Delta S$ (J.K <sup>-1</sup> .mol <sup>-1</sup> )	$-\Delta G$ (KJ.mol <sup>-1</sup> )
25	298	1.857			22.21014
40	313	2.774	20.66	74.6	23.32914
50	323	3.951			24.07514
60	333	4.263			24.82114

In Tables (8; 9) A positive value of  $\Delta H^\circ$  indicates that the adsorption process is endothermic in nature and negative values of  $\Delta G^\circ$  show the spontaneous adsorption of ammonia on the rice straw. Positive  $\Delta S^\circ$  shows the increased randomness of the solid/solution interface during the adsorption of ammonia on the rice straw.



**Fig.12:-** Van't Hoff plot for the adsorption of ammonia onto rice straw calculated at different temperatures at initial  $\text{NH}_3$  concentration 20 ( $\text{mg.dm}^{-3}$ ).



**Fig.13:-**Van't Hoff plot for the adsorption of ammonia onto prepared activated carbon at different temperatures at initial NH<sub>3</sub> Concentration 20 mg/dm<sup>3</sup>.

### Conclusions:-

Adsorption of ammonia on rice straw from aqueous solutions has been studied. The following specific conclusions can be made from the experimental results:

1. Temperature is advantageous to the adsorption of ammonia on the rice with temperature. The adsorption isotherm follows the type S-shape.
2. The ammonia adsorption on rice straw increases with the temperature of calcination of rice straw in the aqueous solutions. The values of  $q_e$  increased with an increase in temperature of calcinations from room temperature to 700°C.
3. The ammonia adsorption on rice straw treated with sodium hydroxide increases with the increase in temperature from 25 to 60°C.
4. The Langmuir equilibrium isotherm model is found to provide a good fitting of the adsorption data especially in the ammonia initial concentration range of (200-350 (mg.dm<sup>-3</sup>)) with  $r^2$  of 0.99.
5. The maximum adsorption capacity obtained from the Langmuir equilibrium isotherm model is found to be 97.9(mg.g<sup>-1</sup>) for the adsorption of ammonia onto rice straw calcinated at 700°C in the ammonia initial concentration range of (200-350(mg.dm<sup>-3</sup>)). However it was 68.97(mg.g<sup>-1</sup>) in the ammonia initial concentration range of (10-200 (mg.dm<sup>-3</sup>)) at the same temperature.
6. For the activation of calcinated rice straw with NaOH at different temperatures the maximum adsorption capacity is found to be 25.25(mg.g<sup>-1</sup>) at 60 °C in the ammonia initial concentration range of (10-200(mg.dm<sup>-3</sup>)) with  $r^2$  of 0.95. However it was 96.15(mg.g<sup>-1</sup>) at 60°C in the ammonia initial concentration range of (200-350(mg.dm<sup>-3</sup>)) with  $r^2$  of 0.96 compared to 17.19 (mg.g<sup>-1</sup>) maximum adsorption capacity of original activated carbon reported by Xiang et al.,(2008).
7. From the Freundlich isotherm, the highest values of  $K_F$  and  $n$  were 70.08 and 7.46, respectively obtained for the adsorption of ammonia onto rice straw calcinated at 700°C proved its high favorability of adsorption in the ammonia initial concentration range (200-350(mg.dm<sup>3</sup>)).
8. The highest values of  $K_F$  and  $n$  were 5.13 and 0.87, respectively obtained for the adsorption of ammonia onto calcinated rice straw treated with NaOH at 60°C in the ammonia initial concentration range (10-200(mg.dm<sup>3</sup>)). However they were 41.33 and 7.41, respectively obtained for the adsorption of ammonia onto rice straw treated with NaOH at 60°C in the ammonia initial concentration range (200-350 (mg.dm<sup>3</sup>)) proved its high favorability of adsorption at this temperature.
9. Of all studied conditions the best one is the adsorption of ammonia onto rice straw calcinated at 700°C as it gives the highest value of Freundlich constants and the maximum adsorption capacity according to Langmuir constants.
10. Thermodynamic parameters such as  $\Delta G^\circ$ ,  $\Delta H^\circ$ , and  $\Delta S^\circ$  for adsorption reaction are estimated. A positive value of  $\Delta H^\circ$  indicates that the adsorption process is endothermic in nature and negative values of  $\Delta G^\circ$  show the

spontaneous adsorption of ammonia on the rice straw. Positive  $\Delta S^\circ$  shows the increased randomness of the solid/solution interface during the adsorption of ammonia. The same result was reported by Xianget al.<sup>29</sup> for the adsorption of ammonia onto activated carbon.

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#### Abbreviations:-

- 1) (NaOH) : Sodium hydroxide
- 2) (NH<sub>4</sub>Cl) : Ammonium chloride
- 3) (HCl) : Hydrochloric acid
- 4) C<sub>e</sub>: The remaining concentration of adsorbate after equilibrium (mg.dm<sup>-3</sup>).
- 5) C<sub>o</sub> : The initial concentration of adsorbate(mg/dm<sup>-3</sup>).
- 6) C<sub>t</sub> : The concentration at time t (mg/dm<sup>-3</sup>).
- 7) C<sub>AE</sub> The adsorbed amount of adsorbate at equilibrium
- 8) q<sub>e</sub> : The amount adsorbed per gram of adsorbent at equilibrium (mg.g<sup>-1</sup>).
- 9) q<sub>theo</sub>:The theoretical amount adsorbed per gram of adsorbent obtained from linear models (mg.g<sup>-1</sup>).
- 10) q<sub>mod</sub>:The theoretical amount adsorbed per gram of adsorbent obtained from non linear models (mg.g<sup>-1</sup>).
- 11) a<sub>L</sub>:The indicative of maximum adsorption capacity (mg.g<sup>-1</sup>) of adsorbent and energy of adsorption.
- 12) K<sub>L</sub>: The Langmuir constants
- 13) q<sub>exp</sub>: The experimental concentration of adsorbate on adsorbent (mg.g<sup>-1</sup>).
- 14) K<sub>F</sub>: The constant of Freundlich isotherm incorporating adsorption capacity and intensity(mg.g<sup>-1</sup>).
- 15) K<sub>RP</sub>: The Redlich-Peterson isotherm constant.
- 16) ΔG<sup>o</sup> The change in the Gibbs free energy for a reaction(KJ.mol<sup>-1</sup>).
- 17) ΔH<sup>o</sup> The change in the enthalpy for a reaction(KJ.mol<sup>-1</sup>)..
- 18) ΔS<sup>o</sup> The change in the entropy for a reaction(KJ.mol<sup>-1</sup>)..
- 19) K<sub>c</sub>Equilibrium constant for the adsorption reaction of ammonia on rice straw.



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### RESEARCH ARTICLE

#### ANALYTICAL MODELING OF COST EFFICIENT QUAD MATERIAL GATE ALL AROUND STACK ARCHITECTURE OF TUNNEL FET.

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#### Abstract

Increase in speed is achieved by shrinking the dimensions of MOSFET's. But scaling of parameters leads to short channel effects which degrade the device performance. The predominating problems associated with SCE's are change in threshold voltage, drain-induced barrier lowering (DIBL) and sub threshold leakage current. SCE's causes degradation of sub threshold slope and increase in drain off-current.

Among the different possible solutions, TFETs are chosen to be the potential candidate because of its immunity against the SCEs, low leakage current and CMOS compatible technology.

In order to incorporate the advantages of Surrounding Gate (SG), Quad Material Gate (QMG), Gate Stack Architecture (GSA) and Tunnel Field Effect Transistor (TFET), novel device architecture has been proposed known as Quad Material Gate All around Stack Architecture - Tunnel Field Effect Transistor (QMGAASA- TFET).

Materials used:

Oxide1: TiO <sub>2</sub> (Titanium dioxide)	Oxide2: HfO <sub>2</sub> (Hafnium dioxide)
Oxide3: SiO <sub>2</sub> (Silicon dioxide)	Oxide4: ZrO <sub>2</sub> (Zirconium dioxide)
Metal1: Gold	Metal2: Silver
Metal3: Aluminum	Metal4: Copper

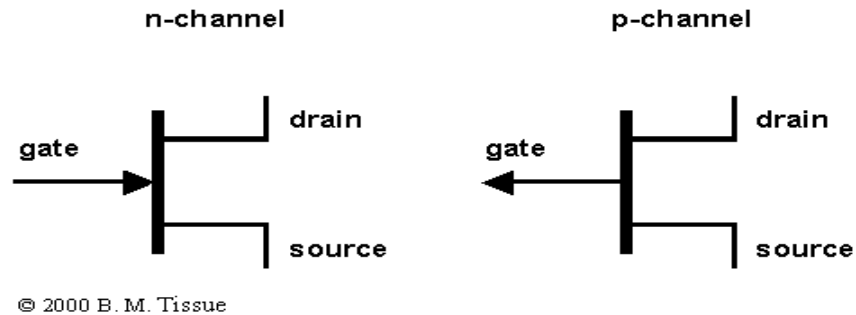
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#### Introduction:-

The **Tunnel Field-Effect** transistor (TFET) is a new type of transistor. Even though its structure is very similar to a Metal-Oxide-Semiconductor Field-Effect Transistor (MOSFET), the fundamental switching mechanism differs, making this device a promising candidate for low energy electronics. TFETs switch by modulating quantum tunneling through a barrier instead of modulating thermionic emission over a barrier as in traditional MOSFETs.



The field-effect transistor was first patented by Julius Edgar Lilienfeld in 1926 and by Oskar Heil in 1934. The **field-effect transistor (FET)** is a transistor that uses an electric field to control the shape and hence the electrical conductivity of a channel of one type of charge carrier in a semiconductor material. FETs are also known as **unipolar transistors** and as they involve single-carrier-type operation. The FET has high input impedance.



**Fig 1: - Symbols for n-channel and p-channel FET**

This fourth terminal serves to bias the transistor into operation. The device consists of an active channel through which charge carriers, electrons or holes, flow from the source to the drain. The conductivity of the channel is a function of the potential applied across the gate and source terminals.

#### Types:-

The channel of a FET is doped to produce either an n-type semiconductor or a p-type semiconductor. The drain and source may be doped of opposite type to the channel, in the case of enhancement mode FETs, or doped of similar type to the channel as in depletion mode FETs. Field-effect transistors are also distinguished by the method of insulation between channel and gate. Types of FETs include:

- The **JFET** (junction field-effect transistor) uses a reverse biased p–n junction to separate the gate from the body.
- The **MOSFET** (metal–oxide–semiconductor field-effect transistor) utilizes an insulator (typically  $\text{SiO}_2$ ) between the gate and the body.

#### Operation of fet:-

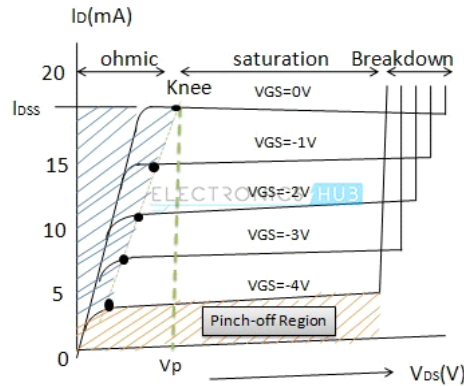
With no external Gate voltage ( $V_G = 0$ ), and a small voltage ( $V_{DS}$ ) applied between the Drain and the Source, maximum saturation current ( $I_{DSS}$ ) will flow through the channel from the Drain to the Source restricted only by the small depletion region around the junctions.

If a small negative voltage ( $-V_{GS}$ ) is now applied to the Gate the size of the depletion region begins to increase reducing the overall effective area of the channel and thus reducing the current flowing through it, a sort of “squeezing” effect takes place. So by applying a reverse bias voltage increases the width of the depletion region which in turn reduces the conduction of the channel.

Since the PN-junction is reverse biased, little current will flow into the gate connection. As the Gate voltage ( $-V_{GS}$ ) is made more negative, the width of the channel decreases until no more current flows between the Drain and the Source and the FET is said to be “pinched-off” (similar to the cut-off region for a BJT).

It is essential that the Gate voltage is never positive since if it is all the channel current will flow to the Gate and not to the Source, the result is damage to the JFET.

The characteristics curves example shown above shows the four different regions of operation for a JFET and these are given as:

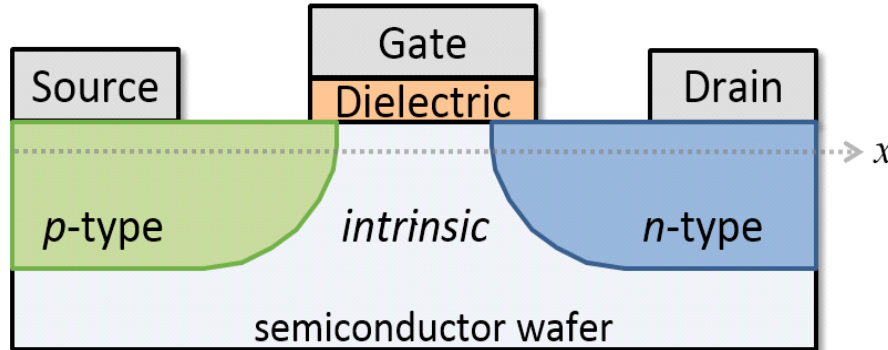


**Fig2:- V-I characteristics of FET**

- **Ohmic Region** – When  $V_{GS} = 0$  the depletion layer of the channel is very small and the JFET acts like a voltage controlled resistor.
- **Cut-off Region** – This is also known as the pinch-off region where the Gate voltage,  $V_{GS}$  is sufficient to cause the JFET to act as an open circuit as the channel resistance is at maximum.
- **Saturation or Active Region** – The JFET becomes a good conductor and is controlled by the Gate-Source voltage, ( $V_{GS}$ ) while the Drain-Source voltage, ( $V_{DS}$ ) has little or no effect.
- **Breakdown Region** – The voltage between the Drain and the Source, ( $V_{DS}$ ) is high enough to cause the JFET's resistive channel to break down and pass uncontrolled maximum current.

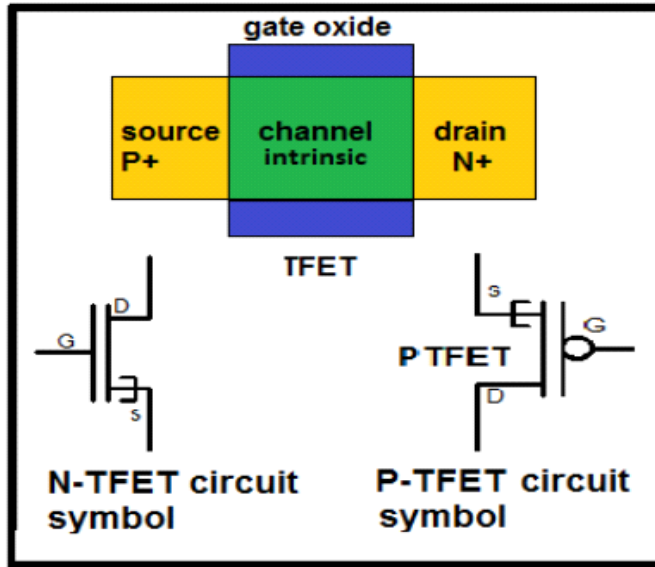
**Structure of tfet:**

The basic TFET structure is similar to a MOSFET except that the source and drain terminals of a TFET are doped of opposite type (see figure).



**Fig3: TFET Structure**

**Symbol of TFET:**



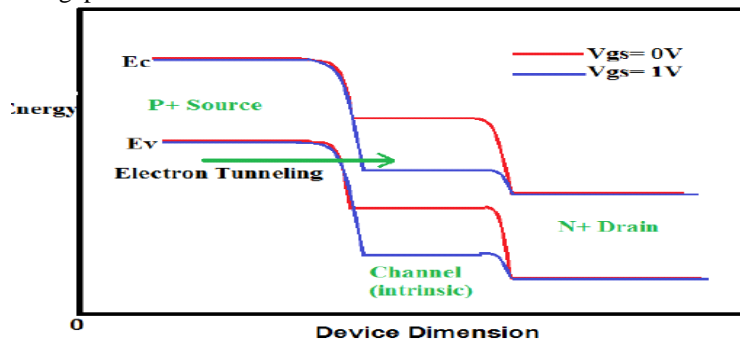
**Fig4: Symbol of N-TFET and P-TFET**

**Device operation:-**

The device is operated by applying gate bias so that electron accumulation occurs in the intrinsic region. At sufficient gate bias, band-to-band tunneling (BTBT) occurs when the Conduction band of the intrinsic region aligns with the valence band of the P region. Electrons from the valence band of the p-type region tunnel into the conduction band of the intrinsic region and current can flow across the device. As the gate bias is reduced, the bands become misaligned and current can no longer flow.

**5.1 BAND-TO BAND TUNNELING:-**

Tunneling is a quantum mechanical process where electrons move through potential energy barriers. Band-to-band tunneling is the effect when electrons travel from the valence band to the conduction band (or vice versa) through the forbidden energy band gap.



**Fig5: Energy band diagram showing band to band tunneling**

**Types of tfet's:-**

Below device structures of Silicon based double gate N-channel TFET and P-channel TFET with a body thickness of 7 nm. This are called P+- I - N+ structure. The dielectric medium for the gate can be SiO<sub>2</sub> (relative permittivity, =  $\epsilon_r = 3.9$ ) or HfO<sub>2</sub> (Hafnium Oxide) ( $\epsilon_r = 21$ ). The HfO<sub>2</sub> dielectric used in this case has a thickness of 1 nm and the channel length of the device is 30 nm for both the structures. The source and drain are heavily doped regions with channel being intrinsic. The N-type TFET consist of a source region which is P+ and has a boron doping

concentration of  $1 \times 10^{20} \text{cm}^{-3}$ . The N+ drain region has a phosphorus doping concentration of  $1 \times 10^{20} \text{cm}^{-3}$ . Similarly, the p-type TFET consists of N+ source region doped with phosphorus doping concentration of  $1 \times 10^{20} \text{cm}^{-3}$ . Its P+ drain region has a boron doping concentration of  $1 \times 10^{20} \text{cm}^{-3}$ .

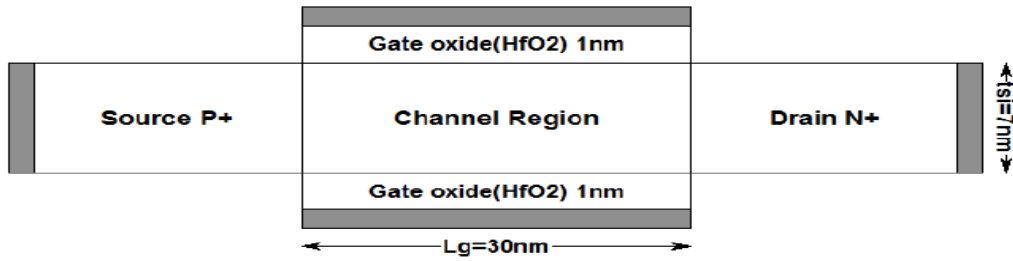


Fig6: Cross sectional view of N-type TFET

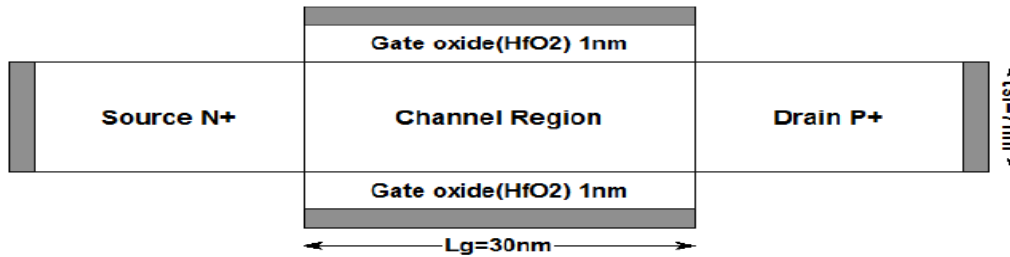


Fig7: Cross sectional view of P-type TFET

**CONSTRUCTION OF QMGAASA TUNNEL FET:-**

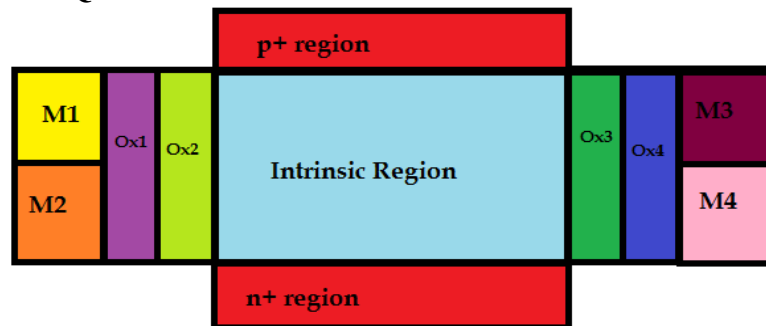


Fig 8: QMGAASA TUNNEL FET

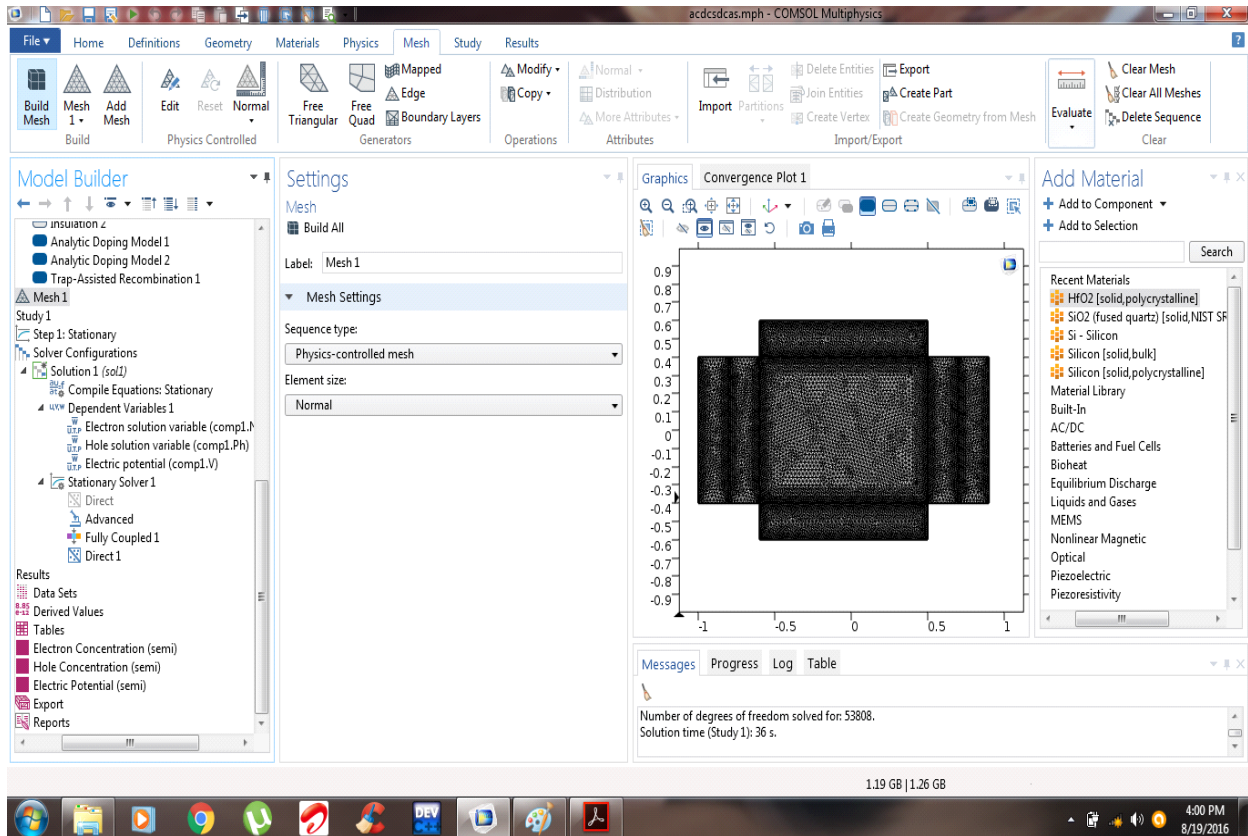
TFETs are chosen to be the potential candidate because of its immunity against the SCEs, low leakage current and CMOS compatible technology. Various device structures such as Double Gate, Pi Gate, Triple Gate, Omega Gate, Surrounding Gate, Gate Stack structures have been proposed to overcome the scaling limitations and to increase the device performance. Among these structures Surrounding Gate offers higher packing density, steep sub threshold characteristics and higher current drive.

Quad Material Gate Architecture has also been investigated as one of the possible solution for reducing short channel effects. In this design four different metal gate electrodes are used having different work functions. Due to this work function difference carrier transport efficiency is increased thereby suppressing the short channel effects. Steady downscaling of device dimensions leads to reduction in voltage level as well as the gate oxide thickness. This causes an increase in static power consumption, which can hamper the circuit operation. In order to overcome the above limitations intensive stress has been made for the use of four gate oxides among which two have high K dielectric value and the other two oxides have comparatively less dielectric value namely SiO<sub>2</sub>, HfO<sub>2</sub>, TiO<sub>2</sub>, ZrO<sub>2</sub> to prevent direct tunneling leakage current. As we are using two high K dielectrics and two normal dielectric oxides the device is cost efficient. This new structure is called as Gate Stack Architecture.

In order to incorporate the advantages of Surrounding Gate (SG), Quad Material Gate (QMG), Gate Stack Architecture (GSA) and Tunnel Field Effect Transistor (TFET), novel device architecture has been proposed known as Quad Material Gate All around Stack Architecture - Tunnel Field Effect Transistor (QMGAASA- TFET). In this work, a 2-dimensional analytical model is presented to examine the impact of the structure on various device characteristics.

## RESULTS AND DISCUSSION:-

In the below mesh plot gives the 3-D view of the device. It shows how the device will look after it is designed.



**Fig9:-** plot showing mesh for QMGAASA of TFET

The below plot shows how the electrons are distributed across the device. Different colors represent different levels of electron concentration distribution across the device

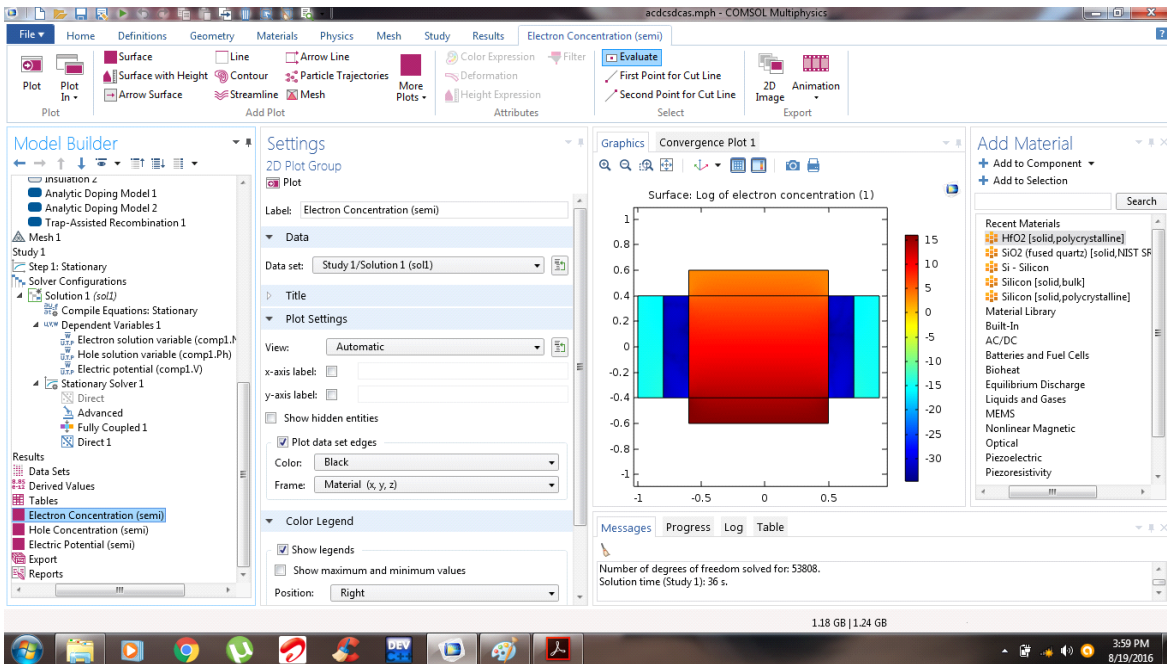


Fig 10:- Plot showing electron concentration of QMGAASA of TFET

The below plot shows how the holes are distributed across the device. Different colors represent different levels of hole concentration

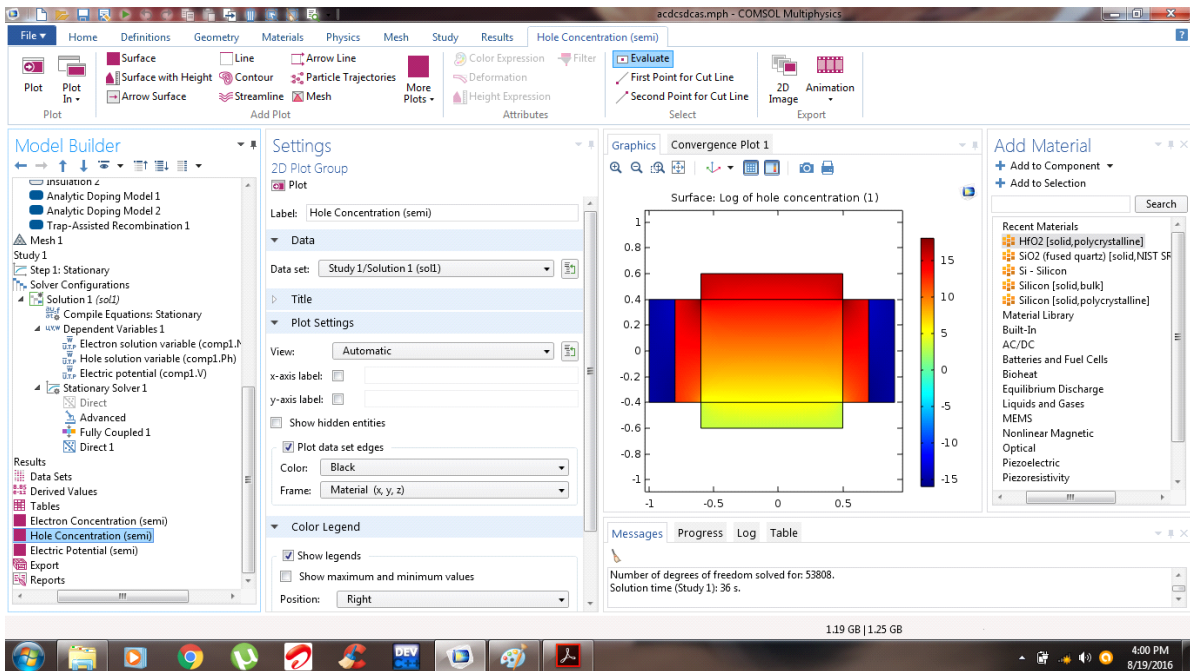


Fig11: - Plot showing hole concentration of QMGAASA of TFET

## Final result

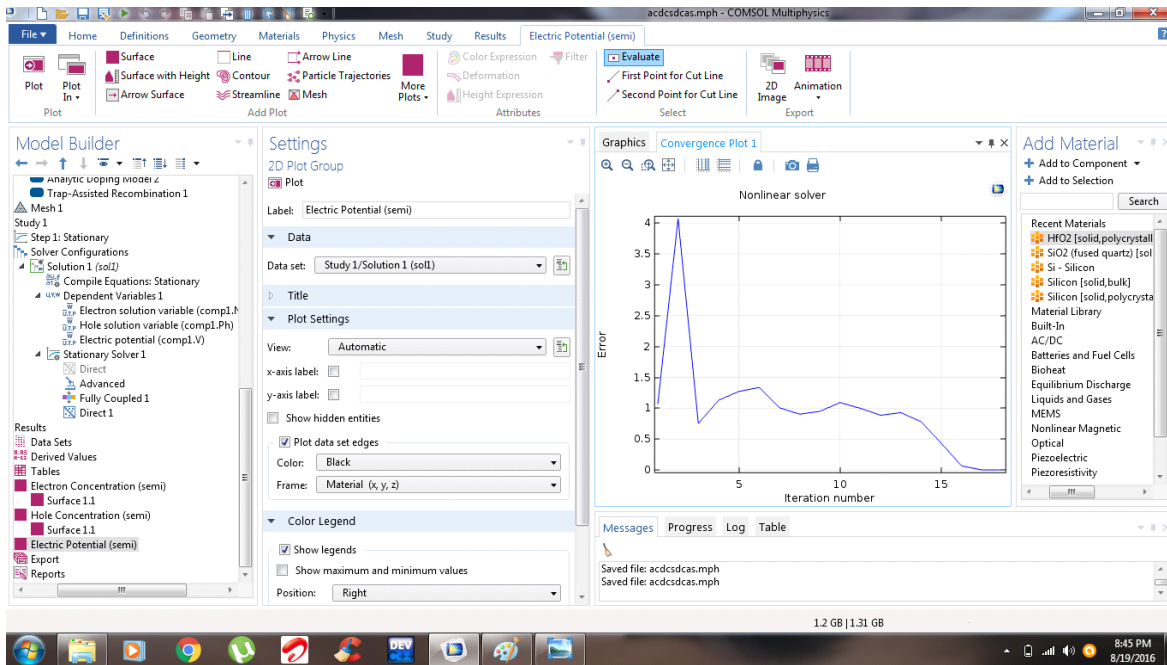


Fig 12. Plot showing electric potential of QMGAASA of TFET

## CONCLUSION:-

TFETs are used in digital circuit implementation due to their low sub-threshold loss and low voltage operation. It was observed that TFETs have steep sub-threshold swing ( $< 60$  mV/decade) compared to MOSFETs which is the primary reason behind low sub-threshold power loss. The reason behind the steeper sub-threshold slope is band-to-band tunneling transmission. However, TFETs have a higher gate to drain capacitance compared to a MOSFET. For a 30 nm N type TFET it was observed that the  $C_{gde}$  equals 3.2 fF compared to a MOSFET which has 0.15 fF in saturation region. This results in higher overshoots during dynamic operation of gates.

A TFET based 6T-SRAM was implemented and verified using Cadence. The read and write operation was observed to be satisfactory.

Thus it has been demonstrated that incorporation of Quad Material Gate All Around electrode design along with Gate Stack Architecture leads to an improvement in short channel immunity and hot carrier reliability thereby ensuring better carrier transport efficiency which results in better performance.

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### RESEARCH ARTICLE

## INVESTIGATION OF USAGE OF PHOTOVOLTAIC SOLAR CELL FOR POWER GENERATION WITH ENVIRONMENTAL IMPACTS.

Dr. E. N. Ganesh.

### Manuscript Info

#### Manuscript History

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#### Key words:-

Life Cycle Assessment, Multicrystalline silicon modules, CdTe technology, Energy analysis, Resource depletion, Module decommissioning, Emissions to the environment, Health and safety risks.

### Abstract

In this paper the authors have shown the other aspect of photovoltaic cells. A burning issue in the energy sector is to find out the appropriate alternative resource of power generation, due to the rising rate of consumption and price of fossil fuels and the environmental problems caused by the conventional power generation methods, among all the available alternatives non-conventional resources, photovoltaic cell can be considered the most essential and sustainable source for power generation. But this paper discusses about the comparative picture between the utilization of photovoltaic cells and the production of photovoltaic cells related with the environmental aspects.

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### Introduction:-

It is widely recognized that photovoltaic solar energy conversion has the potential to become a major energy source in the next century. Although photovoltaic solar energy (PV) is clearly a renewable energy source, the question whether it is also a "sustainable technology" needs more careful consideration. The potential environmental risks and the energy requirements of (the components of) a PV system should be investigated over its entire life-cycle in order to answer this question. If such analyses are made before large-scale implementation of the technology has started, potential bottlenecks can be identified so that R&D priorities can be set accordingly to reduce or eliminate the bottlenecks beforehand. As a result of such an environmental assessment it might be decided for instance to start investigations on alternatives with regard to cell materials, production technologies or module encapsulation techniques. To conduct a series of studies on potential environmental and safety risks for a number of solar cell technologies. The objective of the studies is to identify potential bottlenecks for each technology and to formulate ensuing recommendations with regard to the photovoltaic policy. In the study the potential environmental effects of PV modules are investigated for their entire life-cycle that is from raw material mining through module production and utilization to module decommissioning and, possibly, recycling. It was agreed that four different types of solar cells would be investigated in these studies, namely:

- 1) **Multicrystalline silicon** cells (mc-Si; also called semi-or polycrystalline silicon);
- 2) **Amorphous silicon** cells (a-Si);
- 3) **Cadmium telluride** cells (CdTe);
- 4) **Copper indium selenide** cells (CuInSe<sub>2</sub>; also shortened to CIS);

The studies concerning the above-mentioned cell technologies are discussed in three separate headings. In this report we will present a summary of the method of approach and the obtained results for all four cell types. It should be noted, however, that the methodology and the scope of the analyses has developed in the course of the discussion..

In our own studies which form the basis for this summary report we have tried to integrate results in the framework of the Life Cycle Assessment (LCA) methodology and to extend the scope towards future technologies which seem probable for large-scale module production. In order to understand the sensitivity of the results with respect to possible future developments, we will draw up three different sets of assumptions concerning the future status of the technology for each cell type. These sets of assumptions will be called A,B and C case technology. In this paper the B case represents the most probable technological status at the time of large-scale deployment. The A case reflects the status of present-day commercial production technology. Finally, the C case represents an more optimistic view on future technology. As already indicated, this discussion will be limited to a life-cycle assessment of solar cell modules. In this paper we will first introduce briefly the method of environmental Life Cycle Assessment and further define the goal and scope of our assessment study. Subsequently, we will discuss the most important assumptions concerning module and cell characteristics, production methods, etc. Next, some results are presented, among which the expected emissions to the environment and the energy requirements. Finally we will draw some conclusions concerning potential environmental bottlenecks of PV modules.

#### **Life Cycle Assessment:-**

##### **LCA goal:**

In this study we want to investigate the environmental bottle-necks which might arise when PV modules are deployed on a large scale for energy supply. A consequence of this objective is that production levels of the order of GWp's per year should be considered rather the current MWp production level. As a reference one can keep in mind that a yearly solar cell production of more than 10 GWp/yr will be required to sustain a PV capacity that can contribute 5% to current electricity supply.

##### **LCA Method:-**

In the Analysis we made use of the method of environmental Life Cycle Assessment (LCA), a methodological framework for the analysis of environmental aspects of product life-cycles, which has evolved over the past few years. In such a LCA the material and energy flows for the entire life cycle of a certain product are surveyed and analyzed with special attention to possible environmental hazards. For this purpose the product life cycle is divided into a number of processes, each of which is described by the typical product input and output flow, secondary material inputs, energy input, process yield, water and air emissions, solid waste production and the output of reusable (secondary) materials. By chaining a number of relevant processes into a product life cycle and accounting all material flows through these processes it becomes possible to assess the total impact on the environment and on energy and raw material resources for the entire product life cycle. One consequence of our study objective is that we will have to make projections about the technological status of future production processes. Because this necessarily involves major uncertainties we will distinguish three cases: the A case reflecting the status of present-day commercial production technology, the B case representing the most probable technological status at the time of large-scale deployment, and finally the C case representing an optimistic view on technology development. For the B case technology we assume implementation within the next 10 years, while the time frame for the (possible) realization of C case technology is 15 years. Regarding our assessment method it should further be noted that in a full Life Cycle Assessment a certain procedure is followed involving a number of steps, such as: definition of LCA goal and scope, drawing up of the inventory table of environmental interventions and classification and evaluation of these interventions. For the purpose of this study where we consider future production technologies not all of the prescribed LCA steps are relevant or practicable, because of lack of data etc. For these reasons our studies cannot claim to be "full" LCA studies, in which the majority of the material flows is inventoried and the environmental impacts are evaluated. For example in our first study on CdTe and CIS modules, we restricted the material flow analysis to the elements Cd, Te, Se, and In and did not consider any auxiliary material usage. The main reason for this was the lack of detailed information on (future) production processes for these module types. Also at that time the methodological framework for Life Cycle Assessments had not yet been fully developed so that the terminology and reporting format in our study deviates from the standards which later evolved for LCA studies. In the amorphous silicon study and the multicrystalline silicon study we had access to more detailed data on production technology which allowed us to take into account most material flows. Also we adhered more closely to the "standards" regarding LCA terminology and study set-up. Still, we decided not to perform an analysis of environmental impacts after our investigation of material flows, because: 1) there are insufficient data to allow a reliable impact evaluation for all emitted substances and 2) emission estimates for the future technology cases (B and C case) are often too uncertain to make reliable impact evaluations for these cases.

### LCA scope and the functional unit:-

The scope of our material flow analysis is restricted to *direct* material inputs only, which means that the production of for example glass or aluminium is outside our *system boundary* and is not considered in our analysis. The scope for the analysis of energy requirements, however, is broader and includes also the energy use for the production of glass and aluminium and for the production of capital equipment. In the energy analysis auxiliary materials which are used in relatively small quantities (e.g. solvents, etchants, hydrogen, argon) were not taken into account, mainly because energy data are unavailable for most of these products. Figures 2.1 and 2.2 illustrate the definition of the system boundaries for the materials and energy analyses for the example of mc-Si technology. The scope definition given above implies that the non-energy related emissions from the production of aluminium and glass are not accounted for in this study. Such aspects, however, should be investigated in relation to module mounting technology. The functional unit for our Life-Cycle Assessment, that is the unit of end-product to be considered, we have defined as 1 square meter of *cell* area, manufactured in a commercial scale production process. If needed, corresponding values per m module area can be derived by applying the cell/module area ratio. The photovoltaic efficiency will refer to the total area stabilized energy conversion efficiency of the *cell* as it is encapsulated in the module (encapsulated cell efficiency).

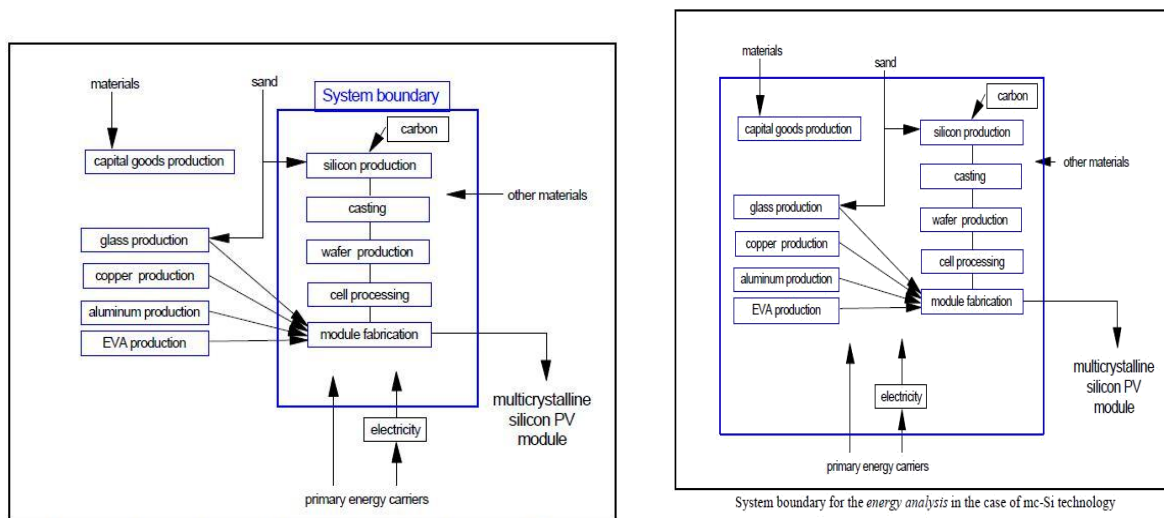


Figure 2.1: System boundary for material flow analysis in the case of mc-Si technology.

System boundary for the energy analysis in the case of mc-Si technology

### Figure 2 System Boundary Flow for Energy Analysis

#### 3 Major assumptions

#### Multi-crystalline silicon modules:-

##### Cell, module and process characteristics:-

Multicrystalline silicon (mc-Si) technology is one of the major technologies for production of solar cell modules and this type of modules presently has a share of some 25% of the PV module market. Present-day mc-Si modules are generally composed of 36-40 interconnected solar cells, where each solar cell consists of a silicon wafer with a surface area of about 10x10 cm and a thickness of 0,2-0,3 mm. Multicrystalline silicon solar cell technology is closely connected to the older *mono* crystalline solar cell technology (which is still the most important technology with a 60% market share). The main difference between multi-and monocrystalline silicon solar cell manufacturing is found in the crystallization process, while less important differences may be encountered in the solar cell processing itself (e.g. passivation). To a large extent, however, the material flows and emissions found in multicrystalline silicon technology will also be found in mono crystalline silicon technology. Therefore the results of our study on multicrystalline silicon will probably also give an fair indication of the environmental aspects of monocrystalline silicon technology. In our study we assume the encapsulated cell efficiency for mc-Si to improve from A to B and C case from 13% to 16% and 18% respectively, a development which is to be achieved by introducing new technologies and solar cell features. In tables 3.1 and 3.2 an over view is given of the most important differences between the cases. The life cycle of a multicrystalline silicon PV module starts with the mining and refining of silica (quartz). Silica is reduced with carbon and the reduction step is either followed or preceded by a purification step. For the A and B case we depart from the process developed by Union Carbide Corp.

in which SiCl<sub>4</sub> is hydrogenated and subsequently distilled to semiconductor grade (sg) silane. This silane can then be converted to solid polycrystalline silicon, or it can be used as source gas for amorphous silicon solar cell production. Subsequently the high purity polycrystalline silicon is melted and cast into large blocks of multi-(or semi-)crystalline silicon. The blocks are portioned into ingots, which are subsequently sliced into wafers. The wafers are processed into solar cells by etching, texturing, formation of the emitter layer, application of back surface layer and contacts, passivation and deposition of the antireflective coating. Finally the solar cells are tested, interconnected and subsequently encapsulated and framed into modules. The application of a back surface layer and the passivation step are omitted in the C case. The general trend in the expected future developments is towards improved energy and material efficiency. This can be seen in higher process yields for high purity silicon production, casting, portioning and material production, in the usage of thinner wafers, in lowering of the metal coverage factor in contact formation, in the reduction of contouring and wafering losses and in the reduction of process energy requirements. The most influential differences regarding energy and material requirements are the usage of thinner and larger wafers and reducing portioning and wafering losses in B and C case, and the development of a production process for solar grade silicon in the C case.

**Table 3.1:-** Cell and module characteristics for multicrystalline silicon technology

	<b>A case</b>	<b>B case</b>	<b>C case</b>
Cell efficiency <sup>1</sup> (%)	13	16	18
Wafer size(cm <sup>2</sup> )	10x10	12.5x12.5	15x15
Wafer thickness (μm)	300	200	150
Cells/module	36	36	40
Module size(m <sup>2</sup> )	0.44	0.65	1.00
Cell/module area ratio	0.82	0.87	0.90
Module efficiency <sup>2</sup> (%)	10.6	13.8	16.2
Module structure:			
-glass (mm)	3	3	3
-EVA <sup>3</sup> (mm)	2x0.5	2x0.5	2x0.25
-Tedlar/Al/Tedlar(μm)	125	125	125
Module life time (yr)	15	25	30

- 1) Efficiency is for the cell as en-encapsulated and interconnected in the module.
- 2) derived values;
- 3) EVA = Ethyl Vinyl Acetate;

**Table 3.2:-** Major process characteristics for mc-Si module production.

	<b>A case</b>	<b>B case</b>	<b>C case</b>
sg-Si production	UCC <sup>1</sup> - process	UCC <sup>1</sup> - process	reduction of hp-SiO <sub>2</sub>
casting	conventional	advanced conventional	electro-magnetic
Wafering loss (μm)	300	200	150
Back metal coverage (%)	100	100	10
Front metal coverage (%)	10	7	6
Solar cell process yield <sup>2</sup>	95%	95%	95%

- 1) process developed by Union Carbide Corporation to produce solar grade silane/silicon for cell processing only, not for Si production and wafering.

#### Module Use:-

Negligible material inputs and/or emissions are expected during the utilization phase of the module (only from occasional washing). Significant emissions due to fires are not expected from mc-Si modules. In this phase the

module will produce electrical energy, the amount of which depends on module efficiency and location. Module lifetimes of resp. 15, 25 and 30 years are assumed for the three cases.

**Module decommissioning:-**

At the end of the module lifetime the PV system will be decommissioned and the resulting waste will have to be disposed in a responsible way. Options for recycling of the silicon wafer have been investigated but are at this moment not commercially available. Because there is hardly any data available on the technology of mc-Si module recycling I did not consider this in our study.

**Amorphous silicon modules:-**

**Cell, module and process characteristics:-**

Amorphous silicon (a-Si) solar cell technology is very different from crystalline silicon cell technology, in that the amorphous silicon cell consist of a very thin layer of amorphous (i.e. non-crystalline) material. The low requirement of cell material and the possibility of large-area cell manufacturing processes, makes a-Si technology a potential candidate for production of low-cost modules. Furthermore with a-Si there is the possibility of cell stacking, an approach in which two or three different a-Si solar cells are stacked into a tandem or triple structure. And which may ultimately lead to a higher conversion efficiency. Mainly because of their relatively low efficiency a-Si modules have only a modest market share of about 14% at present. Our A case and B case definitions for the amorphous silicon technology are both Based on a tandem cell structure, be it with differing i-layer thicknesses (see table 3.3). For the C case I assume a triple-junction structure Based on a-SiC/ a-Si/ a-SiGe. The a-Si layers are deposited on a glass substrate by way of the Plasma Enhanced Chemical Vapour Deposition with a material utilization rate which increases from 15 to 70% (table 3.4). In all three cases the front-side contact layer consists of tin oxide doped with fluorine and deposited by CVD, while the back-contact consists of a sputtered or evaporated aluminium layer. The silane source gas for a-Si deposition is produced by the same process from Union Carbide Corp. which was assumed for the mc-Si technology. Module encapsulation is changed from two glass sheets for the A and B case (2 x 3 mm resp. 2 x 2 mm), to one 2 mm glass sheet with a sprayed-on back-side foil in the C case. Module use Considerations for the module utilization phase are similar as for mc-Si.

**Module decommissioning**

After decommissioning the a-Si module can be disposed as solid waste without problems as all module components (including metals) are inert or relatively harmless. Recycling of the glass or reuse of the glass sheet plus SnO<sub>2</sub>-layer is possible in principle. However, to maintain comparability with other considered module types I have not considered the effects of these recycling options.

**Major process characteristics for a-Si module Table 3.3**

	A case	B case	C case
Silane production	UCC <sup>1</sup> -	Ucc <sup>1</sup> -	UCC <sup>1</sup> -
	Process	process	process
Silane utilization	0.15	0.40	0.70
SnO <sub>2</sub> utilization	0.25	0.40	0.85
Al utilization	0.30	0.50	0.70
Solar cell process yield <sup>2</sup>	0.90	0.94	0.98
<b>Cell characteristics for CdTe technology</b>			
<b>Table 3.4</b>			
	A case	B case	C case
Cds layer (µm)	0.2	0.15	0.1
CdTe layer (µm)	4	2	1
Cell efficiency(%)	10 <sup>1</sup>	15	18

**Table 3.5:- Cell characteristics for CIS technology**

	A case	B case	C case
Cds layer ( $\mu\text{m}$ )	0.1	0.05	0.02
CdTe layer ( $\mu\text{m}$ )	4	2	1
Cell efficiency(%)	$10^1$	15	18

**CdTe and CIS modules:-****Cell, module and process characteristics**

Cadmium telluride (CdTe) and copper indium selenide ( $\text{CuInSe}_2$ ; also: CIS) solar cells are two other representatives of thin-film solar cell technology, which is characterized by the use very thin layers of cell material ( $<50 \mu\text{m}$ ). For CdTe and CIS modules also good prospects exist for low-cost production processes and for efficiency enhancement by way of cell stacking. Production technology for CdTe and CIS solar cells is much less established than for mc-Si and a-Si. CdTe modules are produced only on a small scale while CIS cells have up to now not been produced on commercial basis. Specific data about production technology are therefore scarce. For this reason I have limited our investigation of CdTe and CIS technology to assessment of the material flows for Cd, Te, In, and Se and to an analysis of the energy requirements. Table 3.4, 3.5 and 3.7 summarize the main cell and module characteristics that we have assumed for CdTe respectively CIS modules. Note that, in deviation of the assumption for a-Si modules, and in deviation of our original study, I have maintained the back glass cover for the C case CdTe/CIS module. Reason for this is that lower emissions of heavy metals, especially in fires and in waste dump sites are expected from modules with a back glass cover.

**Table 3.7:- Module characteristics for CdTe and CIS technology.**

		A case	B case	C case
Module structure:				
-front glass (mm)		3	2	2
-EVA (mm)		0.5	0.5	0.5
-back glass (mm)		3	2	$2^1$
Module size ( $\text{m}^2$ )		1	1	1
Cell/module	area	0.94	0.94	0.94
ratio				
Module		9.4	14.1	16.9
efficiency(%)				
Module life time (yr)		$15^3$	$25^3$	30

Regarding the production technology I assume for deposition of the CdS and CdTe layers in the CdTe cell that the electrode position process will be employed, with material utilization factors of 90 to 99% (table 3.8). For the CIS cell first the CdS layer is sputtered, while the CIS layer is prepared by physical vapor deposition of copper and indium followed by selenization (reaction with  $\text{H}_2\text{Se}$  gas).

**Table 3.8:- Major production process characteristics for CdTe and CIS technology.**

		A case	B case	C case
CdTe cell	material	0.90	0.95	0.99
	utilization			
	(Cd,Te)			
CIS cell	material	0.60	0.70	0.80
	utilization			
	(Cd,In,Se)			
Process yield	1	0.60	0.70	0.80
Cd emission to air ( $\text{mg}/\text{kg}$ ) <sup>2</sup>		500	100	50
Se,Te, In emission to air ( $\text{mg}/\text{kg}$ ) <sup>2</sup>		5000	1000	500

**Note: 1) cell/module production only 2) emission in mg per kg:-**

The environmental impacts from the mining of Cd, In, Se and Te, materials which are all produced as a by-product of zinc or copper mining, have been calculated as a fraction the total impact of the mining process. Based on the economic value of by-product and main product these fractions were set at respectively 2.5%, 0.2%, 0.2% and 0.36%. The B case emission rates for Cd were based on emission data of a cadmium production facility in The India. Because emission control for Se, Te and In will probably be less strict I have assumed emission rates for these substances to be a factor 10 higher.

**Module use**

During use of the modules there is a risk that they will be involved in a fire. This is especially the case for modules installed on the roof of a building. Emission of a certain fraction of cell material in CdTe and CIS cells may then occur. Although acute health risks from these emissions are improbable, the overall environmental impacts still need consideration. Therefore an estimate of the fire risks and A to C case assumptions for the emitted fraction have been made (table 3.9). Different other routes for human exposure to Cd, Te or Se during the use of CdTe and CIS modules have also been investigated. but in all cases the risks are found to be small.

**Table 3.9:** Assumptions on emissions from module use and decommissioning for CdTe and CIS technology.

				A case	B case	C case
fraction of cell material released						
during fire1:						
-Cd,Te				0.10	0.75	0.05
-Se				1.00	0.75	0.05
fire risk (yr)				$10^{-4}$	$10^{-4}$	$10^{-4}$
fraction	of	decomm	modules	0.10	0.02	0
entering waste incineration						
fraction of heavy metals emitted				0.0015	0.0015	0.0015
to air from waste incineration <sup>3</sup>						
fraction	of	decomm	modules	0	0.03	0.01
going to household dump site <sup>4</sup>						
fraction of heavy metals emitted				0.001	0.001	0.001
to water from waste dump						

**Module decommissioning**

In view of the heavy metal content of CdTe and CIS modules separate collection of decommissioned modules seems advisable. However, it is probable that a small fraction of the modules will still end up in household waste which may either be incinerated or disposed of at a landfill site. In each case a certain emission of the heavy metals to the environment will result. Relevant assumptions to estimate these emissions are given in table 3.7. Although recycling of CdTe and CIS modules is subject of investigations, there is not sufficient data to consider the effects of a possible recycling process at this time.

**Energy analysis:-****Introduction:-**

In this chapter, we will analyze the Gross Energy Requirement (GER) of the considered solar cell modules. A GER value gives the total amount of primary energy incorporated in a product, as a result of all the production processes necessary to manufacture it, including the heating value of the product (if relevant). The energy required in a specific process step is called the Process Energy Requirement (PER). This PER can be separated into a direct and an indirect part where the first value gives the electrical and fuel energy which is consumed in the production process itself, while the indirect PER represents the "overhead" amount of energy consumption due to for example lighting, heating and ventilation. So cumulation of all PER values for the subsequent steps in a production process and summation with the product's heating value results in the GER value of the product. and our analysis of module GER values I will distinguish the following contributions: the Gross Energy Requirement of the input materials (GER input), the Process Energy Requirements (PER) and the Gross Energy Requirement of the capital goods (GER capital). Energy required for the production of the input materials like glass or EVA is also taken into account. In the B and C cases a 10% resp 20% autonomous reduction on the Process Energy Requirements is assumed for commodities like glass, EVA and aluminium. Although energy requirements will generally be a mix of thermal (fuel) and an electrical energy all results will be presented here in thermal energy units. For the conversion of

thermal energy units (kWh<sub>th</sub>) to electrical energy units (kWh<sub>e</sub>) a factor of resp. 0.39, 0.42 and 0.45 was used, reflecting the expected improvements in average conversion efficiency of the electricity supply. The Energy Pay-Back Time (EPBT) for the different cases will also be presented. This EPBT will be calculated for a PV system under Indian irradiation conditions (1000 kWh/m<sup>2</sup>/yr) and "global average" irradiation (1700 kWh/m<sup>2</sup>/yr). Furthermore I assumed a yearly Performance Ratio (a measure of system performance) of respectively 0.75, 0.80 and 0.85 for the A, B and C case. Appendix A gives an overview of energy production data per m<sup>2</sup> module area in the different cases. Note that energy pay-back times are given for frameless modules only because Balance-of-system components like support structures etc. are not evaluated in our studies and because framing requirements are dependent on the method of installation of the modules.

### Material flow analysis:-

#### Introduction:-

For all four cell types I have analyzed material flows and estimated emissions due to module production. In these analyses I have considered only direct material inputs, so the production of commodities, like aluminum and glass, and capital goods was not taken into account. A comprehensive overview of all material requirements and emissions is impossible in the context of this summary report, therefore I will highlight a few notable aspects per cell type, beginning with the issue of resource depletion. **5.2 Resource depletion** In order to evaluate resource depletion impacts I will estimate the material requirements if 5% of the current world electricity production is supplied by means of one specific type of solar cell modules (B case variant). This would mean that 13 GWp of solar cell modules have to be produced annually. The corresponding material requirements will be compared with current production levels and estimated reserves. As no recycling technologies are currently available for solar cell modules, the effect of recycling of resource materials will not be considered here.

#### mc-Si modules:-

Quartz sand, the primary feedstock material for production mc-Si cells, is very abundant so on this point resource availability will probably never be an issue. One point of concern, however, is the consumption of silver for the contacts. It was estimated that about 50 g of silver is required per m<sup>2</sup> cell area, so that supply of 5% of electricity consumption would require 4 kton of silver per year or 30% of the current silver production (table 5.1). So reduction of silver use in the contacts is of importance. Probably a reduction of silver use will also be pursued for reasons of cost reduction. In fact, the silver requirement in our C case mc-Si modules is only 7% of the B case requirement.

#### CdTe and CIS modules:-

For production of B case CdTe modules about 60 ton/ GWp of both Cd and Te is required. In view of current production levels and estimated reserves (table 5.2) the supply of cadmium will not be a bottleneck. The supply of tellurium, however, may become a problem if CdTe modules are to contribute significantly to the world electricity supply. Te is mainly produced as byproduct of copper, and as such the production capacity may be limited to 400 ton maximum. For B case CIS module production about 70 ton of indium and 125 ton of selenium is needed. Current indium production is very small (140 ton/y) and the maximum production capacity as a by-product of zinc winning may be limited to 1000 tons. Also the reserves may be depleted within a few years if CIS modules are to supply 5% of the world electricity production. Selenium supply, on the other hand, will be much less problematic. The resource requirements for the A and C case CdTe and CIS modules can be found by multiplication with a factor 5 resp. 0.35. In view of these resource considerations recycling of the metals in CdTe and CIS modules will become a point of major importance if these module types are to be implemented on a large scale.

**Table 5 :-** Resource material requirements for PV module production.

Cell type	resource material	Requirement for 5% electr. Prod. by PV (kton/y)
mc-Si	Si	120
mc-Si	Ag	4
a-Si	Si	0.3
CdTe	Cd	0.8
CdTe	Te	0.8
CIS	In	0.9



**Emissions to the environment:-****General remarks:-**

For all module types the material balance is dominated by the bulk type materials used for module encapsulation (glass, EVA). Also waste emissions consisting of rejected order commissioned modules form an important contribution (in mass terms). For the thin film type of modules (a-Si, CdTe, CIS) the emission of tin to the water resulting from the TCO deposition process, is a point of attention. With respect to different cases one may remark that, going from A to C case, the general trend for increased material efficiency will mostly lead to decreasing emissions per unit cell area. Furthermore emissions on energy-basis, which are more relevant in comparisons with other energy technologies, will of course benefit from the increasing cell performance.

**mc-Si modules:-**

Environmentally relevant substances which may be released in multicrystalline silicon PV module production are fluorine, chlorine, nitrate, isopropanol, SO<sub>2</sub>, CO<sub>2</sub>, respirable silica particles and solvents. Emissions of (non-energy-related) CO<sub>2</sub> and SO<sub>2</sub> from mc-Si module production are mainly caused by the carbothermic silica reduction process. Standard measures, like the use of low-sulphur fuel and desulphurization of flue gases can may significantly reduce the SO<sub>2</sub> emissions. Most other process emissions seem relatively small and will have little or negligible environmental impact. Possible exceptions are the water-borne Cl- and F-emissions resulting from neutralizing etching and texturing solutions and flue gases. Compared on an energy basis the Cl- and F-emissions for the B case module are estimated to be resp. 89,000 and 1,500 kg/TWh, which is of the order of 20-25% of the equivalent emissions of a coal-fired electricity plant. Some attention may be necessary for emission of solvents or other volatile organic compounds from various process steps, among others from metal paste firing and -possibly - module lamination. These emissions will depend highly on processing conditions and control measures. Also care should be taken to prevent accidental emissions of CF<sub>4</sub>, because this gas has a very high Global Warming Potential. The possibilities for reuse of production waste, e.g. silicon wafers and silicon carbide, should be investigated. The differences between respective cases for mc-Si modules are not remarkable, although emissions will decrease somewhat due to increased material efficiency.

**a-Si modules:-**

Apart from the remarks made above with respect to (thin-film) modules in general there are little or no significant emissions to be expected from a-Si module production, use and decommissioning. The emissions from the silane production process contribute only very little to the total emissions and can be neglected. Regarding the comparative emissions of the three a-Si cases I can conclude that the trends toward improved material utilization and low Ir glass content of the module which may be expected from current R&D efforts, will also contribute to a further reduction of the environmental impacts of a-Si module production. In total, I can say that for the assumed system boundaries and assuming proper emission control measures large-scale production of a-Si modules will not result in any serious environmental emission.

**CdTe and CIS modules:-**

As stated above I have only considered the material flows of the heavy metals contained in CdTe and CIS modules. A first point to note in this respect is that CdTe or CIS modules contain only a relatively small amount of heavy metals, for example B case CdTe modules contain ca. 6 g of cadmium per m<sup>2</sup> module area. By comparison, a single NiCad penlight battery contains 2.5 g of cadmium. If I consider both products as an energy supplier (although NiCads are obviously not a real energy source) then I find that the amount of cadmium contained in the B case CdTe module is about 0.001 g per kWh supplied (0.006 g/kWh for the A case), while the NiCad battery requires about 5 g Cd per kWh supplied. For our assessment of environmental emissions I will focus on the estimated emissions of cadmium resp. selenium to the atmosphere which are summarized in tables 5.2 and 5.3. I can see that in the B case the emissions mainly occur in the resource mining (and refining) and in the module utilization phase. From A to C case the emissions differ by roughly a factor of 10, reflecting the uncertainty regarding emission rates for future technology cases. Emissions of selenium are considerably higher than for cadmium because of less stringent emission control measures. It should be noted that there is some uncertainty in the assumptions underlying the emission estimates for the module utilization and decommissioning phases. Also it is important to note that the risks of cadmium (or selenium) releases to the environment from the utilization and decommissioning phases are very much dependant on the type of encapsulation that is chosen for the module. Experimental tests suggest that releases from modules with a double glass encapsulation are considerably lower than for modules without a glass cover at the backside. Unfortunately CdTe modules which are presently offered on the market often do not have a back glass cover

**Table 5.2:-** Atmospheric cadmium emission from the life cycle of CdTe modules and from coal-fired electricity generation.

		<b>A</b>	<b>B</b>	<b>C</b>
		<b>case</b>	<b>case</b>	<b>case</b>
Mining (mg/m <sup>2</sup> )		11	0.9	0.2
Module production (mg/m <sup>2</sup> )		8	0.4	0.05
Utilization (mg/m <sup>2</sup> )		1.8	1.1	0.5
Decommissioning (mg/m <sup>2</sup> )		1.8	0.2	0.005
Total Emission (mg/m <sup>2</sup> )		22.6	2.6	0.8
Emission per unit	energy	11.8	0.5	0.1
(g/GWh)				
Cd emission from coal plan (g/GWh)				0.6-10
Cd emission from coal gasification plant (g/GWh)				0.06-1
	<b>Table 5.3</b>			
	<b>A--Case</b>	<b>B--Case</b>		<b>C-Case</b>
Mining (mg/m <sup>2</sup> )	260	19		3.6
Module	210	11		1.5
production(mg/m <sup>2</sup> )				
Utilization(mg/m <sup>2</sup> )	25	15		6
Decommissioning	5	0.5		0.07
(mg/m <sup>2</sup> )				
TotalEmission	500	45.5		11.2
(mg/m <sup>2</sup> )				
Emission per unit	260	8.9		1.8
energy				

In order to put these emission estimates into perspective I can compare them with the emissions of cadmium and selenium from coal-fired electricity generation which has been estimated at 0.6-10 g/GWh resp. 70 g/GWh for a modern coal plant in the India. For a plant Based on coal gasification technology, however, emissions are lower, namely 0.06-1g/GWh for Cd and 60 g/GWh for Se. I can therefore conclude that the atmospheric Cd emissions for the B case CdTe module of 0.5 g/GWh (0.9 g/GWh in the India) are lower than those of a modern coal power plant, but may be higher than for a coal gasification power plant. With regard to CIS modules the B case Se emissions to the air are significantly lower than Se emissions both from conventional coal plants and from coal gasification plants. An important point to note in this respect is that coal-fired plants have many more emissions(a.o. SO<sub>2</sub>, NO<sub>x</sub>, Cl, F, B, Cr, Hg, Pb) which are often larger than the Cd or Se emissions. For CdTe or CIS modules, on the other hand, cadmium respectively selenium will be one of the few environmentally relevant emissions. A second way to put the results above into perspective is to compare the estimated emissions with the total emissions of Cd or Se from all existing economic activities. Consider for example situation where 5% of the current Indian electricity production would be generated by B case CdTe or CIS modules. The resulting Cd and Se emissions from this activity. would then be 3.5 kg/yr respectively 60 kg/yr, which is equivalent to 0.2% resp. 0.6% of the current total emissions of Cd and Se in the India. The evaluation whether emissions as estimated above may be acceptable for society or not remains a difficult problem and in the end it is a political choice. However, it seems to us that the results above give no reason for immediate concern, although it would be good if the range of uncertainty could be reduced.

#### **Module decommissioning and recycling options:-**

After their useful lifetime the solar cell system will be dismantled and resulting waste streams will have to treated in a responsible manner. In this section we will consider some issues of module waste management and discuss recycling possibilities.

#### **mc-Si modules:-**

Mc-Si modules consist mainly of glass (78 wt. %), with smaller fractions of EVA (10 wt.%),polyester (7%) and silicon (4 wt. %) all rather harmless materials. However, small amounts of silver (0.4 wt. %) and copper (0.3 wt.%)

for the A case module are also in the module waste in concentrations which are just below the threshold value for "Dangerous Waste" (0.5 wt%) according to Indian environmental regulations. As yet there is no commercial process available for recycling of mc-Si modules. Recycling of the module cover glass should be possible if methods are developed to separate it from the EVA and other module components. Recycling of module glass with adherent EVA will meet some restrictions (see below under a-Si modules). Methods for reclaiming the silicon wafers from a (rejected) module have been investigated, but to our knowledge they are not commercially applied up to now.

#### ***a-Si modules:-***

a-Si modules consist mainly of glass and can therefore be used as feedstock for secondary glass production (glass recycling). Recent experiments have shown that the only restrictions are the modules should mainly be used for production of coloured packing glass and that the fraction of module waste in the total feedstock should remain below 10%. These restrictions, however, would not pose any serious limitations on future a-Si module deployment. Also it has been demonstrated that it is technically possible to re-use a glass substrate (including the TCO layer) after etching off the a-Si and back contact layers from an *anon-encapsulated* module. This approach may be interesting for the reprocessing of rejected modules in a module production plant.

#### ***CdTe/CIS modules:-***

The heavy metal content of CdTe and CIS modules would require them to be treated as "Dangerous Waste" under the existing regulations in India. On the other hand, at least one type of commercially available CdTe modules has been shown to meet the proposed EC regulations for waste disposal in land fill sites. The heavy metal content of CdTe/CIS modules makes them less attractive as feedstock for secondary glass production. One viable option for disposal is to feed the modules into non-ferrous smelters. Although no estimates are available at this time, it would seem that the total volume of module waste which can be disposed of in this way is rather limited, so that it is probably not a long-term solution. If large scale deployment of CdTe or CIS modules is considered then the recovery of the heavy metals from the module waste will probably be required, from the viewpoint of both waste management and resource management. It appears that hydrometallurgical methods offer the prospects for such a metal recovery process, although effective extraction of the metals from an encapsulated module may be problematic. Also the low concentration of metals would probably lead to added cost for the recycling process.

#### **Conclusions:-**

From our analyses we conclude that for the immediate future and within the considered system boundaries there are no reasons for concern regarding the material requirements and emissions of solar cell modules. Only if large scale deployment of modules -with annual production levels of several GW's -becomes probable there are some points which need closer attention, namely:

- \* resource depletion of silver (mc-Si modules);
- \* resource depletion of indium (CIS modules)
- \* waste management and recycling possibilities for decommissioned modules (mc-Si, CdTe, CIS);
- \* cumulative fire-induced emissions from CdTe and CIS modules.

Although there is still a considerable range of uncertainty in our emission estimates the risks from cadmium or selenium use in CdTe respectively CIS modules seem acceptable in comparison with some existing products or services like NiCad batteries or coal-fired electricity production.

#### **6 Health and safety risks:-**

In this topic we will shortly review occupational health and safety risks and external safety risks. Public health risks are not discussed here because they are a consequence of the emissions discussed in the previous chapter. Moreover, the estimation of public health risks from emission data was not part of our study scope because it is a very complex task. We will focus here on risks resulting from module production. One general point of attention for module installation and use are the electrical shock hazards. However, with a proper design of the electrical lay-out so that dc voltages are either kept below 110 V or higher voltages are properly shielded, no serious risks should result.

#### **mc-Si module:-**

No serious health and safety risks are expected for workers involved in mc-Si module production. Exposure to etchants like HF, HNO<sub>3</sub> and HCl and exposure to silane or other hydrides poses a moderate risk, which should be controllable within normal safety procedures. External safety risks seem small for mc-Si module production, only

the storage of silane should be performed with the proper safeguards (see under a-Si below). Silane use is, however, much smaller than for a-Si module production.

#### **a-Si modules:-**

Silane, the primary feedstock gas in a-Si module production, is a highly flammable gas which may ignite spontaneously in air. Because self-ignition does not always occur, large gas clouds may build up which can cause a severe explosion. Proper control measures are therefore necessary to prevent these situations. There is a review on various control measures for storage and handling of hazardous gasses in a-Si module production facilities. However, no detailed risk analysis are known of installations where silane and the other hydrides are handled in the amounts needed for a 10-50 MWp PV production capacity. Therefore, reliable statements on the safety risks of large-scale a-Si production facilities cannot be made with the available data.

#### **CdTe and CIS modules:-**

First of all one should note that CdTe and CIS contain only little toxic material. Moreover the toxicity of *ingested* CdTe appears to be relatively low because of its low solubility. Obviously, the exposure to cadmium of workers in a module production plant should be kept as low as possible. Current practices in such plants have proven to be more than sufficient in this respect, so there appears to be no reason for concern about occupational health risks if proper measures have been taken. Recent studies have furthermore shown that there is negligible risk of dangerous exposure to cadmium from a stock of CdTe modules during a fire. This should also rule out acute health risks due to fires in roof-top PV installations. Regarding selenium the exposure limits for air-borne material are a factor 10 higher than for cadmium compounds so it should be relatively easy to keep occupational Se exposures at acceptable levels. Furthermore the toxicity of elementary selenium appears to be moderate (upto now toxicity data on CuInSe<sub>2</sub> itself are very limited); therefore the main health risk from CIS appears to be exposure to SeO<sub>2</sub> which may be formed at temperatures above 350 C. A major risk factor of CIS module production can be the use of hydrogen selenide, which may be used as a feedstock gas in the CuInSe<sub>2</sub> deposition process. An accidental release of 25 kg (=one typical gas container) of H<sub>2</sub>Se can lead to dangerous exposure levels in an 40 m x 3000 m area. However, there are alternative CIS deposition methods available which do not require the use of H<sub>2</sub>Se.

#### **Conclusions:-**

The only significant risks regarding occupational health and safety and external safety are found in the storage and handling of explosive and/or toxic gasses, i.e. silane in a-Si production and H<sub>2</sub>Se in certain CIS deposition processes. With proper safety measures in place silane risks seem to be well manageable, but still the issue of silane storage at large-scale a-Si module production facilities (>10 MWp/yr) remains a point of attention. Regarding CIS module production it is advisable to avoid deposition methods involving the use of hydrogen selenide gas.

The environmental aspects of four major solar cell technologies have been reviewed with special attention for future expected technology developments. Cell technologies investigated are multicrystalline silicon (mc-Si), amorphous silicon (a-Si), cadmium telluride (CdTe) and CuInSe<sub>2</sub> (CIS). The following aspects are considered: energy requirements and energy pay-back time, material requirements and resource depletion, environmental emissions, waste handling, possibilities for recycling of modules, occupational health and safety and external safety. Although the energy pay-back time of the present-day mc-Si and a-Si modules is relatively high, around 4 to 4.5 years for frameless modules under Indian irradiation conditions, this pay-back time is still considerably shorter than the expected technical lifetime of the module (15-30 years). Moreover, very good prospects exist for reduction of energy requirements by future technology developments, resulting in energy pay-back times below 1.5 years for all module types (under Indian irradiation conditions; below 1 year for global average irradiation). It is remarkable that thin film technologies (a-Si, CdTe, CIS) do not score significantly better (in some cases even worse) as wafer-Based mc-Si technology. This mainly caused by the superior efficiency of mc-Si cells. Note that frames and support structures can add substantially to the energy requirements and may double the energy pay-back time of the total PV system (compared to modules only). Therefore serious attention is necessary for designs of array support structures which have a low energy requirement. From our analyses of the material flows we conclude that for the immediate future (and within the considered system boundaries) there are no reasons for concern regarding the material requirements and emissions of solar cell modules. Only if large scale deployment of modules -with annual production levels of several GW's -becomes probable there are some points which need closer attention, namely:

- \* resource depletion of silver (mc-Si modules);
- \* resource depletion of indium (CIS modules);
- \* waste management and recycling possibilities for decommissioned modules (mc-Si, CdTe, CIS);
- \* cumulative fire-induced emissions from CdTe and CIS modules.

Although there is still a considerable range of uncertainty in our emission estimates the risks from cadmium or selenium use in CdTe respectively CIS modules seem acceptable in comparison with some existing products or services like NiCad batteries or coal-fired electricity production. Regarding occupational health and safety and external safety the only significant risks are found in the storage and handling of explosive and/or toxic gasses, i.e. silane in a-Si production and H<sub>2</sub>Se in a certain CIS deposition process. With proper safety measures in place silane risks seem to be Ill manageable, but use of hydrogen selenide gas should be avoided. Finally, table 7.1 presents a qualitative comparison of these cell types on the aspects mentioned above. we can see that there is not one single cell type that scores good or excellent on all considered aspects, although future a-Si technology, seems to be the most "environmentally friendly" technology, with mc-Si as a good second. CIS and CdTe score less Ill because of problems related to the use of heavy metals, some of which are rather scarce. However, these problems should not be considered as a major bottle-neck for the immediate future. Therefore they should not be used as a reason for ruling out one or more of the considered solar cell technologies from further R&D efforts.

Table 7.1: Qualitative comparison of the investigated solar cell technologies. *Present* respectively *future* indicates the assumed technology status with regard to module production, emission control technology and recycling. Scores for present technology are Based on the A case results described in previous chapters, while scores for future technology are Based on both B case (70%) and C case results (30%). Note that effects of increasing production volumes, leading for example to increasing emissions, are *not* considered between present and future technology.

#### Cell Characteristics for CDTe Technology

	A--Case	B--Case	C-Case
CdS layer(μm)	0.2	0.15	0.1
CdTe layer(μm)	4	2	1
Efficiency(%)	10	15	18
. Cell Characteristics for CIS Technology .			
	A--Case	B--Case	C-Case
CdS layer(μm)	0.1	0.05	0.1
CuInSe <sub>2</sub>	4	2	1
layer(μm)			
Efficiency(%)	10	15	18

All in all we conclude from our investigations that -at least for the immediate future -there are no major bottlenecks from environmental point of view for the considered solar cell technologies. However, during module production substances are used which may be harmful for workers, the public or the environment. Therefore manufacturers should take proper measures to avoid harmful exposures or emissions .Points which deserve further attention both from manufacturers and researchers are: the energy requirements of modules (and module frames and supports), the use of heavy metals, gas safety issues and module recycling possibilities.

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### RESEARCH ARTICLE

#### IOT Based Environment Monitoring using Wireless Sensor Network.

Dr. E. N. Ganesh

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#### Abstract

The Internet of Things (IoT) provides a virtual view, via the Internet Protocol, to a huge variety of real life objects, ranging from a car, to a teacup, to a building, to trees in a forest. Its appeal is the ubiquitous generalized access to the status and location of any “thing” we may be interested in. The Internet of Things (IoT) is the network of physical objects, devices, vehicles, buildings and other items which are embedded with electronics, software, sensors, and network connectivity, which enables these objects to collect and exchange data. WSNs are integrated into the “Internet of Things”, where sensor nodes join the Internet dynamically, and use it to collaborate and accomplish their tasks. Wireless sensor networks (WSN) are well suited for long-term environmental data acquisition for IoT representation. This paper presents the functional design and implementation of a complete WSN platform that can be used for a range of long-term environmental monitoring IoT applications.

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#### Introduction:-

The future Internet, designed as an —Internet of Things| is foreseen to be —a world-wide network of interconnected objects uniquely addressable, based on standard communication protocols| [1]. Identified by a unique address, any object including computers, sensors, RFID tags or mobile phones will be able to dynamically join the network, collaborate and cooperate efficiently to achieve different tasks. . Including WSNs in such a scenario will open new perspectives. Covering a wide application field, WSNs can play an important role by collecting surrounding context and environment information. Key enablers for the IoT paradigm are : RFID and WSN. RFID is well known and established for low-cost identification and tracking. WSNs bring IoT applications richer capabilities for both sensing and actuation. In fact, WSN solutions already cover a very broad range of applications, and research and technology advances continuously expand their application field. However, the sheer diversity of WSN applications makes increasingly difficult to define —typicall requirements for their use in IoT applications [2]. The generic WSN platforms can be used with good results in a broad class of IoT environmental monitoring applications. However, many IoT applications (e.g., those in open nature) may have stringent requirements, such as very low cost, large number of nodes, long unattended service time, ease of deployment, low maintenance, which make these generic WSN platforms less suited.

#### Related Work:-

WSN environmental monitoring includes both indoor and outdoor applications. The later can fall in the city deployment category (e.g., for traffic, lighting, or pollution monitoring) or the open nature category (e.g., chemical hazard, earth-quake and flooding detection, volcano and habitat monitoring, weather forecasting, precision agriculture). The reliability of any outdoor deployment can be challenged by extreme climatic conditions, but for the

open nature the maintenance can be also very difficult and costly. Recent advances in wireless communications and electronics have enabled the development of low-cost, low-power, multi-functional sensor nodes that are small in size and communicate undeterred in short distances. These tiny and generally simple sensor nodes consist of sensing units, data processing, and communicating components [3], [4], [5]. A large number of such nodes deployed over large areas can collaborate with each other.

To be cost-effective, the sensor nodes often operate on very restricted energy reserves. Premature energy depletion can severely limit the network service [4]– [7] and needs to be addressed considering the IoT application requirements for cost, deployment, maintenance, and service availability. Open nature deployments [8]–[12] and communication protocol developments and experiments show that WSN optimization for reliable operation is time-consuming and costly. It hardly satisfies the IoT applications requirements for long-term, low-cost and reliable service, unless reusable hardware and software platforms [13] are available, including flexible Internet-enabled servers to collect and process the field data for IoT applications. This paper contributions of interest for researchers in the WSN field can be summarized as: 1) detailed specifications for a demanding WSN application for long-term environmental monitoring that can be used to analyze the optimality of novel WSN solutions, 2) specifications, design considerations, and experimental results for platform components that suit the typical IoT application requirements of low cost, high reliability, and long service time, 3) specifications and design considerations for platform re-usability for a wide range of distributed event-based environmental monitoring applications, and 4) a fast and configuration-free field deployment procedure suitable for large scale IoT application deployments.

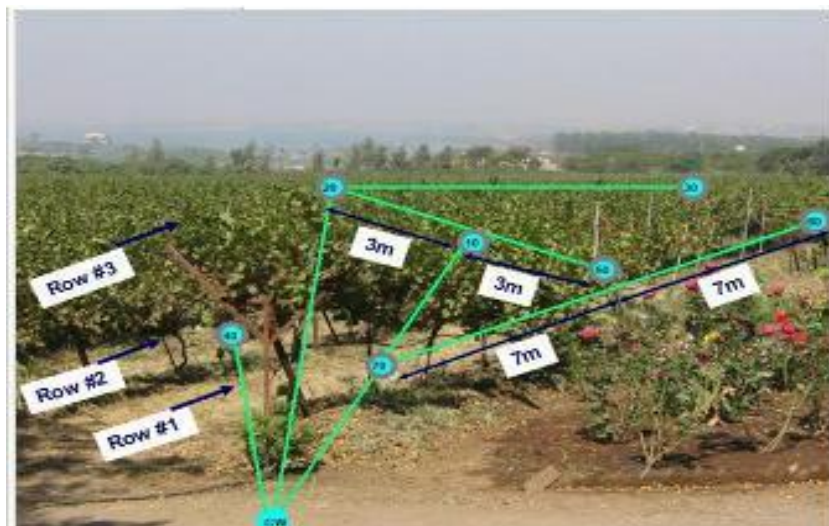


Figure 1. WSN application in Agriculture

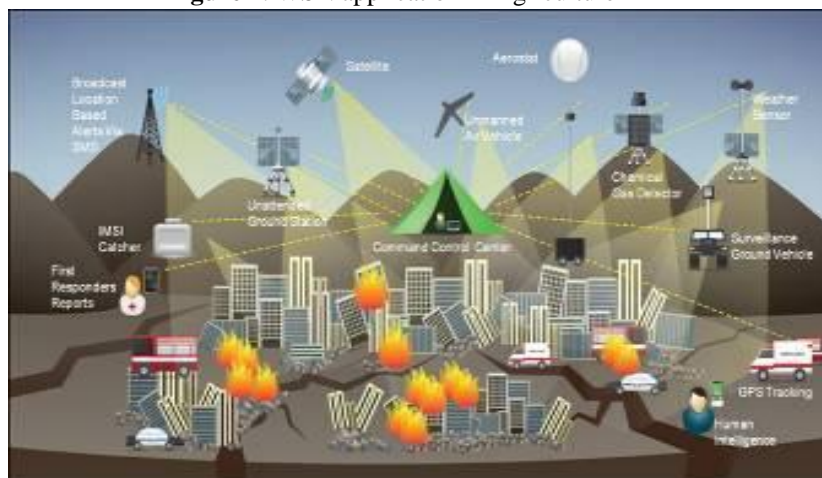


Figure 2. WSN application in Surveillance System

Wsn Applications:-



The wide wireless sensor network application field can be divided into three main categories according to [3]: Monitoring space, monitoring objects and monitoring interactions between objects and space. Example for first Category is Environment monitoring. WSNs are deployed in particular environments including glaciers, forests, and mountains in order to gather environmental parameters during long periods. Temperature, moisture or light sensor readings allow analyzing environmental phenomena, such as the influence of climate change on rock fall in permafrost areas [14].

Structural monitoring is one of the possible illustrations of second category. By sensing modes of vibration, acoustic emissions and responses to stimuli, mechanical modifications of bridges or buildings indicating potential breakages of the structure may be detected. Monitoring interaction between objects and space is the combination of both previous categories and includes monitoring environmental threats like floods and volcanic activities [15]. By extending application area of WSN, we can apply WSN to medical field for health monitoring. Figure 1 - 4 shows various application areas for WSN, such as agriculture, military, medical field, surveillance using fire detection, etc.

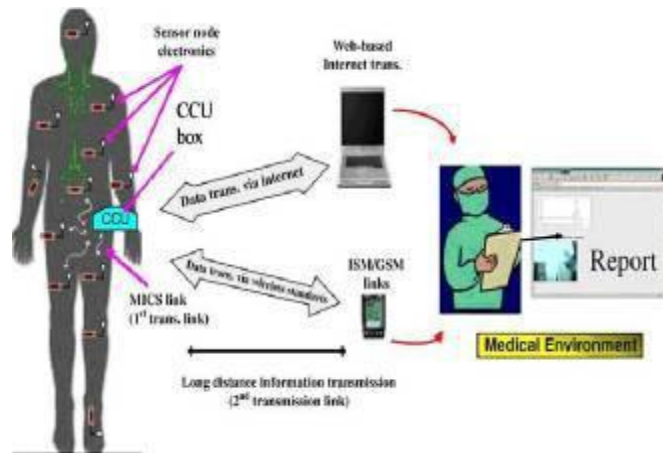


Figure 3 WSN in Medical Field

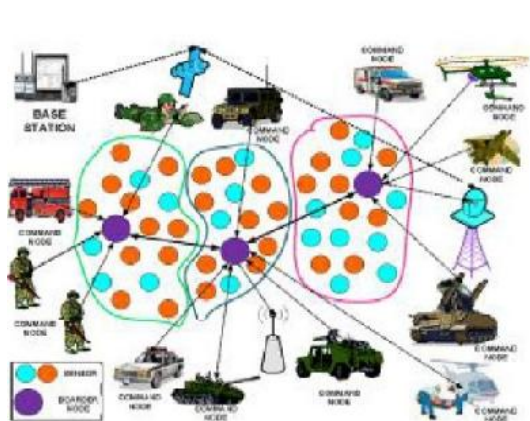


Figure 4. WSN application in Military

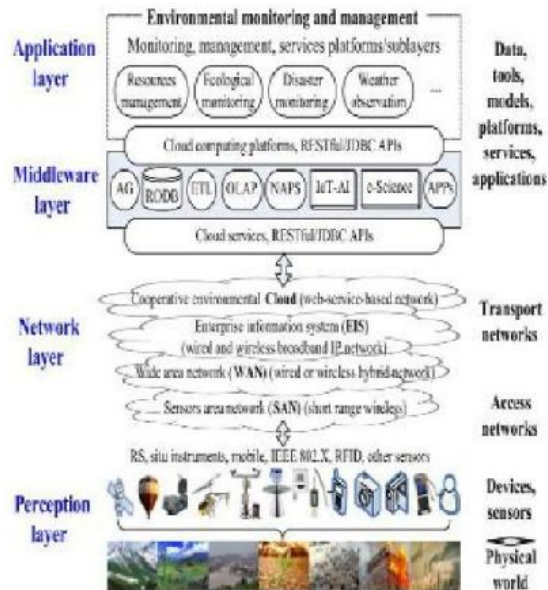


Figure 5. Proposed System Diagram

**IoT Environmental Monitoring Requirements:-**

WSN data acquisition for IoT environmental monitoring applications is challenging, especially for open nature fields. These may require large sensor numbers, low cost, high reliability, and long maintenance-free operation. At the same time, the nodes can be exposed to variable and extreme climatic conditions, the deployment field may be



costly and difficult to reach, and the field devices weight, size, and ruggedness can matter, e.g., if they are transported in backpacks. Most of these requirements and conditions can be found in the well-known application of wildfire monitoring.

### **Proposed System:-**

The proposed architecture of the system for environmental monitoring and management based on IoT contains four layers: perception layer, network layer, middleware layer, and application layer. Figure 5 shows all the layers of proposed system.

### **Perception layer:-**

The perception layer is mainly used for collecting data and other information of detailed factors of physical world (targets or tasks) in environmental monitoring and management, usually including real-time datasets, models/methods, knowledge, and others. The real-time data collection based on IoT is related to multi-sensors.

### **Network Layer:-**

The network layer performs basic functions of data and information transmission as well as the interconnection of systems and platforms. The network layer mainly consists of access networks and transport networks. Access networks are short-range wireless networks, usually consist of Sensors Area Network (SAN), 2G, 3G, WiFi, and ZigBee are common components to support the connection of things. In transport networks, various Wide Area Networks (WANs) of wired or wireless hybrid network are usually subsystems of EIS with wired and wireless broadband IP network, and EISs could be connected to the cooperative environmental cloud with Web service-based global network transport protocols [HyperText Transfer Protocol/ Transmission Control Protocol (HTTP/TCP) and Constrained Application Protocol/User Datagram Protocol (CoAP/UDP)], and Internet Protocol version 4/Internet Protocol version 6 (IPv4/IPv6) are common technologies or standards for the transport networks.

### **Middle layer :-**

The middleware layer is a set of sub-layers for the management of data, software/tools, models and platforms, and interposed between the network layer and the application layer. Interactions between components, interfaces, applications, and protocols were implemented by representational state transfer (RESTful) APIs or Java database connectivity (JDBC) APIs.

### **Application layer :-**

The application layer provides the functions of storing, organizing, processing, and sharing the environment data and other information obtained from sensors, devices, and Web services, as well as the functions of taking professional applications in environmental monitoring and management, such as resources management. The application layer is the top level and represents the final task of IIS for environment decision management and planning service. Perception layer: The perception layer is mainly used for collecting data and other information of detailed factors of physical world.

Network layer: The network layer performs basic functions of data and information transmission as well as the interconnection of systems and platforms. Here LAN is used for transmitting or receiving the data.

Application layer: Application layer does the work of middle layer also. The layer is responsible for interaction of data to n fro from network layer and is also responsible for processing of the data received for environmental management.

Application involves the usage of 3 sensors 1. Temperature sensor 2. Light sensor 3.dry/wet sensor. The data from the sensors are collected and processed using a processor and is send to the authorized person's email through Internet.

### **Components**

#### **a. ARM11**

: The ARM1176JZF-S processor incorporates an integer core that implements the ARM11 ARM architecture v6. It supports the ARM and Thumb™ instruction sets, Jazelle technology to enable direct execution of Java bytecodes, and a range of SIMD DSP instructions that operate on 16-bit or 8-bit data values in 32-bit registers.

### **The ARM1176JZF-S processor features:-**

Provision for Intelligent Energy Management

(IEMTM). TrustZone™ security extensions

High-speed Advanced Microprocessor Bus Architecture (AMBA) Advanced Extensible Interface (AXI) level two interfaces supporting prioritized multiprocessor implementations. An integer core with integral EmbeddedICE-RT logic .

- An eight-stage pipeline .
  - Branch prediction with return stack .
  - Low interrupt latency configuration .
  - Internal coprocessors CP14 and CP15 .
  - Vector Floating-Point (VFP) coprocessor support .
  - External coprocessor interface .
  - Instruction and Data Memory Management Units (MMUs), managed using MicroTLB structures backed by a unified Main TLB .
  - Instruction and data caches, including a non-blocking data cache with Hit-Under-Miss(HUM) .
  - virtually indexed and physically addressed caches
- 64-bit interface to both caches .
- Level one Tightly-Coupled Memory (TCM) that you can use as a local RAM with DMA .
  - Trace support.
  - JTAG-based debug.

#### **ARM1176JZF-S architecture with Jazelle technology**

The ARM1176JZF-S processor has three instruction sets:

- the 32-bit ARM instruction set used in ARM state, with media instructions
- the 16-bit Thumb instruction set used in Thumb state
- the 8-bit Java bytecodes used in Jazelle state.

#### **AT 89C2051 Microcontroller Features**

- Compatible with MCS®-51 Products
- 2K Bytes of Reprogrammable Flash Memory •2.7V to 6V Operating Range
- Fully Static Operation: 0 Hz to 24 MHz •Two-level Program Memory Lock •128 x 8-bit Internal RAM
- 15 Programmable I/O Lines •Two 16-bit Timer/Counters
- Six Interrupt Sources •Programmable Serial UART Channel •Direct LED Drive Outputs
- On-chip Analog Comparator •Low-power Idle and Power-down Modes •Green (Pb/Halide-free) Packaging Option

#### **LM35 Precision Centigrade Temperature Sensor**

: LM35 converts temperature value into electrical signals. LM35 series sensors are precision integrated-circuit temperature sensors whose output voltage is linearly proportional to the Celsius temperature. The LM35 requires no external calibration since it is internally calibrated. . The LM35 does not require any external calibration or trimming to provide typical accuracies of  $\pm 1/4^{\circ}\text{C}$  at room temperature and  $\pm 3/4^{\circ}\text{C}$  over a full  $-55$  to  $+150^{\circ}\text{C}$  temperature range.



**Figure 6** PCB Board for the Proposed Project

#### **LDR - Light Dependent Resistor:-**

: LDRs or Light Dependent Resistors are very useful especially in light/dark sensor circuits. Normally the resistance of an LDR is very high, sometimes as high as 1,000,000 ohms, but when they are illuminated with light, the resistance drops dramatically.

**Moisture sensor:-**

Soil moisture sensors measures the water content in soil.

A soil moisture probe is made up of multiple soil moisture sensors. One common type of soil moisture sensors in commercial use is a Frequency domain sensor such as a capacitance sensor. Another sensor, the neutron moisture gauge, utilize the moderator properties of water for neutrons. Cheaper sensors -often for home use- are based on two electrodes measuring the resistance of the soil.

**RASPBERRY PI:-**

The Raspberry Pi has a Broadcom BCM2835 system on a chip (SoC),which includes aARM1176JZF-S 700MHz processor (The firmware includes a number of "Turbo" modes so that the user can attempt over clocking, up to 1GHz, without affecting the warranty), VideoCoreIV GPU, and was originally shipped with 256 megabytes of RAM, later upgraded to 512 MB. It does not include a built-in hard disk or solid-state drive, but uses an SD card for booting and long-term storage. The Foundation's goal was to offer two versions, priced at US\$25 and US\$35.

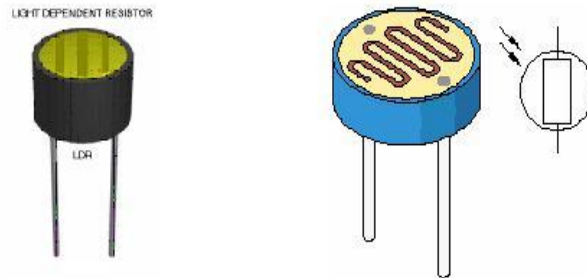


Figure 7. Raspberry PI

**Application Server:-**

The main purpose of a WSN application server is to receive, store, and provide access to field data. It bridges the low power communication segments, with latency-energy tradeoffs, and the fast and ubiquitous end user field data access (by humans or IoT applications).

The full custom server software has the structure shown in Fig. 8. It provides interfaces for:• field nodes (gateways);• the operators and supervisors for each field;• various alert channels;• external access for other IoT systems.

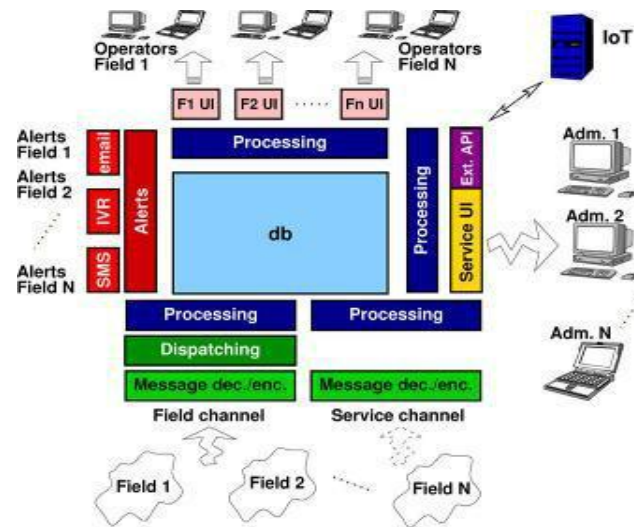


Figure 8:- Application Server Interfaces.

Two protocols are used to interface with the field nodes (gateways) for an energy-efficient communication over unreliable connections: normal and service (boot loader) operation.

**Conclusion:-**

WSNs are traditionally considered key enablers for the IOT Paradigm. However, due to the widening variety of applications, it is increasingly difficult to define common requirements for the WSN nodes and platforms. All

aspects of the WSN Platform are considered and discussed are Platform structure, flexibility and reusability, optimization of the sensor and gateway nodes, optimization of the communication protocols for both in-field and long range, error recovery from communications and node operations, high availability of services at all levels, applications server reliability and the interfacing with IOT Applications. Of particular importance of this discussion are IOT Requirements for low cost, fast deployment and long unattended service time. All platform components are implemented and support the operation of a broad range in the application sector discussed and also in indoor and outdoor field deployments with several types of sensor nodes built using the generic node platforms presented.

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### RESEARCH ARTICLE

#### THE EFFECTIVENESS OF USING PADLET IN ESL CLASSROOM.

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Padlet; Subject-Verb Agreement; SVA;  
Web 2.0; Education

#### Abstract

Learning and working together on a wall is what a Padlet might look like for those who has tried this digital pinboard. This multimodal production tool is simple yet powerful to support teaching and learning. This study investigates the effectiveness of using Padlet in improving students' learning in English grammar. The data was collected by the means of pre-post tests and questionnaire survey. 30 students at University Sains Islam Malaysia were participated in this study. The data was analyzed using both descriptive and inferential analysis. The result from pre-post tests indicated a significant improvement in students' performance. The result from survey also showed high preference and participants' positive attitude towards using Padlet as a means for learning grammar. The findings indicated that the use of Padlet is effective in enhancing students' performance in language learning.

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#### Introduction:-

Grammar is one of the fundamental aspects needed in learning a language. Sufficient knowledge of English grammar contributed much in two main aspects in English – writing and speaking (Valentine &Repath-Martos, 1997). For a second language learner, writing with the right grammar might be one of the concerns the students faced. For this to be improved, the use of strategies might be helpful. One of the most widely implemented strategies in teaching and learning nowadays is by integrating technology.

The world today drowns us in an ocean of technological tools and gadgets. In education, without exception, technology already became a part of teaching tools as well as a support for learning. Looking closely in language learning, implementing technological tools and apps might be a good approach to scaffold learning. In this respect, in particular in grammar learning, educators can integrate the use of technology to assist students and to polish their understanding on grammatical concept. One of the technologies that can be used is Padlet, an online virtual website application where anyone can work on an idea or do activities together anytime anywhere.

#### Literature Review:-

##### Web 2.0 Technologies in Education :-

For a vast development of technologies introduced in education claiming their effectiveness for learning, a number of studies have been done to see whether the integration of these tools could promote active learning for students and a support for teaching (Bower, 2015, Yunus, Kiing&Salehi, 2013). This is particularly looking at the booming of Web 2.0 applications such as Blendspace, Slideshare, Padlet, Voki and Storybird. Web 2.0 technologies offer a platform to establish a learning network, collaborate and share information to engage students with their learning

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(Boyd, 2007; McLoughlin & Lee, 2007; Brown, 2010; Amelia A. Rahman Sidek & Melor Md. Yunus, 2012). Shih's study (2011) investigated the effect of integrating Web 2.0 technology in language learning. The findings revealed a significant improvement in students' performance particularly in writing. This paper will focus on one of Web 2.0 tools – Padlet.

#### **Padlet: A Virtual Wall:-**

Padlet features an 'online wall' web-based where ideas are collating via virtual post from the users (Shield, 2014). This tool offers enormous benefits to its users without the need to have an account. Users can create unlimited walls, invite others to collaborate on their walls, customize and set privacy on their Padlets merely by using a free account (Fiester & Green, 2016; Miller, 2016). Users can also add links, images, text, documents and video files in their wall and move them round freely like sticky notes on the wall. Sign in up for an account will be beneficial for teachers as they can manage their classroom interaction and performance. An email will be sent to notify the teacher each time a student responded to the teacher's wall (Wood, 2016).

In classroom setting, Padlet works well with activities such as brainstorming, discussion and project work (Stannard, 2015). Students can learn through Padlet anytime anywhere with any internet-enabled devices such as smartphone, tablet, and computer with internet connection. There is no software needed to be downloaded to use Padlet. Students can then share their works on Facebook, Google+, e-mail or even embedded the URL into their blog (Wood, 2016). Previous studies on Padlet mostly covered the usefulness of Padlet to support collaborative activities (Dembo & Bellow, 2013; Fuchs, 2014; Ellis, 2015). However, there is very little research that has been done on the effectiveness of Padlet in enhancing students' language performance in classroom. Therefore, the present study was designed and conducted for this sole purpose.

This study was designed to investigate the effectiveness of using Padlet for grammar learning in English language classroom. In order to achieve the purpose of this study, the following research questions were addressed:

- a) Does using Padlet is effective for enhancing students' performance in language learning?
- b) What is the students' perception and attitude towards using Padlet in classroom?

### **Methodology:-**

#### **Study Design:-**

This study was a pre/post-test experimental design. The respondents were introduced to the use of Padlet during their grammar lesson and were given few tasks on Subject-Verb Agreement (SVA). Pre- and post-tests were given to the students to evaluate their current understanding of the SVA concept as well as their performance before and after using Padlet. The students were also asked to complete a questionnaire survey at the end of the post-test.

#### **Participants:-**

The participants of this study were 30 first-year undergraduate students at Universiti Sains Islam Malaysia (USIM). They came from diverse majors including Islamic Finance, Islamic Study, and Business. They were currently enrolled in an English course as part of the university requirement courses. The course was designed to prepare the students before they sit for Malaysian University English Test (MUET). The class met once a week and took two hours for each session. All the participants are native speakers of Bahasa Melayu and learning English as their second language. As far as their English proficiency was concerned, they have a relatively wide range of proficiency level from low to high. Most of them were at low intermediate level of English proficiency and their use of English was mainly limited to the classroom context. All the participants owned a smartphone and have active connectivity with the internet.

#### **Instruments:-**

One of the instruments used in this study was Pre/Post-Test. The test was adapted from OWL English website using the link <http://OWL/SubjectVerbAgreement/>. The pre-test was given to the participants as a means to diagnose their current understanding of one part of English grammar – Subject Verb Agreement (SVA). After few weeks of learning SVA using Padlet, the participants were then asked to redo the test again. This time, post-test questions were given to the participants. The items were the same one with pre-test but have been purposely rearranged from the original number of arrangement in order to see their performance.

Another instrument used in this study was questionnaire survey. The questionnaire items were adapted from Izyani & Mohamed Amin Embi's (2016) study to identify students' views and attitude on using Padlet in language learning.

The questionnaire items were provided with four-point Likert scale. The participants were required to respond on each item based on the given rating scale: Strongly Agree (4), Agree (3), Disagree (2), and Strongly Disagree (1). The rating scale was presented in even number considering the issues of the existence of middle category (i.e. 'Neither Agree Nor Disagree', 'Indifferent' or "Neutral") that will prevent the participants for making the real choice (Dörnyei, 2003). The participants will be given further explanation if they did not understand any item of the survey. The reliability of was calculated using Cronbach Alpha which was 0.97 representing good internal consistency.

For the instructional material, the researcher used the usual syllabus planned by the course lecturer. However, instead of using slides and whiteboard, the lesson used Padlet as the means of teaching and learning. The students were just started their learning in Grammar component after completing their speaking component in their previous class. Following their syllabus, Subject-Verb Agreement (SVA) was their first topic for the grammar component.

#### **Data Analysis and Procedures:-**

Before they started their lesson on SVA, the participants were given a pre-test as a diagnostic tool to see their understanding of this grammar aspect. Following the pre-test, the participants were taught about SVA using Padlet. The learning took 5 weeks and all the lessons and activities were all delivered via Padlet. At the end of the lessons, they were asked to sit for the post-test to assess their performance. A questionnaire survey was also distributed right after the post-test. All the data collected were analyzed through descriptive and inferential statistics. Descriptive methods using frequency, percentages, means, and standard deviation were used for analyzing the pre- and post-tests. A bar graph was presented to illustrate the score performance. Statistical method using t-test analysis of variance was also been used in order to answer the research questions.

#### **Results:-**

The purpose of this study is to investigate the effect of using Padlet in learning English grammar for ESL students in Malaysia.

#### ***The effectiveness of using Padlet to enhance students learning:-***

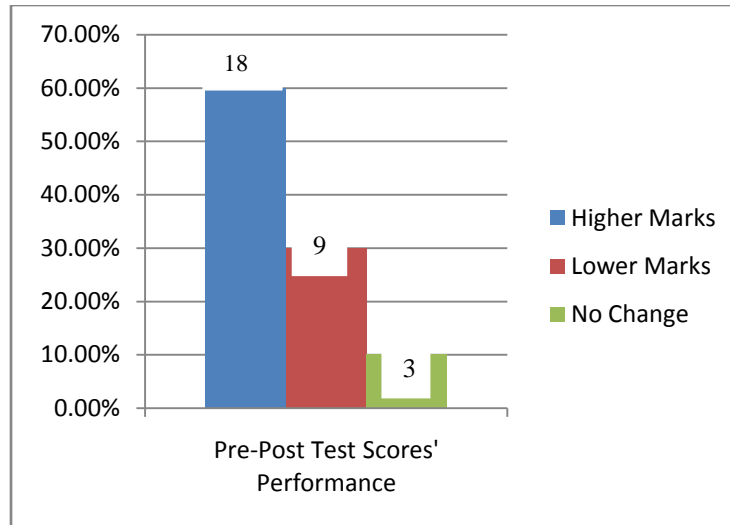
The data was computed and the pre/post-test scores were compared in terms of frequency, percentages, mean and standard deviation. Table 1 shows the results of the pre-test and post-test scores of the group.

SVA	N	Mean	Std. Deviation	Std. Error Mean
Pre_Test	30	13.97	2.606	.476
Post_Test	30	15.07	2.258	.412

**Table 1.** Result of the Pre-test Scores and Post-test Scores of the group.

As shown in Table 1, the mean scores for pre-test is 13.97 and 15.07 for the post-test.

This means scores indicated a significant improvement in students' score after integrating Padlet in their grammar learning. This analysis can be supported by the percentages of differences in score performance as indicated in Figure 1 below:



**Figure 1:** Pre/Post Test Score's Performance

Based on the result, out of 30, 18 students scored higher marks in their post-test compared to their pre-test. This number makes about 60% percentages of students who performed better after incorporating Padlet in their grammar learning. On the other hand, 30% obtained lower marks for the post-test and 10% showed no changes in their scores performance. With the percentages of performance, there is a significant improvement depicted to show the effectiveness of using Padlet in enhancing students' performance in learning grammar.

To support the above descriptive analysis, paired t-test was conducted to find out any statistically significant differences in this study and the result is as shown in Table 3.

Paired Samples T-Test									
	Paired Differences	t	df	Sig. (2-tailed)					
					Mean	SD	Std. Error Mean	95% Confidence Interval of the Difference	
								Lower	Upper
Pre_Test - Post_Test	-1.100	2.103	.402	-1.922	-.278	-2.735	29	.011	

**Table 2:-** Dependent sample t-test results for the Pre/Post-test of the group.

The t-test results indicate a significant difference between the mean scores before and after using Padlet in grammar learning ( $t = -2.735$ ,  $p > 0.011$ ). Overall, the differences in scores indicate that the use of Padlet is effective enough in improving students' performance in grammar learning. This finding is parallel with other previous studies which showed the effective usage of Padlet in learning (Dembo & Bellow, 2013; Fuchs, 2014; Ellis, 2015).

#### **Students' perception and attitude towards using Padlet in classroom:-**

The questionnaire items have been analyzed and the data was calculated in percentages. The result can be referred in Table 3 below:

Item	Strongly Agree	Agree	Disagree	Strongly Disagree
<b>Learning language via Padlet is a good idea.</b>	18.4%	78.9%	2.6%	0.0%
<b>My interaction in Padlet messaging was clear.</b>	10.5%	36.8%	52.6%	0.0%
<b>My interaction in Padlet messaging was understandable.</b>	5.3%	60.5%	34.2%	0.0%
<b>It was easy for me to become skilful in discovering information via Padlet.</b>	10.5%	50.0%	39.5%	0.0%
<b>Learning English language using Padlet is</b>	21.1%	63.2%	15.8%	0.0%



<b>convenient for me.</b>				
<b>Padlet is convenient for academic engagement purposes.</b>	13.2%	65/8%	21.1%	0.0%
<b>Padlet allows me to academically engage with peers and lecturers at any time and any place.</b>	15.8%	73.7%	10.5%	0.0%
<b>I found that Padlet is useful in my language learning.</b>	21.1%	63.2%	15.8%	0.0%
<b>Using Padlet was effectively improved my language learning.</b>	13.2%	57.9%	28.9%	0.0%
<b>My performance in language learning was improved by the used of Padlet.</b>	5.3%	55.3%	39.5%	0.0%
<b>My performance in English writing has improved by the used of Padlet.</b>	15.8%	50.0%	34.2%	0.0%
<b>Interaction via Padlet helped me to become active in language activity.</b>	21.1%	63.2%	15.8%	0.0%
<b>In future, I will use Padlet in learning English language.</b>	7.9%	81.6%	10.5%	0.0%

**Table 3:-** Students' perception and attitude towards using Padlet in classroom.

The findings in Table 4 indicated that majority of participants favored incorporating Padlet in learning grammar. Most of the items received a higher weightage in 'Agree' column whereas there is no vote in the 'Strongly Disagree' column. Looking closely in terms of attitude and perception on using Padlet in grammar learning, Table 4 showed that in general, more than 50% of participants have positive attitudes towards Padlet. 97.3% agreed that learning language via Padlet is a good idea. 79% agreed that Padlet is convenient for their academic engagement purposes and 84.3% found that Padlet is useful for their language learning, Even though they favor the use of Padlet, 52.6% disagree that their interaction in Padlet messaging was clear. This can be explained as it was the first time for majority of them to use Padlet. Thus, even though they like it, it still taking time for them to get to know the tool and communicating using it for learning grammar. In terms of their performance, 60.6% agreed that their performance in language learning was improved by the used of Padlet while 84.3% agreed that the interaction via Padlet helped them to become active in language activity. Overall, most participants regarded Padlet as an effective means for learning language and 89.5% participants will use Padlet in their language learning in the future.

### **Discussion and Conclusion:-**

From the analyses of pre/post-test and questionnaire results, it can be concluded that there is a significant improvement in students' performance when integrating Padlet in their grammar learning. Also, the participants favored the use of Padlet and found it useful for their language learning. Some students found that it is their interaction in Padlet messaging was unclear due to the fact that it was their first time learning via Padlet. This should be an aspect to be considered by researcher. Issues in digital competency and technical aspect of the tool can disrupt learning process since students need to explore how to use this tool and may take some time to familiarize it before using it for their learning (Redecker, Ala-Mutka, Bacigalupo, Ferrari & Punie, 2009). Overall, Padlet provides a platform for students to actively participate in their learning. Students' engagement in learning established through collaboration and sharing ideas using Padlet. This will help students to be aware of their own learning and thus improve their performance in learning language. The findings of the present and the previous studies support the effectiveness of Padlet in learning. Therefore, Padlet is as one of the Web 2.0 technologies that should be promoted and utilized as a means to support students' language learning. For future suggestion, further studies can be done on Padlet to other parts of English grammar such as tenses and nouns or to a larger extent of other language skills such as speaking and writing.

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### RESEARCH ARTICLE

#### EVALUATION OF LIPID PEROXIDATION AND ANTIOXIDANT ENZYME ACTIVITIES IN TYPE 2 DIABETIC PALESTINIAN PATIENTS FROM THE GAZA STRIP.

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Antioxidant, Oxidative stress, Lipid peroxidation, type 2 diabetes.

#### Abstract

**Background and Objective:** Diabetes mellitus is a group of metabolic disorders associated with increased oxidative stress and free radical production that play important roles in diabetic pathogenesis and complications. The present study was aimed to evaluate lipid peroxidation and antioxidant enzyme activities in patients with type 2 diabetes in comparison with normal healthy individuals.

**Material and Method:** Lipid peroxidation and antioxidant enzymes: Malondialdehyde (MDA), glutathione peroxidase (GSH-Px), glutathione reductase (GR), glutathione-S-transferase (GST), reduced glutathione (GSH) and lipid profiles were determined in 40 males of type 2 diabetic patients, in addition to 10 males of healthy controls matched for age and BMI. Descriptive, statistical comparisons, and correlations were performed using the SPSS program, significance was considered when  $P$  value  $< 0.05$ .

**Results:** The MDA, GR, and GST concentrations were significantly increased in type 2 diabetic patients compared with the healthy controls group. While significant reduction in the activities of GSH and GSH-Px were reported in type 2 diabetic patients compared with the healthy controls group. Significant positive correlations between oxidative stress status (MDA and GST) and lipid profiles (especially total cholesterol, LDL-C, triglyceride and VLDL-C) were found in type 2 diabetic patients.

**Conclusion:** Our study revealed an increase lipid peroxidation coupled with decrease antioxidant enzymes in type 2 diabetic Palestinian patients from the Gaza Strip.

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#### Introduction:-

Diabetes mellitus is a group of metabolic disorders characterized by hyperglycemia (Lin and sun, 2010) resulting from insulin resistance (IR) and fall of functional pancreatic  $\beta$  cells. Chronic hyperglycemia causes serious complications for diabetic patients, such as damage, dysfunction, and failure of various organs, especially the eyes, kidneys, nerves, heart, and blood vessels (Expert Committee on the Diagnosis and Classification of Diabetes Mellitus, 1997, 2003). According to the World Health Organization (WHO), more than 220 million persons worldwide had diabetes; 90% of them are diagnosed with type 2 diabetes (WHO, 2009). In 2005, 1.1 million people worldwide died from diabetes and the WHO estimates that the number of deaths may double between 2005 and

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2030 (WHO, 2009). The reasons for this global rise are the growth of aged population, increasing trends towards obesity, unhealthy diet, and sedentary lifestyle (Bagust *et al.*, 2001; Cowie *et al.*, 2008). This condition requires medical treatment and a number of lifestyle changes.

Diabetes mellitus is associated closely with increased oxidative stress and free radical production (Bonfont-Rousselot *et al.*, 2000). Oxidative stress reflects an imbalance between the formation of free radical oxygen and antioxidant defense system in the body (Rahimi *et al.*, 2005). Oxidative stress plays an important role in the pathogenesis of diabetes and its complications (Johansen *et al.*, 2005; Rahimi *et al.*, 2005). In the diabetic condition, oxidative stress, through the production of reactive oxygen species (ROS), impairs glucose uptake in muscle and fat (Rudich *et al.*, 1998; Maddux *et al.*, 2001) and decreases insulin secretion from pancreatic  $\beta$  cells (Matsuoka *et al.*, 1997).

Several diabetic complications are associated with overproduction of ROS and accumulation of lipid peroxidation products (Palanduz *et al.*, 2001), which is potentially harmful because it's uncontrolled, the self-enhancing process causes disruption of membranes, lipids, and other cell components.

There is not much data available about the relationship between oxidative stress and diabetes in Palestinian type 2 diabetic patients at Gaza strip. Therefore, the aim of the present study is to evaluate oxidative stress by measuring lipid peroxidation and antioxidant enzymes in patients with type 2 diabetes as compared to healthy controls, also to determine the correlations between the pro-oxidant (lipid status) and antioxidant parameters in studied subjects.

### Materials and Methods:-

*Subjects:* The current study was conducted on 40 males patients with type 2 diabetes. The patients were chosen from those attending the United Nations Relief and Works Agency for Palestine Refugees in the Near East (UNRWA) health centers in Gaza Strip. Clinical examination was done for all patients to exclude any diabetic complication such as neurologic, cardiac, kidney, and eye complications. All patients were on oral hypoglycemic agents Metformin. Ten healthy subjects (10 males) matching the average age and socioeconomic status were selected randomly as a control group. The healthy subjects were chosen randomly from those working at UNRWA health centers. Clinical examination was also done for all healthy subjects to exclude any health problem that may they suffer from. None of the patients or control subjects reported any intake of dietary supplements such as vitamins or minerals, at least in the last year before launching the study.

*Measurements:* Weight, height, waist circumference (WC), waist hip ratio (WHR) and blood pressure were measured for each subject then the body mass index was calculated as following:  $BMI = \text{Body weight (Kg)} / \text{height (m}^2)$  (Bray, 1987).

*Blood samples and biochemical parameters:* Blood samples were collected from each subject after an overnight fasting (at least 8-12 hours). Glycosylated hemoglobin (HbA1c) was measured by a direct enzymatic method (Goldstein *et al.*, 2004). Serum MDA was measured by thiobarbituric acid assay (Satoh, 1978). Serum GSH, GR, GST and GSH-Px activities were measured by the method of Beutler *et al.*, (1963), Goldberg *et al.*, (1983), Habig *et al.*, (1974) and Paglia *et al.*, (1967) respectively, by using Biodiagnostic kit. Fasting blood glucose level, urea, creatinine, uric acid, alanine aminotransferase (ALAT) and aspartate amino transferase (ASAT), triglycerides, total cholesterol and high density lipoprotein cholesterol (HDL-C) levels were measured by using Diasys kit.

Low density lipoprotein cholesterol (LDL-C) was estimated by the equation of Friedewald *et al.*, (1972).  $LDL-C = [\text{Total cholesterol} - (\text{Triglyceride}/5 + \text{HDL-C})]$ .

### Statistical Analysis:-

Statistical Package of social science (SPSS) version 22 was used for analysis of data. Data was summarized as mean  $\pm$  standard deviation (SD) and compared between type 2 diabetic patients and healthy controls subjects. Pearson's correlations were also performed to define correlations of individual parameters. All statistical tests were two-tailed.  $P$  values  $\leq 0.05$  were considered statistically significant.

**Results:-**

The descriptive characteristics of the type 2 diabetic patients and healthy control subjects are shown in Table 1. The type 2 diabetic group significantly differed from the healthy control group in fasting blood glucose level ( $88.15 \pm 3.31$  vs.  $158.82 \pm 5.07$ ,  $P < 0.05$ ) and HbA1c% ( $5.53 \pm 0.13$  vs.  $8.43 \pm 0.214$ ,  $P < 0.05$ ).

**Table 1:-** Comparison of descriptive characteristics and glycemc status between healthy control and type 2 diabetic subjects.

Variables	Healthy control N (10 M) Mean $\pm$ SD	Type 2 diabetic patients N (40M) Mean $\pm$ SD	P-value
Age (years)	50.10 $\pm$ 2.16	51.02 $\pm$ .86	>0.05
W.C (cm)	113.70 $\pm$ 4.18	106.82 $\pm$ 1.194	> 0.05
WHR	0.98 $\pm$ 0.03	0.99 $\pm$ 0.01	>0.05
BMI (kg/m <sup>2</sup> )	32.79 $\pm$ 1.42	30.96 $\pm$ 0.69	>0.05
Systolic	117.00 $\pm$ 2.13	120.19 $\pm$ 1.100	> 0.05
Diastolic	77.00 $\pm$ 2.13	78.59 $\pm$ 1.382	> 0.05
FBG (mg/dL)	88.15 $\pm$ 3.31	158.82 $\pm$ 5.07	< 0.05
HbA1c (%)	5.53 $\pm$ 0.13	8.43 $\pm$ 0.214	< 0.05

BMI, body mass index; FBS, fasting blood glucose; HbA1c, glycosylated hemoglobin. WHR, waist hip ratio;  $P < 0.05$  is significant.

The lipid profiles of the type 2 diabetic patients and healthy control subjects were shown in Table 2. The diabetic subjects had significantly increase ( $P < 0.05$ ) in serum triglyceride, ( $138.45 \pm 14.66$  vs.  $237.08 \pm 9.74$ ), VLDL-C levels ( $27.69 \pm 2.93$  vs.  $47.33 \pm 1.95$ ) and HDL-C ( $45.30 \pm 1.37$  vs.  $39.37 \pm 1.13$ ) compared with healthy control subjects.

**Table 2:-** Lipid profile in healthy control and type 2 diabetic subjects.

Variables	Healthy control N (10 M) Mean $\pm$ SD	Type 2 diabetic patients N (40M) Mean $\pm$ SD	P-value
TC (mg/dl)	194.22 $\pm$ 6.67	213.57 $\pm$ 4.72	>0.05
TG (mg/dl)	138.45 $\pm$ 14.66	237.08 $\pm$ 9.74	< 0.001
HDL-C (mg/ dl)	45.30 $\pm$ 1.37	39.37 $\pm$ 1.13	<0.05
LDL-C (mg/dl)	121.23 $\pm$ 5.41	126.79 $\pm$ 4.52	>0.05
VLDL-C (mg/dl)	27.69 $\pm$ 2.93	47.33 $\pm$ 1.95	< 0.001

TC, total cholesterol; TG, triglycerides; HDL-c, high density lipoprotein; LDL-c, low density lipoprotein; VLDL-c, very low density lipoprotein.  $P < 0.05$  is significant.  $P < 0.001$  is highly significant.

The concentrations of MDA, GR, GST were found to be highly increased in type 2 diabetic patients, ( $P < 0.05$ ) ( $2.56 \pm 0.20$  vs.  $4.30 \pm 0.21$ ), ( $13.73 \pm 0.33$  vs.  $21.08 \pm 0.55$ ), ( $351.28 \pm 17.63$  vs.  $508.44 \pm 11.756$ ) respectively, in contrast GSH-Px and GSH activity were significantly decreased in type 2 diabetic patients, ( $P < 0.05$ ) as compared to healthy control subjects ( $738.81 \pm 26.38$  vs.  $514.32 \pm 15.83$ ), ( $41.00 \pm 1.41$  vs.  $26.93 \pm 0.846$ ) respectively as shown in Table-3.

**Table 3:-** Oxidant and antioxidant parameters in healthy control and type 2 diabetic subjects.

Variables	Healthy control N (10 M) Mean $\pm$ SD	Type 2 diabetic patients N (40M) Mean $\pm$ SD	P-value
MDA (nmol/mL)	2.56 $\pm$ 0.20	4.30 $\pm$ 0.21	< 0.05
GR (U / L)	13.73 $\pm$ 0.33	21.08 $\pm$ 0.55	< 0.05
GST (U/L)	351.28 $\pm$ 17.63	508.44 $\pm$ 11.756	< 0.05
GSH-Px (mU / mL)	738.81 $\pm$ 26.38	514.32 $\pm$ 15.83	< 0.05
GSH (mg/dL)	41.00 $\pm$ 1.41	26.93 $\pm$ 0.846	< 0.05

GSH-Px, glutathione peroxidase;GR, glutathione reductase;GSH, reduced glutathione; GST, glutathione -S-transferase;MDA, malondialdehyde.

There is no significant difference in liver and kidney functions parameters in type 2 diabetic patients when compared with healthy control subjects. Table-4.

**Table 4:-**Liver and kidney functions parameters in healthy control and type 2 diabetic subjects.

Variables	Healthy control N (10 M) Mean $\pm$ SD	Type 2 diabetic patients N (40 M) Mean $\pm$ SD	P-value
ALAT (mg/dl)	20.48 $\pm$ 1.32	23.52 $\pm$ 1.29	> 0.05
ASAT (mg/dl)	19.40 $\pm$ 0.85	18.80 $\pm$ 0.82	> 0.05
Urea (mg/dl)	27.94 $\pm$ 0.78	27.28 $\pm$ 0.56	> 0.05
Uric acid(mg/dl)	5.45 $\pm$ 0.28	4.88 $\pm$ 0.18	> 0.05
Creatinine (mg/dl)	0.81 $\pm$ 0.05	0.78 $\pm$ 0.019	> 0.05

ALAT, alanine aminotransferase; ASAT; aspartate aminotransferase.

### Discussion:-

In the present study, the patients with type 2 diabetes had shown elevation of HbA1c comparing to their age-matched healthy individuals. It has been reported that various proteins, hemoglobin and LDL, undergo non-enzymatic glycation in diabetes (Klein., 1995). The rate of glycation is proportional to the concentration of blood glucose (Sheela *et al.*, 1992). In addition, HbA1c has been found to be increased over a long period of time in diabetes (Bunn *et al.*, 1978). Free radical increases proportionally with increased glycation rate (Gupta *et al.*, 1997). So, the measurement of HbA1c is very sensitive index for glycemic control (Jain *et al.*, 1989).

In the current work, we found that patients with type 2 diabetes were presented with low HDL-C and high triglyceride levels. This result is compatible with the previous studies (Howard, 1987; Taskinen., 1992; Yoshino *et al.*, 1996). The insufficient amounts of anti-atherogenic and antioxidative effects due to the low level of HDL-C, is a key feature for oxidative stress status (Hansel *et al.*, 2004). The reduced HDL-C level is often accompanied with high level of triglyceride (Lamarche *et al.*, 1996), which is in agreement with the present study. In type 2 diabetes, the increased secretion of apolipoprotein B (apoB) as a result of fatty acid synthesis in the liver (Duvillard *et al.*, 2000; Krauss *et al.*, 2004), a protein identified as a key component of the VLDL which induced an increase in plasma level of triglyceride and reduce level of HDL-C. Moreover, the elevation of free fatty acid and glucose in type 2 diabetes may decrease the activity of lipoprotein lipase, a pivotal enzyme in the removal of these lipoproteins from the circulation, and control the triglyceride-rich lipoproteins and HDL-C particles (Kastelein *et al.*, 1999).

The present study showed significant increases in MDA, GR, GST, and significant decreases in GSH and GSH-Px levels in patients with type 2 diabetes as compared with the control, which is an indication of marked oxidative stress. The increase of oxidative stress in diabetes mellitus was explained by several mechanisms. These mechanisms fall into two general categories first; Increased production of ROS, second; decreased antioxidant defenses. In diabetes, glucose auto oxidation and glycation products, non-enzymatic protein glycosylation, and changes in antioxidant defense systems can increase production of ROS (Baynes 1991; Inouye *et al.*, 1999; Bonnefont-Rousselot *et al.*, 2000; Courderot-Masuyer *et al.*, 2000; West, 2000). Increased production of ROS as well as reduced antioxidant defense mechanisms have been suggested to play a role in type 1 and type 2 diabetic patients (Mahboob *et al.*, 2001).

A significant increase in MDA was observed in patients with type 2 diabetes as compared with the healthy individuals. MDA, the end product of lipid peroxidation and acts as a marker of balance between pro-oxidant and antioxidant. This balance is a disturbance in diabetic patients. As a result, there is a high level of MDA present in the serum of patients with type 2 diabetes. This result is in agreement with the finding of (Griesmacher *et al.*, 1995; Beaudeux *et al.*, 1995; Pasaoglu *et al.*, 2004; Ozdemir *et al.*, 2005). Hyperglycemia may increase of ROS and lipid peroxidation production that is dependent in the redox potential of non-enzymatic antioxidant (glutathione) and decreased enzymatic antioxidant defense system.

The decrease in GSH-Px activity and the increase in GR activity were significant in patients with the type 2 diabetes as compared to the healthy individuals. These results are similar with the results of previous studies (Kumawat *et*

*et al.*, 2005). The low activity of GSH-Px could be directly explained by the low content of GSH found in patients with the type 2 diabetes since GSH is a substrate and cofactor of GSH-Px. Enzyme inactivation could also contribute to the low GSH-Px activity. GSH-Px is a relatively stable enzyme, but it may be inactivated under conditions of severe oxidative stress. Inactivation of this enzyme may occur through glycation governed by prevailing glucose concentration (**Rahbani-Nobar et al.**, 1999). The increased activity of GR may be a compensatory response to oxidative stress. The changes in GSH-Px and GR activities found in this study may be considered as an adaptation of antioxidant defense against the increased production of ROS.

GSH dependent enzyme activities, such as GSSH-Px,  $\gamma$ -glutamyltranspeptidase, and GST were changed in diabetes (**Ballatori et al.**, 2009). The results showed that patients with the type 2 diabetes had lower GSH concentrations in erythrocytes (RBCs) than observed in the healthy individuals. This result is similar to the finding of **Livingstone et al.**, (2007). The present results showed that GST activity was increased significantly in patients with type 2 diabetes than in the healthy individuals. In RBCs, decreased GSH as well as increased serum total GST levels may be due to a compensatory mechanism of the antioxidants to defend the oxidative stress in diabetic conditions.

Positive correlation between MDA, total cholesterol and LDL-C, as well as positive correlation between GST, triglyceride and VLDL-C were found in patients with the type 2 diabetes. Positive correlations between GSH-Px and LDL-C in healthy individuals could indicate possible association between high lipid concentrations leading to accelerated lipid peroxidation and potentially increased the reduction of the organic hydroperoxides as a consequence of increased activity of GSH-Px. No such correlation was found in patients with the type 2 diabetes, while these were other significant correlations between GSH-Px and triglyceride in the healthy individuals.

### Conclusions:-

It was concluded that the Palestinian patients with the type 2 diabetes are presented with a significant increase in lipid peroxidation coupled to a significant decrease in the antioxidant mechanism. The study suggests the evaluation of antioxidant levels as a useful marker in the prevention of the diabetic complications.

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### RESEARCH ARTICLE

#### SYMPTOMATIC ESOPHAGEAL WEB: A DIAGNOSTIC CLUE TO EPIDERMOLYSIS BULLOSA- CASE SERIES FROM PAKISTAN.

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Esophageal web, epidermolysis bullosa,  
 barium swallow

#### Abstract

Esophageal webs are infrequently reported with epidermolysis bullosa. We are presenting two cases of epidermolysis bullosa with symptomatic esophageal webs and typical dermal and skeletal features. Esophageal webs were reported on barium swallow examination and retrospectively correlated with physical and lab findings to establish the diagnosis of epidermolysis bullosa.

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#### Introduction:-

Webs are amongst the most common esophageal structural abnormalities and most of them are asymptomatic but they can produce progressive dysphagia. An esophageal web is a 1-2 mm thick, shelf like extension of normal esophageal mucosa and submucosa that can occur anywhere along the length of the esophagus but is typically located in the anterior wall of the cervical esophagus. [1] Webs are seen in 5—15% of patients undergoing barium swallow study for the evaluation of dysphagia. [2] Although most proximal esophageal webs are considered idiopathic several associations have also been described. Commonly they are observed in Plummer Vinson syndrome, but they are also associated with rare skin disorders such as epidermolysis bullosa (EB) or other bullous diseases. [2] The overall incidence and prevalence of the disease is 8 per one million population in United States [3] and 32 in 1 million in Northern Ireland. However prevalence rates in Middle East population is unknown. [4]

Here we are presenting two cases of epidermolysis bullosa and its association with symptomatic esophageal web formation with typical skeletal and skin features, but no family history. These cases were primarily diagnosed on barium swallow examination.

#### Case I:-

A boy aged 14, presented with complaint of progressive dysphagia for solids for past five years with recurrent episodes of sticking of food at cricoid level, no history of regurgitation of food or hematemesis was given. There was no history of caustic ingestion. At the time of birth he had few blisters on extremities and had history of recurrent blistering of skin with even minor trauma. Blisters were itchy and rupture easily leaving a reddened skin which heal with scarring. His parents had consanguineous marriage but had no family history of such skin diseases nor did he had any significant surgical history. Physical examination revealed generalized scarred skin secondary to ruptured blisters, including perineal region. There was clubbing of hand nails while toe nails were small with loss of big toe nails. There were contractures in hands leading to flexion of fingers. Some atypical skeletal features were also observed including small ears, pointed fingers and long wide palms giving appearance of claw hands. Small tongue with inability to protrude forward. Few superficial oral ulcers were found but there was no angular glossitis

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or dental carries. His hemoglobin level was 10 g/dl (range 12-14 g/dl). A barium swallow was performed which showed two esophageal webs one at C4 and another at C7 with little hold up of contrast proximally. Endoscopy was suggested. He was diagnosed with epidermolysis bullosa on clinical grounds and was treated with different anti allergies and antibiotics; no immunosuppressant therapy was given. (Figure 1).

Figure 1:-



**Case II:-**

Second patient was a middle aged male presented with history of difficulty in swallowing for past 10 years gradually worsening. Only able to take soft diet for past 5 years. His birth history revealed presence of blisters on skin and limb deformity at time of birth. Spontaneous blistering stopped after age of 20 years and now occurs rarely only after trauma. No biopsy was done and he did not receive any immunosuppressant therapy as well. His parent had consanguineous marriage. His three other siblings also had history of blistering of skin but it was mild, not associated with skeletal deformity and resolved spontaneously with time by age 15 to 20 years. On physical examination he also had scarred skin with fixed flexion at right wrist joint congenitally and flexion at metacarpophalangeal joints of both hands. Clubbing discoloration and deformity of nails of hands and feet. He gave history of oral soreness but no oral ulcers appreciated on examination. His hemoglobin level was 8 g/dl (range 12-14 g/dl). Skin biopsy for definitive diagnosis was advised but not performed due to affordability issue. He underwent barium swallow examination which showed multiple segments of circumferential smooth narrowing involving cervical esophagus and upper dorsal esophagus due to esophageal webs. (Figure 2).

Figure 2:-



### Discussion:-

Epidermolysis bullosa acquisita (EBA) is a well-defined, blistering disorder of the skin associated with autoantibodies to type VII collagen<sup>[5, 6]</sup> Esophageal involvement of EB was first described in 1929, including spectrum of manifestations, such as, diffuse inflammatory changes; disordered motility; bullae, ulcers, and mucosal scarring; webs; strictures; traction hiatal hernia and gastroesophageal reflux; complete obstruction of esophagus and perforation of esophagus. Webs are considered one of the earlier and milder manifestations. Dysphagia is reversible when caused by bullae or webs and permanent when due to strictures.<sup>[7]</sup>

Blistering of mucosa in epidermolysis bullosa is produced by minor trauma, but the actual mechanism behind this is not completely known. Presumably trauma from hot or rough foods causes separation of the esophageal epithelium from the lamina propria. Since the proximal third of the esophagus is the narrowest and least distensible, this might account for it being the most commonly affected segment. The distal third is the next most commonly involved, possibly because it is subject to both reflux gastric juice and pulsations of the heart and aorta.<sup>[8]</sup> Repeated blistering and healing probably results in fibrosis and stricture formation. As in our case blistering was improving with age but dysphagia caused by esophageal web was more troublesome for the patient. In a previously done case series of four patients by Marsden et al, it was observed that radiological examination is usually helpful when esophageal involvement is suspected. Radiological evidence of narrowing and irregularity of the upper third of the esophagus was present in all four patients of their study, while dysphagia severe enough to seek medical assistance was experienced by only two cases. Perhaps if all patients with epidermolysis bullosa were subjected to a routine barium swallow examination then esophageal involvement might be found to be more common than has been suspected.<sup>[8]</sup>

Our two patients remained un-diagnosed and were not given any immunosuppressant agent, therefore we can presume that early diagnosis and commencement of immune suppressive therapy could have prevented esophageal wear and tear and improve quality of life.

Nevertheless, barium swallow examination proved to be a diagnostic tool in our two cases, leading to early diagnosis of esophageal involvement and prompt treatment. It saved the patients from more advanced and debilitating condition of dysphagia due to esophageal stricture formation, complete obstruction or perforation.

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### RESEARCH ARTICLE

#### STUDY OF COUPLE'S AWARENESS ABOUT THE RELATIONSHIP BETWEEN STREP THROAT AND RHEUMATIC FEVER IN THE WESTERN AREA OF THE KINGDOM OF SAUDI ARABIA.

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#### Abstract

**Objectives:** The aim of the study to assess the family habit and status related to the factors associated with the development of the rheumatic fever and be aware about it.

**Methods:** The Type Of The Study Is Cross Sectional, It Will Include Collection Of Data From The Community's To Measure Their Awareness About Sore Throat And Its Relation To Rheumatic Fever. The Data Will Be Collected In The Western Area Of Kingdom Of Saudi Arabia, By Distributing A Form To The Families Which Included Questions About The Awareness Based On The Literature Review.

**Results:** This Study Was Applied On (407) Husbands And Wives From Different Cities In Western Area Of Kingdom Of Saudi Arabia. Most Of Them Were Female 260 (63.9 %) And 147 (36.1) Were Male.

**Conclusion:** We Conclude That The Parent Who Lived In The Eastern Region Of Saudi Arabia Need To Be More Educated Regarding The Sore Throat And Its Complication To Reduce The Incidence In The Future. This Could Be Done By Conducting Many Voluntarily Campaigns To The Family, Educative Accounts In The Social Media, Distribution Of Leaflet To The Parents.

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#### Introduction:-

A Sore Throat Is Frequently The Primary Indication Of A Cold. In Any Case, A Sore Throat Usually Improves Or Cures After A Day Or Two. Other Cold Manifestations, For Example, A Runny Nose And Clog May Take After The Sore Throat. Strep Throat, Which Is A Contamination Because Of Streptococcus Microorganisms, Is Another Reason For Sore Throats And Tonsillitis. With Strep Throat, The Sore Throat Is More Serious. (1)

In United States The Frequency Of An Intense Rheumatic Scene Taking After Streptococcal Pharyngitis Is 0.5-3% . (2)

Acute Rheumatic Fever (ARF) And Its Sequelae Remain The Leading Cause Of Cardiovascular Disease In Children And Young Adults Especially In Developing Countries. It Represents A Major Public Health Problem Causing A Lot Of Suffering To The Patient And Their Families. (3)

In Western Locale In Saudi Arabia Rheumatic Heart Disease Was 24 For Every 10,000 Schoolchildren (6-15 Years) Higher In Country Ranges And In Females And 34% Is The Bearer Rate Of Beta-Hemolytic Streptococci. (2) Around The World, Rheumatic Heart Disease (Rhd) And Its Confusions Result In Around 233 000 Passings Every Year. The World Wellbeing Association (Who) Appraises That Around 16 Million Individuals Are At Present Influenced By The Disease. The Dominant Part Of Rhd Cases Happen In Africa Where Commonness Rates Are As High As One In 10 Individuals In A Few Groups. (4)

Consistently, Around 15 Million Individuals Are Influenced, 200,000 Bite The Dust, And 100,000 Get To Be Disabled.(5)

We Have Proven From Past And Current Activities, Founded In Different Parts Of The World, That Far Reaching Programs Joining Mindfulness Raising, Observation, And Anticipation Can Control RHD As Well As Make A Worldwide RHD Plan And Develop A Stage For Cooperation. (6)

Starting Here, We Do A Poll To Assess Awareness About Rheumatic Fever To Know Degree Of Awareness In Group As A First Study In Kingdom Of Saudi Arabia Done To Know The Couple's Awareness About Rheumatic Fever.

### **Methodology:-**

The Type Of The Study Is Cross Sectional, It Will Include Collection Of Data From The Community's To Measure Their Awareness About Sore Throat And Its Relation To Rheumatic Fever.

The Data Will Be Collected In The Western Area Of Kingdom Of Saudi Arabia, By Distributing A Form To The Families Which Included Questions About The Awareness Based On The Literature Review And Who Recommendation.

The Questions Include Ages, Number Of Children, City, Financial Status, And General Information About The Disease.

The Ethical Approval Will Be From The Research Committee In The College Of Medicine, Taif University.

### **Results:-**

The Aim Of The Study To Assess The Couple's Awareness About Sore Throat And Its Relation To Rheumatic Fever. This Study Was Applied On (407) Husbands And Wives From Different Cities In Western Area Of Kingdom Of Saudi Arabia. ( Table 1 ) .Most Of Them Were Female 260 (63.9 %) And 147 (36.1) Were Male (Graph 1). The Age Of The Studied Group Was Above 18 Years ( Distribution Of Age Will Be Shown On The Graph Below ( Graph 2 ) .

Education Level Of The Studied Group Is Shown On Table (2) 71.5% (291) Of The Studied Group Were Having University Or Higher Education, 22.4% (91) Were Having Secondary School Education, 4.2% (17) Were Having Intermediate School Education, While 2.0% (8) Were Having Primary School Education. Works Areas Of The Studied Group Were 37%(151) Were Not Working, 33% (133) Were In Educational Field, 13% (52) Were Health Care Workers , 8% (34) Were In Army Field , 7% (27) Were Private Sector And 2% (10) Were General Work Or Business(Graph 3 ) .

Monthly Income Of The Studied Group Is Shown On Table (3) 45.2% (184 ) Were More Than 10000 SR, 27.8% (113) Were 5000-10000 SR , 19.2% (78) Were Between 2000-5000 SR, 7.9% (32) Were Less Than 2000 Sr. 88.5% (360) Of All Studied Group Had Children While 11.5% (47) Did Not Have Children (Graph 4). 38.33% (156) Of All Studied Group Had More Than Three Children, 19.17% (78) Had One Child, 15.72% (64) Had Three Children While 15.32% (62) Had Two Children (Graph 5).

86.4% (352) Have The Children Previously Had Sore Throat While 13.6% (55) Did Not Have (Graph 6). 71.7% (292) Of All Studied Group Went To A Doctor To Treat His/hers Infected Child With Sore Throat, 9.34% (38) Did Not Do Anything And 5.4% (22) Home Remedies (Graph 7). 86.2% (351) Of All Studied Group Had An Infected Child With Sore Throat While 13.8% (56) Did Not Have An Infected Child With Sore Throat (Graph 8). 31.2% (127) ) Of The Studied Group Were Believe That The Cause Of Sore Throat Is Virus , 11.5 (47) They Did Not

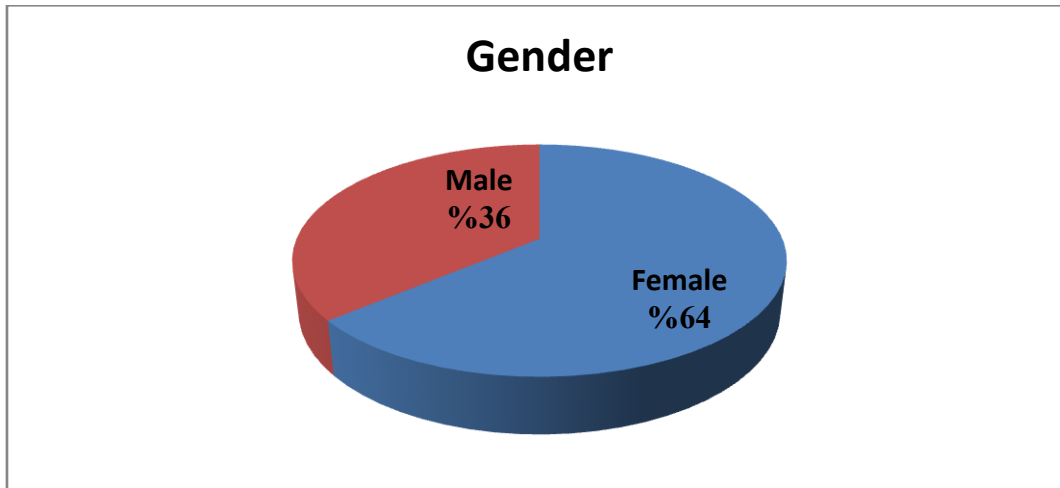


Know, 10.1% (41) Bacteria, 2.9% (12) Dry Throat, 2.7 % (11) Allergy, 0.2 % (1) Gastroesophageal Reflex Disease, 0.5 (2) Tumors, 33.2% (135) Some Of Them While 7.6% (31) Were Believe All Of Them Can Cause The Sore Throat (Graph 9). 33.9% (138) Were Believe That There Is A Relationship Between Sore Throat And Some Heart Diseases, 14.3% (58) Were Believe That There Is No Relationship Between Sore Throat And Some Heart Diseases While 51.8% (211) They Did Not Know (Graph 10).

45.5% (185) Of All Studied Group Were Think That The Best Treatment For Sore Throat Has A Relationship To Prevent Heart Disease, 6.1% (25) Think That The Best Treatment For Sore Throat Has No A Relationship To Prevent Heart Disease While 48.4% (197) They Did Not Know (Graph 11 ) . 15.5% (63) Of All Studied Group Had Family Member Or Friend Diagnosed With Rheumatic Fever While 84.5% (344) Did Not Have (Graph 12 ) . 45.7% (186) Of All Studied Group Believe That The Age From 5 To 15 Years Old Are More Affected Of Rheumatic Fever, 21.6% (88) Believe That The Age More Than 36 Years Old Are More Affected, 17.2% (70) Less Than 5 Years And 15.5% (63) Believe That The Age From 16 To 35 Years Old Are More Affected (Graph 13). 14.0% (57) Of All Studied Group Think That Fever, Pain In The Joints, Involuntary Movements, Rash On The Body, Protrusions In The Skin Are Signs Some Of Heart Disease, 15.7% ( 64) Did Not Think , 70.3% (286) They Did Not Know (Graph 14 ) . 16.7% (68) Of All Studied Group Were Know That To Treatment A Patient Who Had A Rheumatic Fever, Has To Follow A Course Of Antibiotic (Mostly By Injections) For A Five To Ten Years Old If His Case Affecting The Heart While 83.3% (339) They Did Not Know (Table 4).

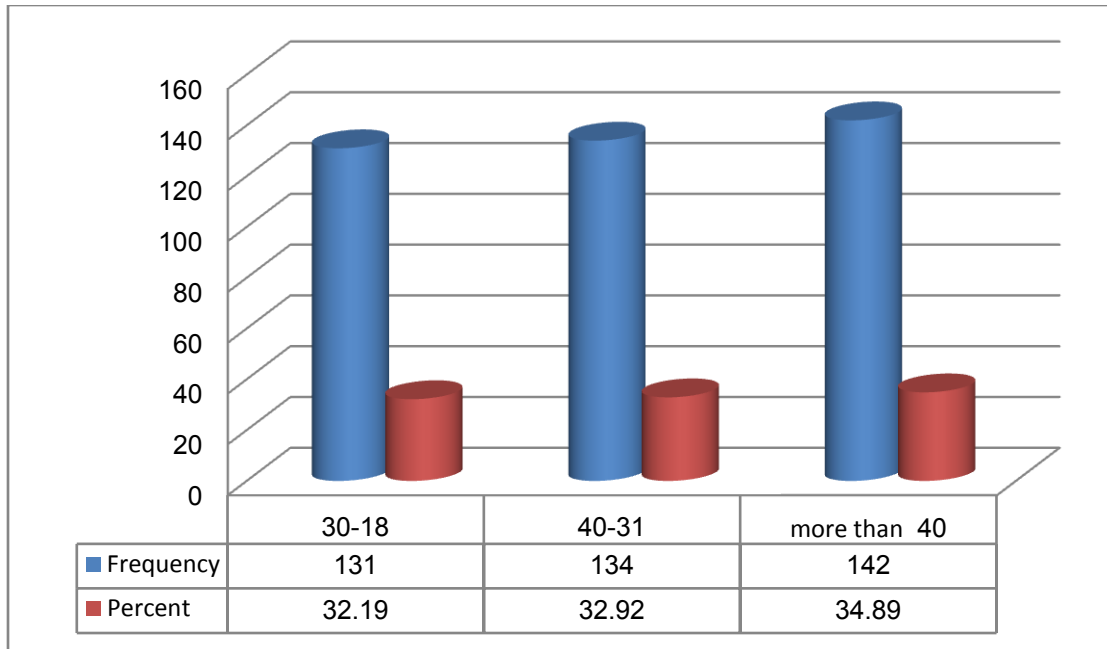
The Cities Of The Studied Group( **Table 1** ).

City	Frequency	Percent
Jeddah	129	31.7
Laith	4	1.0
Makkah	57	14.0
Qanfatha	5	1.2
Rabig	3	.7
Taif	209	51.4



**The Graph (1):**-Shows The Gender Distribution Of The Studied Group : 260 (63.9 %) Were Females And 147 (36.1) Were Males

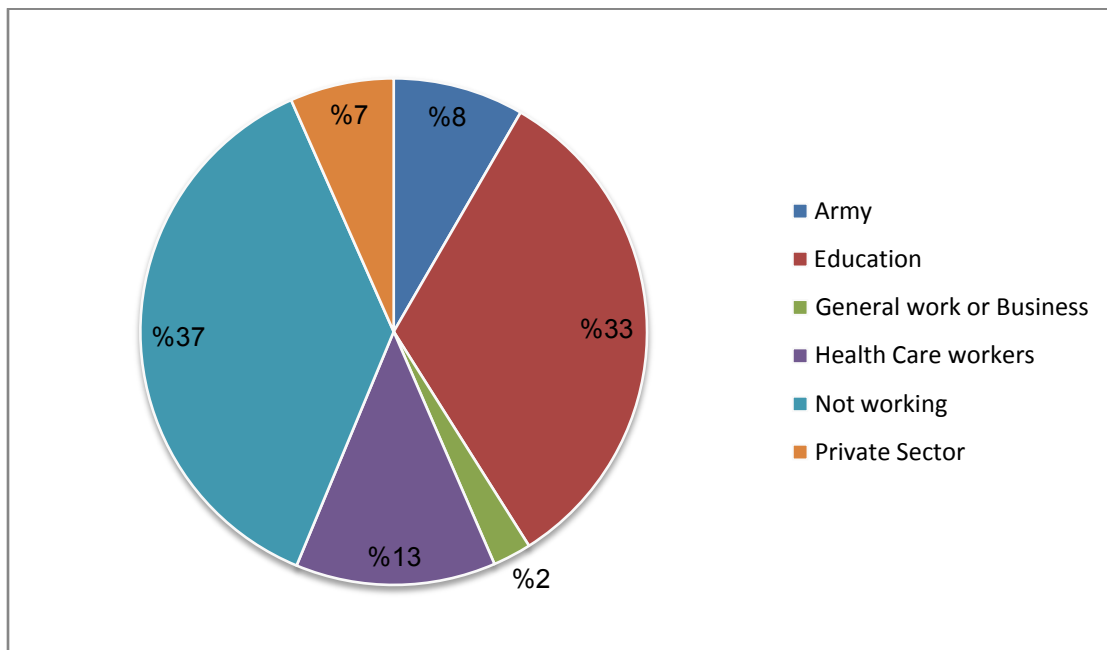




The Graph (2):- Shows The Age Distribution Of The Studied Group.

Education Level Of The Studied Group Is Shown On (Table 2).

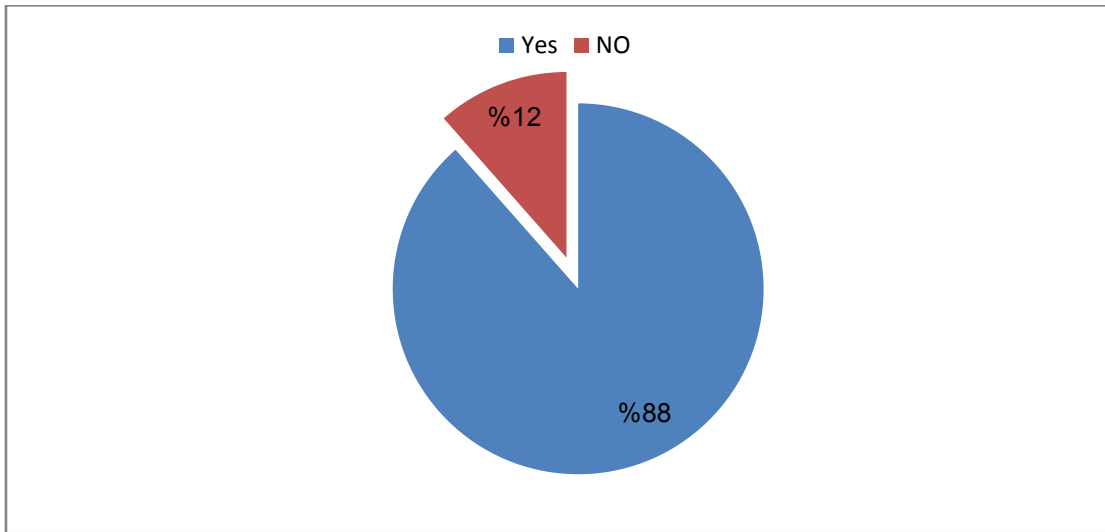
Education Level	Frequency	Percent
Intermediate School	17	4.2
Primary School	8	2.0
Secondary School	91	22.4
University Or Higher Studies	291	71.5



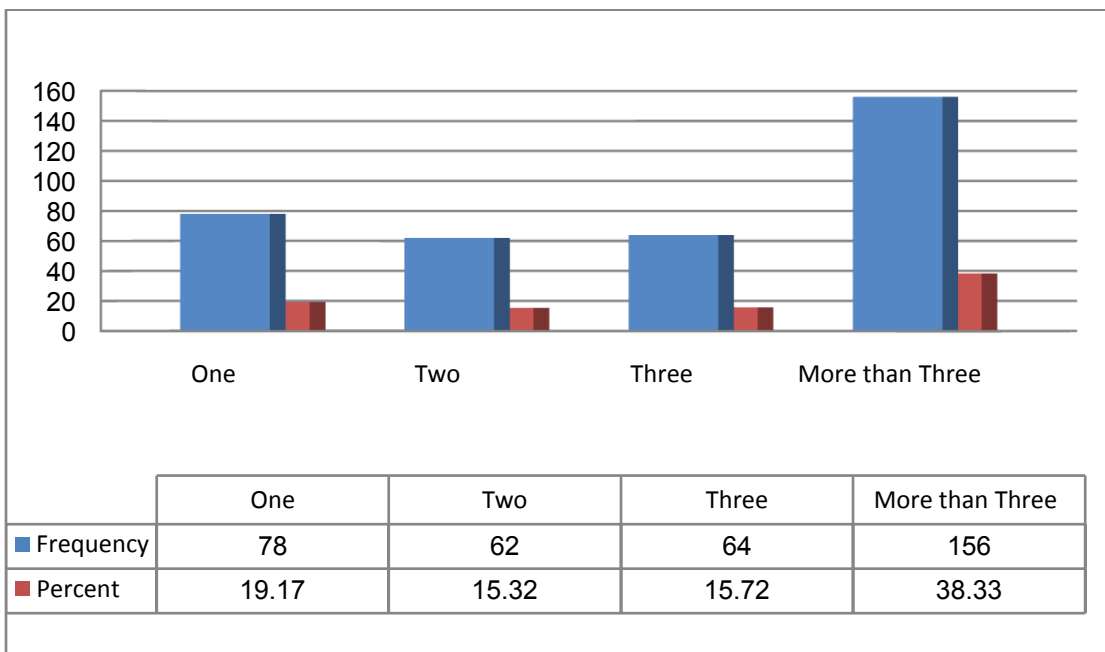
The Graph (3):- Shows Work Areas Of The Studied Group.

Monthly Income Of The Studied Group (Table 3).

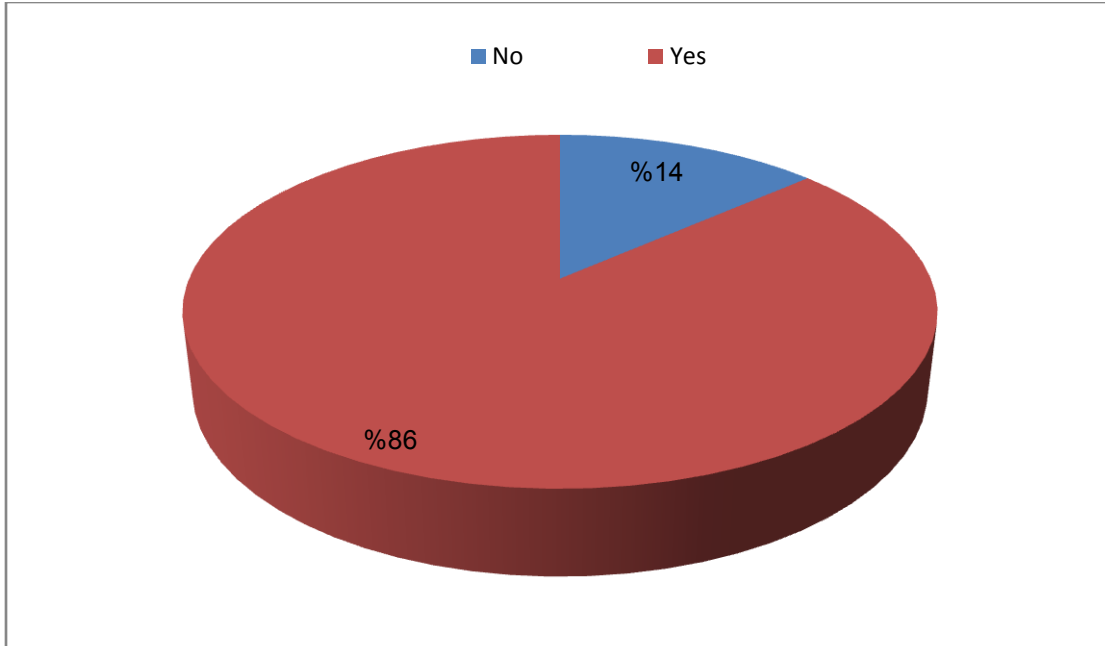
Monthly Income	Frequency	Percent
Less Than 2000	32	7.9
2000-5000	78	19.2
5000-10000	113	27.8
More Than 10000	184	45.2



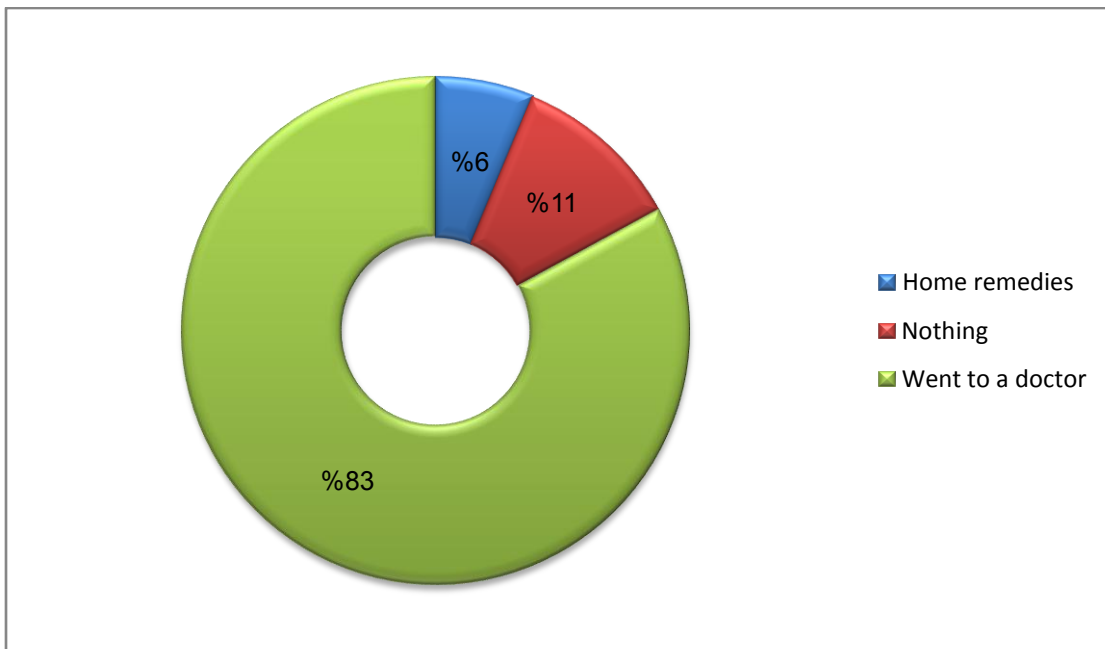
The Graph (4):-Showing The Percentage Of Couples Have Children In The Studied Group.



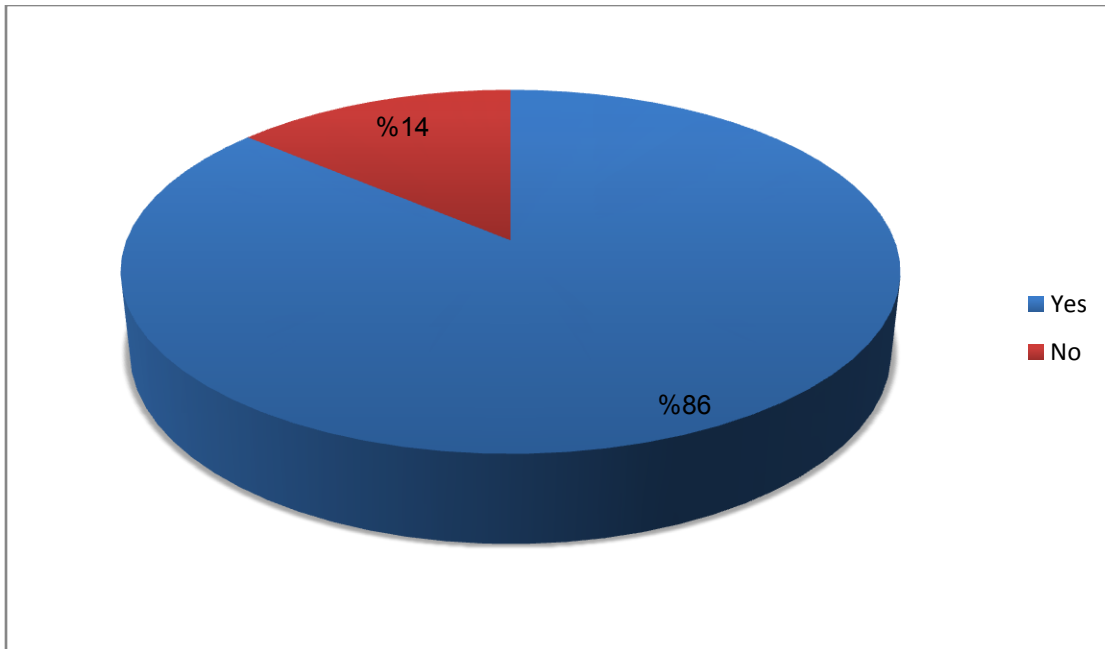
(Graph 5):- Shows The Number Of Children Of The Studied Group



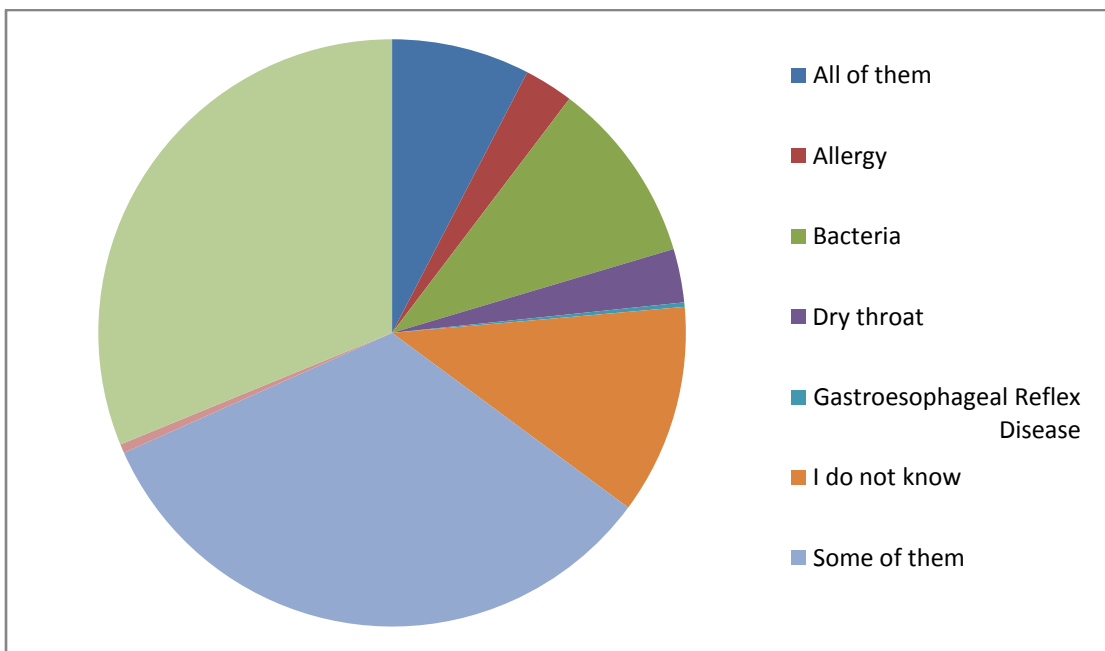
(Graph 6):- Shows Percentage Have The Children Previously Had Sore Throat In The Studied Group.



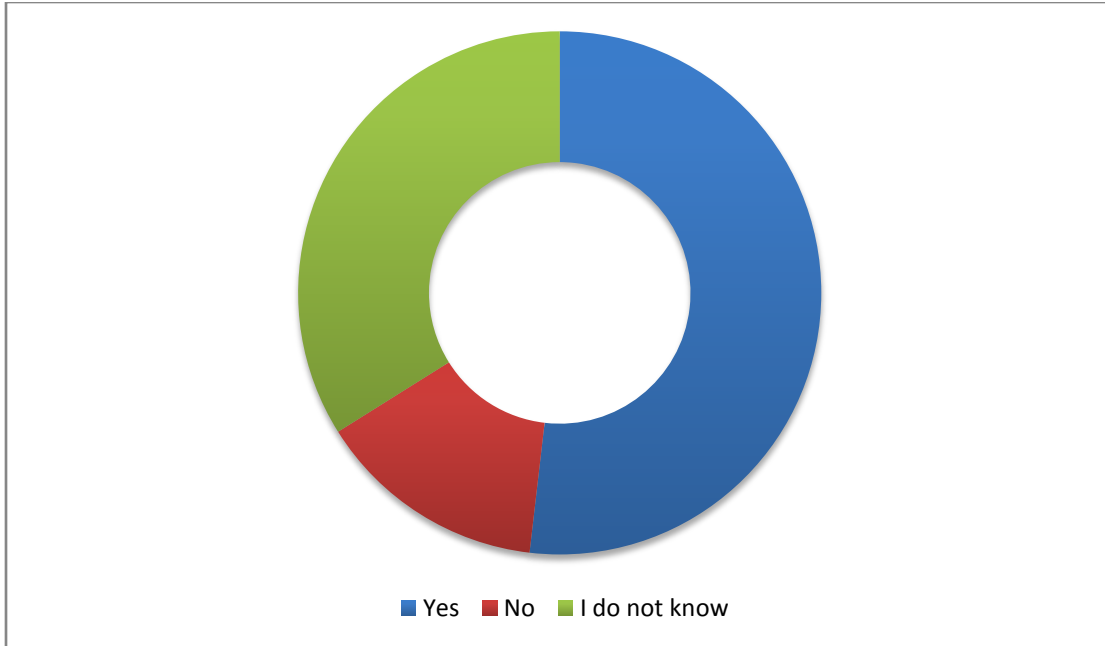
(Graph 7):- Shows What To Did To Treatment Of Sore Throat In The Studied Group.



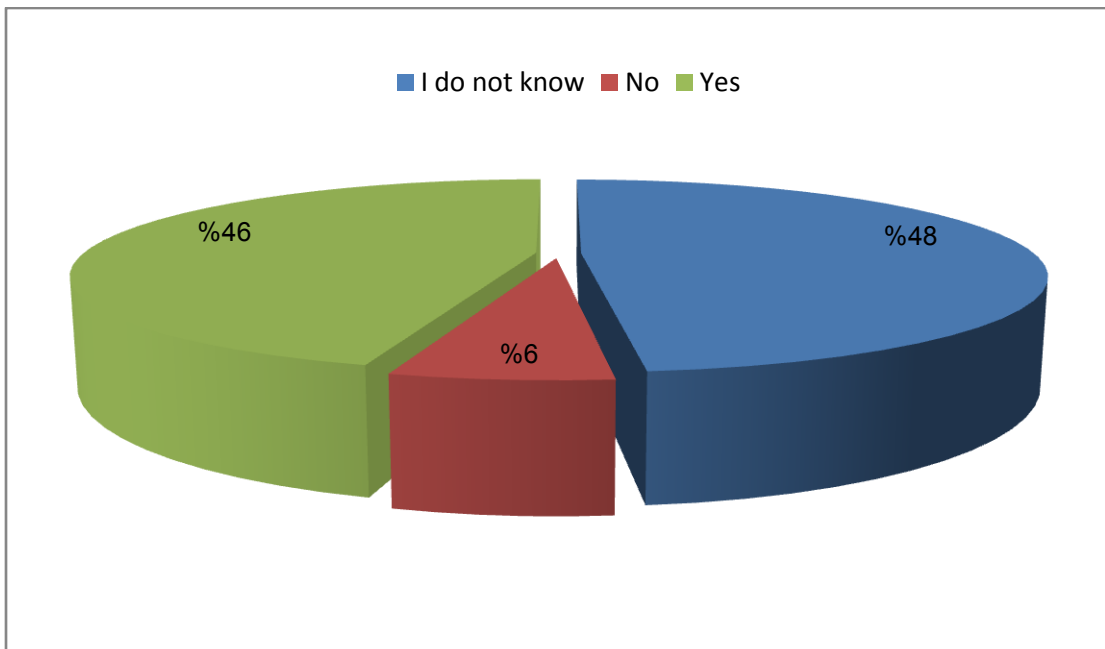
The Graph (8):- Showing The Percentage Of Couples Have Had An Infected Child With Sore Throat In The Studied Group.



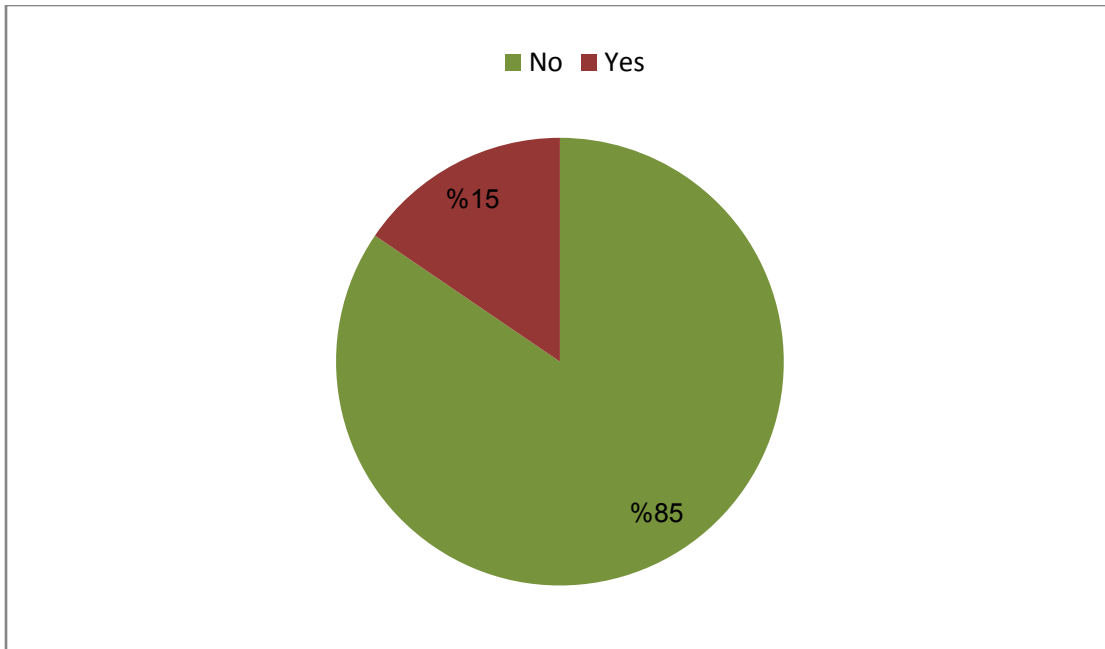
The Graph (9):- Showing The Causes Of Sore Throat That The Studied Group Believe



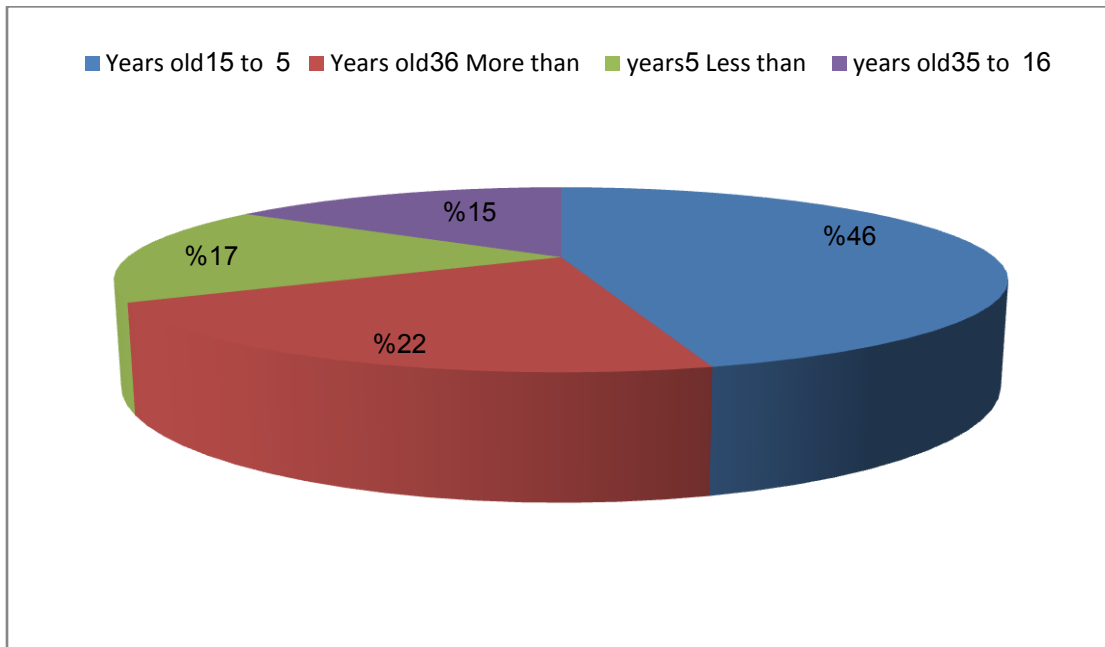
**The Graph (10):-** Shows The Best Treatment For Sore Throat Relationship To Prevent Heart Disease In The Studied Group.



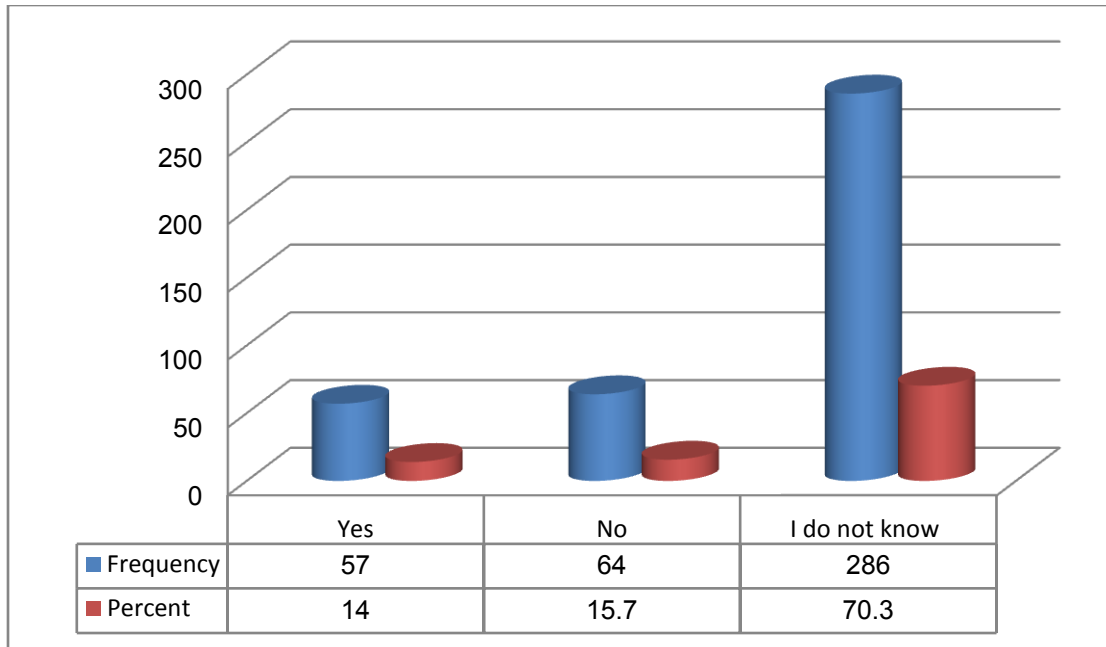
**Graph (11):-** Shows The Think Of The Studied Group.



(Graph 12):- Shows Family Member Or Friend Diagnosed With Rheumatic Fever In The Studied Group



(Graph 13):- Group Of Ages Are More Affected Of Rheumatic Fever In Believe Studied Group



(Graph 14):- Shows The Think Of The Studied Group About The Some Signs Of Heart Disease.

Affecting The Heart With Antibiotic Treatment A Patient Who Had A Rheumatic Fever (Table 4).

Treatment With Antibiotic	Frequency	Percent
No	339	83.3
Yes	68	16.7

**Discussion:-**

Confusions Of Strep Throat Are Uncommon Yet Can Happen, Particularly If Strep Throat Is Not Appropriately Treated With Antibiotics Now And Again Because Of A Strep Disease, The Body's Safe Framework Will Assault Solid Tissues, Bringing About Complexities, For Example, Rheumatic Fever.<sup>(7)</sup>

Rheumatic Fever Can Bring About Long Haul Confusions In Specific Circumstances. A Standout Amongst The Most Common Confusions Is Rheumatic Coronary Illness. Kids Who Experience The Ill Effects Of Long Haul Harm Identified With Rheumatic Fever Might Be Qualified For A Specialized Curriculum And Other Related Administrations.<sup>(8)</sup>

The Quality Of Our Review Is The Main Overview In The Kingdom Of Saudi Arabia Do To Know The Couple's Mindfulness About Rheumatic Fever, In Our Insight .

Constraints In Our Review Incorporate Utilization Of An Online Overview That May Prompt To Determination Inclination And Not All Couples Can Be Utilize Web. Consequently, We Couldn't Sum Up Our Discoveries To All Couple's .

**Conclusion:-**

We Conclude That The Parent Who Lived In The Western Region Of Saudi Arabia Need To Be More Educated Regarding The Sore Throat And Its Complication To Reduce The Incidence In The Future. This Could Be Done By Conducting Many Voluntarily Campaigns To The Family, Educative Accounts In The Social Media, Distribution Of Leaflet To The Parents.

**Acknowledgment:-**

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### RESEARCH ARTICLE

#### SOLID WASTE DISPOSAL METHODS PRACTICED BY INHABITANTS OF A TYPICAL NIGERIAN RURAL COMMUNITY.

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Solid Waste, Practice, Inhabitants.

#### Abstract

Interactions between man and his environment have led to generation of wastes that pose problem of management and disposal. Failure to adopt appropriate disposal methods is followed by risk of infectious diseases. This study reports a survey involving a sample of 300 respondents drawn from a population of 3,427 rural inhabitants using the cluster sampling procedure. Two research questions were raised for the study that aimed to determine the solid waste disposal practices of typical Nigerian rural inhabitants. Instrument for data collection was the questionnaire designed by the researchers and contained 4 response options and used to elicit information from the respondents through interview schedule. Validity of the instruments was established through the judgment of three health educators and the reliability index value yielded 0.86 using the split half method and Spearman Brown correlation statistic. Data was analyzed on item-by-item basis using mean. It was found that the respondents disposed their refuse using all the refuse disposal methods highlighted by the researcher, but the once used very often by the rural inhabitants were open or uncontrolled burning, indiscriminate dumping on the ground and in the river. Implications of the practice for human health were articulated. The researchers recommended among other things that rural health extension workers should increase their enlightenment of the inhabitants on the need to adopt proper and suitable waste disposal methods.

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#### Introduction:-

Management of wastes, especially, the solid type remains a cardinal element in the protection and promotion of public health. The continuous interaction between man and his physical, social and psychological environment has led to the generation of wastes that pose problem of management and disposal. This is followed by the risk of infectious diseases as a result of failure to adopt appropriate disposal methods. Waste according to Basavanthappa (2008) applies to unwanted or discarded waste matter. Also waste can be described as the unwanted solid-state materials originating from diverse environment. This means that waste is anything that is no longer useful and needs to be got rid of. The practice of getting rid of the wastes has been perceived as disposal (Basavanthappa, 2008, Park, 2011 and Obionu, 2015). Solid waste disposal therefore is the act of getting rid of solid-state materials that

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have been rejected as being useless and no longer wanted or needed. Suitable disposal methods are desired because of the variations in the types of waste generated in different places. This is evident in the views of Obionu (2015) who observed that a typical Nigerian solid waste could be classified into vegetable wastes; animal wastes; and mineral wastes. Consequently Otujo and Awokoya (2014) stated that one of the greatest threats to public health is improper disposal of waste, the presence of wastes poses serious health problems especially when such wastes are given less attention or left unattended to in terms proper disposal or management.

Similarly, methods adopted in the disposal of the wastes generated could also vary according to the locations. This is why it has become necessary that solid waste disposal methods adopted by the inhabitants of typical Nigerian rural community are determined. These unwanted solid-state materials are known to be disposable through various acceptable methods. Such methods according to different authorities (Akinsola, 2006, Lucas and Gilles, 2009 and Obionu,2015) are: controlled tipping; composting; incineration; berging; indiscriminate dumping; burying; pulverization; and recycling. Controlled tipping is the practice of piling wastes at a place and covering them with sand daily as against indiscriminate dumping of wastes anywhere without control and care. While incineration is burning the wastes in a large container, compositing is heaping the wastes in a pit for months with periodic turning. Berging is dumping the wastes inside water body such as sea or river. Pulverization is crushing the wastes with intention of either to convert into useful materials or burying.

Nonetheless, a typical Nigerian rural community may be faced with the environmental challenges of solid waste disposal. Following the obvious consequences of not being on top of solid waste challenges as a result of adopting unsuitable waste disposal methods, the need to determine the methods practiced by inhabitants of a typical Nigerian rural community has become needful. Practice according to Hornby (2001) is a thing that is done regularly as custom or habit. In the present study the methods regularly adopted by rural inhabitants in the disposal of solid waste will be determined.

Focusing such studies more on the rural area of Nigeria where well over 80 percent of Nigerians live (Ezedum (2002),Ani and Ezeugwu, 2014) may even be more rewarding. Furthermore, the Federal Environmental Protection Agency (EPA) and the State Environmental Sanitation Authorities in Nigeria, appear to have their focus on urban areas, thereby neglecting the rural areas. For instance, the desired impact of the monthly environmental sanitation exercise is hardly extended to and felt in the rural areas. Also In a similar study by Ani and Ugwuoke (2015), they found that there was a low level of provision of human waste disposal facilities in the rural community where the study was conducted. This development leaves the inhabitants of rural areas with the potentiality of being exposed to waste disposal related infectious diseases.

One of such typical Nigerian rural communities is Obioma in Udi Local Government Area of Enugu State. The community is organized into five villages and nineteen wards with undulating topography and the majority of the inhabitants who may be made of female subsistent farmers sharing different levels of education and ages. Whether these characteristics of the community could influence the choice of disposal methods therein is yet to be determined by this study. It is in view of this that Obionu (2015) held that the choice of a method for disposal of refuse would depend on the physical characteristics of the locality such as topography, character and quantity of the waste. Be that as it may, the broad objectives of any waste disposal method are to eliminate hazard to man; to prevent pollution of natural environment and; to salvage materials of economic value (Lucas and Gills, 2009). For these desired objectives to be achieved, especially in a rural area of a developing country, appropriate disposal methods have to be adopted. This is why the researchers specifically intend to:

- 1) determine the solid waste disposal methods of the inhabitants of a typical Nigerian rural community
- 2) find out the solid waste disposal methods often used by the inhabitants of a typical Nigerian rural community

The following research questions guided the study

- 1) What are the solid waste disposal methods adopted by the inhabitants of a typical Nigerian rural community?
- 2) What solid waste disposal methods are often used by the inhabitants of a typical Nigerian rural community

### **Methods:-**

The survey research design was adopted for the study. Three thousand four hundred and twenty seven (3,427) inhabitants (NPC, 2007) of Obioma community formed the population for the study. Cluster sampling procedure was employed in drawing the sample. Each village of Aba, Ameke, Umunugwo, Oluku and Amachalla was regarded as a cluster. Six respondents were selected from each of the ten households that were purposively drawn from each

cluster. The purpose was to control for the households that have up to six members with respondents' characteristics.

Instrument for data collection was a 16- item questionnaire with four response options. The respondents were required to indicate the disposal methods used and how often they dispose their solid wastes using the outlined methods of solid wastes disposal. Validity of the instrument was established through the judgment of three experts and the reliability for internal consistency was determined using test re-test method. The correlation coefficient index value yielded .86 using Spearman Brown correlation statistic .Data was collected personally by the researchers with the help of two research assistants, using interview schedule technique. Data collected from 300 inhabitants who responded to the questionnaire were analysed item-by-item using mean. The response options were assigned weights of 4, 3, 2, and 1 accordingly. Mean responses of 3.00 – 4.00 were regarded as strongly agree or very often; 2.00 – 2.99 were regarded as agree or sometimes, 1.00 – 1.99 were regarded as seldom or disagree while below one were regarded as never practiced or strongly disagree.

### Results:-

**Table 1:-** Mean Responses of the Inhabitants' on Solid Waste Disposal Methods used (n = 300).

S/N	Waste Disposal Methods	X	SD	Interpretation
1	Controlled Tipping	2.14	1.02	Agree
2	Composting	2.43	1.07	Agree
3	Open or uncontrolled Burning	2.22	0.84	Agree
4	Berging or throwing inside river	2.96	0.73	Agree
5	Indiscriminate Dumping	3.00	0.98	Strongly agree
6	Burying	2.52	0.89	Agree
7	Pulverization	1.96	0.78	Disagree
8	Recycling	1.88	0.72	Disagree
9	Incineration	1.58	0.64	Disagree
	<b>Grand Mean</b>	<b>2.30</b>	<b>0.85</b>	<b>Agree</b>

Data in Table 1 show a grand mean score of 2.30 which indicates that inhabitants agree that they dispose their solid wastes. Data in the Table also reveal that item 5 attracted mean score of 3.00 meaning that the inhabitants strongly agree that they dispose their refuse indiscriminately. Also in the table, it was shown that the respondents agreed that they dispose their solid waste by control tipping, composting, open burning, berging and burying. However, the Table shows that items 7, 8 & 9 attracted mean scores of 1.96, 1.88 & 1.58 respectively. This implies that the inhabitants disagree with disposing their solid wastes by pulverization, recycling and incineration.

**Table 2:-** Mean Responses on Solid Waste Disposal Methods often used by the inhabitants of a typical Nigerian rural community (n = 300).

S/N	Waste Disposal Methods	X	SD	Interpretation
1	Controlled Tipping	1.62	1.02	Sometimes
2	Composting	2.14	1.07	Sometimes
3	Incineration	2.22	0.84	Sometimes
4	Bergin or throwing inside river	3.16	0.73	Very often
5	Indiscriminate Dumping	3.46	0.98	Very often
6	Burying	2.52	0.89	Sometimes
7	Pulverization	1.16	0.78	Never
8	Recycling	1.38	0.72	Never
9	Incineration	1.25	0.42	Never
	<b>Grand Mean</b>	<b>2.10</b>	<b>0.88</b>	<b>Sometimes</b>

Data in Table 2 show a grand mean score of 2.10 which indicates that inhabitants sometimes dispose their solid wastes. Data in the Table also reveal that items 4 and 5 attracted mean scores of 3.16 and 3.46 meaning that the inhabitants practice throwing of waste inside river and indiscriminate dumping of refuse very often. Also in the table, it was shown that the respondents sometimes dispose solid waste by control tipping, incineration, composting and burying. However, the Table shows that items 7, 8 & 9 attracted mean scores of 1.16, 1.38 & 1.25 respectively.

This implies that the inhabitants never practiced pulverization, recycling and incineration as methods of disposing their solid wastes.

#### **Summary of Findings:-**

1. Rural inhabitants agreed that they dispose their wastes
2. Waste disposal practices often adopted by rural inhabitants were mainly indiscriminate dumping on the ground and sea, burying and open burning.

#### **Discussion:-**

The purpose of this study was to determine the solid waste disposal methods of the inhabitants of a typical Nigerian rural community. The findings showed that typical Nigerian rural inhabitants dispose their solid wastes by mainly dumping them indiscriminately, burning them, throwing inside river or sometimes burying. A typical Nigerian solid waste is composed of leaves, food items, paper, cartons, rags, plastic and polythene, tins, broken bottles and glasses (Obionu, 2015). Majority of them are dry refuse which may promote fire disaster if not properly disposed. Given this background of the methods adopted by rural inhabitants, exposure to health hazards of enormous dimension is highly imminent. This is because it has been warned that indiscriminate dumping of refuse would lead to fire outbreak and injuries, especially to children playing around and also cause flooding by blocking drainage channels.

In addition to these, it is known that improper solid waste disposal would lead to offensive conditions such as bad smells, fly mosquito breeding and proliferation of other hazardous vectors and vermin. However, the finding that these rural inhabitants dispose waste indiscriminately was not surprising to the researcher. This is because, Akinsola (2006) had earlier observed that uncontrolled dumping of waste was commonly used in rural tropical communities where there was either no facility for proper disposal or that control measures were lacking, however it is not a positive development because it is expected that their ought to be an improvement in the waste disposal practices of the people going by the efforts on the ground by various health and environmental agencies in ensuring that there is improved environmental sanitation in Nigeria.

The implication of the finding is that, the objective of eliminating hazard to man; and preventing pollution of natural environment through proper waste disposal would become a mirage in the rural communities. Furthermore, poor sanitary environmental-related diseases will be promoted and optimal health status may reduce. This finding is in agreement with Lucas and Gilles (2009), Otujo and Awokoya (2014) who had observed that failure to manage and dispose waste properly exposed people to increased risk of infectious disease. It is the suspicion of the researchers that, the burying that is sometimes practiced by the inhabitants is limited to the disposal of the dead. Disposing the dead by burying is a generally adopted method especially among the Christians and Moslems. The burning found to be practiced by these inhabitants is generally seen as having its demerits. Apart from the danger of disease spread, it contributes to ozone layer depletion, atmospheric pollution, and global warming; hence there is need for improved waste disposal practices by the rural dwellers.

#### **Conclusion:-**

Based on the findings of the study, the following conclusions are made:

- (1) Rural inhabitants dispose their solid waste.
- (2) Solid waste disposal practices of rural inhabitants are indiscriminate dumping and dumping inside river.
- (3) These methods adopted by the rural dwellers expose them to increased risk of infection and diseases.
- (4) Possibilities abound that the rural inhabitants may not have optimal health as a result of improper waste disposal.

#### **Recommendations:-**

- (1) Rural health extension workers should increase their enlightenment of the inhabitants on the need for proper and suitable waste disposal methods.
- (2) Supervision and enforcement of the monthly environmental sanitation exercises in the country should be extended to the rural areas.

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### RESEARCH ARTICLE

#### AN EMPIRICAL ANALYSIS OF CONSUMER BUYING BEHAVIOUR OF MOBILE PHONE: A STUDY OF BHIWANI, HARYANA.

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#### Abstract

We are living in an electronic age. The whole world is taking a new turn with every fraction of time. It has given birth to globalization. The world has been contracted and concise at a tip. There are a lot of new means of communication which have made our life so simple and easy going. Mobile phone can be seen as the most used present day phenomenon in this fast growing time. Mobile phone is a revolutionary step in the field of tele-communication. The objective of this paper is to study the relative preferences of influencing factors and satisfaction of rural and urban consumers regarding durable goods for mobile.

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#### Introduction:-

Consumers play very important role in the economy. They are largest economic group in any country and present day activities are done because of consumer only. Consumers are the pillars of the economy. Consumers in India are very heterogeneous in composition, following different religions, speaking different languages, using different products and services and adhering closely to their tradition. The Indian economy has ushered in a new era, wherein the country's per capita income in recent years has increased. Due to this, the share of essential items likes food, clothing, electricity and fuels, footwear in total average annual per capita consumption expenditure has reduced whereas the share of durable goods has increased, which reflect the changing preferences of consumers. The increase in share of expenditure on durable goods shows change in buying decision of consumers in favor of durable goods. The share of durable goods such as refrigerator, cars or mobile phones usually continues to be increases in this duration. But the courage of brands now shifts most in mobile phones. The consumers influence on brands, quality and new features. Thus there is to understand the factors which influence the consumers while purchasing durable goods like Mobile.

#### Objective Of The Study:-

To study the relative preferences of influencing factors and satisfaction of rural and urban consumers regarding durable goods for mobile

#### Research Methodology:-

The study has been based on primary data. Primary sources have been used to acquire the necessary information from respondents by survey method. A sample of 200 respondents, 150 respondents from urban area (Bhiwani City)

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and 50 respondents from rural area (Siwani Khera village) from Bhiwani District have been selected on the basis of convenience sampling. Four durable goods Mobile have been selected for the study. The study explained five main factors (Price, Quality, Style, Functions and Brand Name) which influencing consumers while purchasing durables. The study also examines brand of durables and sources of information used by rural and urban consumers and also, satisfaction of rural and urban consumers for their durables. The primary data was collected through structured questionnaire. The data has been tabulated, analyzed and interpreted with the help of some necessary and statistical tools simple percentage, mean score, Analysis of Variance.

### Present Scenario Of Mobile Phones:-

One of the most astonishing explosions in modern consumer culture is undoubtedly the mobile. People see their phone as a reflection of themselves and their status; they use it to communicate how they are feeling and to improve their everyday experience of life. Mobiles present an exciting opportunity to establish how technology developed for communication with others could have an increasingly prominent impact on the subjective configuration of the self. It could be contended that the mobile—a technological tool initially designed simply as means of communication—has had an impact beyond its function; it has become a fashion accessory, a prosthetic extension of and delineation of the self, a symbol of economic status and power. The mobile phone market in India is expected to grow by 4% to 250 million units this year and can see more handsets available for less than Rs 5,000, a research report has said. "An examination of the present scenario, coupled with an analysis of historical trends tells us that the market for India mobile handsets will settle around 250 million units in 2016, a 4 per cent growth compared to 2015," the report, India Mobile Handsets Market, by Cyber Media Research (CMR) said. The Smartphone segment grew at an annual average rate of 32% to about 95 million in 2015 from 77 million a year ago. The report said it expects 4G shipments to cross 50 million units in 2016. The CMR researchers also noted that average selling price for a Smartphone in 2013 was Rs 13,000 (when 41 million units were sold), which has come down to Rs 10,700 by the end of 2015.

### Result And Discussions:-

**Table -1:-** Brand of Mobile used by the Rural and Urban Respondents.

Sr. No.	Brand Used	No. of the Respondents	
		Rural	Urban
		No. (%)	No. (%)
1	Nokia	17 (34%)	60(40%)
2	Apple	0 (0%)	05(3.33%)
3	Samsung	16 (32%)	50(33.3%)
4	Motorola	05 (10%)	10(6.66%)
5	Others	12 (24%)	25(16.6%)
Total		50(100%)	150(100%)

Source: Field Survey

From the above table 1, it is inferred that in a sample of 50 respondents in rural area, 34% respondents used Nokia followed by 32% Samsung, 10% Motorola and 24% other brand of Mobile. In urban area in a sample of 150 respondents 40% respondents used Nokia followed by 3.33% Apple, 33.3% Samsung, 6.66% Motorola, 3.33% LG and 16.6% others brand of Mobile. Thus both in rural and urban area Nokia and Samsung are mostly used brand of Mobile.

### Mean Score Analysis:

**Table-2:-** Mean Score of Factors while purchasing Mobile phone by Rural and Urban Respondents.

Factors Influencing	Rural	Urban
Price	2.86	2.42
Quality	3.82	4.26
Style	1.96	2.56
Functions	3.16	2.86
Brand Name	3.30	2.90

Source: Field Survey

Mean score of factors regarding Mobile is given in table-2 which shows that both Rural and Urban respondents have shown highest preferences towards quality while purchasing Mobile with mean score 3.82 and 4.26 followed by

brand name 3.30 and 2.90. Rural respondents given lowest preference given to style with mean score 1.96 while urban respondents given to price with mean score 2.42. Thus quality and brand name are the preferred factors both in rural and urban area.

**Table-3:-** Results of ANOVA showing difference in the mean score of influencing factors of Rural and Urban Respondents in case of Mobile.

Factors		Sum of Squares	df	Mean Square	F	p-value
Price	Between Groups	7.042	1	7.042	3.066	.081
	Within Groups	454.713	198	2.297		
	Total	461.755	199			
Quality	Between Groups	7.482	1	7.482	7.608	.006
	Within Groups	194.713	198	.983		
	Total	202.195	199			
Style	Between Groups	13.802	1	13.802	8.415	.004
	Within Groups	324.753	198	1.640		
	Total	338.555	199			
Functions	Between Groups	3.227	1	3.227	2.298	.131
	Within Groups	278.053	198	1.404		
	Total	281.280	199			
Brand Name	Between Groups	6.000	1	6.000	3.375	.068
	Within Groups	352.000	198	1.778		
	Total	358.000	199			

Source: Field Survey

ANOVA table-3 is generated to unearth the differences in the mean score of influencing factors on rural and urban respondents in case of Mobile. Table-shows that analysis of variance does not show significant difference in the mean score of rural and urban respondents regarding 'Price Consciousness', 'Functions Consciousness' and 'Brand Consciousness' but shows significant difference regarding 'Quality Consciousness' and 'Style Consciousness' in case of Mobile.

### Conclusion:-

The forgoing study revealed that now in era of science and technology the whole market is depends upon the consumer behaviour. But there is difference in the preference and knowledge of brands in rural and urban area. Due to the open market condition, many foreign companies have entered into the Indian market with advanced technology. This has led to change in life style of our Indian consumers' that has in turn resulted in a challenge to our existing Indian companies to reconsider their strategies of production and marketing. On the other hand Product characteristics include quality, price, style (design), brand name, functions (features) and packaging of the product. Thus while purchasing the products, consumers may be influenced by various attributes, since each consumer may prefer different sets of attributes, the researcher is interested in identifying the level of influence of each attribute while they purchase the durable products. The result of the study indicated that Mobile used by most of the rural and urban respondents was Nokia followed by Samsung. It was found that highest preference was given to quality and lowest preference to price by both of the rural and urban respondents while purchasing Mobile. In case of Mobile, it was found that there was no significant difference between mean score of rural and urban respondents regarding 'Price Consciousness', 'Functions Consciousness' and 'Brand Consciousness' but found significant difference in 'Quality Consciousness' and 'Style Consciousness'. It indicates that urban consumers were highly quality and style consciousness compare to rural consumers.



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### RESEARCH ARTICLE

## INCREASING THE COMPETENCE OF UNIVERSITY STUDENTS' LEARNING RESULTS IN THE ENGINE ELEMENTS COURSE BY BENEFITTING THE MACHINERY TOOLS IN THE ENGINEERING LABORATORY OF SEMARANG STATE UNIVERSITY<sup>10</sup>.

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##### **Key words:-**

laboratorium-based engineering learning.

#### **Abstract**

The study was to find the improvement on the competence of university students' learning results in the Engine Elements Course in the topic of Shaft Planning and Calculation. The competencies that would be improved were knowledge, analysis, calculation results and cumulative learning results. In order to achieve the objective of the study, the researcher implemented a quasi-experiment method by selecting 49 university students to be given lesson and be tested. There are three types of learning stages. The first stage consisted of theoretical study and test. Then, the second stage consisted of laboratory study and test. Last but not the least, the third stage consisted of laboratory observation and test. The analysis that the researcher performed in the stud was the Partial Least Square (PLS) analysis in order to identify the differences from one test to another. From the results of the study, there were three aspects which results improvement might be measured, namely knowledge (A), analysis (B) and calculation results (C). The learning results improvement between knowledge A1 and knowledge A2 was 3.5% and between knowledge A2 and knowledge A3 was 1.1%. Then, the learning results improvement between analysis B1 and analysis B2 was 40.0% and between analysis B2 and analysis B3 was 10.5%. Next, the learning results improvement between calculation results C1 and calculation results C2 was 59.4% and between calculation results C2 and calculation results C3 was 46.1%. Altogether, the improvement on the learning results competency between P1 and P2 was 25.6% and between P2 and P3 was 14.89%.

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#### **Introduction:-**

Learning is a process that cultivates a set of values that have been consumed by the students and that have been taken from multiple sources. According to Arief Sadiman (2002)<sup>1</sup>, learning sources might be classified into five categories namely: human, books/library, mass media, natural environment and educational media. In other words, learning sources refer to every single matter that might be used as a place where the teaching materials might be attained or where the origin of an individual's learning process might be attained. The engineering laboratory might also serve as an educational media that assists the teachers in enriching the learning participants' insight. In

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explaining an object, a lecturer might take his or her students to a laboratory. By the looking at the objects in the laboratory, these objects might serve as learning sources.

Learning medium as an assisting tool serve to ease the way in achieving the teaching objectives. The statement is based on a belief that the teaching-learning process with the assistance of the media may improve the learning participants' learning activities within a long period of time. In other words, the learning participants' learning activities that are assisted by the learning medium will result in better learning process and results. Ali Imron (2002)<sup>2</sup> provides limitation regarding media, namely medium refers to any form and material that has been used for delivering message or information. In addition to serving as a system of delivery or introduction, media that has been derived from the word mediator, according to Azhar (2002)<sup>3</sup>, is a cause or a tool that interferes two parties in order to provide peace among the two parties. With the term mediator, the media shows its role or function namely to regulate an effective relationship between two main parties in the students' learning process and the learning content. If the media deliver instructional messages or information, or if the media contain the teaching intentions, then the media will be regarded as teaching media.

According to Azhar (2003)<sup>3</sup>, there are three main levels in the learning mode namely direct experience (enactive level), pictorial experience (iconic level) and abstract experience (symbolic level). Such experience level in attaining the learning results is depicted as a process of communication. The materials that the teachers want to deliver and that the students demand, until the students master all of the materials, are known as messages. The teachers as the source put the messages into certain symbols (encoding process) and the students as the retriever will interpret these symbols in order to understand these symbols as messages (decoding process). Learning by using double senses (the vision and the auditory) will gain more results compared to learning by only using the vision or the auditory. The comparison on the learning results between the vision and the auditory has significant difference. Approximately 90% of an individual's learning results are attained by the vision and only 5% of those are attained by the other senses<sup>12</sup>. On the other hand, Arief Sardiman (2002)<sup>1</sup> predicts that the students attain 75% of their learning results from the vision, 13% of their learning results from auditory and 12% of their learning results from other senses.

In a learning process, two most important elements are the teaching methods and the learning media. The selection of certain teaching methods will influence the type of appropriate learning media. Several aspects that should be given attention in selecting the media are: the learning objectives, the learning contexts, the lesson types and the students' characteristics. All of these aspects are expected to be mastered by the students after the learning process has occurred. Skinner (1998)<sup>4</sup> state that there are four functions of learning media, especially the visual learning media, namely the attentive function, the affective function, the cognitive function and the compensatory function. The four functions might support one to another so that they will strengthen one to another in the learning process. Then, according to Jujun (2003)<sup>5</sup>, learning media might meet the three main functions namely to motivate interest or action, to provide information and to give instruction. Learning media might also be implemented for individual, group or hugh group of listeners. Saiful Sagala (2001)<sup>6</sup> states the benefits of using learning media in the students' learning process as follows: the learning media will draw more attention, the learning materials will have clearer meaning, the teaching methods will be more various and the students might display more learning desire. From the opinions of several experts, the researcher might conclude several practical benefits from the use of learning media, namely to ease and to increase the learning process and results. From the perspective of learning theory, multiple conditions and psychological principles that should be considered in selecting and in using the learning media are related to the improving the students' motivation.

An effective teaching is the result of good learning plan; therefore, the learning media that will be used in the teaching process should also have good planning. Several aspects that should be considered by the teachers in selecting the learning media for the class activities are: the selected media are easy to use, the selected media might provide better explanation, the selected media might draw the students' interest and attention and the selected media might lead to the more structured and organized presentation. The consideration is expected to meet the needs in achieving the objectives that have been formulated.

Competence, on the other hand, refers to the capacity of performing certain jobs that include the aspects of knowledge, skills and attitudes. Therefore, competence might be improved. According to Spencer & Spencer (1990)<sup>7</sup>, Essential competencies as the foundation of knowledge and skills need by everyone; these can be developed through training and are relatively easy to identify. From the statement, the researcher might conclude that the competencies of an individual might be developed through training programs. Tjutju Yuniarsih (2008)<sup>8</sup> states that

the knowledge competencies and the skill competencies are relatively easy to develop and the learning and training programs are the most effective ways for developing these competencies. Therefore, learning programs, training programs and the combination of both programs in the working place will be the main key for developing and improving the competencies.

The Engineering Elements Course is a course that will be the foundation of engineering shaft planning. Therefore, the explanation of engineering shaft will be better if it is assisted by the object. Based on the learning experiences, the researcher found that many university students have not understood that object that will be planned. The same findings might also be seen in the results of a test conducted in 2015: only 20% of the students had been able to achieve the limit of the already formulated competencies. Since the competencies have not been achieved in accordance to the expectation, the lecturers should benefit the existing engineering laboratory as the learning media for Engineering Elements Course especially in the shaft planning.

Based on the explanation, the engineering laboratory might be used as the learning medium in order to improve the university students' learning results in the Engineering Element Course especially in the shaft planning. In addition, the engineering laboratory might also be used for increasing the size of influence so that the lecturers might improve the competencies on the learning results.

### Research Methods:-

The study made use of quasi-experiment approach by taking all of the Engineering Education Study Program students who took the Engineering Elements Course in 2015 as the respondents and the number of the respondents were 49 people. The study took place in the Department of Engineering Semarang State University and the study was conducted in the classroom and in the laboratory. The classroom session was related to learning the theory all aspects that had been related to the shaft planing. Then, the laboratory session was related to learning all types of shafts, the forces that worked on the shaft, the materials that should be used and the allowed positioning and tolerance. All tests were conducted after the session had ended.

In order to gain the accurate data regarding the unclear problems for the students, there should be several personal approaches and these approaches might be conducted by increasing the number of consultation sessions for the students whose test results had been less than the already determined criteria (under 75). All of the data from the test results were analyzed by means of Partial Least Square (PLS) program in order to measure the improvement on the test results and several factors that influenced the improvement.

### Results And Discussion:-

#### Competence Improvement on the Test Results:

##### Test Results:

The test results were the reflection of the competence achievement that had been attained from the test on each learning stage. In each learning stage, there were three components that had been assessed namely knowledge (A), analysis (B) and calculation results (C). The final score consisted of  $A + B + C$  and the results of summation would be divided by three; the final score will be the final result for each learning process. The conclusion of the test results in the Learning Stage I might be seen in the following Table 1:

**Table 1:-** Learning Stage I (P1) Test Results.

Score	A1	B1	C1	P1
Mean	83	56	37	59
Total	4075	2775	1835	2915
Min	80	30	25	45
Max	90	80	55	75

From Table 1, the researcher might state as well that from the Learning Stage I results (P1) the mean score was 59 and the total score was 2916 with 45 as the lowest score and 75 as the highest score. From the test results in the first stage there were only 5 students (10%) who had been able to achieve the minimum passing grade that had been determined. The achievement above the minimum passing grade was heavily supported by the A1 score, which referred to the score of knowledge.

Learning Stage II (P2) Test Results.

**Table 2:-** Learning Stage II (P2) Test Results.

Score	A2	B2	C2	P2
Mean	86	76	59	74
Total	4245	3755	2905	3625
Min	80	70	40	65
Max	90	85	70	80

The conclusion of the Learning Stage II results might be seen in the following Table 2.

From Table 2, the researcher might conclude that from the Learning Stage II (P2) results the mean score was 74 and the total score was 3625 with 65 as the lowest score and 90 as the highest score. From the second test, there were 20 students (40%) who had been able to achieve the minimum passing grade that had been determined.

Learning Stage III (P3) Test Results.

**Table 3:-** Learning Stage III (P3) Test Results.

Score	A3	B3	C3	P3
Mean	86	84	83	85
Total	4235	4130	4105	4155
Min	80	80	80	80
Max	95	95	95	95

The conclusion on the Learning Stage III (P3) test results might be seen in the following Table 3.

From Table 3, the researcher might conclude that from the Learning Stage III (P3) test results the mean score was 84 and the total score was 4155 with 80 as the lowest score and 95 as the highest score. From the third test all of the students (49 = 100%) might achieve the minimum passing grade that had been determined.

Improvement on the Competence Test Results

There were three aspects that might be measured in terms of test result improvement namely knowledge (A), analysis (B) and calculation result (C). The improvement on the competence test result was attained twice, namely the improvement on the Second Learning Stage (P2) test results from the First Stage Learning Stage (P1) test results and the improvement on the Third Learning Stage (P3) test results from the Second Learning Stage (P2) test results. Improvement on the Learning Stage I (P1) Competence Test Results and the Learning Stage II (P2) Competence Test Results on the Aspect of Knowledge (A1 and A2).

**Table 4:-** Improvement on the A1 Knowledge Test Results and A2 Knowledge Test Results.

Test	N	Mean	Standard Deviation	- T Statistics
A1	49	83	3.636	1.101-
A2	49	86	3.444	-

In Table 4, the researcher found that the mean score of A1 knowledge test was 83 and the mean score of A2 knowledge test was 86. The T-Statistics = 1.101 and this score was smaller than T-table = 1.69. These findings show that there had been improvement on the knowledge test results but the improvement was not significant and the improvement had been marked by the increasing test results in A2 from A1 and by the T-count that had been smaller than the T-table. The improvement in overall was 3.5%.

Improvement on the Learning Stage II (P2) Competence Test Results and the Learning Stage III (P3) Competence Test Results in the Aspect of Knowledge (A2 and A3).

**Table 5:-** Improvement on the A2 Knowledge Test Results and A3 Knowledge Test Results.

Test	N	Mean	Standard Deviation	T Statistics
A2	49	86	3.444	0.76
A3	49	87	5.103	-

In Table 5, the researcher found that the mean score of A2 knowledge test was 86 and the mean score of A3 knowledge test was 87. The T-Statistics = 0.76 and the score was smaller than T-table = 1.69. Thereby, the researcher might conclude that there had been improvement on the knowledge test results but the improvement was not significant and the improvement had been marked by the increasing test results in A3 from A2 and by the T-Count that had been smaller than the T-table. The improvement in overall was 1.1%.

The Improvement on the Learning Stage I (P1) Competence Test Results and the Learning Stage II (P2) Competence Test Results in the Aspect of Analysis (B1 and B2).

**Table 6:-** Improvement on the B1 Analysis Test Results and B2 Analysis Test Results.

Test	N	Mean	Standard Deviation	- T Statistics
B1	49	56	15.730	12.34
B2	49	76	4.256	-

In Table 6, the researcher found that the mean score of B1 analysis test results was 56 and the mean score of B2 analysis test results was 76. The T-Table = 12.34 and the score was bigger than T-table = 1.69. These findings showed that there had been significant improvement on analysis test results and the improvement had been marked by the increasing mean score of test results in B2 from B1 and by the T-count that had been bigger than the T-table. The improvement in overall was 40%.

Improvement on the Learning Stage III (P3) Competence Test Results from the Learning Stage II (P2) Competence Test Results on the Aspect of Analysis (B3 from B2).

**Table 7:-** Improvement on the B3 Analysis Test Results from the B2 Analysis Test Results.

Test	N	Mean	Standard Deviation	- T Statistics
B2	49	76	4.256	9.63
B3	49	84	4.208	-

In Table 7, the researcher found that the mean score of B2 analysis test results was 76 and the mean score of B3 analysis test results was 84. The T-Statistics = 9.63 and the score had been bigger than the T-table = 1.69. Thereby, the researcher might conclude that there had been significant improvement on the test results and the improvement had been marked by the increasing B3 test results from B2 test results and by the T-count that had been bigger than the T-table. In overall the improvement was 10.5%.

Improvement on the Learning Stage II (P2) Competence Test Results from the Learning Stage I (P1) Competence Test Results in the Aspect of Calculation Results (C2 from C1).

**Table 8:-** Improvement on the Test Results of C2 Calculation Result from C1 Calculation Result.

Test	N	Mean	Standard Deviation	- T Statistics
C1	49	37	8.173	12.30
C2	49	59	9.895	-

In Table 8, the researcher found that the mean score of C1 was 37 and the mean score of C2 was 59. The T-Statistics = 12.30 and the score was bigger than the T-table = 1.69. These findings showed that there had been significant improvement and the significant improvement had been marked the increasing test results of C2 from those of C1 and by the T-count that had been bigger than the T-table. In overall the improvement was 59.4%.

Improvement on the Learning Stage III (P3) Competence Test Results and the Learning Stage II (P2) Competence Test Results on the Aspect of Calculation Results (C3 from C2).

**Table 9:-** Improvement on the Test Results of C3 Calculation Result from C2 Calculation Result.

Test	N	Mean	Standard Deviation	- T Statistics
C2	49	59	9.895	21.33
C3	49	83	4.273	-

In Table 9, the researcher found that the mean score of C2 as 59 and the mean score of C3 was 83. The T-Statistics = 21.33 and the score had been bigger than the T-table = 1.69. Thereby, the researcher might conclude that there had been significant improvement and the significant improvement had been marked by the increasing test results of C3 from C2 and the T-table that had been bigger than the T-count. In overall, the improvement was 46.1%.

Improvement on the Learning Stage II (P2) Cummulative Competence Test Results from the Learning Stage I (P1) Cummulative Competence Test Results.

The results of Learning Stage (P) competence test was a score that had been consisted of knowledge (A) score plus analysis (B) score plus calculation result (C) divided by 3 ( $P = (A + B + C)/3$ ).

**Table 10:-** Improvement from the Learning Stage II (P2) Competence Test Results from the Learning Stage I (P1) Competence Test Results.

Test	N	Mean	Standard Deviation	- T Statistics
P1	49	59	9.199	7.15
P2	49	74	4.998	-

In Table 10, the researcher found that the mean score of P1 test results was 59 and the mean score of P2 test results was 74. The T-Statistics = 7.15 and the score had been bigger than the T-table [= 1.69]. These findings showed that there had been improvement on the learning stage cumulative test results and the improvement had been marked by the increasing mean score in P2 from P1 and by the T-count that had been bigger than the T-table. In overall, the improvement was 25.6%.

Improvement on the Learning Stage III (P3) Cummulative Competence Test Results from the Learning Stage II (P2) Cummulative Competence Test Results.

**Table 11:-** Improvement on the Learning Stage III (P3) Cummulative Competence Test Results and the Learning Stage II (P2) Cummulative Competence Test Results.

Test	N	Mean	Standard Deviation	- T Statistics
P2	49	74	7.211	4.331
P3	49	85	1.523	-

In Table 11, the researcher found that the mean score of P3 competence test results was 74 and the mean score of P2 competence test results was 85. The T-Statistics = 4.331 and the score had been bigger T-table = 1.69. These findings showed that there had been significant improvement on the cumulative competence test results and the significant improvement had been marked by the increasing mean score of P2 from P2 and the T-count that had been bigger than the T-table. In overall, the improvement was 14.89%.

### Discussions:-

The learning activity that the researcher conducted was direct observation toward the object that would be planned. By directly observing the object that would be planned, the students had better comprehension and increasing competence. This finding was in accordance with the statement of Azhar (2003)<sup>3</sup> that the main level of learning mode had been the direct experience (enactive level). Learning by means of vision would cause the students to retrieve more learning materials. Furthermore, Saiful Sagala (2002)<sup>6</sup> stated that the attainment of learning results through the vision of an individual might approximately be 75%. Thereby, the results of the study had proved the studies conducted by the experts.

Two most important elements in the learning process were the teaching methods and the learning media. Both aspects were related from one to another and the selection of certain teaching methods would influence the appropriate learning media. In the learning activities that had been conducted, the students were invited to the engineering laboratory in order to observe the object that would be planned. The students apparently were very interested with what they saw in the engineering laboratory, namely the engine shaft; then, they asked the functions of the engine shaft and how to plan and to design the shaft. From the situation, the researcher might infer that the teaching methods and the learning media that had been implemented might draw the interest, might provide better information and might send very beneficial learning messages. The statement was in accordance with the statement of Jujun (2003)<sup>5</sup> that good learning media should be able to meet the main three functions namely to motivate interest or action, to provide information and to give instruction. The teaching method that had been selected was also in accordance with the statement of Saiful Sagala (2001)<sup>6</sup> who stated that the benefits of learning media in the teaching-learning process were: the learning media would draw more attention, the teaching materials would provide better meaning, the teaching methods would be more various and the students might display greater learning desires. From the results of the study regarding the engineering laboratory-based learning process the researcher found many situations that had been in accordance with those of other studies and, therefore, the researcher might conclude that the practical benefit of using learning media had been to ease and to improve the learning process and results. From the perspective of learning theory, multiple conditions and psychological principles that should be considered in selecting and in using the learning media were the ones that would increase the students' motivation.

The competence improvement on the university students' learning results in the study was also in accordance with the results of a study by Eka Ariyani (2009)<sup>9</sup>, which concluded that the learning of ecosystem and biodiversity through the laboratory practice-based learning process might significantly improve the critical thinking capacity of the university students with the moderate category. Furthermore, the results of a study by Ketut Suma (2009)<sup>9</sup> also stated that the inquiry-based learning had been more effective in increasing the content of Physics and the reasoning capacity of teacher-candidate students in the moderate level.

In overall, the results of the study showed that there had been competence improvement in the learning results of the university students after the students directly observed the object that would be planned. The competence improvement was proved by the improvement on the mean score of the test that had been conducted.

The results of the study were also in accordance with those of a study by R. Mursid (2013)<sup>9</sup>, which concluded that the development of product-oriented competence-based practical learning model might improve the learning results of university students in the Engineering Technology Course. Then, the results of the study were also supported by those of a study by M. Wahyudi (2014)<sup>9</sup>, which stated that the demonstration learning might improve the results of engine regular service practice for the vocational high school teachers in the automotive engineering departments under the training and education program of vocational competence in P4TK BOE Malang. The researcher found that the practical course should be supported by the appropriate use of learning media in order to improve the competence of learning results. Rabiman (2014)<sup>9</sup> stated that the selection of appropriate learning media might improve the learning results of university students in the Department of Engineering, Sarjanawiyata Tamansiswa University, Yogyakarta. The improvement on the competence of test results was not apart of the implementation of the modul that had been appropriate to the context that would be studied. As having been stated by Wijanarka et al. (2014)<sup>9</sup>, the results of implementing the CAD/CAM software modules might improvement the theoretical competencies and the practical competencies of the vocational high school students in Yogyakarta. In overall, the results of the study also stated that the overall learning process that had been conducted should be supported by innovation in order to improve the competence of the learning results.

Based on the overall results of the study regarding the use of laboratory for providing clear information in the learning process, the researcher found that the overall learning process might improve the competence of the students' learning results. It was the overall learning process that had been suitable to the results of the study that had been conducted, namely the overall learning process that made use of the tools and the objects in the laboratory so that the learning process would be more interesting and would provide better materials that would be taught in the learning process.

#### **Limitations:-**

In conducting the study, the researcher encountered several limitations namely the abundant number of university students, the laboratory that had not been designed, the laboratory room that had not been sufficient and the tools and objects that had not been sufficient. The university students were too many to serve as the respondents so that they exceeded the capacity that had been in accordance with the learning standard (20 students). Then, the laboratory had not been designed in accordance with the standards of engineering tools and objects placement and operation. Next, the laboratory room had not been sufficient in terms of placement and operation. Last but not the least, the engineering tools and objects had not been sufficient as well in terms of amount and quality standard. In conducting the study, the researcher provided opportunity for the university students to ask all matters that they had not understood. Thereby, the university students might attain more detailed explanation from the lecturer and the data gathering activity might be conducted correctly and appropriately.

#### **Strengths:-**

The learning plan and the learning test might cause the learning development of the university students to be more directed and the researcher might immediately find the weaknesses on the students' consideration in planning and in calculating the engineering elements. In addition, the researcher might also identify the improvement in each step of university students' considerations and these considerations would be evaluated by the researcher in order to define the appropriate solution. From the statements, it was apparent that all of the competence elements that the university students had, both the ones in the form of knowledge and of analysis, might be evaluated in depth and in details. Thereby, the university students' strengths and weaknesses in the thinking process might be identified immediately.



**Conclusion:-**

From the results of the study, the researcher would like to conclude that there are three aspects that might be measured in identifying the improvement on the competence results, namely knowledge score (A), analysis score (B) and calculation result score (C) altogether with the learning results score. The improvement on the A1 and the A2 knowledge competence test results has been 3.5% and has not been significant. The improvement on the A2 and the A3 knowledge competence test results has been 1.1% and has not been significant as well. Then, the improvement on the B1 and the B2 analysis competence test results has been 40% and has been significant. The improvement on the B2 and the B3 analysis competence test results has been 10.5% and has been significant as well. Next, the improvement on the C1 and the C2 calculation result competence test results has been 59.4% and has been significant. The improvement on the C2 and the C3 calculation result competence test results has been 46.1% and has been significant as well. Altogether, the improvement on the P1 and the P2 learning competence test results has been 25% and has been significant. The improvement on the P2 and the P3 learning competence test results has been 14.84% and has been significant as well.

Based on the study that has been conducted, the researcher would like to suggest that all of the analytical and calculation-involving engineering courses should make use of real objects in order to provide better explanation for the university students.

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### RESEARCH ARTICLE

## THE PERFORMANCE MANAGEMENT OF COMMUNITY SERVICE AND EMPOWERMENT THROUGH FARMERS' COMMUNITY LEARNING CENTRE FOR ECONOMIC EMPOWERMENT IN KANDRI VILLAGE, SEMARANG – INDONESIA.

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##### Key words:-

Empowerment, smart home farmers, empower the local economy, agro-eco-tourism village Kandri.

#### Abstract

The aim of this study was to evaluate the performance management of community service and empowerment in UniversitasNegeri Semarang (UNNES) in empowering farmers' community learning center to strengthen local economy in Kandri village in Semarang, Indonesia. This study employed an evaluation method using Context, Input, Process and Product Evaluation (CIPP). The study site was in the Kandri village - Indonesia. The subjects were farmers, youngsters joining community learning center group, officials of the village, the culinary and handicrafts industry, as well as students who took the community service and empowerment program in UniversitasNegeri Semarang. The object of the study was the performance management of community service and empowerment program in UniversitasNegeri Semarang in empowering farmers' community learning center to strengthen local economy in Kandri village in Semarang, Indonesia. The results showed that the community service and empowerment program in UniversitasNegeri Semarang which was Education for Sustainable Development (ESD), in the field of sustainable education, training, and mentoring could empower community learning center for farmers and strengthen the local economy in Kandri village -Indonesia. The results of this study KKN-PPM indicated that community service and empowerment program in UniversitasNegeri Semarang could improve the performance of community learning center. This model can increase the competitiveness of future graduates, the quality of human resources and industrial products of Kandri village as the university model village.

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#### Introduction:-

The empowerment of farmers has been conducted by many countries. Esbern (2003)<sup>[1]</sup> and Hansen (2004)<sup>[2]</sup> showed the importance of farmer empowerment. The empowerment of farmers through increased resources can lead to increased economy<sup>[3]</sup>. Furthermore, government's policy supports the accelerated success of agriculture<sup>[4]</sup>,<sup>[5]</sup>. Indonesian government has established community learning center in Kandri village in Semarang-Indonesia as a one stop service place for farmers in meeting all the needs of farmers related to farming activities. The farmers' community learning center has the several objectives as follows, (1) increasing the growth domestic product (GDP), (2) reducing poverty and unemployment (3) accelerating the development of rural infrastructure (4) reducing the

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environmental impacts with a focus of increasing the farmers' income through a partnership with industrial sector (funding, technology and the quality of human resources)

Community learning center is located in the Kandri because the most of the inhabitants work as farmers. Table 1 displays the profile of the Kandri village with the more than 50% of its inhabitants work in the agricultural sector either as farmers and land owners or as peasants. (BPS Semarang, 2015).

The operational pattern of the community learning center is to build human and natural resources. The operational pattern of the community learning center was applied through a pattern of "100 Hectares BUSINESS". Intensive assistance activities were carried out in the community learning center, ranging from farming activities until the marketing of the products with minimal cost of goods sold (COGS) or even above market price. The commodities of this pattern consist of rice, maize and soybeans. The 100 ha business patterns is a "label" for the realization of the land area determined by the readiness of facilities and infrastructure in the community learning center.

The development of animal husbandry and health was conducted through a regional approach / region/cluster, and a systemic approach of agribusiness on the community learning center. The agribusiness system was formed using the upstream, cultivation (on-farm), the downstream and support sub-system as well as an institutional approach based on sustainable local resources, while maintaining environmental sustainability and balance of the ecosystem.

The animal husbandry development using pattern of integration in the environmentally friendly agriculture system is a very important strategy in realizing the welfare of the community learning center and rural communities. With the right technological innovations, plant waste can be changed into a source of fiber feed ingredient for ruminants. Using LEISA approach (Low External Input Sustainable Agriculture), each hectare of agricultural land can produce cattle feed to maintain a 2-3 cows /ha. Cattle husbandry becomes a composting plant with plant waste as its raw materials, which in turn, the compost is used as organic fertilizer for plants.

M. Dhamale *et al.*<sup>[6]</sup> explains that farmers in most regions of the world complain about the difficulties in the medical expenses for their livestock. Consequently, it is necessary to increase the results of livestock husbandry with low production costs through the integration of livestock husbandry with food crops, plantations and industrial tree plantations to be developed both technically, economically and socially. One of the benefits of this pattern is that there is not wasted materials<sup>[6]</sup>, as well as the use of proper and efficient innovation such as the sophisticated technology<sup>[5]</sup>. This approach positions the cow as a processing of agricultural waste into compost, while the calves are bonuses as the results of raising cattle properly. On the micro level, the pattern of crop-livestock integration system works to improve the structure, chemical texture and microbiology of the soil, while on the macro level, the pattern strives to increase agricultural productivity, which can ultimately increase the income and welfare of farmers<sup>[5]</sup>.

The community learning center program can ideally improve the economic level of Semarang citizens, especially those of village Kandri. However, the results of the survey in the village Kandri showed that standard of living is still low (Table 2). This condition is corroborated by the data on the table 3 about the average expenditure per capita per month which is still below the poverty line.

There are many factors causing the high poverty and low spending per capita per month below the poverty line in the Semarang city including the weak performance of various institutions / agencies that houses education and training for farmers as the performance of the community learning center. The results of the analysis concluded that performance management of the community learning center has not yet optimal. There are some problems with the management system of the community learning center. In addition, based on data from the preliminary study, the performance of the community learning center is shown on Table 4.

The data in Table 4 shows about the urgency to revitalize the performance of the community learning center. Universitas Negeri Semarang (UNNES) as a government educational institution was called to improve performance of the community learning center. Community service and empowerment of UNNES deployed twenty nine students to Kandri village for 45 days to improve the performance of RPP.

The purpose of this study was to evaluate the performance management of Community service and empowerment of UNNES in the community learning center to empower farmers to strengthen the local economy in Kandri -

Indonesia. The evaluation was conducted on performance management Community service and empowerment of UNNES in empowering farmers to care for the preservation of the environment and be aware of the potential resources that could be developed. The programs of Community service and empowerment was expected to increase the economy of the villagers in Kandri.

Kirkpatrick and Kirkpatrick (2006: 17)<sup>[7]</sup> supports that there are three reasons why it is necessary to evaluate the program, namely: (1) to show the existence and the amount of money spent on the achievement of goals and objectives of the programs, (2) to decide whether the activity will be continued or discontinued, (3) to gather information on how to develop future programs

The activities of community service and empowerment of UNNES were structured to empower the society temporarily and sustainably. The method of Education for Sustainable Development (ESD) was used to solve various problems in community learning center. ESD activities included education and training for farmers for the development of the community learning center program on an ongoing basis. Farmers in the village Kandri were expected to capture and develop mindset covering the triple bottom line which was the interplay between economic, social, and environmental.

The method of empowering community learning center through community service and empowerment included the development of the empowerment of law, engineering, economics, agriculture, fisheries, and culture for the farmers who were the members of the community learning center, and the village community in Kandri-Indonesia. With education as the basis, it was expected to be a good step to cope with and even sustain Kandri village as a village who was aware of all the natural resources that have the potential to be developed, and can be created as the destination of Argo - ecotourism.

### **Research Methods:-**

This study employed an evaluation study on the activities of community service and empowerment of UNNES. The evaluation model used in this study was Context, Input, Process, and Product evaluation (CIPP) developed by Stufflebeam in 1967 at Ohio State University. The focus of this study was on the performance management community service and empowerment of UNNES in community learning center for farmers to empower economic sector of farmers in Kandri village, Semarang-Indonesia. The complete design of the study is shown in Figure 1.

The population of the study consisted of farmers in Kandri village joining the community learning center, community leaders, and students participating in the community service and empowerment with the total of 97 people. 30 people were taken randomly as the samples of the study.

Questionnaires and observation sheet were used to collect the data. The questionnaires were used to measure whether the performance management community service and empowerment was able to strengthen the local economy of Kandri village in Semarang-Indonesia. While, the data from the observation sheet were used as supporting data. Furthermore, the data were tabulated, and analyzed with descriptive techniques to interpret the performance management component such as context, input, process, and product of the community service and empowerment.

### **Results And Discussion:-**

Various literatures in the field of performance management system and management control system are increasingly recognizing the need for fundamental study on the more coherent theoretical foundations<sup>[8]</sup>. The researchers suggest that the theory is used as the contextualization of the findings for the more systematic development of knowledge in various fields (Chapman, 1997).

Some scientists have taken a broader approach by incorporating various topics such as managing by values, participatory empowerment and management<sup>[9]</sup> or the performance of the organization and leadership, or creating a shared vision of organizational goals, emphasizing the need to provide excellence in leadership and management components to achieve organizational goals<sup>[10], [11]</sup>.

Confirmed by Hadromi (2016)<sup>[12]</sup> management started from needing analyzing, planning, organizing, supervising, and evaluating Table 5 up to 8 illustrates the performance management of community service and empowerment in

2016 in Kandri village, Semarang, Indonesia. Specifically, this study focused on economic empowerment of rural communities through farmers' empowerment using community learning center in Kandri village as Argocotourism.

### **The Context components of the performance management of community service and empowerment in community learning center to strengthen local economy;**

Concerning the economic challenges faced by many countries around the world, then idea of nurturing entrepreneurship has become an important goal for the government. Training and assistance have been conducted on the context indicators to improve the performance of the community learning center. Biron, Farndale, and Paauwe (2011)<sup>[13]</sup> has argued that training to enhance the skills, knowledge, and abilities. The training becomes important to increase employee productivity which ultimately affects the organization's performance and effectiveness<sup>[14]</sup>

Furthermore, there is a relevance between the performance of the organization and entrepreneurship to the economic development which has been highlighted by many studies<sup>[15]</sup>. The implementation of community learning center was right on target. The activities that have been implemented could meet the problems faced by the Kandri community with the score between 2.67 sd. 3.67 and the mean score was 3.15. Hezlett and Gibson (2005)<sup>[16]</sup> corroborates that mentoring and training can improve human resources. In this case, human resources increase through mentoring and training which has been conducted on the activities of community service and empowerment. Furthermore, Cooney,(2009)<sup>[17]</sup> examines that the entrepreneurship development system was located in the Appalachian region of the USA and identified four main dimensions of skills: (1) Technical skills - the skills required to produce a business product or service; (2) Managerial Skills required for the daily management and administration of companies; (3) Entrepreneurial Skills - effectively improve the economy; (4) Personal Maturity skills - which include self-awareness, accountability, emotional skills, and creative skills. These skills have been delivered in the activities of community service and empowerment. Therefore, they increased the performance of community service and empowerment and strengthen the economy of the people or farmers who were members of the community service and empowerment.

### **The input components of performance management in community learning center in empowerment of farmers to strengthen the local economy;**

29 students were involved in the community service and empowerment. All of these students have been through the selection according to the needs and issues to be addressed in Kandri. Jimoh. and Danlami (2011)<sup>[18]</sup> state that the quality of human resources affects the organization's performance. The students just like employees were the most important asset in the activities of the community service and empowerment program because they contributed to the growth and success of the program<sup>[19]</sup>. Furthermore, Danish and Munir(2006)<sup>[19]</sup>, Saif, Malik, and Awan<sup>[20]</sup> concludes that in an era characterized by rapid and continuous change, the knowledge must be maintained to enable the organization to become productive and responsive to the stakeholders' needs. Various literature shows that the proper application of some human resource management (SDM) allows employees or in this study, the students joining the community service and empowerment program were more committed to carry out their tasks better<sup>[21]</sup>,<sup>[22]</sup>. Human resource management is essential for organizational success because the quality of human capital is important.

Furthermore, the facilities and infrastructure have been improved during the community service and empowerment program (table 6). Farmers' community learning center was impeded in developing its program in case of limited means or the infrastructure. Provisions, at all (2013)<sup>[23]</sup>, Eliasu, al all (2016)<sup>[24]</sup>, Akinfolarin (2015)<sup>[25]</sup>, corroborate that the inadequacy of infrastructure and facilities, especially buildings, have led to unproductive learning environment in the system of polytechnic Nigeria. Therefore, the facilities and infrastructures become strategic support organizational performance. The community service and empowerment have given two production tools for farmers in the community learning center, namely: (1) vacuum press, and (2) panic presto. Furthermore, these tools functioned in producing processed products in the community learning center to be sold to the consumer, or to the tourists.

The completeness of the equipment helped the training process. The completeness of facilities and infrastructure enhanced the understanding capacity of training material for trainees. The completeness of the facilities and infrastructure required the budget availability to support the goal achievement of the community service and empowerment activities. Shardeo (2015)<sup>[26]</sup>, Mohamed and Tirimba (2015)<sup>[27]</sup>, Provisions, al all (2013)<sup>[23]</sup> argue that the budget can be a parameter to measure the achievement of the program. Furthermore, budget control can ensure

whether or not the actual results community service and empowerment program is positive or negative according to the overall policy objectives.

**Component process of the community service and empowerment performance management in farmers' community learning center to strengthen the local economy;**

The implementation of community service and empowerment was carried out by applying a management function, which began with the planning, implementation, and evaluation. The performance evaluation of community service and empowerment drew attention to be measured. Management performance evaluations reflected the instances where the performance of the individual or entity were measured in relation to the others Gathai, at all. (2012)<sup>[28]</sup> to eliminate the distortion caused by uncontrollable factors (Table 7).

Gathai, at all. (2012)<sup>[28]</sup> shows that the benefits of the performance management evaluation which functions positively from a number of executive projects that have been available to them, while Shammot(2014)<sup>[29]</sup> concludes that the high administrative costs of evaluation performance management lead to their low adoption in executive contracts.

**The products component of community service and empowerment of performance management in farmers' community learning center to strengthen the local economy.**

The community service and empowerment has facilitated and empowered concerned citizens on environmental preservation and were aware of the potential resources that could be developed. The programs were expected to improve the economy of the citizens.

The activities of community service and empowerment were arranged not only to provide a temporary community empowerment, was also based on the Education for Sustainable Development method (ESD), which was used to overcome the various problems (Table 8). ESD activities included education for sustainable program development as an educative and effective medium by deploying students into the midst of the people that would capture and develop the balanced mindset including triple bottom line in the interrelationship between economic, social, and environment. This concurs with Shammot(2014) stating that there are supervisor effects which support the team's success in this case, the community service and empowerment team in the implementation of training.

Furthermore Shaheen, (2013)<sup>[30]</sup> concludes that strategic training and development are tools to improve the performance of the organization effectively. The community learning center was expected to identify the training needs of members. The training program was designed to assist members of community learning center optimally and was actualized to achieve the organizational objectives

Salah (2016)<sup>[31]</sup> argues that the training and development might mean the same thing for many people because they both lead to increased productivity of individuals in an organization, but there are some significant differences.

The methods of community empowerment in the community service and empowerment program included the development of the law, engineering, economics, agriculture, fisheries, and culture empowerment, as well as the empowerment of SMEs of KampungTelo and farmers' community learning center. Education as a basis, in a long-term, is expected to be a good step to cope with and even sustain Kandri village as the village which is aware of the many natural resources that have the potential to be developed, and Village Kandri as argo-ecotourism destination.

**Conclusion:-**

From the results of data analysis, it can be concluded that the community service and empowerment program has been able to improve the performance of the farmers' community learning center and the economy. It would increase the realization of village Kandri as Argo-eco-tourism destination. In particular, the community service and empowerment program of UNNES was able to (1) develop a Village Kandri as a tourist area which is both physically and non-physically sustainable, (2) increase the participation of community in Village Kandri in decision-making, implementation, monitoring and evaluation of the development of tourism village, (3) the realization of a community in a village which is economically independent and able to manage its own territory based on potential, needs and interests of Kandri area, and (4) realization of ecotourism that can be managed by people of Kandri and was supported by SMEs in the field of culinary and handicraft, infrastructure and qualified human resources to realize the village Kandri as an Argo-eco-tourism destination.

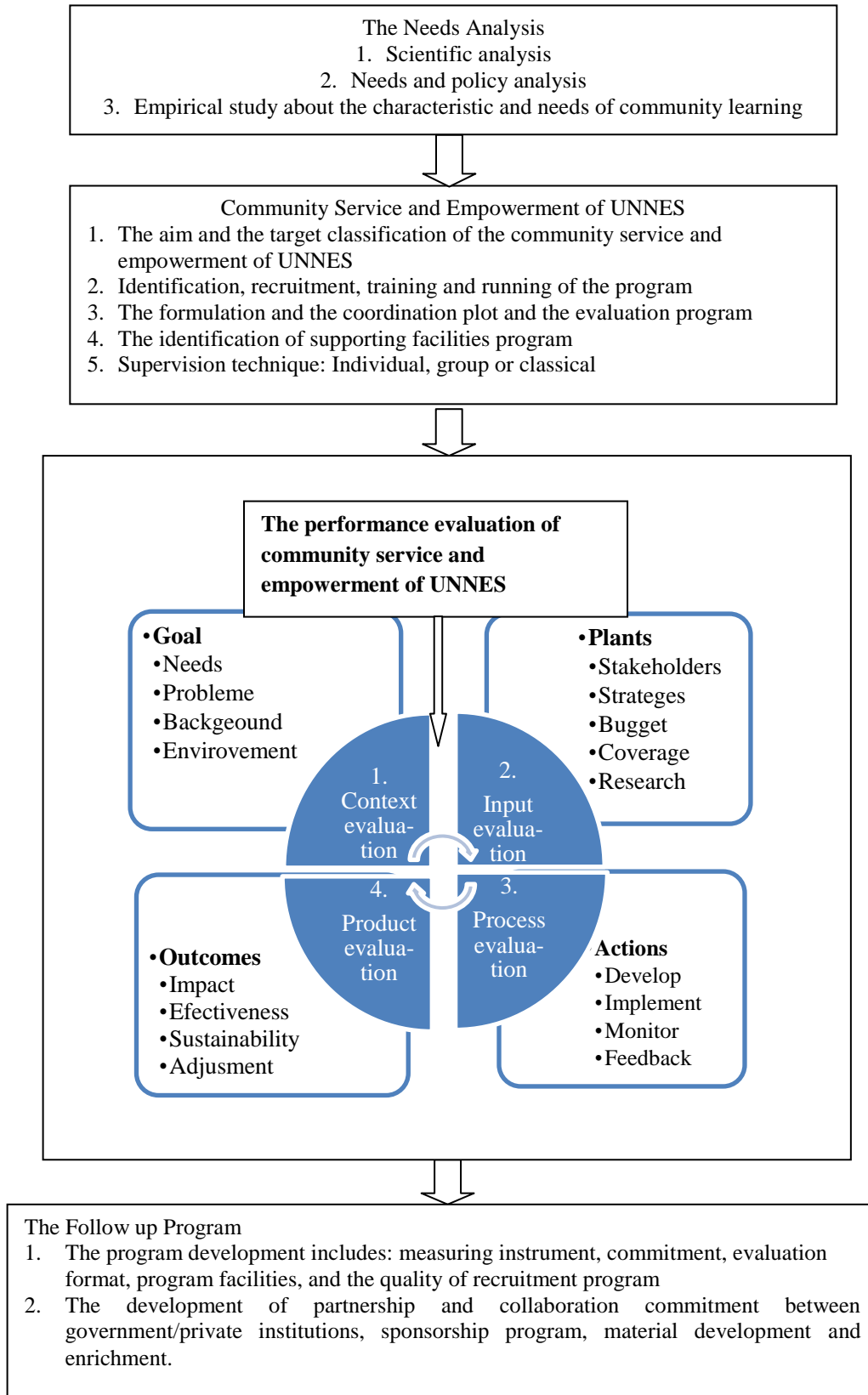


Fig 1.Design of the study

**Table 1:-** Profile of Kandri Village.

No	Identity	General Condition of the Area
1.	Name of the village	Kandri
2.	Subdistrict/City/Province	Gunungpati/ Semarang/ Central Java
3.	Office address	Jl. Kandri Utara RT 05/01 Dusun Kandri, Gunungpati
4.	Area	245,490 ha
5.	The amount of RW/RT	4 (empat)/26
6.	Population according to occupation	Farmer : 329, Peasant : 753 Entrepreneur : 30, Industri worker : 719 Bricklayer : 97, Merchant : 185 Civil servant : 48, Army/police : 8

**Table 2:-** The Percentage of Poor People in Semarang.

City	The Percentage of Poor People (in Percent)				
	2011	2012	2013	2014	2015
Semarang	5.68	5.13	5.25	5.04	4.97

(Central Bureau of Statistics, Semarang, 2016)

<https://semarangkota.bps.go.id/linkTableDinamis/view/id/51>**Table 3:-** Average expenditure per capita per month below the poverty line in the city of Semarang Semarang city

City	The Poverty Line (Rupiah/Capita/Month)			
	2012	2013	2014	2015
Semarang	297848	328271	348824	368477

(Central Bureau of Statistics, Semarang, 2016)

<https://semarangkota.bps.go.id/linkTableDinamis/view/id/50>**Table 4:-** the Problems of Community Learning Center Performance

No	Activities/Production of Small Scale Industry	The Production Problems in Community Learning Center
1.	The cow and goat husbandry	The knowledge of farmers about the health of the husbandry is weak, the maintenance of cage, the resources of the animal feed, culinary products from milk is weak.
2.	Fish cultivation: cat fish, gourami	The knowledge of farmers about the fish cultivation, the maintenance of cage, the limited area in Gunungpati, the resources of the animal feed, fishery products is weak.
3.	Farmers' Training	The Trainer with weak resources, unscheduled training, low farmers' motivation to join the training, the model plant was not well – maintained.
4.	Handcraft and Souvenir Training	The trainer with weak resources, unscheduled training, low farmers' motivation to join the training,
5.	Screen printing training	The tools required for the training was still limited, the monotonous pattern of the screen printing required development by the small scale industry in Kandri to characterize Kandri such as Kreo Cave, monkeys, and Jatibarang Dam.

**Table 5:-**The performance data of the community service and empowerment on contex components

No	Contex Components	Score	Explanation
1.	The purpose of community service and empowerment can meet the needs of Kandri village	3.53	Very good
2.	The deployment of students joining community service and empowerment is right on the target	3.67	Very good
3.	The community service and empowerment supports the improvement of economy of the Kandri village people	2.80	good
4.	The implementation of community service and empowerment was right on target	3,00	good
5.	community learning center required improvement of resources	3.23	good
6.	The performance of community learning center was still weak	2.67	good
	The average of contex components	3.15	good



**Table 6:-** Performance data the community service and empowerment program the input component

No	The input components	Score	Explanation
1.	The human resources of the students joining the community service and empowerment meet the needs of the community learning center.	3,40	good
2.	sufficient resources to support the community service and environment are available	3.33	good
3.	The facilities of the community learning center can support the community service and empowerment program	3.17	good
4.	The people joining the community learning center are able to understand the training and the education conducted by community service and empowerment.	3.50	Very good
5.	The materials of training in the community learning center can meet the needs of the stakeholders.	3.37	good
6.	The budget is able to realize the purposes of the community service and empowerment.	3,36	good
	the average score of the input components	3.49	good

**Table 7:-** The component of performance management process of community service and empowerment in farmers' community learning center to strengthen local economy.

No	The Process Component	Score	Information
1.	The Implementation of community service and empowerment was conducted according to the planning.	3.47	Very good
2.	The Kandri village officials supported the community learning centre activities.	3.27	good
3.	The community of Kandri village joining the community learning centre supported the community service and empowerment.	3.53	Very good
4.	The students' performance in community service and empowerment could empower the community learning centre to improve the economy of Kandri Village community.	3.50	Very good
5.	The students joining the community service and empowerment had the capacity suited for the programs of community learning centre.	3.33	good
6.	The community service and empowerment could improve the performance of community learning center.	3.60	Very good
7.	There was an evaluation for the community service and empowerment activities.	3.67	Very good
8.	There was a follow up for the evaluation for the community service and empowerment activities.	3.47	Very good
		3.47	Very good

**Table 8:-** Components of performance management product of the community service and empowerment in farmers' community learning center to strengthen local economy.

No	Product Components	Score	Information
1.	There was an increase of knowledge and skills after the students completed the community service and empowerment.	3.53	Very good
2.	The community agree that there was an increase of knowledge and skills after joining the community service and empowerment.	3.30	good
3.	There was an increase of community learning center's resources after completing the community service and empowerment.	3.20	good
4.	There was an increase of animal husbandry technique for the community as the target of community learning center.	3,00	good
5.	There was an increase of fishery technique for the community as the target of community learning center.	3.30	good
6.	There was an increase of human resources for the community joining community learning center with regard to the farming technique.	3.30	good

7.	There was an increase of human resources for the community joining community learning center with regard to the results of the crops and animal husbandry into the marketable food products.	3.20	good
8.	There was an increase of human resources for the community joining community learning center with regard to the handcrafting technique.	3.50	Very good
9.	There was an increase of human resources for the community joining community learning center with regard to the screen printing technique.	2.97	good
10.	There was quality and quantity improvement in the facilities of community learning center.	3.47	Very good
11.	There was economic improvement for the people joining community learning center.	3.63	Very good
12	Mean Score	3.30	good

The success of the community service and empowerment performance is supported by the opinion of Lawani, Moore (2016) [32]. Lawani, Moore (2016) [32] argue that the activity starts from the beginning and the end within a specified time and uses a certain amount of budget and resources to complete tasks with clear objectives indicating that the main mission of the project is to combine individual tasks into a single, integrated conglomerates, which is useful for people or customers. The sustainability plan of the community service and empowerment is expected to provide a comprehensive and significant impact on each aspect. In this regard, the community service and empowerment should be able to adopt the usefulness of the process into three main stakeholders.

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### RESEARCH ARTICLE

#### A STUDY ON A MULTI-MODALITY IMAGING SYSTEM IN A TERTIARY CARE HOSPITAL: A CASE ON CARDIAC IMAGING.

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#### Abstract

**Objectives:** The increased need for optimizing the use of imaging modalities in the hospital setting has led to the introduction of numerous applications in various disciplines to meet health objectives. One medical discipline that depends on imaging is cardiology, which uses a full-fledged multi-modality picture archiving and communication system (PACS) solution. This research explores how healthcare professionals are using this PACS solution, as part of a transformational process in the healthcare system in general.

**Methodology:** A qualitative study was conducted on the PACS solution system at King Khalid University Hospital (KKUH) during the month of December 2013. The study used a semi-structured interview protocol to understand how cardiologists and technicians at the King Fahad Cardiac Center (one of the research centers in KKUH) interact with this system.

**Results:** Three out of 10 cardiologists (33.3%) and four technicians were interviewed during the visit. Responses were then analyzed using thematic analysis. Themes analyzed were clinical benefits of the system and challenges of using the system.

**Conclusion:** An overall positive experience was reported by the participants in the study. The system has not only increased the quality of the care provided at the center but also provided fast and effective access to patient-imaging data from anywhere in the hospital. Moreover, the system helped clinicians to perform research on patients' data. Several recommendations to optimize the use of this system include combining it with a lab order system to augment the clinical decision-making process and addressing the managerial issues.

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#### Introduction:-

The increased need for optimizing various imaging modalities in the hospital setting has led to the introduction of numerous applications in different disciplines to meet that objective. One of the medical disciplines that depends on imaging is cardiology, which uses a full-fledged multi-modality picture archiving and communication system

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(PACS) solution. The system can be present in either a single workstation or it can be a fully integrated multiple-work station system. The general aim of this system is to improve clinical workflow by providing a single access point for advanced clinical applications, multi-modality images and reports <sup>(1)</sup>. It is integrated with advanced tools for numerous modules related to cardiovascular imaging, including echocardiography, catheterization, electrophysiology, cardiovascular X-ray, nuclear medicine, computed tomography (CT), magnetic resonance imaging, and electrocardiography <sup>(2)</sup>. At present, only echocardiography and catheterization modalities are covered by this system at the Kind Fahad Cardiac Center at the King Khalid University Hospital (KKUH) where this study was conducted

The King Fahad Cardiac center, established in 2002, serves patients with heart disease. It is also a research and teaching hospital for heart disease and related conditions. Most of the hospital's research and treatment requires the echocardiography modality provided by the PACs system as it is less invasive and uses lower levels of radiation than other technologies. The cardiology PACS solution was introduced to KKUH in 2011, and took two years to become fully implemented.

After wide implementation of the multi-modality cardiology PACS solution, major improvements in quality and care were observed, but few studies have been done to assess outcomes. In one study done on the PACS system in Denmark back in 2013, participants found the system convenient and easy to use, improving clinical outcomes <sup>(3)</sup>. Another study done in 2008 showed excellent results obtained by the system in viewing the heart mitral valve leaflets through a trans-esophageal Echocardiogram (TEE) <sup>(4)</sup>.

Following the growing trend of computerization of healthcare systems, numerous hospitals around the world have moved towards efficiency-based electronic systems with the objectives of delivering cost-effective, high-quality healthcare. Hence, there is a need for more extensive studies to assess the results of using such systems. This is a preliminary study on healthcare providers' experience of using multi-modality cardiology PACS at King Khalid University hospital.

### **Methodology:-**

This a qualitative study was conducted on the use of the multi-modality cardiology PACS solution in King Fahad Cardiac Center during the month of December 2013. The study used semi-structured interview protocol that was developed by Zakaria et al <sup>(5)</sup> to explore this issue in depth. The interview protocol contains background information on the system (including its organizational background); clinical and educational uses; how it has benefited overall healthcare quality versus problems reported; how it is operated in general; and who the original developers, main users, and maintainers of the system are.

The target population is the cardiologists and technicians of the King Fahad Cardiac Center in KKUH. These professionals meet the purpose of the study, due to their direct use of this system and their experience with using this system. A visit to King Fahad Cardiac Center in KKUH was undertaken in December 2013. This center has a total of 12 cardiologists and 20 technicians who use this system on a daily basis. The participants' responses were recorded and analyzed using thematic analysis. Participants' responses were coded and themes and subthemes were generated from the data. All ethical considerations were taken into account by ensuring participant's anonymity, and patients' information for the attached images was kept confidential.

### **Results and Observations:-**

Three cardiologists out of a total of 10 (33.3%) and four technicians were available at the time of the interview. The sample size is small due to the specificity of those who have constantly used the system since its implementation. However, the depth of data obtained make up for the small number of interviewees who can be representative to the rest of the hospital's staff.

### **System Background:-**

The functionalities of the system can be summarized as (1) statistics and comparative studies; (2) documentation, storage, and retrieval of images; (3) reporting of certain cases and; (4) use for educational purposes. PACs is a vendor-based system, developed and maintained by Philips Company.

Cardiologists are the main users. Multiple PACs stations are situated around the hospital for convenience. Secondary users are technicians and nurses of the cardiology department only. External parties (such as physicians from other departments and medical students) can use and access the systems but with limited access and solely for getting information.

### Theme 1: Clinical Benefits:-

Clinical benefits of this system that were mentioned were in the diagnosis of heart diseases, along with reporting and storage of radiological images. The system has also helped with comparing different images of the same patient or different cases at the same time. Furthermore, the system helped with increasing the Key Performance Indicators (KPIs) of the organization, which are metrics used to assess the factors that are necessary for institutional success. As for educational benefits, any faculty member at the King Saud University College of Medicine, with access to the system can import the images to be used in lectures and demonstrations. In addition, this system provides statistics and comparative studies for cardiac sciences and research.

Participants also reported the ease of use that was observed immediately after its implementation. The technician first performs the required modality (Echocardiography/Cath) in the clinic, after which he uploads the image to the system. Then, the treating physician logs in to the system and enters the patient's ID (see Image 1). To look up a certain item, he double-clicks on the relevant image, which is attached to a full report of the procedure (Image 2). Finally, he can either contact the technician for more images (e.g. Doppler) or he can compare a new image with a patient's previously archived images (up to five years) and report findings (Images 3 & 4).



Image 1:- Main Search Interface



Image 2:- Medical Report Review Interface

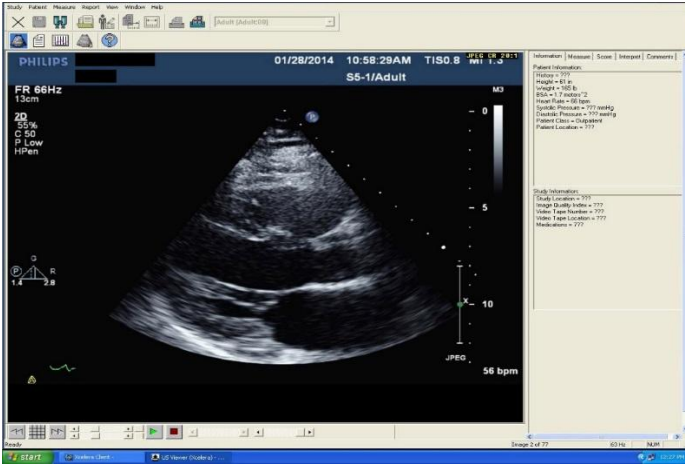


Image 3- Radiological Imaging Review Interface #1



Image 4- Radiological Imaging Review Interface #2

### Theme 2: Challenges Using the System:-

Regarding managerial issues, those encountered were: (1) Limited storage space for the images and (2) a lack of local technical support from the vendor. The organization proposed addressing these issues by (1) expanding the hard drive capacity from time to time and (2) by appointing and training members of the local IT department to solve some of the technical difficulties that may arise. Those measures have yet to be implemented, however.

### Discussion:-

As the results suggest, this system has led to improvements in the overall accessibility and efficiency of the clinical workflow. Currently, there are numerous and diverse electronic systems that serve to augment the administrative functions for any given health institute; these are collectively known as Health Information Systems (HIS). Al-Ali et al. performed a survey study in Qatar back in 2013 to assess and describe the current state of Hospital Information Systems in large hospitals, and to establish a baseline or reference point. This study showed that all Qatari public hospitals and four out of six private hospitals use some form of a Hospital Information Systems (HIS) and/or Hospital Management System (HMS). Radiology Information Systems (RIS) and Laboratory Information Systems (LIS) were also commonly deployed HIS components. On the other hand, Electronic health records (EHR) and Pharmacy Management Systems (PMS) were absent or underused<sup>(6)</sup>.

However, because there is an accelerated implementation and growth of HIS to enhance the safety and quality of care delivered, the process of implementation and optimization of an HIS requires a pre-intervention baseline from which comparisons pertaining to performance and impact can be elicited. Furthermore, since the benefits the PACS would deliver are influenced by the acceptance of users, further knowledge of their concerns and acceptance rates is needed. This has also been shown in a few other studies found in the literature. One study that was done in 2012 looked at the usage of the PACs system at a university hospital in Jeddah, Saudi Arabia to assess the level of acceptance among staff in the radiology department. In this study, users found PACS to have improved the quality of their work in providing better patient care. Though technologists had lower ratings than did clinicians/radiologists, acceptance level was not found to be influenced based on gender, age, or length of experience using the PACS. Before implementing a PACS system, however, the health organization must consider their system users' acceptance and whether they will adapt to the new system<sup>(7)</sup>.

In addition, some articles in the literature have reported on a newer form of web-based PACS, which are more attractive than conventional, server-based systems. One 2013 article showcased that the web-based cardiology PACS allowed for better interoperability, broader access, remote accessibility to data and images, and reduction in IT burdens. In addition, having one system that combines all the separate workstations in one place allows the cardiologist and support staff to conduct their daily duties from a single point of entry. Staff may handle and manage all cardiac imaging modalities and related reports, echocardiograms (ECG), procedural reports and prior exams from any computer with Web access. Moreover, it allows for new workflows, such as doing rounds using a tablet rather than a clipboard, and gives more freedom of mobility to the cardiologist and technician. However, a limitation of this system might be the need for special software to be installed to permit access to data using a web



browser. This will need to be addressed as many physicians now expect to be able to use mobile devices such smart phones and tablets to access data and images<sup>(8)</sup>.

### **Conclusions and Recommendations:-**

In summary, the findings of this qualitative study showed that the system not only improves the quality of services provided by the Cardiac Center but also provides fast and effective access to patient imaging data from anywhere in the hospital. In addition, it decreases medical errors and time needed for treatment decisions. The system also helps with performing research and gathering statistics on patients' data.

We recommended that the Center provide restricted access for students interested in cardiology coupled with a simple education and training program. Limited access for consultations by other organizations could be offered as part of inter-institutional collaboration. Additionally, yearly updates and maintenance for the PACs system in King Fahad Cardiac Center should be conducted; this could be optimized by a visit from a local company representative to address technical issues. Finally, the center should combine a lab order system with the imaging system for more efficient decision-making.

### **Acknowledgements:-**

This study was supported by the Deanship of Scientific Research, Research Chairs at King Saud University. We extend our thanks to all those who helped in our study, namely the Medical Informatics and e-learning unit, the Medical Education department, and the College of Medicine and its dedicated staff.

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### RESEARCH ARTICLE

#### GLYCATED HEMOGLOBIN (HBA1C) IS A PREDICTOR OF DYSLIPIDEMIA IN TYPE 2 DIABETES NEPALESE PATIENTS.

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##### Key words:-

Type 2 diabetes mellitus, HbA1c, dyslipidemia, cardiovascular disease, hyperglycemia.

#### Abstract

**Background:** Type 2 diabetes mellitus (T2DM) have an increased prevalence of dyslipidemia. Dyslipidemia is characterized by high cholesterol (TC), high triglyceride (TG), high LDL cholesterol (LDL-C) and decrease HDL cholesterol (HDL-C) and is major risk factor for cardiovascular disease in T2DM. HbA1c serve as a gold standard indicator of glycaemic status over long term.

**Aim:** The study aimed to investigate the correlations between lipid profile parameters, as well as the glycated hemoglobin (HbA1c) values of Nepalese population with type 2 Diabetes mellitus (T2DM).

**Material and Methods:** This was a cross sectional, retrospective study of 140 T2DM patients (81 male and 59 female) who had visited department of Internal Medicine, Manmohan Memorial Community Hospital were included in this study. Venous blood samples were collected for fasting plasma glucose, HbA1c and serum lipid profile from all subjects in the morning after at least 8 hours fasting by using methods following standard operating procedures (SOPs). The statistical analysis was done by SPSS.

**Results:** There is alteration in the serum levels of FBS, total cholesterol (TC), triglycerides, LDL cholesterol (LDL-C) and HDL cholesterol (HDL-C) were noted in patients with T2DM. The HbA1c was found to be significant correlation with FBS, TC, TG, and LDL-C but there was no significant relation noticed with HDL-C. Values of HbA1c >6.5 % showed significant correlation with TC, LDL-C, TG, LDL-C/HDL-C and TC/HDL-C ratio, as compared to patients with HbA1c ≤ 6.5% (p<0.05).

**Conclusion:** In conclusion, our study demonstrates that in Nepalese with type 2 diabetes mellitus, dyslipidemia is more common. To reduce the burden of morbidity and mortality from different complications, it necessary to control diabetes and lipid levels in diabetic patients and

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emphasises the additional possible use of HbA1c as a predictor for dyslipidemia.

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## **Introduction:-**

The diabetes mellitus is becoming more and more prevalent in every corner of the globe and a projection for the future is alarming. Type 2 Diabetes Mellitus (T2DM), a metabolic disorder characterized by the hyperglycemia and disturbances of carbohydrate, lipid and protein metabolism due to insulin resistance or relative insulin deficiency. The chronic hyperglycemia of diabetes results in macrovascular complications including heart disease and stroke and microvascular complications including nephropathy, neuropathy and retinopathy [1]. Furthermore, abnormal serum lipids- dyslipidemia, characterized by increased triglycerides level, high low density lipoproteins and low high density lipoproteins [2] are likely contribute to the risk of coronary artery disease, cerebrovascular disease, peripheral vascular diseases and associated with greater risk of morbidity and mortality [3]. It has remained a major concern of healthcare professionals from long time due its strong association with cardiovascular diseases (CVD) [4]. Several factors are likely to be responsible for diabetic dyslipidemia: insulin effects on liver apoprotein production, regulation of lipoprotein lipase (LpL), actions of cholesteryl ester transfer protein, and peripheral actions of insulin on adipose and muscle [5, 6]. In each year, about 5% of all deaths are caused by diabetes globally [7]. This risk, however, can be reduced by good management and control of hyperglycemia as well as dyslipidemia [8].

According to American Diabetes Association (ADA), Glycated Haemoglobin (HbA1c) more than or equal to 6.5% is considered diabetes [9] and it is routinely used marker for long term diabetic control preceding 8-12 weeks of time. As HbA1c functions as an indicator for the mean blood glucose level, it is now considered as an independent risk factor in diabetic patients [10]. Several observational studies demonstrated that a higher HbA1c level was associated with increased risks of cardiovascular diseases and deaths [11, 12]. Furthermore, an elevated level of HbA1c is now considered as an independent risk factor for cardiovascular disease in any subject with or without diabetes. For each 1% increase in HbA1c level increases the risk of CVD by 18% and positive association between HbA1c and CVD has been demonstrated in non-diabetic patients even within normal range of HbA1c. At present HbA1c is the best alternate marker we have for setting goals of treatment [13].

Diabetes complications and control trial established that strict control of diabetes reduces micro vascular complications and glycated hemoglobin as gold standard investigation of diabetes control [14]. If hyperlipidemia is detected early in the course of diabetes mellitus, it will reduce the risk for cardiovascular and cerebrovascular diseases. Lifestyle changes such as diet and exercise are very important in improving diabetic dyslipidemia, but often pharmacological therapy is needed [15, 16]. Keeping in view the large number of type 2 DM patients and poor knowledge of the subject, most patients are prone to develop multiple lipid disorders. Therefore, this study was aim to find out the association between HbA1c (glycemic control) and serum lipid profile in Type 2 Diabetic patients attended at Manmohan Memorial Community Hospital, Kathmandu, Nepal.

## **Materials and methods:-**

### **Patients' characteristics;**

One hundred and forty Type 2 diabetes patients were enrolled in the current study. They were selected from the outpatient clinics of Internal Medicine department, Manmohan Memorial Community Hospital. Patients' consent was obtained according to the regulations of Nepalese Ministry of Health and study design was approved by the local ethics committee.

Furthermore, fasting (at least 8 hours) venous blood samples were collected from the selected patients. Then, serum was analyzed for fasting blood sugar, lipid profile panel- Total cholesterol, Triglyceride, HDL-cholesterol and LDL-cholesterol, and HbA1c.

For defining Diabetes Mellitus, American Diabetic Association (ADA) was used whereas for defining dyslipidemia, the reference levels were used as per National Cholesterol Education Programme (NCEP) Adult Treatment Panel III (ATP III) guideline according to which hypercholesterolemia is defined as TC>200mg/dl, hypertriglyceridemia as TAG>150mg/dl, high LDL-C when the value exceeds 100mg/dl and low HDL-C when the value is below 40mg/dl. And presence of any one of abnormalities in serum lipid concentration it was defined as dyslipidemia. Glycated haemoglobin more than 6.5% is taken as abnormal as per ADA guideline.

**The Inclusion criteria for all participants:**

Type 2 Diabetic patients of age between 30-70 years were only included in the study.

**The exclusion criteria:**

Those patients under lipid lowering therapy and having diabetic complications and endocrinopathies such as Thyroid disorders were excluded from the study.

**Statistical analysis:**

The study data was analyzed by using SPSS program to compute descriptive parameters including mean and frequencies, and inferential statistics was used including student's t test to test the significance of the differences between the mean values of two continuous variables and Chi-square test ( $X^2$ ) test the difference in proportions categorical variables between two groups. The level of confidence ( $P < 0.05$ ) was considered as cutoff value for significance.

**Results:-**

Diabetic (study group) 140 subject (81 male and 59 female) were enrolled in this study. The mean age of the males was  $53 \pm 15$  years (range 10-84) and  $54 \pm 15$  years (range 22-87) for females with no statistical significant difference,  $P = 0.911$ . Fasting Blood Glucose (FBG), Hemoglobin A1c (HbA1c), Triglycerides (TG), Total Cholesterol (TC), High Density Lipoproteins (HDL) and Low Density Lipoproteins (LDL) were studied to assess the association of diabetic condition with the lipids profile.

**Table1:** Comparison of studied parameters between gender types within study group.

Parameters	Male (n=81)	Female(n= 59 )	P- value
<i>Age, years</i>			
Means $\pm$ SD	$53 \pm 15$	$54 \pm 15$	0.911
Range	10-84	22-87	
<i>FBS</i>			
Means $\pm$ SD	$169.9 \pm 62.7$	$168.8 \pm 41.6$	0.910
Range	90-372	90-279	
<i>HbA1c</i>			
Means $\pm$ SD	$7.96 \pm 2.7$	$7.66 \pm 1.9$	0.433
Range	4.7-18.0	5.1-12.5	
<i>TG</i>			
Means $\pm$ SD	$181.1 \pm 60.1$	$185.1 \pm 65.8$	0.714
Range	55-310	100-329	
<i>TC</i>			
Means $\pm$ SD	$216.7 \pm 48.8$	$214.2 \pm 44.9$	0.752
Range	110- 301	145-301	
<i>HDL</i>			
Means $\pm$ SD	$36.6 \pm 5.7$	$38.7 \pm 5.6$	0.014
Range	27- 48	27-53	
<i>LDL</i>			
Means $\pm$ SD	$144.2 \pm 44.1$	$138.4 \pm 41.3$	0.430
Range	39- 221	63- 216	
P value based on Student's t-test: significant at ( $p < 0.05$ )			

**Table1** shows the statistics of biochemical parameters computed for males and females which point out that the results were found to be FBG ( $169.9 \pm 62.7$  and  $168.8 \pm 41.6$ ,  $P = 0.910$ ), HbA1c ( $7.96 \pm 2.7$  and  $7.66 \pm 1.9$ ,  $p = 0.433$ ), TG ( $181.1 \pm 60.1$  and  $185.1 \pm 65.8$ ,  $P = 0.714$ ), TC ( $216.7 \pm 48.8$  and  $214.2 \pm 44.9$ ,  $P = 0.752$ ), HDL ( $36.6 \pm 5.7$  and  $38.7 \pm 5.6$ ,  $P = 0.014$ ), HDL ( $36.6 \pm 5.7$  and  $38.7 \pm 5.6$ ,  $P = 0.014$ ) and LDL ( $144.2 \pm 44.1$  and  $138.4 \pm 41.3$ ,  $P = 0.430$ ) respectively with statistical significance only in HDL parameter.

**Table 2:-** Percentage of abnormal parameters values and association with gender within study group.

Parameters	Male (n=81)		Female(n=59)		X2	P- value
	Normal	Abnormal	Normal	Abnormal		
FBS	20	61(75%)	9	50(85%)	1.85	0.173
HbA1c	16	65(80%)	8	51(86%)	0.92	0.336
TG	27	54(67%)	19	40(68%)	0.02	0.888
TC	37	44(54%)	34	25(42%)	1.94	0.162
HDL	28	53(65%)	22	37(63%)	0.11	0.740
LDL	10	71(88%)	8	51(86%)	0.04	0.832
<i>P value based on chi square test (p &lt; 0.05) significant</i>						

**Table 2** shows that percentage of abnormal result within study group for male and female was found to be FBS (75% and 85%, P=0.173), HbA1c (80% and 86%, P=0.336), TG (67% and 68%, P=0.888), TC (54% and 42%, P=0.162), HDL (65% and 63%, P=0.740), LDL (88% and 86%, P=0.832) respectively, with no statistical significance difference.

**Table 3:-** Percentage of abnormal parameters values and association with age within study group.

Parameters	Less than 40 year		More than 40 year		X2	P- value
	Male	Female	Male	Female		
FBS	15(33%)	9(18%)	46	41	0.70	0.401
HbA1c	11(20%)	8(16%)	54	43	0.03	0.858
TG	13(32%)	9(23%)	41	31	0.03	0.858
TC	11(33%)	6(24%)	33	19	0.01	0.926
HDL	10(23%)	7(19%)	43	30	0.0	0.995
LDL	16(29%)	9(18%)	55	42	0.44	0.509
<i>P value based on chi square test (p &lt; 0.05) significant</i>						

**Table 3** shows that percentage of abnormal result within study group for male and female base on the age category (< 40 year and > 40 year). For the less than 40 years the result shows that FBS (33% and 18%, P=0.401), HbA1c (20% and 16%, P=0.858), TG (32% and 23%, P=0.858), TC (33% and 24%, P=0.926), HDL (23% and 19%, P=0.995), LDL (29% and 18%, P=0.509) respectively, with no statistical significance difference. The association between less and more than 40 years between gender types was depicted in (**figure 1, 2**).

**Table 4:** Correlation between HbA1c and studied parameters within study group.

Parameters	Person correlation (r)	P- value
FBS	0.731	< 0.001
TG	0.250	0.003
TC	0.373	< 0.001
HDL	-0.341	< 0.001
LDL	0.382	< 0.001

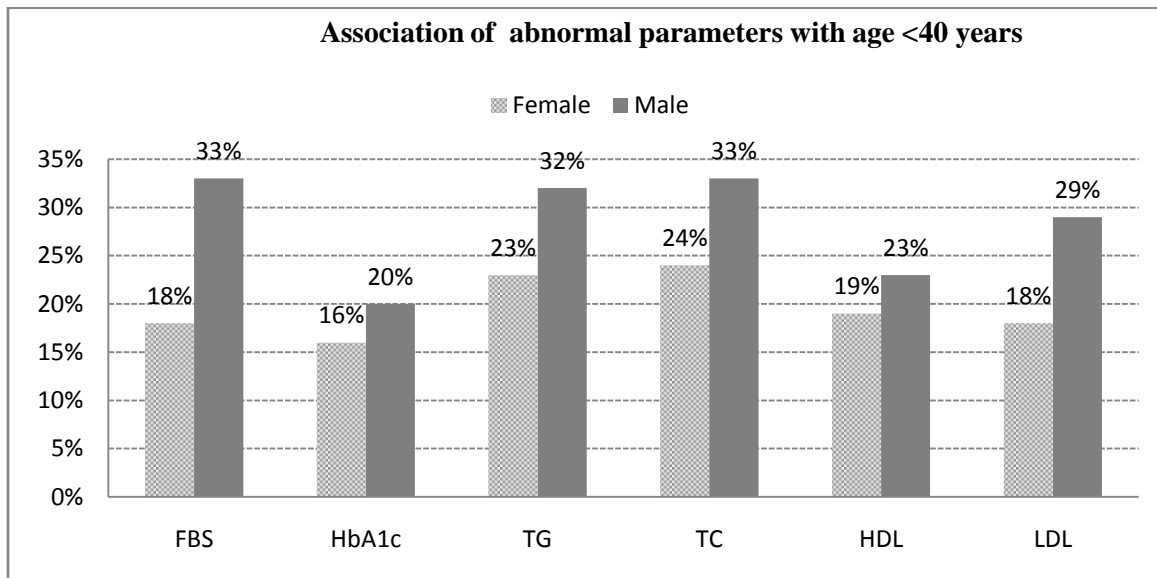
*P value based on chi square test (p < 0.01) significant*

**Table 4** shows the correlation result between HbA1c and studied parameters within study group. All the results indicate there was positive relationship with statistical significance except a negative correlation between HbA1c and HDL. The correlation between HbA1c, HDL and LDL is depicted in (**figure 3, 4**).

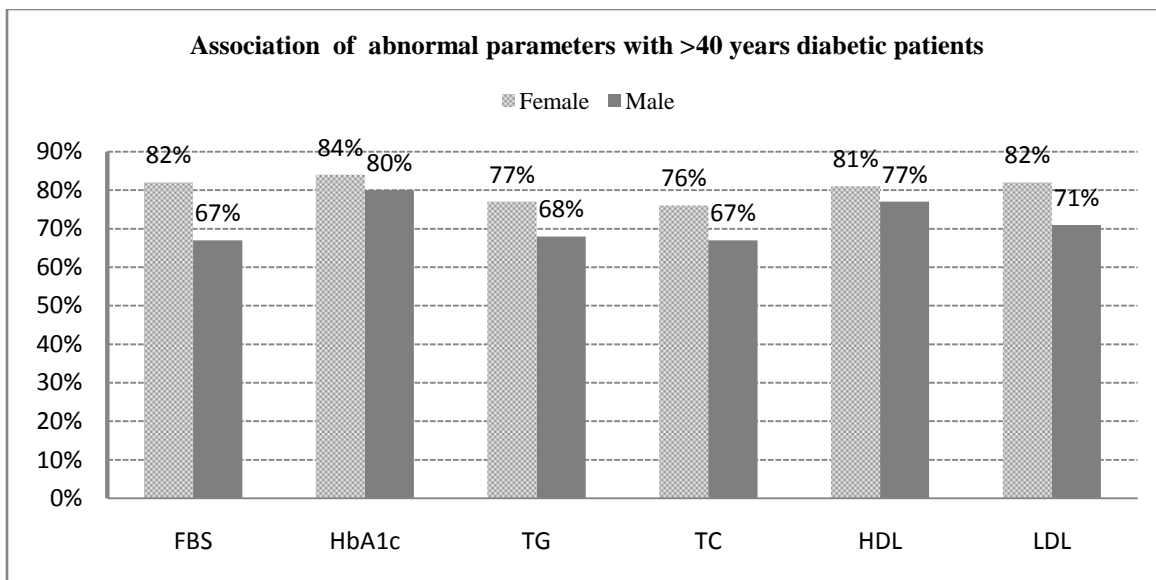
**Table 5:-** Biochemical parameters according to patients glycemetic control.

Parameters	HbA1c		P- value
	<6.5% (n=45)	≥ 6.5 % (n=95)	
FBS	134.6±25.3	186.8±57.0	0.001
TG	165.9±59.1	190.8.0±62.6	0.004
TC	199.3±40.8	223.3±48.0	0.025
HDL	38.1±5.3	36.9±6.0	0.229
LDL	128.0±38.9	148.2±43.3	0.009
TC/HDL	5.4±1.8	6.3±2.1	0.013
LDL/HDL	3.5±1.5	4.2±1.7	0.017
<i>P value based on chi square test (p &lt; 0.05) significant</i>			

**Table 5** The patient’s data were categorized on the basis of HbA1c  $\leq 6.5\%$  and  $\geq 6.5$ . It was found that patients having HbA1c  $\geq 6.5\%$  have higher all the parameters and showed statistically significant ( $p < 0.05$ ) except HDL levels compared to patients having HbA1c  $\leq 6.5\%$ .



**Figure 1:-** Association of abnormal result with < 40 years diabetic patients’ gender



**Figure 2:-** Association of abnormal result with >40 years diabetic patients’ according to gender

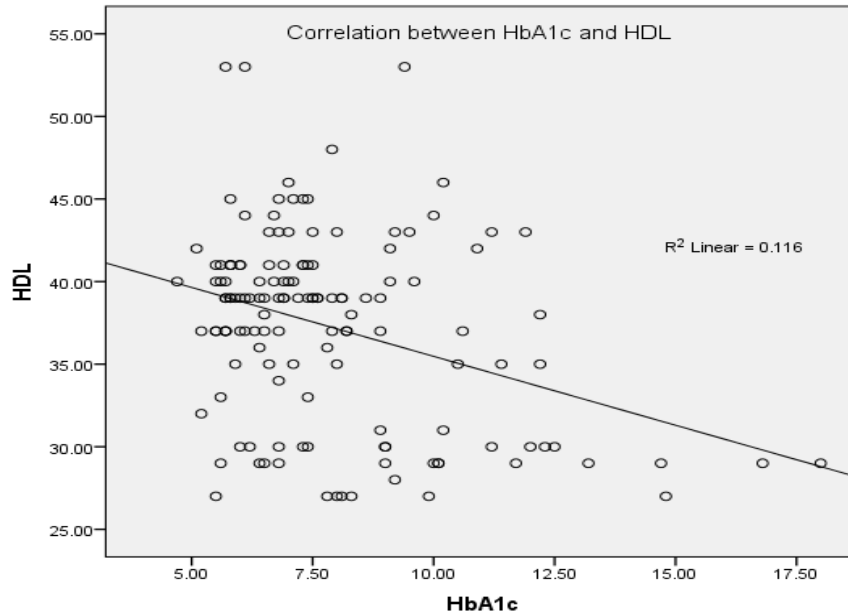


Figure 3:- Correlation between HbA1c and HDL.

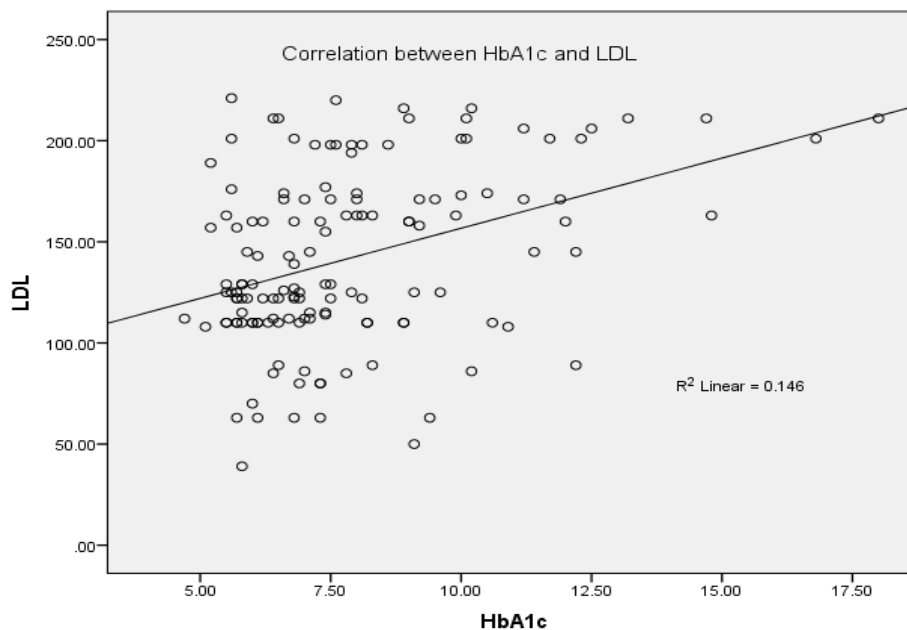


Figure 4:- Correlation between HbA1c and LDL.

### Discussion:-

Type-2 diabetes mellitus (T2DM) is a well-known risk factor for the development of cardiovascular disease, cerebrovascular disease and peripheral vascular disease. Lipids play a vital role in the pathogenesis of diabetes mellitus. Alterations in lipid and lipoprotein profile contribute to atherosclerosis in T2DM [17]. Dyslipidemia is a metabolic abnormality that is frequently associated with diabetes mellitus and both of them play important predictors that can progress to coronary artery disease (CAD) and may even be a prerequisite for CAD, occurring before other major risk factors come into play. [18].

Its prevalence is variable, depending on the type and severity of diabetes, glycaemic control, nutritional status, age and other factors. Glycaemic control is directly related to lipid metabolism. Therefore, in this present study, we have

evaluated the pattern of lipid profile parameters in the patients with T2DM along with their correlation with HbA1c. The results of this study clearly showed that there is alteration in the serum levels of FBS, TC, TG, LDL-C and HDL-C were noted in patients with diabetes, which are well known risk factors for cardiovascular diseases among patients when compared to the normal values. However, the levels of HbA1c, FBG, TC, TG and were LDL-C not affected by patients gender as neither of these parameters differed significantly between male and female diabetic patients. Some of the previous studies showed that the results of lipid profile in female diabetic patients had significantly higher levels of LDL, and TC, which is in contrary with our report [19].

In addition, no such age-related differences were found in women but the frequency of normal HDL-C values in women was significantly higher than in men. Generally, the results from this study have been in accordance with one of the previous research [20]. This may reflect better adherence to diabetic management by females as well as the known higher HDL cholesterol in females due to gender effect particularly estrogen effect during reproductive age. However, our finding is contrary with the similar studies reported earlier [21, 22]. Hyperlipidemia in females may be attributed to the effects of sex hormones and body fat distribution, leading the differences in altered lipoproteins.

In addition, we have analyzed the percentage of abnormal parameters values and association with gender and age within study group. We have noticed that male group has more number of abnormal parameters than female albeit there was no any statistically significant difference between the groups. We also categorized our test results in two groups, age >40 years and <40 years and analyzed the abnormal parameters in these groups and found that more number of abnormal parameters noticed among both genders in age group >40 years. It seems that type 2 diabetic patients of > 40 years of age are slightly more vulnerable in this respect compared to the < 40 age group. However, study done by Al Lawati et al [8], reported that the younger Omani type 2 diabetics exhibited worse glycemic state compared to older patients.

Glycosylated hemoglobin (HbA1c) is the main indicator which is used for evaluation of glycemic control in diabetes mellitus. The high values of HbA1c were associated with an increased risk of complications in patients with type-2 diabetes mellitus. Apart from classical risk factors like dyslipidemia, elevated HbA1c has now been regarded as an independent risk factor for cardiovascular disease in subjects with or without diabetes [23]. A highly significant correlation between HbA1c and FBS, TG, TC, LDL-C and HDL-C were observed in this study, which is in agreement with the findings of several other investigators who also reported significant correlations between HbA1c and individual blood lipid [24, 25]. A significant correlation between HbA1c level and lipid abnormalities were also noted and suggested importance of control of diabetes and control of lipids in Chinese study [26].

In previous studies, the degree of impaired glycaemic control was defined by different HbA1c cut off values. According to American Diabetes Association (ADA), glycated haemoglobin (HbA1c) more than or equal to 6.5% is considered diabetes. So, we have analyzed our parameters on the basis of cut off value 6.5%.

Significant correlation between HbA1c and various circulating lipid parameters and significant difference of lipid parameters in two groups (<6.5% and >6.5%) of glycated hemoglobin were observed. In addition, patients with high HbA1c ( $\geq 6.5\%$ ) exhibited significant increase in FBS, TC, TG, LDL-C, TC/HDL and LDL/HDL ratio in comparison to patients with normal HbA1c (< 6.5%), which is consistent with the findings reported by Hammed et al. [27]. Khan *et al.* reported that HbA1c screening not only reflected glycaemic control, but predicted serum lipid profiles in diabetic patients as well [28]. However, there was no significant difference noticed in HDL levels. Diabetic patients with poor glycaemic control exhibited a significant increase in TC/HDL-C and LDL-C/HDL-C ratios. The reason maybe because that the change of ratios is earlier than individual lipid, especially in patients with normal blood lipid. Improving glycaemic control can substantially reduce the risk of cardiovascular events in diabetics. It has been estimated that reducing the HbA1c level by 0.2% could lower the mortality by 10%. [7].

### Conclusions:-

It was concluded from the results of this study that HbA1c can be used as a predictor of dyslipidemia in type 2 diabetes mellitus in addition to as glycemic control parameter. HbA1c measurement helps to control diabetes mellitus and helps to identify dyslipidemia and will help for the better management of diabetes in preventing cardiovascular diseases due to dyslipidemia.

HbA1c can be used as a good indicator of glycemic control as well as a predictor of lipidemic state in type 2 diabetics.

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### RESEARCH ARTICLE

#### EFFECT OF BONE MORPHOGENETIC PROTEIN COATING OF DENTAL IMPLANT: A SYSTEMATIC REVIEW.

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#### Abstract

Dental implants had become an integral treatment modality in prosthetic dentistry. Implant prostheses have shown dramatic improvements in masticatory performance, esthetics, and patient satisfaction. Recently, the applications of molecular and nanoscale-based biological substances as bone morphogenetic proteins, peptides, and stem cells in association with calcium phosphate coatings always play an essential role in enhancing the osseointegration of dental implants and shortening the time period for implant integration. Hypothetically, oral implants' surfaces covered with a bone inductive agent such as a BMP may stimulate regional bone development and osseointegration in sites of poor bone quality or in need of augmentation. Objectives were to evaluate the effects of bone morphogenetic protein surface coating of dental implant in improving the osseointegration in human. The search was done at Cochrane Central Register of Controlled Trials (CENTRAL), PubMed. Only English papers were to be included. Most recent search: october 2016. The Selection criteria were Randomized controlled clinical trials (RCTs) including patients with dental implant coated with bone morphogenetic protein (BMP) surface coating against dental implants without bone morphogenetic protein (BMP) of surface coating. The outcome measures considered were: osseointegration, implant stability, and implant failure. Chief results: We found that there was no randomized controlled or controlled clinical trials. Conclusions: in this research area, there is utmost need for RCTs to evaluate the role of bone morphogenetic protein surface coating of dental implant in enhancing the osseointegration in human (clinical studies).

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#### Background: -

Dental implants had become an integral treatment modality in prosthetic dentistry. Implant prostheses have shown dramatic improvements in masticatory performance, esthetics, and patient satisfaction. The placement of dental implants and the insertion of implant-supported prostheses have been found to substantially reduce bone loss in the edentulous jaw, as well as promote bone deposition distal to implants. (1)

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Because the time frame to achieve full osseointegration, in addition the physiology and composition at the bone implant connection, is mainly related to the implant surface, there is a necessity to establish surfaces modifications that will lead to a predictive improvement of implant-to-bone response.(2)

Such modifications, whether surface topographical or surface chemical, have been successful in accelerate osseointegration at early implantation times which may shorten the total treatment period.

Recently, the applications of molecular and nanoscale-based biological substances as bone morphogenetic proteins, peptides, and stem cells in association with calcium phosphate coatings always play an essential role in enhancing the osseointegration of dental implants and shortening the time period for implant integration.(3)

**The BMPs are dissoluble**, small molecular weight transmembrane glycoproteins that found as dimers linked by a disulfide bond within natural bone. Due to there is only a little quantity of active protein/kg bone, extraction of adequate amounts would demand a large quantity of bone, making this process very difficult and expensive. (4) BMPs are growth factors that naturally found within the bone matrix and act as pleiotropic organizer of chemotaxis, mitosis, differentiation, excitation of extracellular matrix formation, bound to matrix components, conservation of phenotype and apoptosis. In addition, they play a role in regulation of bone volume, skeletal organogenesis and the Regeneration of bone after a fracture.(5)

Hypothetically oral implants' surfaces covered with a bone inductive agent such as a BMP may stimulate regional bone development and osseointegration in sites of poor bone quality or in need of augmentation. (6)

The consequences of BMP-2 and its application on dental implants' osteoconductivity had been evaluated by (Liu et al, 2007)<sup>(7)</sup> by using a bare titanium surface or with a calcium-phosphate covered implant. They found that the method of application bone morphogenetic protein (BMP-2) was greatly affects the osteoconductivity of dental implant surfaces.

(Kim et al, 2015)<sup>(8)</sup> used recombinant human bone morphogenetic protein-2 (rhBMP-2)-loaded pedicle screws to formulate a new hypothesis of bone-to-bone biological lock .

(Yoo et al, 2014)<sup>(9)</sup> had examined if plasma-sprayed hydroxyapatite implant surfaces dipped in protein solution prior to dental implant installation in order to cover the implant surface with rhBMP-2 onto by immersion in protein solution before implant placement may lead to greatly enhance the process of bone formation . **They concluded** that the mixture of plasma-sprayed calcium-phosphate implant surface and rhBMP-2 coating remarkably improve the osseointegration, which certified the postulated hypothesis.

#### **Biological Function of BMP: -**

- BMPs are growth factors that naturally found within the bone matrix and act as pleiotropic organizer of chemotaxis, mitosis, differentiation, excitation of extracellular matrix formation, bound to matrix components, conservation of phenotype and apoptosis.
- In addition, they play a role in regulation of bone volume, skeletal organogenesis and the Regeneration of bone after a fracture. (5)
- BMP-2 has been the most inclusively studied of any of the BMPs.
- The jobs of the protein have been resolved in fracture healing, bone defects and different spinal fusion models.(5)
- Expression is regenerative with the differentiation of chondroblasts and osteoblasts from mesenchymal stem cells, proposing that it might be an inducer of bone formation and chondrogenesis.(5)
- Meantime, more than 40 agents of the mutated growth factor beta 1 (TGF- $\beta$ ) family were known that they have a great part in differentiation and growth of matters.(10)
- In addition, BMP-2 is considered as one of the growth factors that have osteoinductive properties; others include BMP-4, BMP-6 and BMP-7.(10)
- From all of these advantages, it could be important for implant's patients, clinical researchers, and society to investigate the effectiveness of bone morphogenetic protein surface coating of dental implant in improving the osseointegration in human, as the recombinant human bone morphogenetic protein (rhBMP-2) dental implant coating was approved to be used safely in human

**Objectives: -**

The main objective of this review is to estimate whether the bone morphogenetic protein coating of dental implant's surface can enhance the osseointegration in human.

Moreover, to investigate if the bone morphogenetic protein coating of dental implant can improve the osseointegration better than non-bone morphogenetic protein surface coating of dental implant in human studies.

**PICO: -**

- **Population:** edentulous patients (partial or complete)
- **Intervention:** bone morphogenetic protein surface coating of dental implant
- **Control:** non-bone morphogenetic protein surface coating of dental implant
- **Outcome:** - osseointegration
  - Implant stability
  - Implant failure
- **Study design:** randomized clinical trial (RCTs)

**Methods: -****Inclusion Criteria for selecting studies: -****Included studies:**

- The studies were Randomized controlled clinical trials (RCTs) which may be parallel studied or split mouth design without time limiting frame of these studies.

**Types of participants: -**

- The patients could be male or female with no age limit.
- The Patients could be partially or completely edentulous.
- The dentulous areas can be found at maxilla or mandible
- The edentulous spaced could be anteriorly or posteriorly.
- The super structure could be fixed or removable prosthesis.
- The loading may be immediate or delayed.

**Types of interventions: -**

Dental implants with or absence of the growth factor (bone morphogenetic protein (BMP)) surface coating

**Types of outcome measures: -**

- Assessment of the osseointegration through calculating the bone height around the dental implant at each follow up period in each group
- Evaluation of stability of dental implant, where primary or secondary implant stability are pre-requisite for successful osseointegration and subsequent success of implant treatment
- Implant failures which could be identified through detecting the mobility of dental implant that may be caused by marginal bone loss around the installed implant.

**Search procedure for the included studies: -**

For identification of included studies, there were some databases used in search process.

**Databases used in searching: -**

- The latest electronic search was performed on 14 October 2016 by using PubMed- NCBI data base, and Cochrane Library for the Controlled Trials.

**Language selected: -**

The articles with English language only selected during the search strategy.

**Hand searching: -**

hand searching was made through electronic search in different journals and screening the references of relevant papers and reviews.

Search strategy: -

PubMed index term: -

**#1 ( bone morphogenetic protein[MeSH ] OR bone morphogenetic proteins[MeSH ] OR bone morphogenetic protein 2[MeSH ] OR bone morphogenetic protein-2[MeSH ] OR bone morphogenetic protein 4[MeSH ] OR bone morphogenetic protein receptor[MeSH ] OR bone morphogenetic protein 7[MeSH ] OR bone morphogenetic protein signaling[MeSH ] OR bone morphogenetic protein 6[MeSH ] OR bone morphogenetic protein-7[MeSH ] OR bone morphogenetic protein 9[MeSH ] OR bone morphogenetic protein 15[MeSH ] OR bone morphogenetic protein receptor 2[MeSH ]OR recombinant human bone morphogenetic protein-2[MeSH] OR bone morphogenetic protein 1[MeSH] OR rhbmp-2 dental[MeSH] OR rhbmp-2 bone[MeSH] OR rhBMP-2[MeSH ] OR BMP-2[MeSH] OR Recombinant Human Bone Morphogenetic Protein-2[MeSH] ) ( 22129)**

**#2 (bone morphogenetic protein[T W] OR bone morphogenetic proteins[T W] OR bone morphogenetic protein 2[TW]OR bone morphogenetic protein-2[TW] OR bone morphogenetic protein 4[TW]OR bone morphogenetic protein receptor[TW] OR bone morphogenetic protein 7[TW]OR bone morphogenetic protein signaling[TW]OR bone morphogenetic protein 6[T W] OR bone morphogenetic protein-7[T W] OR bone morphogenetic protein 9[TW] OR bone morphogenetic protein 15[TW] OR bone morphogenetic protein receptor 2[TW] OR recombinant human bone morphogenetic protein-2[TW] OR bone morphogenetic protein 1[TW] OR rhbmp-2 dental[TW]OR rhbmp-2 bone[TW] OR rhBMP-2[TW] OR BMP-2[T W]OR Recombinant Human Bone Morphogenetic Protein-2[TW] (17608)**

**#3 dental implant surface [MeSH] OR dental implant surfaces [MeSH] OR dental implant surface treatment[MeSH] OR titanium dental implant surface[MeSH] OR dental implant surface roughness[MeSH] OR dental implant surface modification [MeSH] OR dental implant surface design[MeSH ] OR dental implant surface modifications[MeSH] OR endosseous dental implant surfaces[MeSH](412)**

**#4 dental implant surface[TW]OR dental implant surfaces[TW] OR dental implant surface treatment[TW] OR titanium dental implant surface[TW] OR dental implant surface roughness[TW] OR dental implant surface modification[TW] OR dental implant surface design[TW] OR dental implant surface modifications[TW] OR endosseous dental implant surfaces [Text Word] (234)**

**#5 (humans [MeSH Terms]) OR human [MeSHTerms] ( 16047664)**

**#6 (human[Text Word]) OR humans[Text Word] (16535072)**

**#7 #1 OR #2 (22187)**

**#8 #3 OR #4 (636)**

**#9 #5 OR #6 (16535072)**

**10 #7 AND #8 AND #9 (37)**

Cochrane literary index terms: -

**#1 (bone morphogenetic protein OR bone morphogenetic proteins OR bone morphogenetic protein 2 OR bone morphogenetic protein-2OR bone morphogenetic protein 4 OR bone morphogenetic protein receptor OR bone morphogenetic protein 7 OR bone morphogenetic protein signaling OR bone morphogenetic protein 6 OR bone morphogenetic protein-7 OR bone morphogenetic protein 9 OR bone morphogenetic protein 15 OR bone morphogenetic protein receptor 2 OR recombinant human bone morphogenetic protein-2 OR bone morphogenetic protein 1 OR rhbmp-2 dental OR rhbmp-2 bone OR rhBMP-2 OR BMP-2 OR Recombinant Human Bone Morphogenetic Protein-2) (317)**

**# 2 dental implant surface OR dental implant surfaces OR dental implant surface treatment OR titanium dental implant surface OR dental implant surface roughness OR dental implant surface modification OR dental implant surface design OR dental implant surface modifications OR endosseous dental implant surfaces. (348)**

**# 3 humans OR human (741994)**

**#1 and # 2 and #3 (5)**

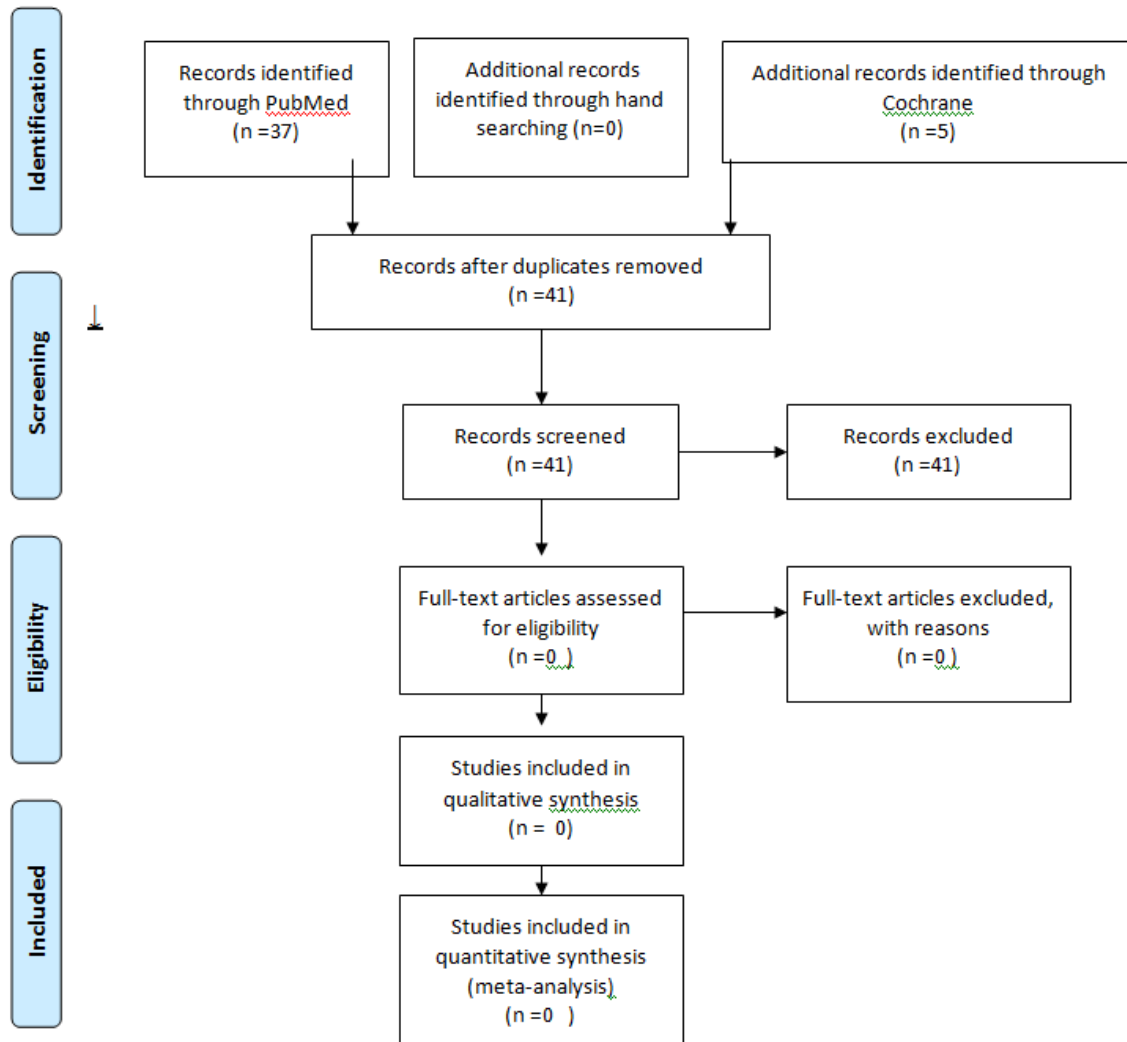
Data extraction

- Literature search resulted in 37 studies in PubMed and 5 studies on Cochrane data base. the first step of filtrating studies was performed through title and /or abstract with the resultant of zero studies retrieved from PubMed and Cochrane data base

The subsequent data should be registered for each clinical study:

- ❖ publication year, originating country, environment and origin of study funding.
- ❖ participants' information including demographic data and inclusion criteria.
- ❖ the type of intervention's details and information.
- ❖ Detailed information of the outcomes measured, incorporating method of evaluation and time interval

#### PRISMA 2009 Flow Diagram: -



#### Gathering and analysis of data: -

All the studies selected according to the criteria of search strategy were screened by titles and abstracts independently by two authors to decide whether these selected studies followed up the inclusion criteria. In addition, in case of insufficient available information about the studies in title and abstract, a report was made about the status of each study to be checked by the two authors independently to make a clear decision about them. In case of disagreements, the discussion was the appropriate solution in this condition but if this way is not worked, a third author was invited to give the final decision. After that, the quality of each selected study was evaluated, then a table of exclusion studies was made with clarifying the cause of this exclusion.

#### Quality assessment of the included studies: -

- ❖ The evaluation was done according to standard criteria:
- ❖ The first one was the Allocation concealment which may be: adequate concealment or un clear or inadequate one.
- ❖ After that, evaluation of follow up period, if all patients complete the whole study period or there was a drop out. In this case, a clear explanation for this drop out should be given, as it was evaluated as follow:
- ❖ The answer was yes, in case of the presence of clear explanation for drop out.
- ❖ The answer was no, in case of absence of explanation.
- ❖ The studies were to be gathered in groups after analyzing the data of each one in to these categories:
- ❖ If all evaluation criteria were present, this study was considered as low risk of bias.
- ❖ If one or more of the evaluation criteria were not completely explained, this study was considered as moderate risk of bias
- ❖ If one or more of the evaluation criteria were absent, this study was considered as high risk of bias

#### **Data composition: -**

For the estimation of the influence of an intervention, the risk ratios were used with 95% confidence interval for all selected studies. The mean difference with 95% confidence interval were used to continuous outcomes. After screening the types of participants, outcomes and interventions, the clinical heterogeneity was assessed. A planned subgroup analysis for methods of applying bone morphogenetic protein (BMP) coating on the implant surface and sub group analysis for various types of bone morphogenetic protein (BMP). For only studies which had the same outcome measures, assessment methods, and comparisons, the meta analyses were made. The random effect model was used to collect the risk ratio for dichotomous data. In addition, it was used to collect the mean differences for continuous data present. The  $I^2$  test was used to test and quantify the amount of heterogeneity between the studies. The influence of randomization may be evaluated by using sensitivity analysis.

#### **Results: -**

Regarding the studies' description, assessment of risk of bias in the included studies, and the influence of the intervention, it was found that there was no published randomized controlled clinical trials (RCT) or controlled clinical trials after searching in to different data bases.

#### **Discussion: -**

It was so disappointed not to find a randomized controlled clinical trial or even controlled clinical trials to compare and evaluate the effect of bone morphogenetic protein surface coating of dental implant in improving the osseointegration in human. Several published animal studies have become available. We are also ongoing to publish randomized clinical trial (RCT) including 10 patients, they are divided into two groups **Group (I)**: Five patients had received two conventional titanium implant coated with Bone morphogenetic protein (BMP) installed in the inter-foraminal area. **Group (II)**: Five patients had received two conventional titanium implant surface installed in the inter-foraminal area. with a 1-year follow up from Egypt, Cairo University, Faculty of Dentistry.

In this section, we introduce a summary about some of the animal studies performed by using bone morphogenetic protein coating of dental implant's surface with different techniques and types to guide the clinical researchers in this field, and the evidence extracted from this review was limited as there was no randomized clinical trials in this research field.

(Liu et al, 2005)<sup>(11)</sup> had tested kinetics and histomorphometry of bone development in combination with BMP-2 coating of dental implant by using a rat model. The models were divided into one experimental and three control groups. They concluded that the incorporation of BMP-2 with calcium phosphate coatings could enhance the bone development in vivo with excellent degree strength and even with low concentration of the given dose. In addition, the ability to withstand this action was high as its activity may last for large period of time.

The consequences of BMP-2 and its application on dental implants' osteoconductivity had been evaluated by (Liu et al, 2007)<sup>(7)</sup> by using a bare titanium surface or with a calcium-phosphate covered implant. They found that the method of application bone morphogenetic protein (BMP-2) was greatly affects the osteoconductivity of dental implant surfaces.

(Ramazanoglu et al, 2011)<sup>(12)</sup> had tested the influence of recombinant human bone morphogenetic protein-2 in single and double delivery techniques and recombinant human vascular endothelial growth factor (rhVEGF165) from dental implants coated with biomimetically octa-calcium phosphate on osseointegration. These implants were installed into frontal skulls of nine domestic pigs. **They concluded** that the combination of coating implants with BMP-2 and VEGF could enhance the bone volume density in the area surrounding the implants, although there was not bone implant contact observed in this condition.

(Kim et al, 2015)<sup>(8)</sup> used recombinant human bone morphogenetic protein-2 (rhBMP-2)-loaded pedicle screws to formulate a new hypothesis of bone-to-bone biological lock.

(Yoo et al, 2014)<sup>(9)</sup> had examined if plasma-sprayed hydroxyapatite implant surfaces dipped in protein solution prior to dental implant installation in order to cover the implant surface with rhBMP-2 onto by immersion in protein solution before implant placement may lead to greatly enhance the process of bone formation. **They concluded** that the mixture of plasma-sprayed calcium-phosphate implant surface and rhBMP-2 coating remarkably improves osseointegration, which certified the postulated hypothesis.

The effects of bone morphogenetic proteins (BMPs) in cellular functions in adult and postnatal animals have been investigated in recent years. Most of these animal studies recommend to use the BMP as surface coating for dental implant. Moreover, bone morphogenetic protein as surface coating for dental implant is considered to be a new surface coating technique for dental implant. For these reasons, it is important to plan good standard randomized clinical trials (RCTs) to evaluate the influence of bone morphogenetic protein coating for dental implant, this is a very important step to produce trustable evidence about its effectiveness in improving the bone formation. In addition, different techniques for BMP application and mode of coating delivery should be properly tried and tested in vivo studies.

## Conclusions: -

### Clinical suggestions:

There were no published randomized controlled clinical trials or controlled clinical trials, thus the good evidence is difficult in this case to recommend the clinician to use the bone morphogenetic protein surface coating of dental implant in improving the osseointegration in human. It seems that bone morphogenetic protein surface coating might improve the osseointegration depends on the technique used for application of coating on to the implant surface, however, these results depend on animal studies. Thus, we don't recommend to use bone morphogenetic protein as surface coating for dental implant till a strong and reliable evidence developed.

### Research suggestions:

Although, the bone morphogenetic protein surface coating for dental implant is relatively a new coating technique, the absence of randomized clinical trial on this point is so depressed, as its effect in improving the osseointegration in human still doubtful. For this reason, we advise the researchers to pay attention to this research point to help in generating reliable and strong evidence base decision. In addition, different techniques for BMP application & release should be tried.

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### RESEARCH ARTICLE

#### PROBIOTIC CHEWING GUM TREATMENT OF PERIODONTAL DISEASE.

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#### Abstract

**Background:** Periodontitis is defined as an inflammatory disease of the supporting tissues of the teeth caused by specific microorganisms or groups of specific microorganisms, resulting in progressive destruction of the periodontal ligament and alveolar bone with pocket formation, recession, or both. The clinical feature that distinguishes periodontitis from gingivitis is the presence of clinically detectable attachment loss.

**Aim of the study:**Comparative study the effect of probiotic s as chewing gum in patient with periodontal disease.

**Methods:**In thisstudy, 20 patient with periodontal disease (chewing gum with probiotic supplement group)(test group) and 20 patient(chewing gum) (control group) both received treatment in periodontal department of dentistry college by means of scaling and polishing , the (test group) in addition received probiotic chewing gum in order to study its effect and compare it with the( control group).

**Result:**Probiotic chewing gum users demonstrated less amount of plaque than in the (control group), and less gingival inflammation in the study group than in the control group.

**Conclusion:**Probiotic chewing gum has more effect on the periodontal tissue health, by decreasing the amount of plaque and gingival inflammation with adjunct scaling when compared to the control group.

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#### Introduction:-

The first studies of the use of probiotics for enhancing oral health were for the treatment of periodontal inflammation.<sup>43</sup> Patients with various periodontal diseases, gingivitis, periodontitis, and pregnancy gingivitis, were locally treated with a culture supernatant of a *L. acidophilus* strain. Significant recovery was reported for almost every patient. There has been significant interest in using probiotics in treatment of periodontal disease recently, too. The probiotic strains used in these studies include *L. reuteri* strains, *L. brevis* (CD2), *L. casei*Shirota, *L. salivarius* WB21, and *Bacillus subtilis*. *L. reuteri* and *L. brevis* have improved gingival health, as measured by decreased gum bleeding<sup>(1, 2, 3)</sup>. The use of probiotic chewing gum containing *L. reuteri* ATCC 55730 and ATCC PTA 5289 also decreased levels of pro-inflammatory cytokines in GCF,<sup>(3)</sup> and the use of *L. brevis* decreased MMP (collagenase) activity and other inflammatory markers in saliva.<sup>(2)</sup> With *L. casei*Shirota and *Bacillus subtilis* no difference in test and control groups in gingival bleeding or measured plaque index was observed, but the use of *L. casei*Shirota decreased PMN elastase and MMP-3 activities in GCF, and gingival inflammation was lower in the group consuming the probiotic product, as measured by MPO activity after a four-day period of experimental gingivitis.<sup>(4)</sup>*B. subtilis* seemed to reduce the number of periodontal pathogens.<sup>(5)</sup> Use of tablets containing *L.*

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*salivarius* WB21 has been shown to decrease gingival pocket depth, particularly in high-risk groups such as smokers, and also affect the number of periodontal pathogens in plaque.<sup>(6,7)</sup>

Again, although encouraging results have been observed, most studies have been fairly short. Furthermore, in some studies the observed differences were quite small, though statistically significant.

Some probiotic *Lactobacillus* and *Streptococcus* strains seem able to colonize the oral cavity of some people during the time that products containing them are in active use. However, both in vitro and in vivo evidence indicate that the differences between various probiotic strains, products, and also host individuals are obvious.<sup>16,2</sup> *L. rhamnosus* GG and two different *L. reuteri* strains have been reported to colonize the oral cavity of 48–100% of volunteers consuming products containing them.<sup>2</sup>

At least some of the probiotic bacteria used in various probiotic products may colonize the oral cavity during the time they are in use; thus, the effects of probiotic bacteria in the oral cavity are important to understand. Probiotic bacteria seem to affect both oral microbiota and immune responses. On the other hand, the extent to which bacteria in food or in food ingredients can influence relatively stable oral microbiota is difficult to predict. Thus, both research to unravel the mechanisms of possible probiotic action and long-term clinical trials are needed if probiotics are to provide a new scientifically proven means of preventing or treating oral diseases,<sup>2,3</sup>

### Material And Method:-

Across-sectional survey of forty patient divided in to two group(test group),chewing gum with probiotic and( control group) chewing gum without probiotic( probiotic chewing gum prepared in college of agriculture department of food science .the test group was composed of twenty subject and control group was composed also of twenty subject .the patient was selected from periodontal department in collage of dentistry-university of Baghdad .the subjects for the study were selected randomly and they were in good general health and were not using any medications and the subject we take contain male and female patient we carried out a careful examination of patient using the plaque index (PI)(silness and loe in 1964),gingival index (GI)(loe, 1967) of those patient a comparison analysis. We usedSPSS statistics for analysis and Microsoft excel 2013 for figures.

### Method:-

After doing scaling and polishing for test group subjects asked them to use probiotic chewing gum(with lactobacillus acidophilus probiotic) two time daily 10 minute during one week and examined the subject during the first and second visit to make comparison analysis . While control group was done scaling and polishing askedthem to chew sugar free chewing gum two time daily for 10 minute during one week, and made comparison analysis. A thorough periodontal examination was carried out under good artificial light ,and parameter selected for the study were carefully record .plaque index , gingival index all were measured using these specific index and record on case sheet design for this study .

Informed consent was obtained from all the subjects before starting periodontal examination.

### Clinical examination:-

#### Plaque index:-

The plaque index (loe and silness,1963)was created for the assessment of the plaque accumulation on the basis of 0 to 3 the criteria are:

Scores	Criteria
0	No plaque
1	A film of plaque adhering to the free gingival margin and adjacent area of the tooth cant be seen by naked eye.
2	Moderate accumulation of soft deposit within the gingival pocket or the tooth and gingival margin can be seen by naked eye.
3	Abundance of soft matter within the gingival pocket and Or on the tooth and gingival margin

#### Gingivalindex :-

The gingival index (loe1967)was created for the assessment of the gingival condition and records qualitative changes in the gingival .it records the gingival and interproximal tissue separately on the basis of 0 to 3.the criteria are :

Scores	Criteria
0	Normal gingival
1	Mild inflammation –slight change in color and slight edema but no bleeding on probing
2	Moderate inflammation –redness ,edema ,glazing bleeding on probing
3	Sever inflammation –marked redness and edema, ulceration , with tendency to spontaneous bleeding

**Instrument:-**

- dental mirror
- tweezers
- towels
- mask
- Kidney dish
- periodontal probe
- Cotton
- Alcohol
- Gloves

**Statistical analysis**

Use spss.21. of windows 7 and use excel.10 for fig.

## 1-descriptive statistic

- tables
- mean
- standard deviation (SD)

## 2-invertrial statistic

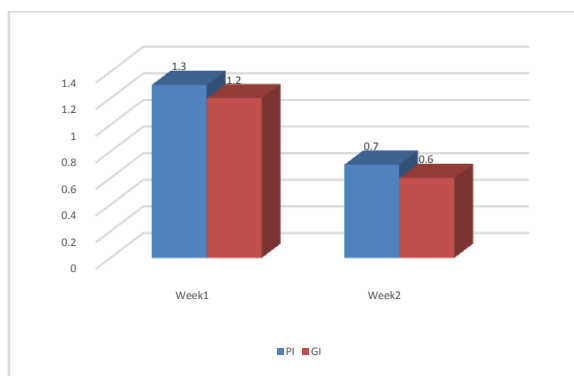
- t-test
- person complex (r)
- p-value
- If  $p < 0.05$             significant
- If  $p > 0.05$         non significant
- If  $p < 0.01$         high significant

**Result:-****Plaque Index and gingival index:-**

The following table and figures summarized the descriptive statistics of group A and B regarded plaque index (PI) and gingival index(GI).

**Table 1:-Descriptive of group A(test group)**

	Base line		Week1	
	Mean	SD	Mean	SD
PI	1.3	0.033	0.7	0.018
GI	1.2	0.03	0.6	0.015

**Figure 1:-Descriptive statistic of group A(test group)**

As we see in the figure (1) there are high differences between PI and GI of test group between first and second week

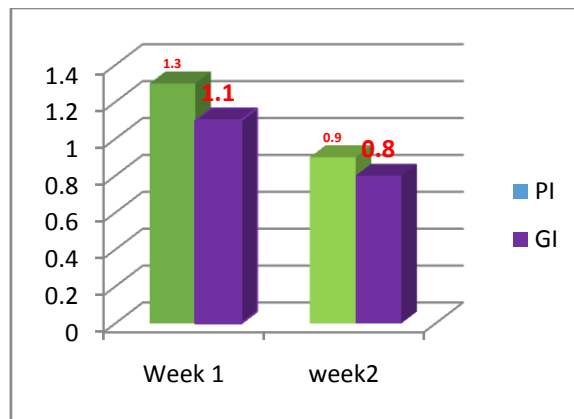
**Table2:-t-test between weeks(test group)**

	t-test	P-value	Sig
PI	3.862	0.029	S
GI	4.36	0.028	S

Now if we see the descriptive statistic of subject group B(see figure 2) we also see a result similar to group A also there are high differences between the first and second week.

**Table3:-Descriptive of groups B(Control)**

	Week1		Week2	
	Mean	SD	Mean	SD
PI	1.3	0.033	0.9	0.023
GI	1.1	0.028	0.8	0.02

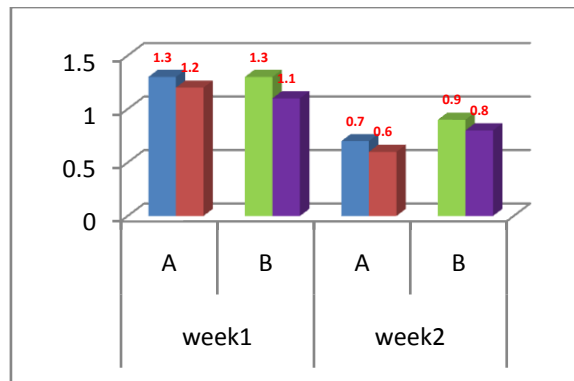


**Figure 2:-Descriptive statistic of group B(control).**

If we compared between the result of group (A) and (B) we will found the following result (see figure 3).

**Table 4:-Descriptive of groups by weeks.**

	Base line				Week1			
	GroupA		GroupB		GroupA		GroupB	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
PI	1.3	0.033	1.3	0.0325	0.7	0.018	0.9	0.023
GI	1.2	0.03	1.1	0.0275	0.6	0.015	0.8	0.02



**Figure 3:-A comparison between the descriptive of group A and B(chewing and control)**

**Table 5:-t-test between Group A& Group B of weeks**

	Base line		Week1	
	t-test	P-value	t-test	P-value
PI	0	NS	0.36	0.86 NS
GI	0.12	NS	0.465	0.796 NS
**P>0.05 Non significant				

	Group A		GroupB	
	t-test	P-value	t-test	P-value
PI	4.26	0.034 S	3.625	0.036 S
GI	2.03	0.049 S	2.036	0.028 S
*P<0.05 Significant				

Table6:-PH of saliva and FR of saliva

Second week	Test group		Control group		
	Mean	SD	mean	SD	p-value
PH	7.85	+0-31	7.50	+0.23	0.23
FR	5.7	+2.3	4.83	+2.6	0

P<0.5 not significant

Table (7):

	Control group	Test group	Total subject
chewable	10	8	20 control
trestles	10	10	20 test
sticky	0	1	
flaweble	0	1	

### Discussion:-

Probiotics can be defined as living microbes, or as food ingredients containing living microbes, that beneficially influence the health of the host when used in adequate numbers.<sup>1</sup>

In figure (1) the (20) patient (groupA) and make scaling to them after that we record the plaque and gingival index then give to them probiotic chewing gum. After one week we record (GI,PI) index we see high difference between the first and second week, this agree with (Wetman et al, 2009).

In figure (2) the same experience another (20) patient (group B)but give them just chewing gum, after one week we also see difference in (GI,PI) index between the first and second week due to mechanical plaque control.

In figure (3) we compare between group A(chewing gum) and group B(control), the chewing gum patient show slightly higher decrease in plaque index and gingival index between the first and second week than the controlled patient, this agree with (Hojo et al., 2007).

In table 5 shown that there are significant deference between two group and that agree with many research that the probiotic can defense the bacterial plague and enhance the oral hygiene which is the ability of lactobacillus acidophilus to fight the biofilm in oral cavity. Della Riccia DN, Bizzini F, Perilli MG, Polimeni A, Trinchieri V, Amicosante G, et al 2007., . Mayanagi G, Kimura M, Nakaya S, Hirata H, Sakamoto M, Benno Y, et al.2009.

Some probiotic *Lactobacillus* and *Streptococcus* strains seem able to colonize the oral cavity of some people during the time that products containing them are in active use. However, both in vitro and in vivo evidence indicate that the differences between various probiotic strains, products, and also host individuals are obvious.<sup>26,44,57,58</sup> *L. rhamnosus* GG and two different *L. reuteri* strains have been reported to colonize the oral cavity of 48–100% of volunteers consuming products containing them.<sup>44,58–60</sup> In addition, *S. salivarius* K12, used for treating oral malodor, temporarily colonizes the oral cavity for a short time after use.<sup>61</sup> Furthermore, consumption of a mixture of seven different *Lactobacillus* strains increased the number of salivary *Lactobacillus* counts, although the identities of the strains in the saliva were not determined.<sup>41</sup>

Patients with various periodontal diseases, gingivitis, periodontitis, and pregnancy gingivitis, were locally treated with a culture supernatant of a *L. acidophilus* strain. Significant recovery was reported for almost every patient. There has been significant interest in using probiotics in treatment of periodontal disease recently, too. Improved gingival health, as measured by decreased gum bleeding. The use of probiotic chewing gum containing *L. reuteri* ATCC 55730 and ATCC PTA 5289 also and Use of tablets containing *L. salivarius* WB21 has been shown to decrease gingival pocket depth, particularly in high-risk groups such as smokers, and also affect the number of periodontal pathogens in plaque.<sup>7,8</sup> Again, although encouraging results have been observed, most studies have been fairly short. Furthermore, in some studies the observed differences were quite small, though statistically significant. Table 6 show that the chewing gum increase the salivary flow and the pH of the saliva and that also in agreement with many study<sup>40,41</sup>. which decrease the gingivitis by washing the mouth from materia alba and plaque .

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### RESEARCH ARTICLE

#### PROTOCOLE DE PREPARATION DE PLASMA RICHE EN PLAQUETTES.

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#### Abstract

Le PRP est une thérapie cellulaire facilement accessible. C'est une thérapie cellulaire autologue contenant de nombreux facteurs bioactifs qui sont impliqués dans la cicatrisation des plaies, la réparation des tissus, et la régénération tissulaire.

L'industrie pharmaceutique ne cesse d'innover en matière de méthode de préparation, vu les intérêts économiques énormes que constitue « le phénomène » PRP. Cependant, la compréhension des différences dans les préparations PRP est essentielle lors de l'interprétation des résultats d'études cliniques.

Nous proposons un protocole de prélèvement simple et peu onéreux pour l'obtention du PRP, le but de ce travail est de décrire les différentes étapes de ce protocole et ainsi démontrer son efficacité.

Par conséquent, étant donné que peu de standardisation a été faite à ce jour, il existe toujours une controverse sur les avantages cliniques de la PRP. Des études prospectives et randomisées sont nécessaires pour évaluer l'efficacité des préparations normalisées de protocoles.

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#### Introduction:-

Plasma riche en plaquettes (PRP) est un volume de plasma de sang autologue ayant des niveaux de plaquettes au-dessus de la concentration dans le sang périphérique. La concentration de plaquettes peut fournir une plus grande quantité de plusieurs facteurs de croissance bioactifs pour favoriser la cicatrisation.

Les méthodes employées sont diverses, le choix de la méthode doit prendre en considération la qualité globale des plaquettes, des résultats et des coûts. Le taux initial moyen de plaquettes sanguines est de  $200\ 000 \pm 75\ 000$  / pi et les plaquettes sont in vivo une demi-vie d'environ 7-10 jours.

Les plaquettes activées, au contact de l'endothélium exposé à l'intérieur des plaies ou des tissus endommagés, sont connues pour libérer dans la plaie beaucoup de facteurs, y compris le facteur de croissance dérivé des plaquettes (PDGF), le facteur de croissance transformant (TGF), le facteur de croissance endothéliale vasculaire (VEGF), analogue à l'insuline facteur de croissance (IGF) et le facteur de croissance épidermique (EGF). Tous ces facteurs vont préparer le terrain pour la cicatrisation des tissus qui implique des processus qui se chevauchent, complexes, ses facteurs interviennent dans l'hémostase, l'inflammation, la prolifération et le remodelage tissulaire.<sup>1</sup>

<sup>1</sup>Boswell SG, Cole BJ, Sundman EA, et al: Platelet-rich plasma: a milieu of bioactive factors. *Arthroscopy* 2012; 28: pp. 429-439

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Des études prospectives et randomisées seront nécessaires pour évaluer l'efficacité des préparations normalisées de PRP dans la cicatrisation des plaies.

La première étape vers cette normalisation devrait être la production de PRP la plus rentable, la plus simple qui le rendrait ainsi accessible à plusieurs centres de traitement et donc à un nombre plus important de patients. Ceci permettra de faciliter le développement et la conception d'études cliniques<sup>2</sup>.

Dans l'ensemble, la technique de préparation de PRP que nous décrivons dans cet article peut être mise en œuvre par le personnel médical, sans formation spécialisée supplémentaire. Les opérateurs étant sensibilisés à tous les risques liés à la récolte, le transport, le traitement, et l'injection ou l'application du PRP.

#### Le Protocole Prp:-

- ❖ Prélèvement à faire au flacon sous vide et non à la seringue : Pour éviter les turbulences lors du prélèvementsanguin (éviter les cathéters et les aiguilles fines de 18 et 20 G)
- ❖ L'abord veineux au pli du coude : Privilégier les veines du bras (Cubitale, Céphalique et Basilique) : Veines de la main trop étroites: prélèvement compliqué par l'utilisation d'une aiguille de taille importante.
- ❖ Enlever le garrot juste après l'abord veineux, pour éviter l'hémolyse et l'activation des plaquettes
- ❖ Volume de sang prélevé: maximum 20 mL en circuit fermé dans des tubes citratés de 5ml
- ❖ Temps de centrifugation: 5 minutes (*fig 1*)
- ❖ Vitesse de centrifugation: 1500 tours/min pour rayon 10 à 13 cm (à adapter en fonction du rayon de la centrifugeuse) (*fig 2*)
- ❖ Volume de PRP obtenu: 5 à 8 ml. (*Fig 3*)
- ❖ La durée totale de la procédure ne doit pas dépasser **30 minutes** car les facteurs de croissance sont libérés progressivement : 70% sont libérés dans les 10 minutes après activation et 95-100% sont libérés au bout d'une heure.
- ❖ Utilisation ou non d'activateurs :
  - L'activation par la thrombine provoquerait dans certains cas une réaction immunitaire susceptible d'endommager d'avantage les tissus lors de la réaction inflammatoire.
  - L'activation dite 'in-vivo' permettrait d'éviter la formation de tissu cicatriciel au profit d'un tissu semblable au tissu d'origine.
- ❖ Récupérer le PRP directement dans des seringues de 1 cc LuerLock de préférence à l'aide d'aiguille intramusculaire, cela a pour but de minimiser les turbulences et donc de déclencher l'activation prématurée des plaquettes. (*fig 4*)

#### Discussion:-

Lorsque le sang anti-coagulé est centrifugé, trois couches apparaissent. Ceci est dû à des différences dans la densité des constituants du sang: la couche profonde est composée de globules rouges, la couche intermédiaire contient des plaquettes et des leucocytes, et la couche supérieure est constituée de plasma pauvre en plaquettes. La partie inférieure de la couche médiane est aussi appelée couche leucocytaire, qui est riche en leucocytes<sup>3</sup>.

Les principales variables prises en compte lors de l'optimisation de la technique et qui jouent un rôle important dans la préparation du PRP incluent l'agent de collecte, le choix ou non d'utiliser un agent d'activation (tels que la thrombine), et les protocoles de concentration. Ceux-ci doivent être adaptés en fonction de la qualité, de la stabilité des éléments cellulaires et en fin de compte du choix d'un anticoagulant capable de préserver, le mieux possible, la fonctionnalité, l'intégrité et la morphologie des plaquettes.

Quand aucun anticoagulant n'est utilisé, les plaquettes peuvent être réactivées par la contrainte mécanique de la centrifugation.

<sup>2</sup>Castillo TN, Pouliot MA, Kim HJ, et al: Comparison of growth factor and platelet concentration from commercial platelet-rich plasma separation systems. *Am J Sports Med* 2011; 39: pp. 266-271

<sup>3</sup>Dragoo JL, Braun HJ, Durham JL, et al: Comparison of the acute inflammatory response of two commercial platelet-rich plasma systems in healthy rabbit tendons. *Am J Sports Med* 2012; 40: pp. 1274-1281

Le Citrate est un anticoagulant approprié pour la préparation de PRP si les tubes appropriés sont disponibles (stériles, non pyrogènes)<sup>4</sup>. Il a été récemment montré que le PRP non activé utilise des plaquettes en tant que système de délivrance de médicament à libération prolongée, présentant le meilleur effet sur la cicatrisation<sup>5</sup>.

Il a aussi été démontré qu'il n'est pas nécessaire d'avoir des valeurs de plaquette à plus de trois fois la normale, il paraît que des concentrations trop élevées du taux de plaquette peut avoir un effet toxique. L'obsession à chercher à concentrer le taux de plaquette par des centrifugations itératives peut même prématurément les plaquettes<sup>6</sup>.



**Figure 1:**-appareil de centrifugation.

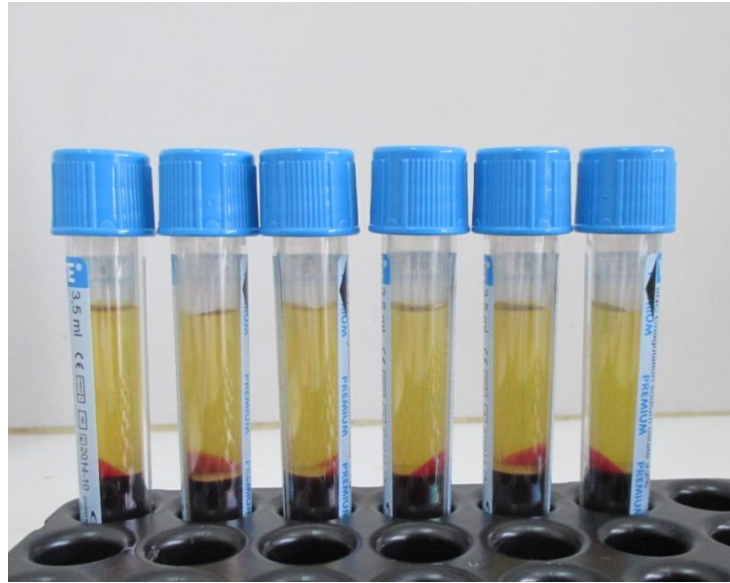


**Figure 2:**-Disposition des tubes de prélèvement dans la centrifugeuse

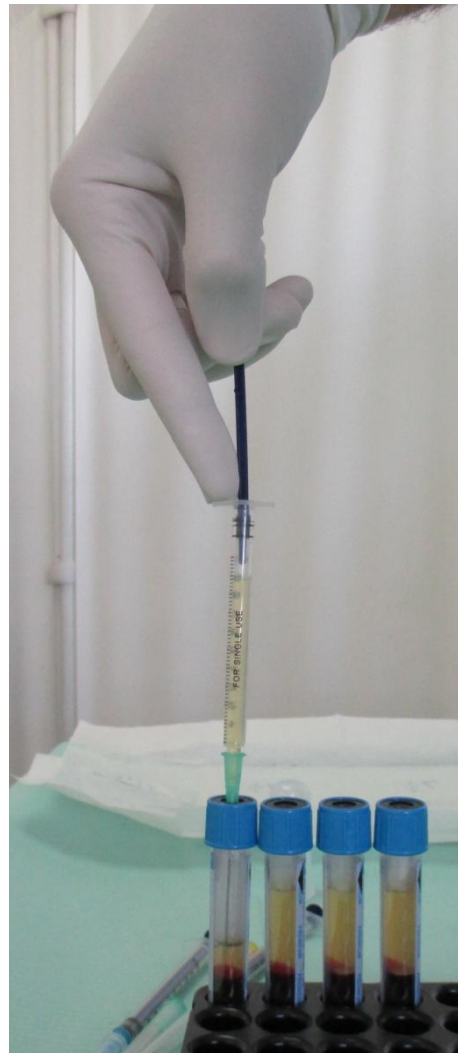
<sup>4</sup>Mazzocca AD, McCarthy MB, Chowaniec DM, et al: Platelet-rich plasma differs according to preparation method and human variability. *J Bone Joint Surg Am* 2012; 94: pp. 308-316

<sup>5</sup>Foster TE, Puskas BL, Mandelbaum BR, et al: Platelet-rich plasma: from basic science to clinical applications. *Am J Sports Med* 2009; 37: pp. 2259-2272

<sup>6</sup>Marx RE: Platelet-rich plasma (PRP): what is PRP and what is not PRP? *Implant Dent* 2001; 10: pp. 225-228



**Figure 3:-**Résultat obtenu après centrifugation.



**Figure 4:-**Prélèvement du PRP au ras du culot globulaire et obtention des seringues prêtes à l'emploi.

**Conclusion:-**

Le PRP est une thérapie cellulaire facilement accessible. C'est une thérapie cellulaire autologue contenant de nombreux facteurs bioactifs qui sont impliqués dans la cicatrisation des plaies et la réparation des tissus, ne nécessitant que peu de manipulations pour obtenir le produit final. Cependant, la compréhension des différences dans les préparations PRP est essentielle lors de l'interprétation des résultats d'études cliniques<sup>7</sup>.

Par conséquent, étant donné que peu de standardisation a été faite à ce jour, il existe toujours une controverse sur les avantages cliniques de la PRP. Des études prospectives et randomisées sont nécessaires pour évaluer l'efficacité des préparations normalisées de protocoles de PRP.

Lorsque les thérapies cellulaires sont impliquées dans la clinique, il est important de garantir la qualité du composant cellulaire. En outre, les coûts élevés et la nécessité de disposer d'un équipement spécialisé pour préparer le PRP ont gravement réduit l'utilisation de plaquettes autologues<sup>8</sup>.

Les méthodes de préparation du PRP simples ne nécessitant pas des équipements coûteux aideraient à accumuler des données cliniques et à faciliter l'introduction de la thérapie cellulaire dans la pratique médicale.

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### RESEARCH ARTICLE

#### STUDYING STRATEGIES TO EXPLAIN STRUCTURE AND ORGANIZING PRODUCT DEVELOPMENT AND DESIGN ORGANIZATIONS WITH OPEN INNOVATION VIEW.

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#### Abstract

In recent years, open innovation has been changed to one of the issues regarded by innovation management. Product development and design (PD&D) organization is a capacity and capability which is able to take an action to convert idea to the product in its own processes. One of the most important management decisions in development and design cycle is to make a decision about this issue that how employees are organized and grouped and how their relationship would be. In this paper, investigating organizational structure and form of PD&D organizations which have an especial importance have been taken into consideration. In the following, owing to the open innovation approach, these organizations are investigated and proper strategies are propounded and then organizational structure proportioned to product lifecycle is proposed.

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#### Introduction:-

Today, by curtailing lifecycle of goods and their applied technologies, innovation issue has found an increasing importance in the commerce [1]. But in today's dynamic and developed environment, innovation is not being done in organizations, but also it has dissimilated beyond the organization's borders. Therefore, organizations are looking for knowledge, information and external partners as the valuable resources of innovation. Recently, a change has been observed from innovation traditional model which is fundamentally focusing on internal development and research toward open innovation [2].

One of the factors which collapse close innovation logic can be pinpointed as increase in replacement of skilled and experienced people, stepped-up trend of academic education, increasing role of private venture capitalists, continuous increasing of customers' and suppliers' knowledge as well as curtailing technology lifecycle [3]. In contrast, close innovation which considers success dependent on exerting control and asks organizations to create ideas by their own; then develop themselves; fabricate; take to the market; hand out; finance and provide after selling services [3]. Open innovation asks the organization to employ external ideas like internal ideas [4]. Henry Chesbrough defines open innovation as "Open innovation is a pattern based on this assumption that if companies intend to promote their technology level, they can and must take an advantage of external technological ideas like their internal ideas and use diverse internal and external ways toward market" [3].

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Fast-paced changes and development in technology area, increase in innovation costs, increasing competitiveness in introducing new products to the market and curtailing lifecycle of products and technologies will lead to enhance in organization's needs to interact with the environment and external beneficiaries via opening organization's borders in order to interact innovative ideas [5]. Reduction in cost and time of new product development, increasing product quality, creating new income resources derived from selling waste technologies not used by the organization and also founding spin-off companies are effects which are resulted through following this approach [6].

In virtue of today's world changes and developments and inevitability of employing open innovation approach, organizations ought to take some strategies by profiting from opportunities created by this view in order to use benefits created by it. That's why; detecting necessities to implement open innovation can be considerably helpful for organizations.

Mortara et al (2009) in a dissertation have studied how to implement open innovation in giant multinational companies. According to their enquiry, changing structures, skills, stimuli and control methods is aiding organization with creating open innovation-supportive culture [7].

Chiaroni et al (2010) have investigated structural changes in transiting from the close innovation to open innovation in four Italian enterprises. In keeping with Rmnakys and Bdyan (1999) which have studied organizational change literature have arrived at this conclusion that open innovation as an organizational change process is carried out via sequences of freezing out-move-institutionalization which are 3 fundamental phases of changing. According to their research, in a travel from close innovation to open innovation, 4 underlying dimensions which are involved are: networks, organizational structure, and evaluation process and knowledge management system [8]. Parid et al (2011) have introduced 3 key areas which have been regarded by organizations in order to exert open innovation. These three areas are: people, process and technology [9]. Ades et al (2013) have investigated conducting open innovation in organizations of nach VRA, IBM and Siemens. According to their study, implementing open innovation in the organization requires development of activities to resolve necessity requirements to exert open innovation. These requirements are: organization's culture, dexterity of people involved in activities related to open innovation and their motivation to achieve pertinent results via applying open innovation [10]. Based on the carried out studies in this area, detected requirements to be transited from close innovation to open innovation in PD&D organizations are: Processes, Organizational structure, Networking as well as KM system. In this paper, studying structure and organizing PD&D organizations with open innovation view and crucial factors of organizations' success have been taken into consideration.

#### **Bases of architecture structure of PD&D organizations:-**

Organizational key challenges are to compromise distinction and integration. Creative activities required organizational structures and managerial systems are different with operational activities whereas development of new products and implementing new activities need integrity of creativity and expertise in technology in tune with production capabilities, marketing, budgeting, distribution and customer support. Gaining such integrity is hard. Fulfilling competitive advantage in elaborate and unpredictable environment of business necessitates this issue that company compile economies of scale along with entrepreneurial flexibility, innovation along with cost efficiency and globalization along with a real responsiveness. This issue creates new challenges for organizational structure designs and management systems whereas an integrated approach to formulate and implement strategy owing to their reciprocate dependencies have been propounded. Basis of structure architecture of each organization has to be the mission and tasks assigned to each organization. Since in this paper, structure architecture of product development and designing company is approached, it is necessary to firstly scrutinize the task of product design and development organization.

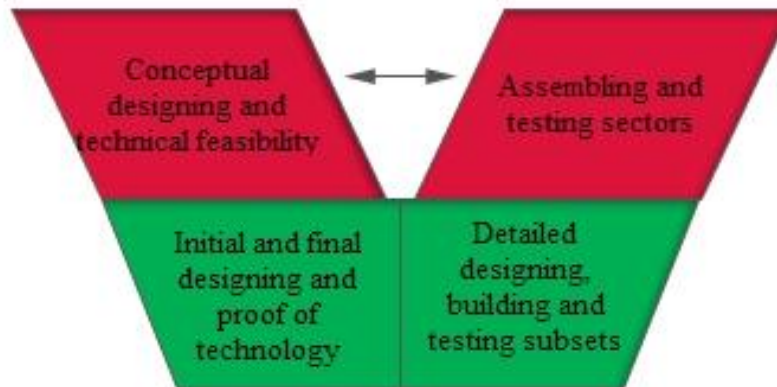
PD&D organization undertakes the mission of fulfilling the system from an idea to the initial sample or criterion sample. In another word, PD&D organizations have the duty to receive requirements of the senior PD&D organization (Employer) and by exerting all of capacities of supplier network in and out of the organization, fulfill the product which meets respective need. Accomplishing a product is feasible through conducting design project. Designing project has some steps and architecture of designing process tailored to each company is different.

#### **Designing process:-**

The main purpose of this process is to profit from external knowledge. This process helps with creating organization's relationship with external people or organizations by aiming to achieve technical and scientific competencies in order to progress organization's innovation [11].



To architect designing process, there are various models and approaches such as waterfall, spiral and V models and so on which are applied tailored to complexity level of product and readiness level of development and design team. Proportionated to these conceptions, it is offered that V model has been considered for PD&D. In the following pic, V model has been formed for the steps of project lifecycle. On this basis, in this paper, structure of PD&D organizations is architected in a way that simultaneously implements both implementation process of PD&D project (The first mission) and engineering designing process (The second mission).



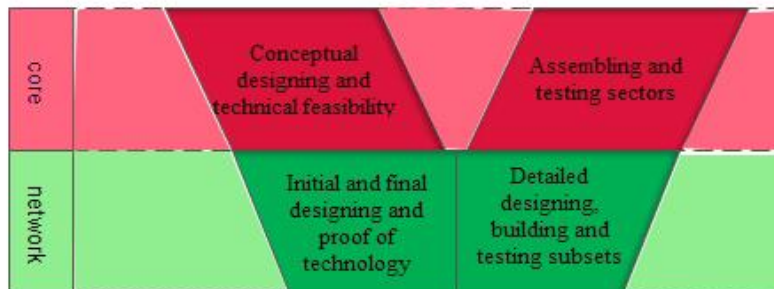
**Fig 1:-** V model proposed for steps of PD&D project

#### Structures of PD&D organizations:-

To manage organization's external knowledge successfully, it is required to assign organizational structure which facilitates achieving external knowledge and its integrity with organization's innovation process. Such structure is required also for proposing organizational internal ideas to the organizational external environment. Organizational structure required for applying open innovation includes: organizational unit, open innovation-supportive organizational roles and education and stimuli tailored to open innovation [12]. Structure of PD&D organization has to be firstly responsive to project lifecycle activities. Moreover, requirement relevant to product lifecycle also has to be considered. At the first step, the structure needed for PD&D organization to accomplish implementation process of designing project is architected. In fig 2, steps of product designing project and their relationship with open innovation approach (Outsourcing) have been portrayed.

#### These steps are:

1. Macro designing and technology feasibility
2. Conceptual designing and technical feasibility
3. Initial and final designing and proof of technology
4. Detailed designing, building and testing subsets.
5. Assembling and testing sectors
6. Integrating product and final tests.



**Fig 2:-** The relationship between designing steps of the conception of open innovation view



**PD & D organizational units:-**

Open innovation practices are carried out by organizational units. Thus, creating independent business unit of open innovation to simplify and make effective knowledge process from external players to internal ones is very crucial. Also, creating business development unit and allocating adequate resources and skills is mostly requiring effective exploiting of owned technologies [13]. Organizational units can be centralized (All projects is managed by centralized control units), decentralized (Each unit has a sector related to the project for itself) or hybrid (A combination of centralized and decentralized) [14]. Due to this issue that there is a wide range of diverse organizational units which are potential can be involved in open innovation, 7 organizational units which are important for implementing innovation are: research and development, process and product development, marketing, production management, supplies, subsidiaries (Contractors) and human resource management [15].

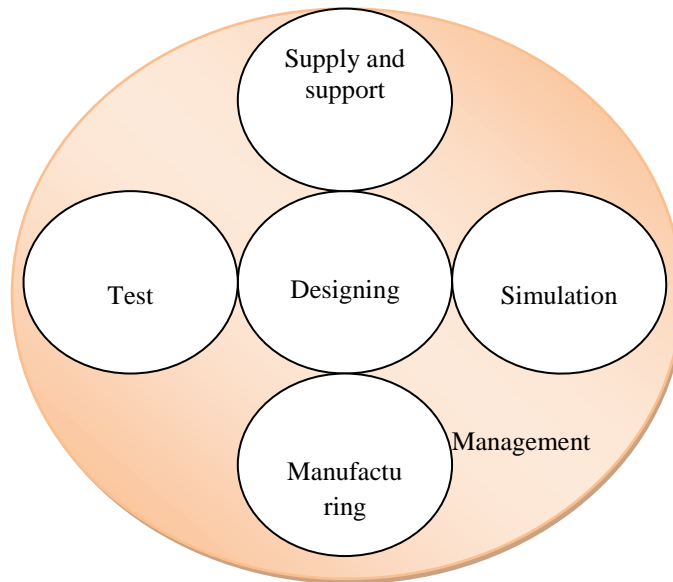
By pondering in designing steps, it can be found that it can be taken an action to break down steps of product designing project so that each activity can be placed in a technical area. Activities can be classified into technical categories including product engineering, manufacturing engineering and test engineering. Another distinction which makes a statement is this issue that activities are based on technology or product. This distinction is in fact the same as the area of outsourcing mission. In this dissertation, based on our underlying approach, activities of core area are serviced from tasks of PD&D organizations and activities of network area are serviced from companies out of the organization. In summary, the results of this classification are brought in the following. Technical area of each activity has been inserted in the bracket and its relationship to the project steps has been inserted in the arc:

1. Technical feasibility and conceptual designing (1) [System];
2. Initial designing (2-A) [technology];
3. Proof of technology (2-B) [technology];
4. Final designing (2-C) [technology and system];
5. Detailed designing of subsystems (3-A) [Technology];
6. Building subsystems (3-B) [Technology];
7. Subsystems test (3-C) [Technology];
8. System assembly (4-A) [system];
9. System test (4-B) [system];

Thus to cover steps of project lifecycle, the following units have to be placed in PD&D organizations. Role of each unit based on open innovation view is as the following:

- ❖ Product designing unit: This unit has responsibility for doing 2-A and 1. Receiving 2-A step from contractors is undertaken by this unit. In other steps, it is playing the role of observer and corroborant.
- ❖ Manufacturing unit: This unit undertakes 4-A activities. Receiving 2-B, 3-A and 3-B from contractors is done by this unit. In other steps, it is playing the role of observer and corroborant.
- ❖ Simulation and test unit: This unit has responsibility for doing 4-B. Receiving 2-B and 3-C from contractors is undertaken by this unit. In other steps, it is playing the role of observer and corroborant.
- ❖ Technical support and supply unit: Receiving support and supply requirements of subsets from contractors in step 3-C is undertaken by this unit. Also, accomplishment and rendering requirements of product support and supply for employer in step 4-B is undertaken by this unit too.

In fig 3, a model of units of PD&D organizations has depicted. The main axis of a project is designing unit which is accounted as the heart and center of innovation in the organization. What has surrounded all activities of a project and will lead to retain integrity of all activities is governance and management area of PD&D organization. By exerting structure of DSM designing matrix, interfaces related to the practices pertinent to different units of PD&D organizations can be scrutinized and in compliance with organization's mission, it can be formulated.



**Fig 3:** Working branches of PD&D organizations

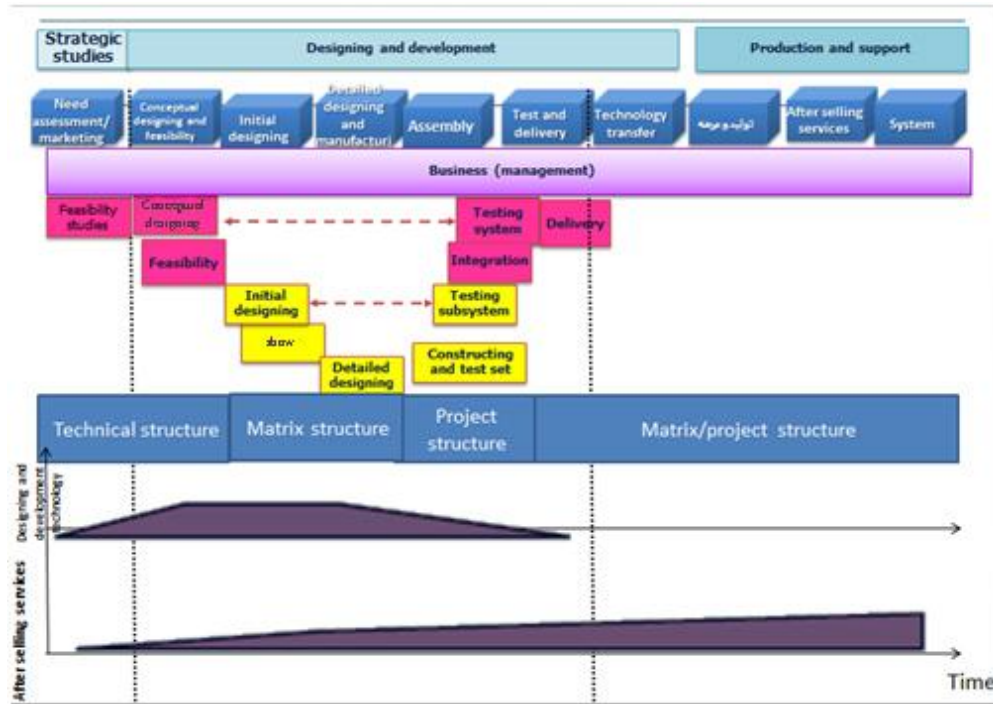
Networking provides collaborative and interactive space. Evidences show that PD&D organizations with open innovation view require creating a vast network of inter-organization communication with some of external roles especially universities and research institutes, suppliers and users [13].

Creating a heterogeneous network of diverse partners also suppliers, customers, consultants, opponents, universities as well as public and private research institutes enhance innovation performance of an organization, because networking approach toward innovation will lead to synergy [15].

Features of innovation networks can be detected by 2 variables of quest vastness and quest depth. Quest vastness indicates the number of external resources or research channels in which PD&D organizations are dependent on. Quest depth is the rate that organization receives information from different external resources or research channels [16].

Organizational structure is a method or path in which organizational activities are divided, organized and coordinated [17]. Structure is an outcome of a combination of the relationship between organizational elements which forms the existence philosophy of activities [18]. Organizational structure enunciates levels existed in administrative hierarchy and determines control domain of managers or supervisors. Also, organizational structure determines people who are working in different departments in the group and grouping or classifying departments which are existed in the whole of organization. Plus, this organization's structure encompasses designs of the systems by which activities of all departments are coordinated and integrated and thereby effective relationship system in the organization will be guaranteed [19].

Another important point which has to be considered in structure architecture is fulfilling conception of concurrent engineering and conception of design for product lifecycle. Hence, it is necessary that plus project lifecycle, product lifecycle and its pertinent requirement are also considered. After expressing required strategies to cover organizing's requirements pertinent to project steps, it is turn to consider required arrangements for designing structure. In basic research step, strategy specific for technical structure has to be adopted, because there is also a need there for low coordination and relatively high flexibility and in engineering development step, project structure is drawn, because need for coordination is reaching the highest point and need for flexibility is diminishing. Requirement for using matrix structure is arisen for product development step. That's why; here there is a need for high coordination and relatively high flexibility. Also in phases of engineering services and production, technical or matrix structure can also be applied. Selecting organizational structure is the function of the management needs rate for coordination and flexibility. In fig 4, the place of designing project lifecycle in product lifecycle, structure and organizing PD&D organization have been displayed.



**Fig 4:-** The place of designing project lifecycle in product lifecycle and human resource and time allocation

Totally, none of the structures can be known as problem- solving of all sorts of PD&D organizations and then, contingency approach in choosing appropriate structure for each organization is recommended.

### Conclusion:-

Organizing design and development organization is not a simple issue but also it is a complex and considerable issue. Organizations have to be able to fast convert each idea in their process to the product. Each organization must have an appropriate structure owing to product lifecycle in order to have reaction ability and proper responsiveness to customer needs in the certain time. By this approach and picking out V method for PD&D, designing process time in complex products has been diminished more than 40% and designing risk and product development have got close to zero.

It is recommended that for forthcoming researches, W model is investigated and organizational structure and project underlying activities due to the model and open innovation view is studied and researched.

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### RESEARCH ARTICLE

#### LA BRULURE ET LE DIABETE : CORRELATION PHYSIOPATHOLOGIQUE ET THERAPEUTIQUE.

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#### Abstract

La brûlure chez le patient diabétique constitue un motif fréquent d'admission au service de chirurgieplastique et des brûlés de l'Hôpital militaire d'Instruction Mohammed V de Rabat. Nous rapportons une série de 11 cas de brûlures survenues chez des patients diabétiques en un an. Les complications dégénératives du diabète sont mises en cause directement à la survenue de la brûlure chez six cas. Le délai moyen de consultation est de sept jours. Les brûlures siègent aux membres inférieurs chez neuf cas. Quatre patients furent admis en décompensation acido-cétosique. La gravité de la brûlure est due à son caractère profond sous-estimé, par le patient et son entourage, cela a pour conséquence un retard à la consultation et donc de la prise en charge en milieu spécialisé. En fait la brûlure siège le plus souvent aux extrémités inférieures. Les lésions dégénératives dues au diabète sont responsables de la survenue de la brûlure et de sa gravité. La neuropathie diabétique est souvent mise en cause dans la survenue de la brûlure et du retard de consultation. Cela rend impérative une prise en charge thérapeutique pluridisciplinaire impliquant chirurgiens plasticiens, réanimateurs et endocrinologues.

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#### Introduction:

Les patients diabétiques constituent une population à risque élevé de brûlure grave, de ce fait le diabète devrait faire parti des scores de gravités de la brûlure.

La neuropathie diabétique est une complication fréquente du diabète, et son incidence augmente avec l'âge. La forme clinique la plus fréquente est la polyneuropathie «en chaussette» avec perte de la sensibilité nociceptive des pieds et de toute la microcirculation. Elle doit être recherchée systématiquement par l'examen clinique<sup>1</sup>.

Sa prévalence est estimée à 50% chez les diabétiques dont la maladie évolue depuis plus de 20 ans, et également à 50% chez les diabétiques âgés de plus de 65 ans<sup>2</sup>.

<sup>1</sup> « Diabetes does not influence selected clinical outcomes in critically ill burn patients », (PMID: 21228710), Dahagam CK, Mora A, Wolf SE, Wade CE. J Graver Resoins [2011]

<sup>2</sup> « The lived experience of a foot burn injury from the perspective of seven Jordanians with diabetes: a hermeneutic », (PMID: 22051001), Al-Ghazal M, Al-Ghazal M, Al-Ghazal M, Al-Ghazal M, Al-Ghazal M, Al-Ghazal M, Al-Ghazal M.

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De ce fait, ces troubles sensitifs expliquent le retard de consultation de cette population de brûlés qui sous estime la gravité de la brûlure et chez qui la lésion est souvent plus profonde et plus délétère.

Ce travail a pour but de rappeler l'intérêt de la prévention et de la sensibilisation de la population diabétique aux dangers de la brûlure, ainsi que de mettre en évidence la corrélation entre le diabète et les circonstances de survenue de la brûlure, son évolution et la difficulté de sa prise en charge thérapeutique.

#### **Patients et résultats:**

Nous rapportons une série de 11 cas de brûlures survenues chez des patients diabétiques en douze mois du 01 janvier 2016 au 31 décembre 2016.

Nous avons inclus dans ce travail les brûlures domestiques survenues dans un contexte d'automédication de trouble neurosensoriel lié au diabète, surface cutanée brûlée inférieure à 20%.

Les complications dégénératives du diabète sont mises en cause directement à la survenue de la brûlure chez six cas. Le délai moyen de consultation est de sept jours. Les brûlures siègent aux membres inférieurs chez neuf cas. Quatre patients furent admis en décompensation acido-cétosique.

Après prise en charge médicale des patients et correction de leurs troubles hydro électrolytique et métabolique. Le traitement chirurgical a consisté en une excision des placards de nécrose. Cinq de nos patients ont eu recours à une greffe de peau (75% semi-épaisse; 25% peau totale) tandis que les deux autres ont bien évolué sous pansement quotidien.

L'oxygénothérapie hyperbare a été indiquée chez tous les patients ainsi qu'une antibiothérapie guidée par les données de l'antibiogramme (prélèvements bactériologiques systémiques devant toute brûlure).

Tous les patients ont été adressés en endocrinologie à leur sortie du service pour une prise en charge adéquate du diabète.

#### **Discussion:**

La gravité de la brûlure est due son caractère profond sous estimé par le patient et son entourage, cela a pour conséquence un retard à la consultation et donc de la prise en charge en milieu spécialisé. En fait la brûlure siège le plus souvent aux extrémités inférieures. Les lésions dégénératives dues au diabète sont souvent des facteurs aggravant la survenue de la brûlure et son évolution<sup>3</sup>.

La brûlure chez les diabétiques présente des caractéristiques différentes de la population non diabétique et que la fréquence de ces brûlures augmente chez cette population. Ainsi, les patients diabétiques sont habituellement des patients susceptibles de faire des complications, à cause de la forte présence des dommages vasculaires de la microcirculation surtout chez les patients indisciplinés, ces troubles affectent des organes multiples : rein, rétine, nerf périphériques et peau. Aussi, le diabète est bien connu pour être associé à une capacité curative diminuée et à une susceptibilité accrue à l'infection, surtout chez les patients mal suivis et qui ont une glycémie à jeun très élevée. Les polyneuropathies diabétiques sont très fréquentes. Il s'agit le plus souvent de polyneuropathies sensitives. Leur topographie est habituellement distale, bilatérale et symétrique, le plus souvent «en chaussette», plus rarement en gant, et exceptionnellement thoracoabdominale<sup>4</sup>.

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<sup>3</sup> « Aging and the pathogenic response to burn » (PMID: 22724078) Rani M, Schwacha MG. Dis vieillissement [2012]

<sup>4</sup> « Clinical outcomes of isolated lower extremity or foot burns in diabetic versus non-diabetic patients: a 10-year retrospective analysis. » (PMID: 22789396) Kimball Z, Patil S, Mansour H, Marano MA, Petrone SJ, Chamberlain RS. Burns, [2013]

Les manifestations subjectives sont de deux ordres<sup>5</sup>:

- les douleurs: fréquentes, volontiers exacerbées la nuit;
- plus souvent, il s'agit de paresthésies et de dysesthésies (fourmillements, démangeaisons, sensation de froid ou de chaud).

D'ailleurs la brûlure survient souvent suite à ces symptômes le patient essaye par une source de chaleur : bouillotte, barbecue traditionnel ou radiateur électrique de « traiter » ses paresthésies et cela provoque souvent la brûlure.

L'étude de la brûlure chez les patients diabétiques permet de constater que la durée d'hospitalisation et de cicatrisation est nettement supérieure par rapport à la population non diabétique, avec un risque accru d'infection et un grand nombre d'interventions chirurgicales à types de pansements et puis de couverture par greffe de peau.

La prise en charge de ce type de brûlure nécessite avant tout l'amélioration de la qualité de prise en charge thérapeutique du diabète. La prévention de ce type de traumatisme est un élément indispensable de cette prise en charge.

Ce travail souligne l'importance des programmes d'éducation de la population diabétique afin de diminuer la mortalité et la morbidité ainsi que le coût et le séjour en milieu hospitalier.

Le patient diabétique subissant une brûlure a besoin d'une attention particulière et d'une surveillance plus importante à la recherche des signes d'infections et de décompensation du diabète.

La prise en charge par l'endocrinologue doit se faire dès l'admission du diabétique brûlé pour prendre en charge le déséquilibre glycémique antérieur à la brûlure et anticiper sur un éventuel trouble glycémique survenant à la suite de la brûlure.



**Figure 1:** Patient de 65 ans brûlé par eau bouillante des avant-pieds par insensibilité liée au diabète

<sup>5</sup> « Systematic review of complications and outcomes of diabetic patients with burn trauma » (PMID: 27595452) AA Sayampanathan. Burns, [2016]





**Figure 2:** Résultats obtenus après 15 jours d'évolution à noter la difficulté de prise de la greffe de peau chez les patients diabétiques



**Figure 3:** Patiente de 45 ans, brûlure thermique par liquide chaud de la cuisse brûlure aggravée par le diabète





**Figure 4:** Patient de 53ans brulure du pied survenu suite à un trouble sensitif de la neuropathiediabétique

La neuropathiediabétiqueestune complication fréquente du diabète. La formeclinique la plus fréquenteest la polynévrite «en chaussette» avec perte de la sensibilité des pieds à la douleur. Les brûlures par les bouillottesontl'apanage des patients diabétiquesatteintsd'unepolyneuropathie sensitive, etellesontprofondes. Leurprise en charge thérapeutiqueestdifficile et doitêremultidisciplinaire. Nous soulignons à traversce travail l'intérêt de l'éducation des patients diabétiques et leursensibilisation aux brûluresdistalesparticulièrement et à la plaiecutanée de façon plus générale.

### Conclusion:

La neuropathiediabétiqueestsouventmise en cause dans la survenue de la brûlure et du retard de consultation. Cela rend impératifuneprise en charge thérapeutiquepluridisciplinaireimpliquantchirurgiensplasticiens, réanimateurset endocrinologues.

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5. « *Systematic review of complications and outcomes of diabetic patients with burn trauma* » (PMID: 27595452) AA Sayampanathan. Burns , [2016].



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### RESEARCH ARTICLE

#### THE IMPORTANCE OF CLINICOPATHOLOGICAL FEATURES FOR DIFFERENTIATION BETWEEN CROHN'S DISEASE AND ULCERATIVE COLITIS.

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#### Abstract

**Background:** Inflammatory bowel disease (IBD) consists of two specific gastrointestinal disorders: ulcerative colitis (UC) and Crohn's disease (CD). Despite their distinct natures, these two diseases share many similar etiologic, clinical and pathological features, as a result, their accurate differential diagnosis may sometimes be difficult. Correct diagnosis is important because surgical treatment and long-term prognosis differ from UC and CD.

**Aim:** This study aims to study the characteristic clinicopathological features which help in the differential diagnosis between UC and CD, and assess the disease activity in ulcerative colitis.

**Materials and methods:** This study was carried out on 50 selected cases, referred to the department of pathology, Alnoor Specialist Hospital. The cases included 27 cases of UC and 23 cases of CD. All the cases were examined using H&E and immunohistochemically for bcl-2 expression.

**Results:** Characteristic features of UC include: decrease in mucous content, irregular villous surface, crypt distortion, and cryptitis, whereas the main cardinal histopathological features seen in CD were: epithelioid granuloma, transmural chronic inflammation, absence of mucin depletion, irregular surface, or crypt distortion. 3 cases of UC were found to be associated with dysplasia. UC mucosa contains fewer Bcl-2+ cells compared with CD mucosa.

**Conclusion:** This study using multiple parameters such clinicopathological features and Bcl-2 expression as studied by immunohistochemical stain, helped to gain an accurate differentiation between UC and CD. Furthermore, this work spotted the light on the activity and different grades of UC which could be important for the prediction of relapse.

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#### Introduction:-

Inflammatory bowel disease is an idiopathic disease caused by an immune response. Two types of IBD are present, ulcerative colitis (UC) and Crohn's disease (CD). To establish a diagnosis of IBD, exclusion of other causes of

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Inflammation will be done first and then the signs and symptoms, blood tests, radiological studies, macroscopic and microscopic examination of biopsies will be used to differentiate between CD and UC (1).

The intestinal inflammatory processes in IBD are triggered by genetic susceptibility in a patient who has environmental factors, defect in the intestinal epithelial tight junction barrier function, and dysfunction of innate and adaptive response pathways, especially the T cell response. The adaptive immune response in CD has long been considered to be driven by the response of Th1 cells. On the other hand, UC has been associated with an unconventional Th2 cells response. Furthermore, Th17 cells have been involved in the gut inflammatory response in IBD(2,3).

The common presenting complaint of IBD is chronic diarrhea with or without blood or mucus. Bloody stool, is more typical of UC. Other symptoms are abdominal pain, weight loss, fever, fatigue and sweat. Most common extraintestinal symptoms are peripheral arthritis, aphthous ulcer, ankylosing spondylitis and erythema nodosum (4,5).

Ulcerative colitis may lead to one or more of the complications such as fulminant colitis, severe bleeding, toxic megacolon, perforation and an increased risk for the development of malignancy. Perianal diseases such as fistulae, skin tags, or anal fissures are complications of Crohn's disease occur in 35% of patients (5,6).

The use of serological markers such as antibodies to *Saccharomyces cerevisiae* may help in differentiating UC from CD; (ASCA) is present in 40% to 80% of patients with CD while the anti-neutrophil cytoplasmic antibody (pANCA) is detected in nearly 75% of patients with UC(7,8).

In an abdominal plain film, a narrowed terminal ileum (Kantor's string sign) is a characteristic finding of CD in upper GI with small bowel follow-through, while in UC, it is important to evaluate colonic distention to rule out toxic megacolon. Barium enema demonstrates lead pipe appearance that is an indication of chronic UC characterized by loss of haustrations and shortening & narrowing of colon. Abscess formation and fistula on abdominal computed tomography are associated with CD(9).

CD may affect any area within the gastrointestinal tract while UC affects the rectum and extends to the colon in a continuous fashion. The endoscopic features in CD are characterized by fat wrapping, thickening of the intestinal wall, ileum involvement and other features such as skip lesions, cobblestoning, confluent deep linear ulcers, aphthoid ulcers, deep fissures, fistulas and strictures. On the other hand, the endoscopic features in UC are not characteristic but mainly include erythema, mucosal vascular congestion, loss of apparent vascular pattern in mild inflammation and clear demarcation between inflamed and normal areas. Granularity, mucosal erosions and mucosal friability can be seen in advanced cases. While Spontaneous bleeding and ulceration located in the inflamed mucosa will be present in severe cases (10,11).

For estimating the histological activity of ulcerative colitis, Geboesscore is used. (Table 1) (12).

The Management of IBD depends on the severity of disease (4). Medications include, steroids, immunosuppressive agents, aminosalicylates and anti-inflammatory drugs (7). Mild cases are treated by anti-inflammatory drugs orally or as enemas. Severe cases can be treated with immunomodulator or immunosuppressant medications either orally, by an IV infusion, or a subcutaneous injection (4). Infliximab is used for moderate to severe CD and UC for preservation of remission, also when managed by immunomodulators and mesalamine is failed.(13).

Surgical management has a role in improving quality of life but still there is probability of recurrence of the disease after surgery (5). Surgical options are indicated if medical treatment failed or in UC or CD associated with neoplasia(14). Also, if there is any complication such as: perforation, abscess, malnutrition and intestinal obstruction.(5).

IBD's patients have a higher risk for developing colon cancer later on (6). Patients with UC have higher mortality rate than those with CD.(15).

**Table 1:-**

Grade 0: structural changes		Grade 3: neutrophils in epithelium	
Subgrades		Subgrades	
0.0	No changes	3.0	None
0.1	Mild abnormality	3.1	<5% of crypts

0.2	Mild to moderate diffuse or multifocal irregularity	3.2	<50% of crypts
0.3	Severe diffuse or multifocal abnormalities	3.3	>50% of crypts
Grade 1: chronic inflammatory infiltrate		Grade 4: crypt destruction	
1.0	No progression	4.0	None
1.1	Mild progression	4.1	neutrophils in part of the crypt
1.2	Moderate progression	4.2	marked depletion
1.3	Marked progress	4.3	absolute crypt loss
Grade 2: lamina propria neutrophils and eosinophils		Grade 5: erosion and ulceration	
2A: eosinophils		2B: neutrophils	
2A.0	No increase	2B.0	None
2A.1	Mild increase	2B.1	Mild increase
2A.2	Moderate increase	2B.2	Moderate increase
2A.3	Marked increase	2B.3	Marked increase
5.0	none	5.1	Recovering epithelium + adjacent inflammation
5.2	Probable erosion, focally stripped	5.3	Unequivocal erosion
5.4	Ulcer or granulation tissue		

### Materials and methods:-

This study was carried out on 50 selected cases, referred to the department of pathology, Alnoor Specialist Hospital during the period between 2010-2015. In all cases, the diagnosis was made from the clinical history, endoscopy, and radiological features which were obtained from the accompanying clinical sheets, and confirmed by microscopic examination.

The collected cases were sent as colonoscopy specimens (41 cases) or surgically removed by colectomy (9 cases). The cases include 27 cases of UC and 23 cases of CD.

### Methods:-

For every case, the following data were recorded: age, presenting symptoms, site of involvement, gross pathology, and microscopic picture.

The specimens were fixed in 10% formol saline and embedded in paraffin. The paraffin blocks were serially sectioned at 4-5 microns and stained by:

1. Hematoxylin and Eosin (H&E).
2. Immunohistochemical staining of Bcl-2: Four  $\mu\text{m}$  thick sections were cut from routine paraffin embedded blocks then deparaffinized in xylene, and hydrated in graded alcohols. Immunostaining was performed with the Dakoautostainer. The positive cells (mucosal T cells) were approximately measured and expressed as mild, moderate, or marked expression.

### Statistical analysis:-

Data were analyzed using SPSS version 12.0.0 for Windows (SPSS Inc., Chicago, IL). Scale variables were presented as the mean  $\pm$  standard deviation (mean  $\pm$ SD) or percentages as appropriate.

### Results:-

#### Clinical characteristic:-

The current study included 27(54%) cases of UC and 23(46%) cases of CD.

In UC, 15 cases (55.6%) were females while the remaining 12 cases (44.4%) were males.

The age and sex of the patients were summarized in table 2.

The differences in age and sex between UC and DC were not significant.

**Table 3:-**

Disease	Age range	Mean age	Sex
Ulcerative colitis	23-59	38.84 $\pm$ 14.26	Female 15 (55.6%)
			Male 12 (44.4%)
Crohn's disease	20-60	35.25 $\pm$ 7.93	Female 10 (43.5%)
			Male 13 (56.5%)

The main clinical manifestations in UC were diarrhea, rectal bleeding, abdominal pain, and some patients complained of extraintestinal symptoms such as arthritis as well. On the other hand, patients with CD were mainly presented by diarrhea, abdominal pain and anal complications such as fissures.

Colonoscopic examination in UC revealed multiple pleomorphic ulcers in 11 (40.7%) cases with evident diffuse or focal erythema. Mucopurulent exudate was present in 6 (22.2%) cases. The mucosa was atrophic and no ulcers could be detected in the remaining cases. Pseudopolyposis was detected in 2 (7.4%) cases. While in CD, colonoscopic examination showed erythematous plaques and discrete ulcers (1-5 mm in diameter) in 11 (47.8%) cases. Evident skip lesions were detected in 9 (39.1%) cases, while rectal sparing was found in all examined cases.

### Histopathological study:-

#### Ulcerative colitis

The different grades of UC were summarized in Table 3 and were shown in Fig.2.

**Table 3:-** Different grades of UC in this study.

Grades	Number of cases
0.3	1 (3.70%)
1.3	2 (7.41%)
2A.2	2 (7.41%)
2B.2	2 (7.41%)
2B.3	1 (3.70%)
3.1	2 (7.41%)
3.3	4 (14.81%)
4.1	3 (11.11%)
4.3	4 (14.81%)
5.4	3 (11.11%)
Low grade dysplasia	2 (7.41%)
High grade dysplasia	1 (3.70%)

In grade 0.3, we found severe abnormalities in the crypts structure, including crypt branching, crypt distortion and villous appearance.

In grade 1.3, we found marked increase of chronic inflammatory cells infiltration in the mucosa.

In grade 2A.2 of UC, we found moderate increase of eosinophils in lamina propria. While in grade 2B.2, there was moderate increase in neutrophils. And in 2B.3 it was a marked increase.

In grade 3.1 of UC, we found that less than 5% of the crypts to be infiltrated by neutrophils. While, in grade 3.3, we found that more than 50% of crypts were infiltrated.

In grade 4.1 of UC, there was excess of neutrophils in parts of the crypts and the crypts showed a severe form of structural abnormalities. And in grade 4.3, there was prominent crypt atrophy. Also, multiple crypt abscesses were found which were formed of acinar structure containing neutrophils and pus cells.

In grade 5.4 of UC, we found multiple superficial mucosal ulcers.

In this study 2 (7.4%) cases showed low-grade dysplasia and one (3.7%) case showed high grade dysplasia, the histopathological features seen in low-grade dysplasia were: nuclear hyperchromasia associated with pleomorphism and Mucin vacuoles were distributed and located in the basal part of cytoplasm which called "dystrophic goblet cells".

In high grade dysplasia, the following features were seen: enlarged hyperchromatic nuclei, marked nuclear stratification with crowding, loss of nuclear polarity, marked architectural disarray and decreased mucin production.

### Immunohistochemical study:-

Examination of sections stained immunohistochemically for the antiapoptotic Bcl-2 protein revealed mild expression of the Bcl-2 protein and this indicate that UC mucosa contains few number of Bcl-2+ cells.



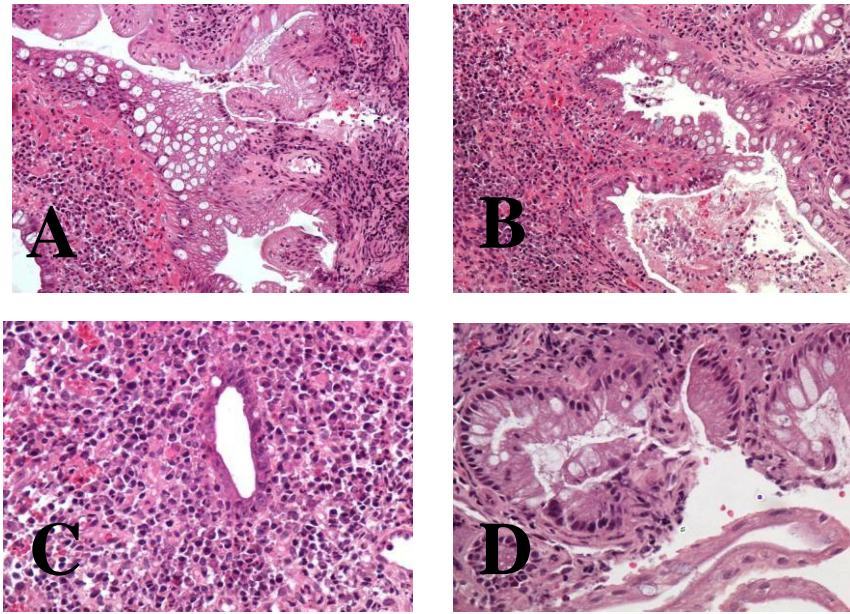
**Crohn's disease:-**

All cases in this work showed transmural inflammation in the form of chronic inflammatory infiltrate (lymphocytes, macrophages, plasma cells and giant cells) affecting all the layers up to the serosa.

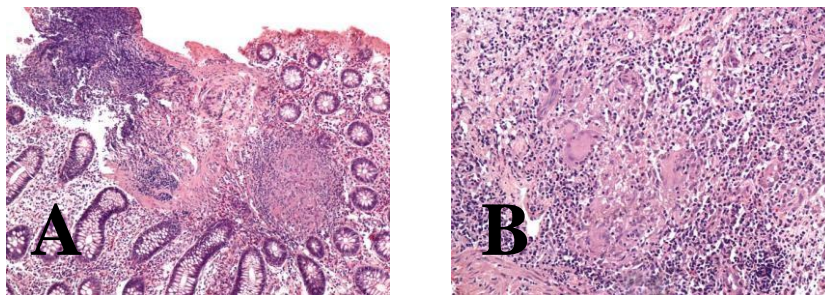
Non caseating granuloma (submucosal and subserosa) formed of epithelioid cells and few giant cells were seen in 14 (60.9%) cases. Dilatation of lymphatic channels was detected in 5 (21.7%) cases. Fissuring ulcer was present in 2 (8.7%) cases. Focal crypt abscess was seen in 3(13%) cases. Transmural lymphoid aggregates were present in 2(8.7%) cases. Submucosal nerve fiber hyperplasia was evident in 4 (17.4%) cases. 2(8.7%) cases exhibited architectural alteration with patchy neutrophils, mucin depletion and damage in the crypt epithelium. Fig. (3)

**Immunohistochemical study:-**

Examination of sections stained immunohistochemically for the antiapoptotic Bcl-2 protein revealed marked expression of the Bcl-2 protein and this indicate that in CD there is a defect in apoptosis which in turn lead to prolongation of T cell survival and contribute to their accumulation in the mucosa.



**Fig.(2):-** (A) UC showing crypt distortion, and irregular villous surface., (B) UC showing crypt abscesses within a disorted crypts, (C) UC showing crypt atrophy together with a dense chronic inflammatory infiltrate of the lamina propria, (D) UC showing low grade dysplasia with distorted architecture, increased N/C ratio, and decreased mucus production.



**Fig.(3):-** (A) CD showing dense inflammation and the presence of granuloma, (B) Higher magnification showing typical granuloma formed of epithelioid cells, giant cells, and many lymphocytes.

**Discussion:-**

Although Crohn's disease and ulcerative colitis have been fully described in several studies, continue to present a problem in the differential diagnosis from the clinical as well as the histopathological point of view. The two diseases share many clinical and histopathological features and the discriminating characteristics are often ill defined.

Our purpose in this study was to study the characteristic clinicopathological features which help in the differential diagnosis between UC and CD, and assess the disease activity in ulcerative colitis. Because a better knowledge of the evolution of the microscopic features would be helpful in the treatment for patients with IBD according to the diagnosis and disease extent, severity and activity. Knowledge of disease activity could also be important for the prediction of relapse and for follow up of patients with dysplasia periodically to avoid development of cancer.

In the recent years, Time trend analysis showed statistically significant increases in the incident of IBD over time. In 2012, the prevalence of IBD in Asia and Middle East was 6.3 per 100,000 person-years. Molodecky et al., (2012). (16).

The current work was carried out on 41 adequate endoscopic biopsies and 9 surgical resection specimens. The cases were categorized as follows: 27 ulcerative colitis and 23 Crohn's disease.

In this study, it was found that the mean age of patients of ulcerative colitis was 38.8, with slight female's predominance (56%). This was in agreement with Cotran, (1999) who recorded that the onset of disease peaks between the ages of 20 -25 years, and women are affected more often than men are. Similar findings were also obtained by Seldenrijk, (1991) and Berre et al., (1995) who found that the mean age for UC was 40 years and 39 years respectively, but the opposite was detected for sex predominance as they found that men were affected more often than women. (17,18,19).

As regard the complaint, the main complaints were diarrhea and abdominal pain (76% both), followed by rectal bleeding (56%), and only 8% of patients complained of extraintestinal symptoms such as arthritis. These findings were in accordance with Seldenrijk, (1991). (18).

Concerning colonoscopic examination 56% of cases showed ulceration, pseudopolyposis was detected in 38% of cases, while edema and hyperemia was found in 32% of cases. Barium enema examination revealed ulcers in 48 % of cases, spasm (12%), narrowing (35 %), and pseudopolyposis (20 %), while it was free in 4 % of cases. These findings were supported by Langmead, (2002). (20).

In this work, 27 cases were diagnosed as ulcerative colitis out of them, 1(3.7%) case was diagnosed as grade 0.3, 2 (7.4%) cases as grade 1.3, 2 (18.5%) cases as grade 2A.2, 2 (7.4%) as grade 2B.2, 1(3.7%) case as grade 2B.3, 2 (7.4%) cases as grade 3.1, 4 (14.8%) cases as grade 3.3, 3 (11.1%) cases as grade 4.1, 4 (14.8%) cases as grade 4.3, 3 (11.1%) as grade 5.4, 2 (7.4%) cases with low grade dysplasia and 1 (3.7%) case with high grade dysplasia.

Nearly similar results were obtained reported before in the literature (11,12,21,22). Tsang, (1999) reported that there are major and minor criteria for the diagnosis of UC, the major ones were: patchy mucosal inflammatory infiltrate, basal plasmacytosis, neutrophils overrunning mucosa, crypt abscesses, cryptitis, crypt distortion and villiform surface, while the minor criteria were: decreased goblet cells, and Paneth cell metaplasia.(23).

Theodossi, et al. (1994), suggested that a decrease in mucous content, an irregular or a villous surface, crypt distortion, diffuse crypt abscesses, and cryptitis are predictive of ulcerative colitis rather than of Crohn's disease. (24).

In the current work, Bcl-2 staining of UC mucosal T cells showed mild expression of the Bcl-2 protein and this indicated that UC mucosa contains few numbers of Bcl-2+ cells. These findings were also detected by Kenji Ina et al., (1999). (25).

In the current study two cases showed low-grade dysplasia, and one case showed high-grade dysplasia, the histopathological features seen in low-grade dysplasia were decreased intracellular mucin, nuclear hyperchromasia and pleomorphism, irregular nuclear membranes, and loss of nuclear polarity. In high-grade dysplasia, the following features were seen: enlarged hyperchromatic nuclei, marked nuclear stratification with crowding, marked loss of nuclear polarity, marked architectural distortion, and marked hyperchromasia and pleomorphism. These figures were consistent with those obtained by Neumann et al., (2011).(26).

In Crohn's disease, the age of predilection was between 22-64 years with a mean of 43.8. Females were affected more than males (60%). This was in agreement with Cotran, (1999) who recorded that the peak age of detection are the teens and twenties with a minor peak in the 5<sup>th</sup> and 6<sup>th</sup> decades, and females were affected slightly more than males.(17).

Clinically most cases were represented by diarrhea (65%), abdominal pain (70%), and 20% of patients complained of anal complications such as fissures. These findings were consistent with those of Robert, (1998).(27).

Endoscopically, all cases revealed rectal sparing; discrete mucosal ulceration was detected in 45% of cases, 35% of cases showed pseudodiverticulosis, but skip lesions were detected in 55% of cases only. These findings were coincided with Quinn, et al., (1994). (28).

Histopathological examination revealed transmural inflammation in all cases, preserved crypt architecture, which was seen in 80% of cases, microgranuloma in 40% of cases, dilatation of lymphatic channels (35%), maintenance of goblet cell population (80%), ulceration (65%), isolated giant cells (35%), excess of histiocytes (65%), Focal crypt abscess (25%), and lymphoid aggregates in 65% of cases. While the distinctive feature of CD non caseatingepitheloid granuloma could be detected in only 45% of cases. These results were in keeping with the previously published data (6,8,10,12,19,26,29,30). On the other hand, these findings were not compatible with those of Tsang (1999), who recorded that crypt abscesses and cryptitis are major features of CD, while crypt distortion (usually milder than in UC) is a minor feature.(23).

Examination of sections stained immunohistochemically for the antiapoptotic Bcl-2 protein revealed moderate expression of the Bcl-2 protein and this indicate that in CD there is a defect in apoptosis which in turn lead to prolongation of T cell survival and contribute to their accumulation in the mucosa. Kenji Ina et al., (1999) obtained nearly similar results and concluded that the number of Bcl-2+ cells can be taken as a discriminating factor between UC and CD. (25).

Tontini, (2015) reported that the gold standard for microscopic differentiation between Crohn's disease and ulcerative colitis should be established by collecting two biopsies from at least five sites along the colon.(31)

In conclusion, this study using multiple parameters: histological features and Bcl-2 expression as studied by immunohistochemical stain, was a trial to gain an accurate differentiation between Crohn's disease and ulcerative colitis. According to these parameters, we were able to distinguish between 50 cases of IBD, 27 cases of UC with different grades, 1 case of UC with dysplasia and 23 cases of CD.

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### RESEARCH ARTICLE

#### Synthesis, characterization and oxidase biomimetic catalytic activity of copper(II) complexes with pyridine based ligand containing N<sub>3</sub>S<sub>2</sub> donors.

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#### Abstract

A new series of hexa-, and five- coordinated copper(II) complexes, having the molecular formulae of [CuLX]X H<sub>2</sub>O, **1**, **2**, **3** (X = Cl<sup>-</sup>, Br<sup>-</sup>, NO<sub>3</sub><sup>-</sup>) and [CuL]X<sub>2</sub> nH<sub>2</sub>O, **4**, **5** (X = AcO<sup>-</sup> and ClO<sub>4</sub><sup>-</sup>) respectively and L is pentadentate pyridine based ligand have been synthesized. Structural characterization of these newly synthesized compounds was achieved by several physicochemical methods including elemental and thermal analysis (TGA and DTG), electrical molar conductance, magnetic moment measurements and spectral investigations such as IR, UV-Vis and ESR. The spectral and magnetic measurements in addition to the electrolytic conductance results demonstrated the octahedral and square-pyramidal stereochemistries for the hexa, and five coordinated copper(II) chelates respectively. Catechol oxidase and phenoxazinone synthase biomimetic catalytic activity of the inspected copper(II) chelates was studied and the results obtained indicated that, the catalytic reactivity is markedly depends on the structural properties of these newly synthesized copper(II) complexes.

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#### Introduction:-

Functional models of the metalloenzymes that activate molecular oxygen possess great potential as catalyst for specific oxidation reactions and as guides for the development of efficient small molecule catalysts [1]. Since, the oxidation of organic substrates with molecular oxygen under mild conditions is of great interest for industrial [2] and synthetic processes both from an economical and environmental [3] point of view, most of the focus of ongoing biomimetic and bioinspired synthetic approaches is on reproducing some structural and/or functional feature of the title enzymes. The synthesis and reactivity studies of transition metal complexes, as functional model compounds for metalloenzymes with oxidase activity, are of particular interest for the development of bioinspired catalysts for oxidation reactions.

The potential role played by copper ions in the active sites of a large number of metalloproteins has stimulated efforts to design and characterize copper complexes as models for providing better understanding of biological systems and for assisting in the development of new homogeneous catalysts for selective oxidation. Particularly, the

coordination chemistry and reactivity of copper complexes involving nitrogen–sulfur donor ligands has received considerable attention as models [4]. In particular the  $\text{CuN}_2\text{S}_2$  chromophore is present in blue copper proteins such as plastocyanin [5] and copper(II) chelates of SNNS ligands have been found to have antineoplastic activities and to interact with biological systems [6].

Oxidase or dehydrogenase enzymes catalyze the oxidation of substrate by employing dioxygen as a hydrogen acceptor e.g. copper containing oxidase, e. g. catechol oxidase and phenoxazinone synthase. Catechol melanin, a black pigment of plants, the black color of banana and black sugar, is a polymeric product formed by the oxidative polymerization of catechol [7]. Another type of catechol oxidase, this copper(II) protein isolated from photogenic materials, only catalyzes the oxidation of catechol to quinones without acting on tyrosine [8,9]. Catechol oxidase forms the third member of  $\text{Cu} / \text{O}_2$  group which belongs the type III copper protein [10,11]. Catechol oxidase in contrast to tyrosinase, catalyze exclusively the oxidation of catechol to the corresponding *o*-quinones without acting on monophenols [12]. This reaction is of great importance in the medical diagnosis for the determination of hormonal catecholamine (adrenaline, noradrenalin and dopamine).

Related to catechol oxidase is phenoxazinone synthase, it is a type 2 copper containing oxidase (subunit molecular mass 88000 3.7 Cu per subunit) [13] is naturally found in the bacterium *Streptomyces* antibiotics and has been cloned and over expressed in *S. lividians* [14]. It is an oligomeric multicopper oxidase, catalyses the oxidative coupling of two molecules of an *o*-aminophenol to form the phenoxazinone chromophore. This reaction constitutes the final step in the biosynthesis of actinomycin and is a complex six-electron oxidative condensation.

In continuation of our earlier work in the area of copper(II) chemistry we describe here in this contribution the synthesis and characterization of a new series of copper(II) complexes containing the pentadentate neutral pyridine base ligands, as potential structural and functional models for the active sites of both catechol oxidase and phenoxazinone synthase.

## **Experimental:-**

### **Materials:-**

All chemicals used were of analytical grade. The benzoyl hydrazine, hydrazine hydrate 95%, 2,5-dibromo methylbenzene and 2,6-dibromo methyl pyridine were purchased from Aldrich. 2,3-Dibromo methyl quinoxaline was synthesized based on the method reported in literature [15]. Phenyl triazole was prepared according to the modified method described below.

### **Preparation of phenyl triazole:-**

$\text{CS}_2$  (0.15 mole) was added drop wise to an ice cold solution of KOH (9.12 gm, 0.16 mol) in absolute ethanol (200 ml) containing benzoyl hydrazine (0.1 mol). The reaction mixture was diluted with ethanol (150 ml) and stirred for 2h at room temperature. Dry ether (200 ml) was added and the resulting solid K-salt precipitate was collected, washed with ether and finally dried.

A solution of the latter K-salt (0.05 mol) and hydrazine hydrate 95 % (0.5 mol) was heated under reflux with stirring for one hour. 5 ml of water was then added and the reaction mixture was neutralized with concentrated hydrochloric acid. The solid obtained upon neutralization was collected and crystallized from acetic acid to give colorless crystals of phenyl-triazole (mp. 214-216 °C).

### **Preparation of the pyridine based ligand (L) :-**

To a solution of phenyl triazole (50 mmol) in aqueous ethanol (50 ml) containing KOH (50 mmol) the appropriate dibromo compounds (25 mmol) was added. The reaction mixture was heated under reflux for 1 h. The solvent was then removed in vacuum and the remaining solid was collected and crystallized from DMF to give colorless crystals of the product ligand pyridine based ligand L.

### **Synthesis of copper(II) complexes 1-5:-**

An equimolar amount of copper(II) salt in 25 ml ethanol was added drop wise to a 25 ml hot ethanolic solution of the organic ligand (L). The reaction mixture was stirred for half hour at room temperature. The resultant reaction mixture was further stirred under reflux for one hour during which time colored products precipitated. After that, the volume of the solution of the reaction mixture was reduced, then filtered and the isolated solid was washed with ethanol and ether and finally dried in *vacuum* over CaO at room temperature for several days.

**Physical measurements:-**

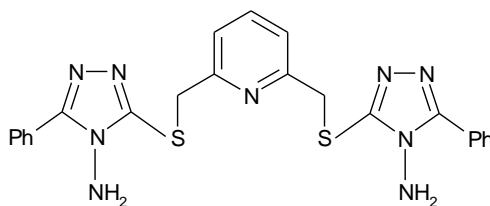
IR spectra were recorded using KBr disks in the 4000-200  $\text{cm}^{-1}$  range on a Unicam SP200 spectrophotometer. The electronic absorption spectra were obtained in DMF solution with a Shimadzu UV-240 spectrophotometer. Magnetic moments were measured by Gouy's method at room temperature. ESR measurements of the polycrystalline samples at room temperature were made on a Varian E9 X-band spectrometer using a quartz Dewar vessel. All spectra were calibrated with DPPH ( $g = 2.0027$ ). The specific conductance of the complexes was measured using freshly prepared  $10^{-3}$  M solutions in electrochemically pure DMF at room temperature, using an YSI Model 32 conductance meter. The thermogravimetric measurements were performed using a Shimadzu TG 50-Thermogravimetric analyzer in the 25-1000  $^{\circ}\text{C}$  range and under an  $\text{N}_2$  atmosphere. Elemental analyses (C, H, and N) were carried out at the Micro analytical Unit of Cairo University.

**Oxidase biomimetic catalytic activity:-**

A mixture of 1.0 ml of studied substrate 3,5-di-*tert*-butyl catechol (3,5-DTBCH<sub>2</sub>) or 2-aminophenol (2-APH) solution (30 mM) in methanol and 1.0 ml of copper complex solution ( $\sim 3$  mM) in methanol was placed in a 1 cm path length optical cell containing 1.0 ml of methanol in a spectrophotometer. The final concentration of reaction mixture is catechol or 2-aminophenol (10 mM) and complex (1 mM). The formation of 3,5-di-*tert*-butyl-quinone (3,5-DTBQ) was followed by observing the increase of characteristic quinone absorption band at 400 nm and for 2-amino-3H-phenoxazine-3-one (APX) at 433 nm.

**Results and discussion:-****Synthesis and characterization of L and copper(II) complexes:-**

The reported ligand L (Figure 1) was prepared as previously reported in the experimental section and characterized by IR, elemental analysis, and UV-Vis spectra. Reaction of the present pyridine based ligand, L with copper(II) salts ( $\text{CuX}_2$ ;  $\text{X} = \text{Cl}^-$ ,  $\text{Br}^-$ ,  $\text{NO}_3^-$ ,  $\text{AcO}^-$  and  $\text{ClO}_4^-$ ) in a 1:1 ratio in ethanol gives a new series of copper(II) complexes having the molecular formulae of  $[\text{CuLX}]\text{X}$  ( $\text{X} = \text{Cl}$ ,  $\text{Br}$ ,  $\text{NO}_3$ ) and  $[\text{CuL}]\text{X}_2$  ( $\text{X} = \text{AcO}$  and  $\text{ClO}_4$ ). The elemental analyses are consistent with the proposed molecular formulae that show the ratio of metal/ligand is 1:1. The molar conductivities of  $10^{-3}$  M solutions of these copper(II) chelates in DMF at 25  $^{\circ}\text{C}$  are measured and the data obtained are listed in Table 1. These electrolytic conductance results reveal that the halogeno and nitrate copper(II) complexes have molar conductivity values in the range 63.67 – 88.16  $\Omega^{-1} \text{mol}^{-1} \text{cm}^2$ , which indicates their ionic nature and they are considered as 1:1 electrolytes [16]. These molar conductance values indicate the hexa coordinate formulation of these halogeno and nitrate copper(II) complexes in an octahedral structure. On the other hand the acetate and perchlorate complexes exhibit molar conductance values of 143.85 and 149.19  $\Omega^{-1} \text{mol}^{-1} \text{cm}^2$ , respectively demonstrating that they are 1:2 electrolytes and suggest the five-coordinate formulation of these complex species. Thus the pyridine based ligand L must act as a neutral pentadentate chelating ligand in complexation to copper(II) ion. On the basis of the elemental analyses, and the molar conductance measurements the complexes were assigned the compositions shown in Table 1.



**Fig. 1.** Structure of the pyridine based ligand (L)

**Table 1.** Molecular formulae, physical properties and analytical data of copper(II) complexes **1-5**

Complex	Color	$\Lambda_M (\Omega^{-1} \text{cm}^2 \text{mol}^{-1})$	Found (Calcd.) %C	%H	%N	%M
1. $[\text{CuL}^1\text{Cl}]\text{Cl} \cdot \text{H}_2\text{O}$	Faint green	95.30	43.16(43.29)	3.63(3.29)	18.95(19.77)	10.57(9.96)
2. $[\text{CuL}^1\text{Br}]\text{Br} \cdot \text{H}_2\text{O}$	Faint brown	93.67	37.67(37.98)	3.18(2.89)	16.85(17.35)	9.11(8.74)
3. $[\text{CuL}^1\text{NO}_3]\text{NO}_3 \cdot \text{H}_2\text{O}$	Fain blue	98.16	40.59(39.96)	3.37(3.04)	21.45(22.31)	9.94(9.20)
4. $[\text{CuL}^1](\text{AcO})_2 \cdot \text{H}_2\text{O}$	Fain blue	143.85	47.50(47.33)	4.15(3.94)	17.92(18.41)	10.05(9.28)
5. $[\text{CuL}^1](\text{ClO}_4)_2$	Green	145.19	37.62(36.92)	2.79(2.54)	16.31(16.86)	09.89(8.49)

**Thermal analysis:-***Thermal decomposition (TGA and DTG) studies:-*

The thermal decomposition studies on the synthesized copper(II) complexes have been carried out so as to corroborate the information obtained from their molar conductance and spectral studies about the statuses of water molecules present in these complexes, as well as to know their general decomposition patterns. Due to the explosion nature of the perchlorate anion the perchlorate complex was ruled out from the thermal studies. The decomposition stages, temperature ranges, maximum decomposition peak  $DTG_{max}$ , percentage mass losses of the decomposition reactions together with their theoretical percentage mass losses and the assignments of decomposition moieties are given in Table 2, which reveals the following findings.

The thermograms (TG and DTG curves) of the hydrated copper(II) complexes  $[CuLCl]Cl \cdot H_2O$ ,  $[CuLBr]Br \cdot H_2O$ ,  $[CuLNO_3]NO_3 \cdot H_2O$  and  $[CuL](AcO)_2 \cdot H_2O$ , show a similar decomposition patterns. Three successive overlapped and unresolved degradation stages within a temperature range 60 - 700 °C are observed. The first stage of thermal decomposition starts at 65 °C and is marked with a regular loss in mass up to 120 °C. The initial mass loss for the complexes varies from 2.53 to 3.15 %, and agrees well with the theoretical expected mass loss of 2.60 – 3.63%. This is mainly due to the dehydrate removal of the out sphere water molecules (the adsorbed, crystalline or lattice water). The maximum rate of mass loss occurs at a temperature range of 85 - 105 °C as indicated from the DTG peaks. The activation energy of this thermal dehydration step is 14.06 – 30.25  $kJmol^{-1}$  (Table 3). This ease of desolvation suggests the weak interaction of and indicates that water plays little or no role in the lattice forces and occupies crystal voids.

The second stage of mass-loss reveals that the formed anhydrous complex species are then further decomposed within the temperature range 110 – 280 °C, with DTG maximum peaks at 140 - 240 °C range. This process corresponds to the volatilization of the loosely bonded non-coordinated electrolytic counter anions with a mass loss of (6.12 – 17.10 %) in accordance with the calculated values of (5.57 – 17.23 %). The energy values of activation of this stage lay in the range 25.23 – 75.24  $kJmol^{-1}$  (Table 3).

The third stage involves a significant mass loss extending in the temperature range from 190 to 675 °C with  $DTG_{max}$  peaks at 250 - 620 °C range ascribed to the exothermic removal of the axially coordinated counter anions namely,  $Cl^-$ ,  $Br^-$  and  $NO_3^-$  in addition to the complete burning of the organic ligand molecule in successive steps, leaving behind metal oxide as the final product of the thermal pyrolysis of the complex molecule. A good agreement between the experimental and calculated values is reported for the mass loss (Exp. 63.94 - 77.63 %; Calcd. 63.81 - 78.38 %), and the associated activation energy values are in the range 30.95 – 65.85  $kJmol^{-1}$ . Further horizontal constant curve may be due to the presence of metal oxide residue in the remaining part. The total loss of weight agrees well with the corresponding calculated data and the final product is anhydrous CuO. For all complexes, the metal content, determined from the oxide residue, was found to be satisfactory agreement with values calculated on the basis of the suggested composition formulae based on the analytical data.

Table 2. Thermogravimetric analysis of copper(II) complexes

*Complex	Temperature °C	$DTG_{max}$ °C	% Weight loss Found (Calcd.)	Species formed
1	75 – 110	85	3.15(2.82)	$[CuL^1Cl]Cl$
	110 – 280	240	6.12(5.57)	$[CuL^1Cl]$
	280 – 530	280, 500	77.63(78.38)	CuO
2	90 – 110	105	2.53(2.77)	$[CuL^1Br]Br$
	110 – 220	200	11.23(11.01)	$[CuL^1Br]$
	220 – 345	250	11.05(11.01)	$[CuL^1]$
	345 – 500	340, 440	63.94(63.81)	CuO
3	65 – 120	90	2.72(2.60)	$[CuL^1(NO_3)]NO_3$
	120 – 190	175	9.15(8.99)	$[CuL^1(NO_3)]$
	190 – 570	250, 545	75.91(75.97)	CuO
4	60 – 110	85	2.45(3.63)	$[CuL^1](AcO)_2$
	110 – 280	140	17.10(17.23)	$[CuL^1]$
	280 – 675	225, 620	68.00(67.56)	CuO

\*Complex details are as listed in Table 1.

**Thermal Kinetic Studies:-**

The thermodynamic parameters of the decomposition processes of the inspected copper(II) complexes, namely, activation energy ( $E_a$ ), enthalpy ( $\Delta H$ ), entropy ( $\Delta S$ ), and Gibbs free energy change ( $\Delta G$ ) were evaluated graphically by employing the Coats-Redfern equations [17] and the data obtained are given in Table 3.

The data in Table 3 show that, the values of the activation energies of the investigated copper(II) chelates reflect the thermal stability of these complexes. The activation energy values ( $E_a$ ) of the removal of the electrolytic non-coordinated counter anions are lower than the subsequent stages of thermal degradation of these complexes. This finding indicates that the electrolytic counter anions are loosely bond to copper(II) center and confirms the presence of one of the two counter anions outside the coordination sphere. In contrary the activation energy values ( $E_a$ ) associated to removal the non-electrolytic coordinated counter anions are higher than that reported for decomposition stage of electrolytic counter anions. This results demonstrate incorporation two types of counter anions in complex molecule and confirm the suggested compositional formulae of these copper(II) chelates. The  $\Delta G$  values of the thermal decomposition of the present copper(II) complex species increase for the subsequently decomposition stages due to increasing the values of  $T\Delta S$  from one step to another. This observed trend in the values of  $\Delta G$  reflects that the rate of the removal of the counter anion ligands is lower than that of the precedent organic ligand. This finding may be ascribed to the structural rigidity of the original complex molecule as compared to the resultant intermediates formed during the thermal pyrolysis processes.

On the other hand the activation energy values of the first stage which describes dehydration (surface or lattice water) are lower than that of the subsequent stages of thermal degradation of these complexes. This may attributed to the less steric strain in the intermediate compounds obtained after the first stage of the thermal pyrolysis. It is noteworthy to note that the removal of the electrolytic counter anion and the crystalline or surface water content of the complex molecule have lower  $\Delta H$  values than the removal of coordinated counter anion and the organic moiety of the coordinated ligand to yield the CuO as a final product.

Table 3. Kinetic and thermodynamic parameters of copper(II) complexes

*Complex	T° (K)	A	$E_a$	$\Delta H$	$\Delta S$	$\Delta G$
1	380	5.690	18.41	15.49	-0.2599	114.26
	514	4.850	25.23	22.31	-0.2637	157.88
	723	3.400	30.95	28.03	-0.2695	222.91
2	388	10.57	14.06	43.14	-0.2358	136.63
	503	16.15	46.68	45.76	-0.2424	165.72
	073	19.71	114.53	111.61	-0.2338	245.61
3	373	4.20	27.13	24.21	-0.2435	115.04
	433	5.98	47.45	44.53	-0.2125	177.53
	523	19.10	83.41	80.49	-0.2543	212.54
4	373	5.16	30.25	27.33	-0.2414	117.38
	445	12.61	75.24	72.33	-0.2374	147.41
	528	9.99	83.74	80.82	-0.2369	166.47

\*Complex details are as listed in Table 1.  $E_a$ ,  $\Delta H$  and  $\Delta G$  are in  $\text{kJ mol}^{-1}$ ,  $\Delta S$  in  $\text{J mol}^{-1}$ .

**IR spectral studies:-**

The most relevant IR bands and proposed assignments for the organic ligand and its copper(II) complexes are listed in Table 4. All compounds under study give normal infrared spectra with vibrations characteristic for the ligand system and the counter anions present in the complex molecule. The IR spectra of the inspected complexes are compared with the free ligand in order to determine the coordination sites that may be involved in chelation. In the IR spectrum of the free ligand the significant bands are observed at  $3247 \text{ cm}^{-1}$  for  $\nu(\text{NH}_2)$ ,  $1440 \text{ cm}^{-1}$  for ring skeletal vibrations  $\nu(\text{C}=\text{C})$ ,  $765 \text{ cm}^{-1}$  for  $\nu(\text{C}-\text{S})$ ,  $1554 \text{ cm}^{-1}$  for  $\nu(\text{C}=\text{N}_{\text{pyridine}})$  and  $\delta(\text{NH}_2)$  at  $1240 \text{ cm}^{-1}$ . Upon complexation these bands are shifted to higher or lower wave numbers in the spectra of complexes. The shift in band position of these characteristic functional groups is an indication of the participation of nitrogen atoms of both the primary amine, and the pyridine ring in addition to the two sulfur atoms of the ligand system in coordination to the copper(II) ions [18]. However, the IR spectra of all complexes are very similar and besides what has been noted above, exhibit medium to strong bands at *ca.*  $1565 - 1579 \text{ cm}^{-1}$  as expected for the high energy ring vibrations of the coordinated pyridine. The bonding of the pyridine nitrogen atom is also shown by the presence of bands at  $1010-1035 \text{ cm}^{-1}$  and  $630 - 668 \text{ cm}^{-1}$  attributable to the ring breathing frequency and the low energy pyridine ring vibrations, respectively

[19]. Therefore, from the IR spectra, it is concluded that the reported ligand behaves as neutral pentadentate in all the complexes and coordinates to the metal ion *via* the pyridyl nitrogen, the two nitrogen atoms of the primary amine groups and the two sulfur atoms of the ligand system. The low frequency bands in all the complexes in the region  $535 - 570 \text{ cm}^{-1}$  and  $421 - 455 \text{ cm}^{-1}$  are assigned to  $\nu(\text{Cu-N})$  and  $\nu(\text{Cu-S})$ , respectively and provide a compelling evidence for the presence of metal– nitrogen and metal- sulfur bond in the complexes molecules [20,21]. For all complexes medium to strong bands present in the region around  $4500 \text{ cm}^{-1}$ , assignable to  $\nu(\text{OH})$ , clearly confirm the presence of surface or lattice water. Since vibrational modes such as wagging, twisting and rocking activated by coordination to the metal have not been found in the expected ranges, it appears that coordinated water is not present. These results are consistent with the thermogravimetric studies, using TG and DTG techniques; in fact this water is lost in the  $60 - 110 \text{ }^\circ\text{C}$  range.

The appearance of a broad absorption band centered on  $4500 \text{ cm}^{-1}$  in the spectra of these hydrated complexes, indicate the presence of lattice water. The band at  $3247 \text{ cm}^{-1}$  is assigned to the amino group stretching vibration in the free ligand. The presence of stretching vibration of the water molecules in the spectra of these complexes renders it difficult to confirm the participation of the amino group in chelate formation of these hydrated complex species. The participation of the  $\text{NH}_2$  group is inferred and confirmed by clarifying the effect of chelation on the in-plane bending,  $\delta(\text{NH}_2)$  vibration. The shift of this band, from  $1240 \text{ cm}^{-1}$  in the free ligand L, to  $1219 - 1229 \text{ cm}^{-1}$  in the spectra of these hydrated complexes indicates the participation of the  $\text{NH}_2$  group in complex formation [18].

In addition to showing the characteristic bands due the coordinated organic ligand the spectra of the present copper(II) complexes also show the characteristic frequencies of the counter anions (electrolytic and nonelectrolytic) incorporated in the complex molecule. Regarding the nitrate complex the asymmetrical stretching frequency for the nitrate ion  $\nu_3$  are observed at  $1304 \text{ cm}^{-1}$  and  $1418 \text{ cm}^{-1}$  and the  $\nu_1$  vibration at  $841 \text{ cm}^{-1}$ . These results signify a monodentate mode of nitrate binding [22]. Moreover two strong bands at  $1420 - 1430$  and  $1306 - 1312 \text{ cm}^{-1}$  at a separation of  $114 - 118 \text{ cm}^{-1}$  indicate that the nitrate is bound in monodentate fashion [22]. On the other hand the weak band observed at  $725$  and  $720 \text{ cm}^{-1}$  may be assigned to  $\nu_2$  of the uncoordinated nitrate ion. These spectral features suggest that this nitrate complex contains both the non-electrolytic coordinated monodentate nitrate ligand and the electrolytic nitrate ion [18,23].

The spectrum of the perchlorate complex exhibits the strong, unsplit absorption band, centered at  $1085 - 1104 \text{ cm}^{-1}$ , characteristic of non-coordinated perchlorate. The non-coordination and the electrolytic ionic nature of the acetate ion was inferred from the strong bands occur at  $1680$ ,  $1258$  and weak band at  $412 \text{ cm}^{-1}$ . These results are in harmony with the electrolytic conductance measurements of the complexes in DMF at  $25 \text{ }^\circ\text{C}$  where the molar conductance values for the perchlorate and acetate complexes lie in the range characteristic of 1:2 electrolytes. For the hexa-coordinated halogeno complexes, the non-electrolytic halide ion exhibits weak absorption band far infra red region characteristic of the axially coordinated halide ion [25].

On the basis of the above discussion the general structures have been proposed for the present copper(II) complexes as shown in Figure 1.

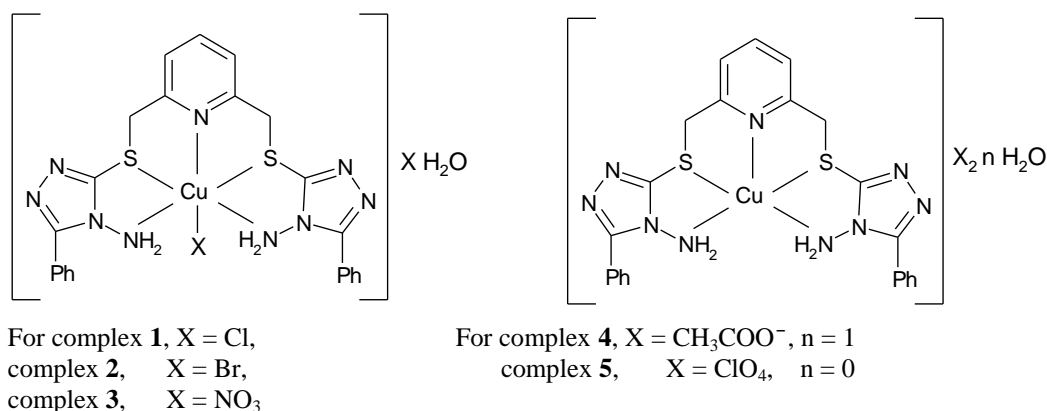


Fig. 2. Structure of copper(II) complexes

Table 4. Infra red spectra of pyridine based ligand (L) and its copper(II) complexes.

*Compound	$\nu(\text{H}_2\text{O})$	$\nu(\text{py})$	$\delta(\text{NH}_2)$	ring breathing	$\nu(\text{C-S})$	$\delta(\text{py})$	$\nu(\text{N-Cu})$	$\nu(\text{S-Cu})$
L	**3247	1554	1240	1010, 630	765	684	-	-
1	4530	1569	1219	1029, 655	773	680	521	415
2	4540	1575	1223	1025, 649	775	690	517	420
3	4529	1565	1227	1030, 660	787	686	519	420
4	4533	1579	1225	1027, 658	779	655	515	450
5	**3223	1570	1229	1035, 668	785	686	525	452

\*Complex details are as listed in Table 1. \*\*Characteristic band of  $\nu(\text{NH}_2)$

#### Electronic absorption spectra:-

The electronic absorption spectra of the inspected ligand and its copper(II) complexes were recorded in DMF solution and the results obtained are given in Table 5. The spectrum of the present ligand (L) exhibits two major peaks. The first one peak at  $34482 \text{ cm}^{-1}$  is assignable to  $\pi \rightarrow \pi^*$  transitions of the aromatic ring. The second band at  $30769 \text{ cm}^{-1}$  is attributed to the  $n \rightarrow \pi^*$  transition of the  $-\text{C}=\text{N}-$  function in pyridine ring of this ligand system [26].

In the high energy region, the electronic absorption spectra of a  $10^{-3} \text{ M}$  solution of the newly synthesized copper(II) complexes in DMF show two major absorption bands in the range  $34482 - 34105, 29171 - 28069 \text{ cm}^{-1}$  range for the first and second peaks respectively in addition to a shoulder at  $25188 - 26315 \text{ cm}^{-1}$  range. The first peak is assigned to  $\pi \rightarrow \pi^*$  intraligand transitions. This band is at some what the same frequency in the free ligands L, which tells us that these transitions are not significantly affected by chelation. The extensive  $\pi$  conjugation present in these ligand systems clearly creates an environment for this type of intraligand  $\pi \rightarrow \pi^*$  transitions [27]. On the other hand the second band is corresponding to the  $-\text{C}=\text{N}-$  group in pyridine ring showed an observable shift to longer wavelength on going from ligand to complex, indicating coordination of ligand to metal enter through the azomethine moiety [28]. The detected shoulder at the range of  $25188 - 26315 \text{ cm}^{-1}$  could be due to  $\text{Cu(II)} \rightarrow$  ligand charge transfer (MLCT) transitions [29a]. The observed band in the  $26306 - 27472 \text{ cm}^{-1}$  region is assigned to  $\text{S} \rightarrow \text{Cu}^{\text{II}}$  (LMCT) transition. The presence of the  $\text{S} \rightarrow \text{Cu}^{\text{II}}$  (LMCT) band in the spectra of all complexes is strong evidence that coordination of the reported ligand to the metal ion occurs *via* the sulfur atom [29b]. Such LMCT bands are quite common in the electronic spectra of related copper(II) complexes containing sulfur donors [30].

The electronic absorption spectra of the investigated hexacoordinated copper(II) complexes, **1**, **2** and **3** at  $10^{-3} \text{ M}$  of complex concentration in DMF show one d-d band at around  $550 \text{ nm}$  in the form of one broad band envelope which can be assigned to  ${}^2\text{E}_g \rightarrow {}^2\text{T}_{2g}$  transition of an octahedral geometry. Though in cases where the  ${}^2\text{E}_g$  and  ${}^2\text{T}_{2g}$  states of the octahedral copper(II) ion ( $d^9$ ) split under the influence of the tetragonal distortion the three transitions  ${}^2\text{B}_{1g} \rightarrow {}^2\text{E}_g$ ,  ${}^2\text{B}_{1g} \rightarrow {}^2\text{B}_{2g}$ , and  ${}^2\text{B}_{1g} \rightarrow {}^2\text{A}_{1g}$  are expected [31], their very close energies could have made them appear as an one broad band envelope. To overcome this difficulty we used saturated solution of metal complexes for measuring the electronic absorption spectra in the low energy region i. e. in the visible and the IR region. Therefore, we have succeeded to detect three d-d bands at wave number ( $\text{cm}^{-1}$ ) ranges of  $20278 - 21418$  and  $16989 - 17723$  and a shoulder band at  $14061 - 14184 \text{ cm}^{-1}$  range corresponding to the above said transitions,  ${}^2\text{B}_{1g} \rightarrow {}^2\text{E}_g$ ,  ${}^2\text{B}_{1g} \rightarrow {}^2\text{B}_{2g}$  and  ${}^2\text{B}_{1g} \rightarrow {}^2\text{A}_{1g}$  respectively in a distorted octahedral geometry (Table 5).

For the inspected hexacoordinated copper(II) complexes, since the planner field and one of the axial field are constant in all these copper(II) complexes, the change in the d-d band's frequency should be due to nature of the other donor set of the axial field. The electronic absorption spectral features of these six coordinate copper(II) complexes reveal that the position and intensity of the d-d bands are sensitive to the nature of the counter anion occupies the axial plane of the octahedral stereochemistry. Thus, the relative energies of the d-d transition will depend upon the extent of the axial ligand-metal interaction. For a given ligand L, the data in Table 5 show that the increasing energy order of the d-d band lies in the sequence:  $\text{CuLNO}_3 < \text{CuLBr} < \text{CuLCl}$  and reflects the decreasing order of the Lewis-acidity of the central copper(II) ion. This finding suggests that the strength of the metal-axial counter anion ligand bond increases in the order of  $\text{NO}_3 < \text{Br} < \text{Cl}$ .

The data in Tables 5, show that, the electronic absorption spectral features for the inspected five-coordinated copper(II) complexes **4** and **5** are similar. Three weak bands appearing in the low energy visible region at  $15057 - 15317, 17104 - 17384$  and  $20755 - 20982 \text{ cm}^{-1}$  ranges may be attributed to the d-d transitions of the copper(II) ion in the square-pyramidal environment ( $\text{C}_{4v}$ ) [32]. In the square - pyramidal copper(II) complexes the plausible d-orbital energy level scheme (idealized symmetry group  $\text{C}_{4v}$ ), is  $dx^2-y^2 > dz^2 > dxy > dxz, dyz$ . Accordingly, for the investigated perchlorate and acetate copper(II) complexes the higher energy band of the d-d transitions can be



assigned to  $d_{xz}$ ,  $d_{yz} \rightarrow dx^2-y^2$ ,  $d_{xy} \rightarrow dx^2-y^2$  while the lower energy band to  $dz^2 \rightarrow dx^2-y^2$ . These spectral parameters are in consistence with the other copper(II) complexes in the five-coordinate square-pyramidal stereochemistry [31,33,34]. This finding is further confirmed from the results of the ESR spectra.

Table 5. Electronic absorption spectra pyridine based ligand and its copper(II) complexes

*Complex	${}^2B_{1g} \longrightarrow {}^2A_{1g}$	${}^2B_{1g} \longrightarrow {}^2B_{2g}$	$\lambda(\text{cm}^{-1})$ ${}^2B_{1g} \longrightarrow {}^2E_g$	$S \rightarrow \text{Cu}^{\text{II}}$	$n \rightarrow \pi^*$	$\pi \rightarrow \pi^*$
L					30769	34482
1	14184	17723	21418	27472	28102	34413
2	14154	17447	20840	26737	28171	34482
3	14071	16989	20658	26173	28005	34398
	$dz^2 \rightarrow dx^2-y^2$	$d_{xy} \rightarrow dx^2-y^2$	$d_{xz}, d_{yz} \rightarrow dx^2-y^2$			
4	15236	17104	20982	26666	29069	34365
5	15317	17314	20755	26315	29018	34413

\*Complex details are as listed in Table 1.

### ESR spectra and magnetic moment measurements:-

As further structural characterization tools, the magnetic moment measurements and the ESR spectra studies have been used to confirm the geometry of the reported copper(II) complexes. Copper (II) ion belongs to the  $3d^9$  and  $S = 1/2$  system [35,36]. The room temperature magnetic moments and details of the polycrystalline ESR spectra of the studied copper(II) complexes are listed in Table 6. The observed magnetic moments of the investigated copper(II) complexes lie in the 1.95 - 2.12 BM range, corresponding to one unpaired electron [35,36] and in consistence with the mononuclear monomeric structure of these complexes. Based on these normal magnetic moment values, there seems to be no exchange interaction between the copper(II) ions in the solid state of these copper(II) chelates. This fact finds support from the ESR spectral data which give G values in the range  $5.3825 - 6.9749 > 4.0$  [37].

The EPR spectra of the inspected copper(II) complexes in the polycrystalline state at 298 K were recorded in the X-band region, using 100 KHz field modulation and the g factors;  $g_{\parallel}$  and  $g_{\perp}$  values were quoted from the spectra relative to the standard g-marker DPPH ( $g = 2.0023$ ). The spectra are interpreted in term of an effective spin of  $S = 1/2$ , and the various ESR parameters  $g_{\parallel}$ ,  $g_{\perp}$ , G and  $g_{av}$  computed from these spectra are given in Table 6. The spectra of most complexes show one signal at  $g_{av} = 2.0920 - 2.1276$  and no hyperfine structures were observed. This finding may be attributed to the strong dipolar interaction between the copper(II) ions in the unit cell. However, the spectra of the present six and five coordinate complexes species are anisotropic, having parallel and perpendicular features.

The ESR spectra of the investigated hexa-coordinate copper(II) complexes **1-3** show a considerable tetragonal distortion occurs, which changes the symmetry of  $O_h$  to  $D_{4h}$ . According to the Jahn-Teller thermo, a tetragonal distortion reduces the symmetry from  $O_h$  to  $D_{4h}$  [36] is expected for all hexa-coordinate copper(II) complexes and this results in an anisotropy of the g-tensor. For the six coordinated copper(II) complexes under study the coordinated donors are not identical, where the coordination chromophore is  $N_3S_2X$  therefore, only static distortion can occur [36]. However, the solid state EPR spectra of these complexes, recorded at ambient temperature were found to be anisotropic with g-values,  $g_{\parallel} = 2.2040 - 2.2748$  and  $g_{\perp} = 2.0326 - 2.0425$  (Table 6). The spectra are axial in nature and  $g_{\parallel} > g_{\perp} > 2.0023$ , indicating that  $dx^2-y^2$  is the ground state, which is characteristic of a distorted octahedral geometry [38]. The value of  $g_{\parallel}$  is greater than  $g_{\perp}$  (Table 6) indicating a tetragonal distortion, corresponding to elongation along the four-fold symmetry Z axis. The  $g_{av}$  value calculated from the relation:  $g_{av} = 1/3(g_{\parallel} + 2g_{\perp})$  was found to lie in the range 2.0920 - 2.1196. The deviation of the  $g_{av}$  from that of the free electron (2.0023) is due the covalent nature [39]. This covalent planar bonding like other complexes of sulfur and nitrogen donor ligands is supported by a  $g_{\parallel}$  values of 2.2040 - 2.2748 range as suggested by Kivelson and Neiman [40]. The parameter G has been calculated by using the expression [41]:  $G = (g_{\parallel} - 2)/(g_{\perp} - 2)$ . The value of G reflects the exchange interaction between copper centers in the polycrystalline complex. According to Hathaway et al. [42] values of G less than 4 indicate considerable exchange interaction in the solid complexes while values of G larger than 4 are typical of negligible exchange interactions, which is the case in the copper(II) complexes under investigation.

The one-electron paramagnetic of the five-coordinated copper(II) complexes  $[\text{CuL}](\text{CH}_3\text{COO})_2$  (**4**) and  $[\text{CuL}](\text{ClO}_4)_2$  (**5**) display axial X-band EPR spectral features that are characteristic for an essentially square pyramidal geometry giving  $g_{\parallel}$  and  $g_{\perp}$  values of 2.2504 - 2.2913 and 2.0359 - 2.0458 range respectively, at 293 K. Both  $g_{\parallel}$  and  $g_{\perp}$  values are within the range expected for square pyramidal or tetragonal copper(II) complexes. The fact that  $g_{\parallel} > g_{\perp}$  is consistent with a  $dx^2-y^2$  ground state for what is probably a distorted square pyramidal

disposition of atoms about the central copper ion [43]. Here also the  $g_{\parallel}$  value is less than 2.3, indicating the covalent character of M–L bonds [40]. For these complexes the value of  $G$ -factor is greater than 4, suggesting that there is no interaction between the copper centers. The small separation between the  $g_{\parallel}$  and the  $g_{\perp}$  lines indicates that the unpaired electron on copper may be significantly delocalized into the ligand system. A pathway for electron delocalization is provided by the pyridine entity directly linked to the copper ion by the nitrogen atom through overlap of d orbitals of copper with the N system of pyridine.

Table 6. ESR spectral parameters and magnetic moment values of copper(II) complexes

*Complex	$g_{\parallel}$	$g_{\perp}$	$g_{av}$	$G$	$\mu_{eff}$ (BM)
1	2.2748	2.0425	2.1196	6.4650	2.12
2	2.2110	2.0326	2.0920	6.4723	2.04
3	2.2040	2.0379	2.0932	5.3825	1.95
4	2.2913	2.0458	2.1276	6.3602	1.97
5	2.2504	2.0359	2.1074	6.9749	2.05

\*Complex details are as listed in Table 1.

### Oxidase Biomimetic Catalytic Activity:-

There is a continuing interest in the biomimetic catalytic activity of the transition metal complexes, which may serve as structural and functional models for various metalloenzymes [44]. In the modeling approach metalloenzymes are regarded as metal complexes embedded in the protein structure. It is therefore convenient to investigate the low molecular mass complexes with the objective of obtaining structural information on the reactivity patterns transferable with the same reservation to the enzyme [45]. We are interested in the modeling of the metalloenzymes catechol oxidase and phenoxazinone synthase. These enzymes play vital roles in the metabolism of the aromatic compounds.

#### Catechol oxidase biomimetic catalytic activity:-

Catechol oxidase is a copper type two enzyme catalyzes the aerobic oxidation of catechol to the corresponding light absorbing *o*-quinone. The two-electron oxidation of 3,5-di-*tert*-butyl catechol (3,5-DTBC<sub>2</sub>) to the light absorbing 3,5-di-*tert*-butyl quinone (3,5-DTBQ) was investigated since this is the reaction that the copper-containing enzyme catechol oxidase catalyzes (Figure 3).

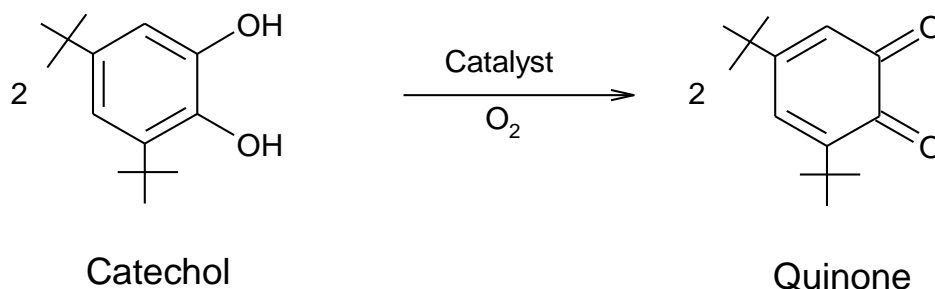


Fig. 3. Catalytic aerobic oxidation of 3,5-di-*tert*-butylcatechol

The catechol oxidase biomimetic catalytic activity of the reported copper(II) complexes was evaluated by determining the turn over rate (amount of 3,5-DTBQ produced per min per mg of catalyst) by making use of molar absorbance value of  $\epsilon = 1900 \text{ M}^{-1} \text{ cm}^{-1}$  in methanol and the obtained results are given in Table 7. As we can see in Table 7, all the inspected complexes catalyze the aerobic oxidation of 3,5-DTBC<sub>2</sub> to the corresponding light absorbing 3,5-DTBQ with the oxidase like catalytic activity varying from a relatively high for **3** to a moderate for **4** and **5** and a low for **1** and **2** complexes. These results demonstrate that, the catalytic activities depend strongly on the nature of both the counter anion incorporateities in the complex molecule and the stereochemistry of the metal chelate. There are a number of factors that could help to elucidate the difference in the catalytic activities of the present catechol oxidase functional models. These include:

- (a) The redox potential of the couple Cu<sup>I</sup>/Cu<sup>II</sup> in the investigated copper(II) complexes during the catalytic cycle.
- (b) The Lewis acidity of the copper(II) center created by nature of the coordinated ligands system.
- (c) The geometry imposed by the coordinated ligands on the copper(II) ion.
- (d) The degree of lability of the sixth donor atom of the hexa-coordinated complex species. Some of these factors will be considered sequentially.

**Geometrical considerations:-**

The surprising oxidase like catalytic activity of the inspected coordinatively saturated hexacoordinated copper(II) complexes may be ascribed to conformational changes in solution. The hexa-coordinate complexes are highly unstable in their ground state due to: (a) the excessive build-up of electron density on the central copper(II) ion (six donating atoms), (b) the Jahn–Teller effect. According to the Jahn–Teller theorem, the hexa-coordinated copper(II) complexes are usually associated with a tetragonal distortion reducing the symmetry from  $O_h$  to  $D_h$  [46]. Consequently we suggest that the axially coordinated counter ion could be forced to get away from the octahedral environment and the coordination number would decrease from six to five. This suggestion find support from the electrical conductivity results in solution (Table 1) which showed that the conductance values of examined complexes are higher than that required for 1:1 electrolytes and lower than that expected for 1:2 electrolytes. Such conformational changes will provide one open site for coordination of the substrate or any reacting species during the oxidation catalytic cycle.

However, the data in Table 7 demonstrate that the five coordinate complexes **4** and **5** exhibit catalytic activity higher than the octahedral halogeno complexes **1** and **2**. The octahedral complexes are coordinatively saturated, and thus have no vacant coordination sites, which can be utilized to bind any reacting species during the catalytic process. Due to the reasons (a) and (b) mentioned above, the reported copper(II) chelates should dissociate in solution to form more stable five coordinate complexes with an available coordination site for the substrate binding. The ability of such coordinatively saturated complexes to dissociate and consequently the energy of dissociation is one of the key factors in imparting catalytic properties to these complexes. On the other hand, the five coordinate square pyramidal complexes already have a vacant coordination site for the substrate binding and thus need no energy for ligand dissociation as in the case of the octahedral complexes.

However the results here show that octahedral complexes can be effective catalysts and that geometrical effect is only one facet of the complexes activity.

**Correlation with the six donor lability:-**

Several studies on catechols oxidation demonstrated that, the degree of lability of the axial donor atom has an effect on the rate of catalysis [47]. In addition it has been shown that electron transfer from catechol to copper(II) can begin only after catechol and the copper(II) species form a copper(II) catecholate intermediate [48]. Our premise is that the ease of dissociation of the sixth coordinated counter anions ligands ( $X = Cl, Br$  and  $NO_3$ ) greatly affects the ability of these hexa-coordinate complexes to catalyze this oxidation process. We assume that prior to oxidation, dissociation of the sixth donor will occur so that a vacant coordination site will be available for the binding of the catechol. Dissociation of the sixth donor counter anion ligand is the spark of the oxidation process so the safe binding of catecholate to copper(II) should be attainable. Therefore, greater the binding ability of the donor counter anion ligand (X) the larger the energy required for the dissociation of the sixth donor X and consequently the slower the reaction will proceed if this step is part of the rate determining step of the reaction. According to the previous studies the coordinating ability of the nitrate ligand is lower than the chloro and bromo ligands. Consequently the lability of the nitrate ligand will be greater than the chloro and bromo donors. This explanation may clarify the superiority of hexacoordinated nitrate complexes as compared with the analogous hexacoordinated halogeno complexes.

When TEA was added to a solution in which the copper(II)-catalyzed oxidation of 3,5-DTBCH<sub>2</sub> was in progress, a remarkable increase *ca.* three fold was found in the oxidation rate (Table 7). There is a kinetic factor, which account for this dramatic increase of the catalytic activity on addition of TEA. This marked effect of TEA on the rate of the catalytic oxidation reaction was previously reported for other catechol oxidase functional models catalyze the aerobic oxidation of catechol [49].

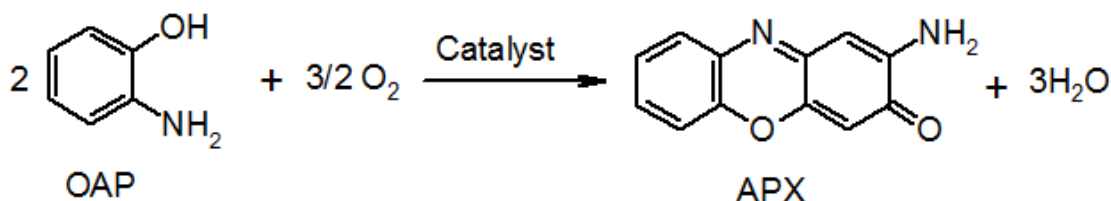
Table 7. Catechol oxidase like catalytic activity of copper(II) complexes

*Complex	**3,5-DTBQ $\times 10^{-2}$ (m mol L <sup>-1</sup> )	TR $\times 10^{-1}$ h <sup>-1</sup>	3,5-DTBQ $\times 10^{-2}$ (m mol L <sup>-1</sup> )	TR $\times 10^{-1}$ h <sup>-1</sup>
1	88.53	147.55	32.36	53.9
2	92.52	154.42	32.68	54.4
3	164.83	274.71	72.57	120.9
4	116.71	194.51	63.17	105.2
5	114.25	190.41	67.48	112.4

\*Complex details are as listed in Table 1, \*\*these data are obtained in presence of TEA

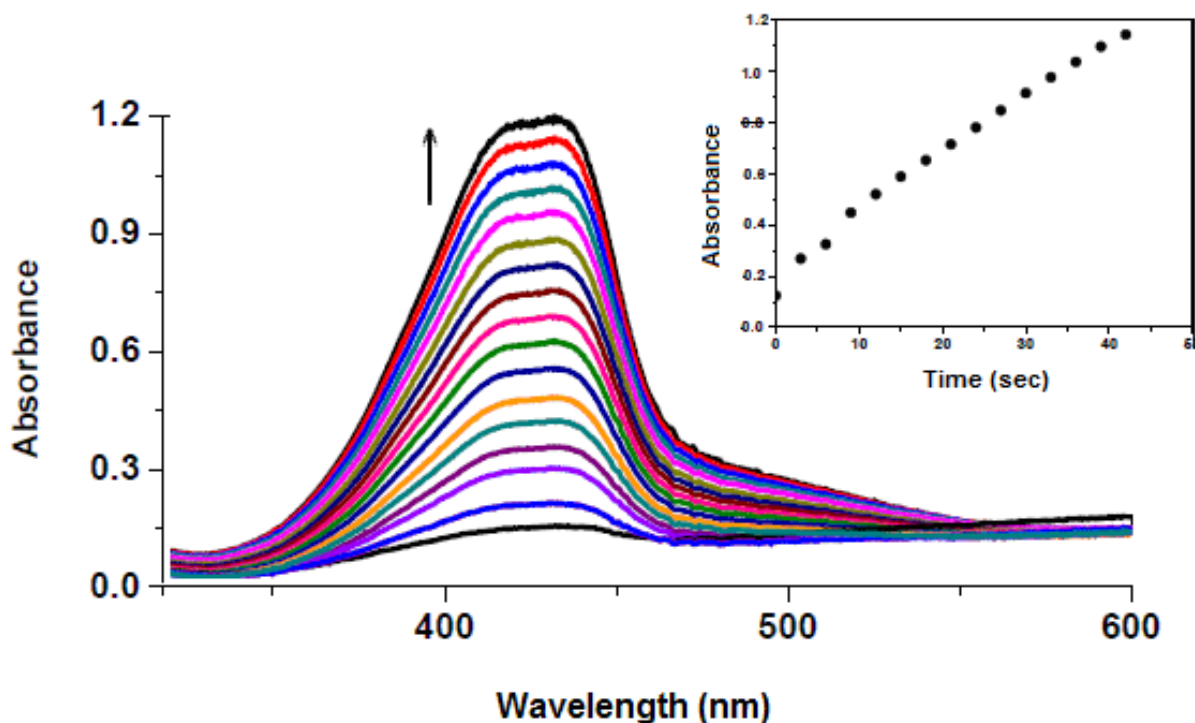
**Phenoxazinone synthase biomimetic catalytic activity:-**

Related to catechol oxidase biomimetic catalytic activity is the ability of the reported copper(II) complexes to promote the oxidation of *o*-aminophenol (OAP) to 2-amino-3*H*-phenoxazine-3-ones (APX) as shown in Figure 4.



**Fig 4:** The aerobic catalytic oxidation of *o*-aminophenol (OAP) to 2-amino-3*H*-phenoxazine- 3-ones (APX)

The present series of copper(II) complexes exhibit promising catalytic activity towards the oxidative dehydrogenation of *o*-aminophenol (OAP) at room temperature in the presence of  $O_2$  in methanol. This system can be regarded as a functional model of phenoxazinone synthase which is involved in the biosynthesis of Actinomycin D (AD) a naturally occurring antineoplastic agent from the *o*-aminophenol derivative. The catalytic measurements were carried out by the spectrophotometric monitoring of the increase in the concentration of the strongly absorbing 2-amino-3*H*-phenoxazin-3-one product (APX) at 433 nm. 2-aminophenol has no absorption in the visible region. The time sequence of the increase in the 400-440 nm band characteristic of the oxidation product (APX) of 2-aminophenol initiated by copper(II) complex **3** at ambient temperature is shown in Figure 5 as a representative of the catalytic aerobic oxidation of (OAP).



**Fig. 5.** UV/Vis spectral changes recorded for the reaction of complex **(3)** with 2-aminophenol (0.05 M) in methanol at 296 K; spectrum obtained several milliseconds after mixing of the reactants in the stopped-flow; inset is the kinetic trace at 433 nm

The phenoxazinone synthase biomimetic catalytic activity of the reported copper(II) complexes was evaluated by using the turn over rate (TR) expression, (TR = the amount of APX produced per mmole of catalyst per min. (Table 8) by making use of molar absorbance value of  $2.23 \times 10^4 \text{ M}^{-1} \text{ cm}^{-1}$  and the results obtained are presented in Table 8.

Although (APX) is produced for all the synthesized copper(II) chelates, the rate at which it is produced varies from one complex to another. The data in Table 8 demonstrate that, the rate of oxidation of *o*-aminophenol is markedly dependent on both the counter anion incorporated in the complex molecule and the stereochemistry of the metal chelate. Similar to that reported above for catechol oxidase like activity the candidates copper(II) complexes exhibit the same order of reactivity towards the oxidative dehydrogenation of 2-aminophenol. The observed variation in the catalytic activity of the present copper(II) complexes can be correlated with structural features of the inspected copper(II) chelate. This finding is similar to what was reported for catechol oxidase mimetic catalytic activity for the present series of copper(II) complexes.

Similar to the catechol-containing systems a much more dramatic increase (*ca.* 2.88 – 4.28 fold) was found for the oxidation rate when TEA was added to a methanolic solution in which the copper(II) catalyzed oxidation of *o*-aminophenol. In methanol solution *o*-aminophenol is mainly present in its protonated form OAPH. Due to the presence of TEA in the reaction medium, *o*-aminophenol may be predominantly present in the non-protonated form OAP<sup>-</sup>. In analogy to catechol, TEA deprotonates OAPH to OAP<sup>-</sup>, and the kinetic activity of OAP<sup>-</sup> presumably is the spark for initiation of the oxidation catalytic cycle.

Table 8. Phenoxazinone like catalytic activity of copper(II) complexes 1-5

Complex*	APX ( $\mu\text{ mol L}^{-1}$ )**	**TR $\text{h}^{-1}$	APX ( $\mu\text{ mol L}^{-1}$ )	TR $\text{h}^{-1}$
1	84.78	14.13	28.40	4.79
2	77.10	13.00	24.68	3.88
3	137.36	37.79	47.86	9.97
4	99.26	19.54	16.8	5.80
5	125.21	20.74	43.47	7.24

\*Complex details are as listed in Table 1; \*\*these data are obtained in presence of TEA. The turn over rate (TR) is the amount of APX produced per min per mg of catalyst.

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### RESEARCH ARTICLE

#### THE IMPACT OF AMMONIUM BIFLUORIDE COMPLEX ON COLMATAGING FORMATIONS DURING THE PROCESS OF IN SITU URANIUM LEACHING.

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#### Abstract

The causes of performance degradation geotechnical wells during ISL of uranium and detail researched the chemical sedimentations from uranium deposits. Identified effective complex of chemical reagents, which can remove sedimentations during sulfuric acid leaching of uranium. Performed laboratory research on samples of sediments and proved the concentration of the composition complex chemicals reagents. Demonstrated effective impact on permeability of the host rock during ISL of uranium.

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#### Introduction:-

In situ leaching (ISL) of ores with natural permeability involves replacing the pore fluid in the rock layer with the solvent, which interacts with the solid and liquid phases of rocks. As a result, various physical and chemical processes occur in the bowels of the earth [1]. The long-observed operation of geotechnical wells that were used for exploitation of uranium deposits by ISL method exhibits the decrease in their productivity over time. One of the main productivity loss causes can be attributed to the increase in hydraulic resistance and reduced filtration in rock layers due to colmatation formation stemming from precipitation of dissolved substances in the process solutions, or mechanical movement of particles of the ore-bearing horizon, and gas excretions.

Mechanical colmatation is the result of clogging of water filter orifices by sand, clay, gravel and blockage of the pore channels by mechanical suspension. Sand and clay precipitate only partially, sometimes completely overlapping the filter. Clogging of filter and formation zones created by drilling fluids containing clay particles can also be attributed to a mechanical colmatation [2]. Thus, the swelling of clay mineral in an aqueous medium and alteration of the pore space of the formation structure can be observed.

Chemical, ion exchange and gas colmatation types are caused by changes in the chemical composition of ground layer waters during ISL as a result of impact from application of chemical materials. The presence in water of dissolved calcium, magnesium and iron cations and the violation of the balance of carbon dioxide lead to the formation of sparingly soluble precipitation [3]. The allocation of carbonate sediments in the filter zone occurs intensively, however when remove the intensity of the precipitation decreases. During the reaction of leaching solutions with the host rock in the liquid phase, the accumulation of a number of the major rock-forming minerals (besides ore) occurs. The amount and kinetics of the transition of these elements into productive solutions depends on the type of lixiviant, end concentration, redox potential, temperature, solubility of the rock-forming

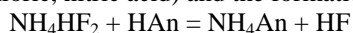


minerals and the size of the active surface of the mineral particles which in turn largely determines the intensity of mass transfer in the solution –solid system.

The purpose of the laboratory work has been reduced to the selection of chemical reagent, capable of changing the balance of the system and transferring of insoluble in a sulfuric acid treatment compounds into a liquid phase, or convert solid colmatants into easily soluble compounds. The technology that is heavily used in the oil and gas industry was taken as the basis for this work. Specific acid treatment ore-bearing rocks with a special solution are used for cleaning the pore spaces, creating new solutions movements channels and improvement of the available sizes, as well as the dissolution of clays in the near wellbore area [4].

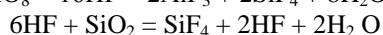
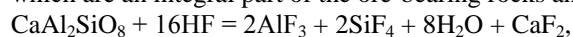
The analytical work for the selection of the formulation of the most effective solution was conducted on the samples of colmatant and ore-bearing rocks. Ammonium bifluoride ( $\text{NH}_4\text{HF}_2$ ) and surfactants for loosening colmatant were used as additives to the sulfuric acid solution.

The ammonium bifluoride was selected due to its ability to exchange reaction with mineral acids (sulfuric, hydrochloric, nitric acid) and the formation of hydrofluoric acid.



where – HAn ( $\text{H}_2\text{SO}_4$ ;  $\text{HCl}$ ;  $\text{HNO}_3$ ).

Hydrofluoric acid, resulting from the reaction, easily reacts with siliceous and aluminosilicate compounds, which are an integral part of the ore-bearing rocks and of precipitation of bridging:



As a result, the dissolution of colmatant and parts of clastic sand takes place, generally increasing the effective porosity ore array block. This hydrofluoric acid is fully utilized due to the large amount of silica contained in the sands. Results of laboratory investigations indicate the possibility of using ammonium bifluoride as an additive in a sulfuric acid solution for effective chemical treatment technology wells [5,6].

Reagents included in ammonium bifluoride complex.

500 ml of 2% ammonium bifluoride solution is combined with 50 ml of a 2% solution sulfoaminovoy acids (CAA) and sodium tripolyphosphate (STPP) and mixed with 100 ml of 10% hydrochloric acid HCl. This mixture of chemicals is conventionally denoted by the CBF. The reagents that are used for the preparation of a fluoride complex for processing colmatant are described below:

Common inhibited hydrochloric acid (HCl) 31, 27, 24% concentration. Comes in tanks. Shipping and handling is carried out by means of special acid equipment. The storage is performed in rubberized containers within bund areas.

Hydrochloric acid (HCl) - a solution of hydrogen chloride in water, emits smoke on air, forming a mist. Hydrochloric acid vapors strongly irritate the respiratory tract and mucous membranes. Prolonged exposure to hydrochloric acid vapor may cause respiratory tract catarrh, as well as the opacification of eye cornea. Skin contact causes irritation and burns.

Ammonium bifluoride ( $\text{NH}_4\text{F} \cdot \text{HF} + \text{NH}_4\text{F}$ ). Its acidity in terms of hydrofluoric acid is 25%, reagent density 1.27 g /  $\text{cm}^3$ . Despite the fact that the use of ammonium bifluoride requires an increased consumption of hydrochloric acid to prepare a working solution (same part HCl participates in the conversion reaction of ammonium bifluoride in HF), reagent is especially useful in remote areas, because it can be stored and transported by conventional methods. Ammonium bifluoride is supplied in polyethylene bags nested in four-five-layer paper bags, weighing not more than 25 kg. Ammonium bifluoride is stored in covered warehouses, protecting it from moisture penetration. Material is a toxic agent. At higher concentrations in the air accepted limit by (0.2 mg /  $\text{m}^3$ ) may cause a violation of the central nervous system, disease bone tissue, eye, skin.

Surface active agents (surfactants) such as disolvan, sulphonol, prevotsell, progol. Sulphonol comes in double kraft bags, and the other surfactants are transported and stored in steel drums. Liquid surfactants (disolvan, prevotsell) are dissolved in ethyl alcohol, thus are toxic and easily flammable.

Sulfuric acid  $H_2SO_4$  is a strong dibasic acid, exhibiting the highest degree of sulfur oxidation. Under normal conditions, the concentrated sulfuric acid is a heavy, oily, colorless and odorless liquid with sour, "copper" taste. Sulfuric acid can also be represented as a mixture with water, or with sulfur trioxide  $SO_3$ . Sulphuric acid and oleum are highly corrosive substances. By inhalation of these substances, they cause shortness of breath, cough.

Hydrofluoric acid (HF) 40% has concentration density of 1,15g / cm<sup>3</sup>. Transportation and storage of hydrofluoric acid must be carried out in plastic containers. Hydrofluoric acid - hydrogen fluoride solution in water, emits smoke in the air, forming mist. Hydrofluoric acid vapors strongly irritate the respiratory tract and mucous membranes, prolonged exposure to hydrofluoric acid vapor may cause respiratory tract catarrh, blurred cornea of the eye. Skin contact can cause severe burns [7].

Laboratory experiments have shown that the most effective colmatant mixture composition is a solution of 10% sulfuric acid or hydrochloric acid with the addition of ammonium bifluoride 2-2.5% by weight.

Colmatant phase composition was monitored by X-ray diffraction analysis, which was carried out on the X-ray diffractometer X'Pert MPD PRO (PANalytical). Shooting conditions:  $CuK_{\alpha}$  - radiation, Ni - filter,  $U=30$  kV,  $I=10$  mA, the rotational speed of 1000 pulses/s, the time constant  $\tau = 5$  s,  $2\theta = 10^{\circ} - 90^{\circ}$ . Intensities of diffraction maxima were evaluated on a 100 point scale as a percentage of the highest line. The processing of experimental data and the interplanar spacings were performed according to the Wulff-Bragg formula. Phase analysis of the chemical composition of bridging materials were determined according to X-ray crystallographic data of the international community.

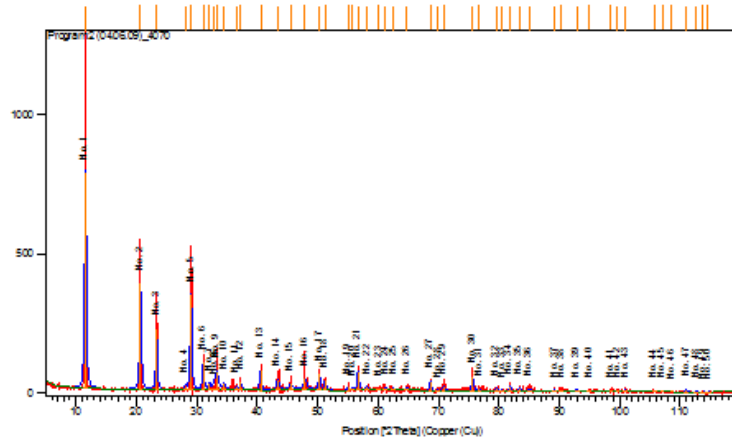
JEOL 6510EX electron microscope was used to acquire images of the surface sediments with high (up to 0.4 nm) spatial resolution, as well as for information about the composition, structure and other properties of the near-surface layers of the micro-diffractions. The method is based on the principle of interaction of the electron beam with the object under study.

The physico-chemical analysis results discussion.

The goal of the study was to evaluate the dissolving ability of different chemicals of varying sediment concentrations in controlled laboratory settings. Then, select the optimal chemical composition based on the analysis results.

For the pilot study the sedimentation from the interior surface of the submersible pumps from four fields located in the Syrdarya uranium ore province. Dried precipitates №1 is a dust-like mixture with the presence of large homogeneous formations and sand particles. Dried precipitates №2 is a white powder with beige spots.

For physical and chemical analysis purposes the samples of colmatant were ground in an agate mortar to a powder. The powder was examined by x-ray analysis. Stable reflection X-ray radiograph colmatant №1 (Fig. 1) shows a high crystallization sediment-chemical compounds. Analysis of the values of interplanar distances confirms the existence of feldspar particles, silica-alumina complex ferrous and plaster. Amorphous state is noticeable due to weak reflection of X-rays.



**Figure 1:-** The XRD pattern colmatant to chemical treatment.

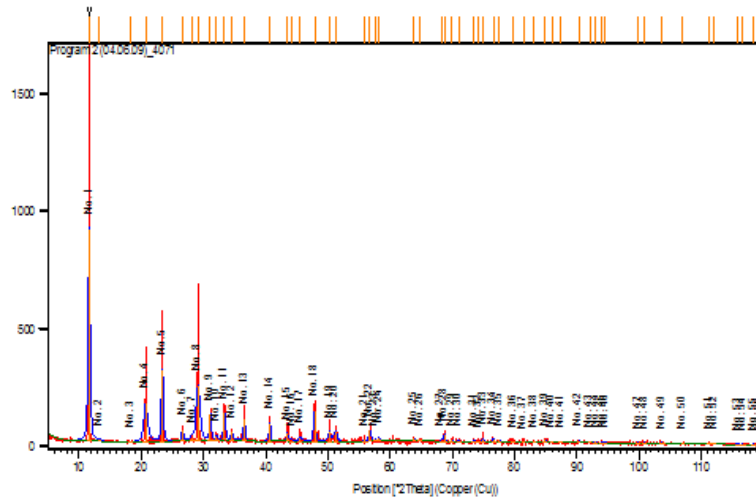
The X-ray diffraction of colmatant in Table 1 shows the quantitative chemical and mineralogical composition of colmatating objects. The data in Table 1 show that colmatant is majorly based (about 70%) on a chemical compound (CaSO<sub>4</sub> · 2H<sub>2</sub>O), mineral - gypsum. The remainder of the colmatant comprises from gibshit rock-forming minerals, anorthite and amphibole (3%, 20%, 7%, respectively).

**Table 1:-** Chemical composition colmatant №1

Reference code	The name of composition	Chemical formula	Content [%]
00-036-0432	Gypsum	CaSO <sub>4</sub> · 2 H <sub>2</sub> O	70
01-075-1690	Gibshit	Ca <sub>3</sub> Al <sub>2</sub> ( Si O <sub>4</sub> ) <sub>1,53</sub> (OH) <sub>5,88</sub>	3
01-087-1616	Anorthite	Ca( Al <sub>2</sub> Si <sub>2</sub> O <sub>8</sub> )	20
01-081-1135	Amphibole	( Ca <sub>5,76</sub> Mg <sub>0,24</sub> ) ( Al <sub>4,44</sub> Fe <sub>0,48</sub> Si <sub>2,08</sub> O <sub>16</sub> ) Cl <sub>2,76</sub>	7

These results prove satisfactory matching to published data of interplanar spacings with the experimental values<sub>experimental</sub> and line radiographs (Appendix A1 и A2).

Drip method was used to determine dissolving properties of ammonium bifluoride and mineral acids in processing precipitations. The №1 sample was treated with the composition complex of ammonium bifluoride, №2 sample was processed by solvent composition of 12% hydrochloric acid, №3 sample was subjected to the treatment of 12% sulfuric acid. During processing a marked penetration of fluids precipitate to varying degrees with a slight change in the amount and color of colmatating object. The drying of processed materials is held at room temperature under a fume hood at atmospheric conditions. After drying, precipitates were triturated in an agate mortar to study phase composition of treated samples. The results of X-ray analysis of the sample №1 (Figure 2) showed the polycrystalline nature of the crystallization of the samples, as well as changes in the crystal chemical and mineralogical composition compared to the original colmatant.



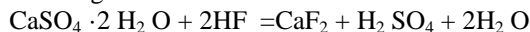
**Figure 2:-**colmatant №1 diffractogram after chemical treatment.

Characteristics of spectral reflections of the X-ray radiograph (Figure 2) remainsimilar in their colmatant diffraction patterns to those before the processing (Fig. 1).This is explained by the fact that all the minerals in the composition of colmatant is of isistructuralcrystallizationtype. Table 2 shows the quantitative phase and mineral composition data of colmatants after chemical processing with ammonium bifluoride.

**Table 2:-** Chemical composition colmatant after chemical treatment.

	Reference code	The name of composition	Chemical formula	Content [%]
	01-085-1569	Granite	$\text{Ca}_{2.83} (\text{Al}_{5.66} \text{Si}_{10.34} \text{O}_{32}) (\text{H}_2\text{O})_{7.1}$	13
	01-073-2041	Gelit	$\text{Ca}_2 (\text{Al} (\text{AlSi}) \text{O}_7)$	4
	01-074-1559	Andradite	$(\text{Ca}_{2.97} \text{Mg}_{.02} \text{Mn}_{.01}) (\text{Fe}_{1.99} \text{Al}_{.01}) (\text{Si}_4)_3$	2
	01-072-0467	Orthosilicate	$\text{Ca Al}_2 \text{Si}_2 \text{O}_8 (\text{H}_2 \text{O})_4$	38
	01-089-8754	Grossular	$\text{Ca} (\text{Al}_4 \text{Si}_2 \text{O}_{11})$	1
	01-072-2375	Epidote	$\text{Ca}_2 \text{Al}_2 \text{Fe Si}_3 \text{O}_{12} (\text{O H})$	5
	01-089-7304	Pirop	$(\text{Mg}_{0.92} \text{Fe}_{0.05} \text{Ca}_{0.03})_3 \text{Al}_2 (\text{Si O}_4)_3$	5
	00-041-1479	Clinozoisite	$\text{Ca}_2 \text{Al}_3 (\text{Si O}_4) (\text{Si}_2 \text{O}_7) \text{O} (\text{OH})$	32

The resultsofX-rayanalysisofthesample №1 showedthe dissolution ofcolmatagingschemicalcompoundof gypsumaccording to thechemicalreaction:



The reaction products are strong electrolytes ( $\text{CaF}_2$ ,  $\text{H}_2 \text{SO}_4$ ) which dissociate into ionsin aqueous solution. Calcium cationsareinvolved in the formation the minerals of different composition (Table 2), showing that increase in the amounts of calcium containing minerals.Solutions of the fluoride ions react with siliceous and aluminosilicate compounds. Sulfuric acid acts as a leaching agent.

Study of the surface colmatantusing scanning electron microscope (Figure 3) shows the frame structure of the mechanism, with a complex association of groups of atoms and molecules, as well as the lack of gaps between the lateral planes, proving close-packed nature of the crystallization colmatagings chemical compounds.

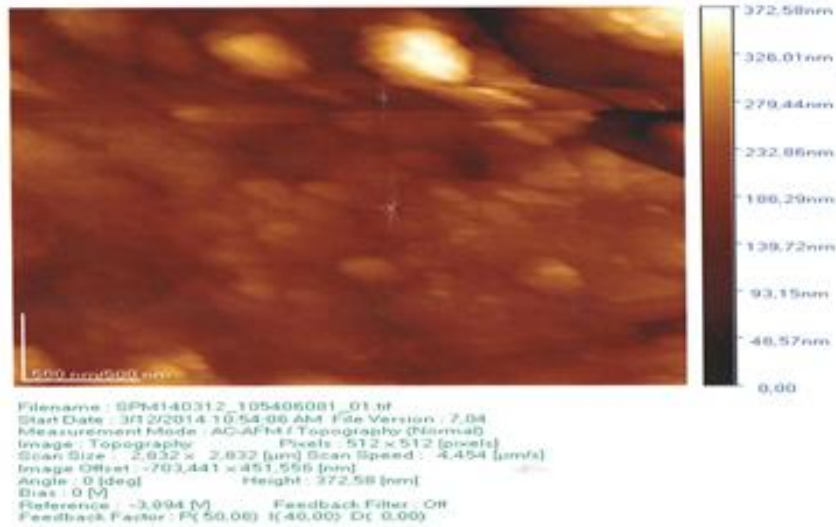


Figure 3:- Image colmatant surface before processing.

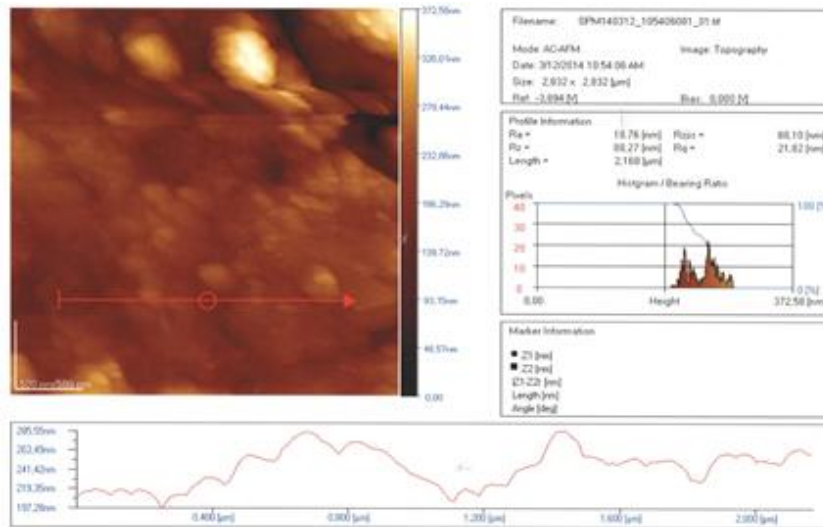
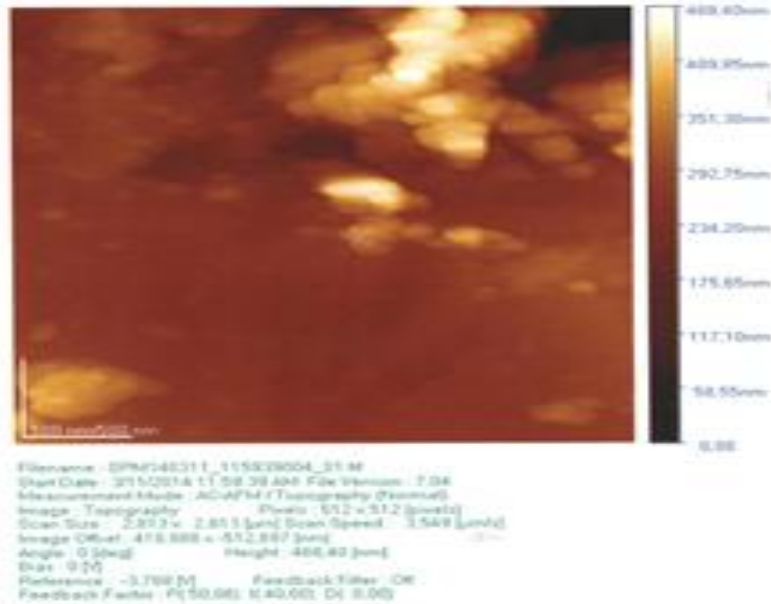


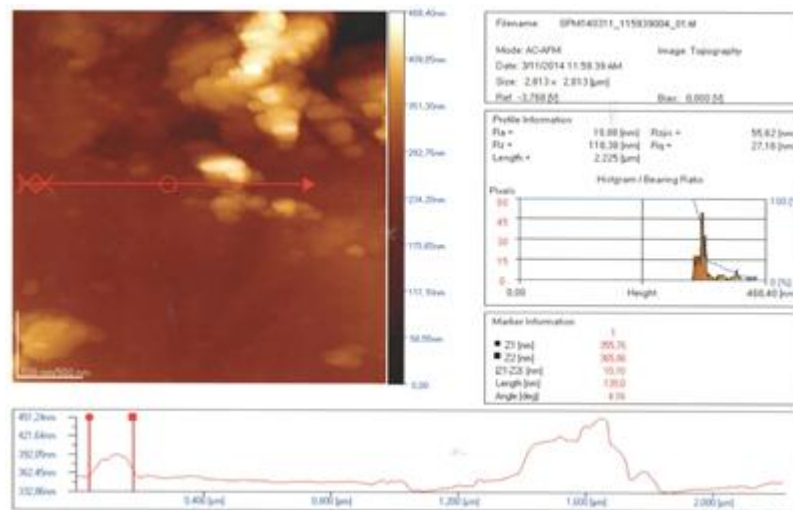
Figure 4:- Topography of the colmatant surface prior to treatment.

Figure 4 shows a picture of the surface microdiffraction colmatating objects. The profile of the histogram shows that the surface is formed by polymerization of silicate to the skeletal structure, which represents an infinite body-tallies framework of SiO<sub>4</sub> tetrahedrons and AlO<sub>4</sub>, in the cavities of which there are other ions, as a result of the drying process, they can turn into a clay and various kinds of silica. Structure without rupture, solid, formation of voids and cracks were not observed.

Post chemical processing (complex of ammonium bifluoride, 12% hydrochloric acid and sulfuric acid) drying and preparation of colmatant samples was performed at room temperature for 24 hours. The results of electron diffraction studies (Figure 5) showed a change in the morphology of the surface of the colmatant. As the result, new chemical formations are being composed within colmatating substance. Chemical formations can be described as smears, with discontinuous streaks and cracks.



**Figure 5:-** Image of the colmatant surface after chemical treatment.



**Figure 6:-** Colmatant surface topography after chemical treatment.

Microdiffraction of colmatant surface after chemical treatment is shown on Figure 6. The surface histogram profile shows a surface discontinuity in a region varying from 200 nm to 300 nm, which proves the structural transformation of colmatant, as well as changes in the chemical composition of the sediment-systems.

Investigation and analysis of laboratory experiments shows that chemicals differently affect the colmatating sediments, depending on the composition and concentration. However, the ammonium bifluoride's effect is strong. According to the electron diffraction, the complex of ammonium bifluoride is the most workable, effectively dissolving the gypsum and producing the maximum depth of a deepening in the sample by destroying the crystal structure colmatant. Thus, the ammonium bifluoride shows better characteristics compared to the solution of 12% hydrochloric or sulfuric acid.

The dissolving capabilities of the tested solutions are directly depended on the chemical composition of colmatating formations and quantitative characteristics of sediment-rock. Its main component, gypsum, is a product of the chemical process of sulfuric acid leaching, its content is 70% by weight of the colmatant. Laboratory studies have shown the effectiveness of ammonium bifluoride usage as an additive in sulfuric acid solutions that are effective for carrying out chemical treatments of colmatant. The complex of ammonium bifluoride - 10% solution of sulfuric acid or hydrochloric acid with the addition ammonium bifluoride 2-2.5% by weight was developed. X-ray

diffraction and electron analysis revealed the complete dissolution of the main colmatant element – gypsum. As the result of chemical processes new formations were observed. Changes were found in the surface morphology and in the formation of voids and cracks of colmatant. To sum up, the ammonium bifluoride complex can be successfully used as a chemical reagent for treating geotechnological wells during their regeneration.

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### **RESEARCH ARTICLE**

#### **PROVIDING PREVENTIVE ADVICE BY DENTAL HYGIENIST, AND PREVENTIVE METHODS OF ORAL DISEASES AMONG ADULTS, IN KINGDOM OF SAUDI ARABIA.**

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#### **Abstract**

**Purpose:** study to assess the performance of dental hygienists for their role at providing preventive advice to patients and assess preventive methods of oral diseases among adults in kingdom of Saudi Arabia.

**Methods:** A self-administered questionnaire was conducted electronically through social media websites and WhatsApp application. This study include randomly selected (658) participants from all kingdom of Saudi Arabia population.

**Results:** 51.5% visit private dental centers. 41.5% reported that dental hygienists had never talk to them. 46% usually commitment the advices of dental hygienists related to their teeth and oral health. 44.2% agreement that using miswak obviates using toothbrush and toothpaste. 91% believe that they can't use another family member's brush. 55.3% aren't smokers. 21% suffer bad mouth smell usually. 35.5% use toothbrush for other purposes as tongue cleaning or massage their gum.

**Conclusion:** There is shortening by dental hygienists in providing preventive advice to patients. Moderate awareness and practice of prevention methods among adults in kingdom of Saudi Arabia.

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#### **Introduction:-**

Optimal oral health care is attained when all members of the oral health care team work effectively together (1). As the public's oral health care needs change, the scope of practice in which oral health care providers can practice adapts to accommodate those changes. It is important to periodically evaluate the utilization of all members of the oral health care team to ensure the changing scope of practice is effective in providing for the public (2). Dental hygienists are highly educated professionals who complete rigorous training and meet strict standards of competency and practice (3). Dental hygienists have a specific scope of clinical procedures they provide to their patients. They assess a patient's condition in order to offer patient-specific preventative and educational services to promote and maintain good oral health.

The use of therapeutic methods assists their patients in controlling oral disease, while providing tailored treatment plans that emphasize the importance of behavioral changes (4). The complex professional role of the dental hygienist is often misunderstood other healthcare professionals (5). Furthermore, how the dental hygienist is utilized in the general dental practice is highly variable (2). Although clinical responsibilities vary based on individual state's scope of practice rules and regulations, the dental hygienists' role as a prevention specialist is constant throughout

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regions. Dental hygienists are trained to assess risk, educate and help patients manage and reduce risk for oral diseases (6).

Oral health is an integral element of general health and wellbeing. Good oral health enables individuals to communicate effectively, to eat and enjoy a variety of foods, and is important in overall quality of life, self-esteem and social confidence (7). Recent decades have witnessed improvement in the oral health status in developed countries attributable to changes in dietary habits, improved oral hygiene habits, and widespread availability and use of fluorides (8, 9). In addition, improved awareness related to oral health has been reported in developed countries and is cited as being partly responsible for better oral health (10, 11). However oral diseases, particularly dental caries and periodontal disease, remain a public health challenge (12). Changing patterns in the global diseases have been linked to changing lifestyles that include diet, use of tobacco, and consumption of alcohol. Changes in these lifestyle factors have a significant impact on oral health. Therefore, oral diseases qualify as a major public health concern (13). Oral diseases affect a significant proportion of the world's population and exact a heavy toll in terms of morbidity and mortality (14). A range of diseases and conditions can be classified as oral diseases including dental caries, periodontal diseases, oral cancers, noma, dental erosion and dental fluorosis (15). It has also become clear that causative or risk factors in oral disease are often the same as those implicated in the major general diseases (16). Oral disease is one of the four most expensive preventable chronic diseases, and in most cases these dental diseases are preventable (17). Inadequate knowledge of available preventive methods is related to non-adoption of preventive practices (18). Adoption of preventive practices and use of preventive modalities is a key message in most health education campaigns (11).

Given the importance of the role of dental hygienists as dental professionals, and the importance of oral diseases preventive means in maintaining the oral health and avoid oral diseases in general. Inadequate data is available about performance of dental hygienists for their role at providing preventive advice to patients and preventive methods of oral diseases among adults in KINGDOM OF SAUDI ARABIA. Researcher conducted this study to assess the performance of dental hygienists for their role at providing preventive advice to patients and assess preventive methods of oral diseases among adults in KINGDOM OF SAUDI ARABIA.

#### **Aims:-**

- To assess the performance of dental hygienists for their role at providing preventive advice to patients in KINGDOM OF SAUDI ARABIA.
- And assess preventive methods of oral diseases among adults in KINGDOM OF SAUDI ARABIA.

#### **Material and methods:-**

Across-sectional was study conducted by researchers, using a questionnaire consist of twenty seven multiple-choice questions divided in to three main domains. The first domain include demographic questions dealing with age, gender, and nationality. While second domain include questions dealing with assessing the scope to which the specialist dental duties. And the third dealing with preventive procedures that carried out by the participants to maintain their oral health. This study include (658) participants from all KINGDOM OF SAUDI ARABIA population, they were selected randomly, and answered the questionnaire electronically through social media websites and WhatsApp application.

#### **Statistical methods:-**

The statistical analysis program (SPSS v.22) was been used in the study in data entry and analysis, with the use of necessary statistical methods to achieve the objectives of the study. The following statistical methods were used:

- Frequencies.
- Percentages.
- Diagrams.
- Chi Square test.

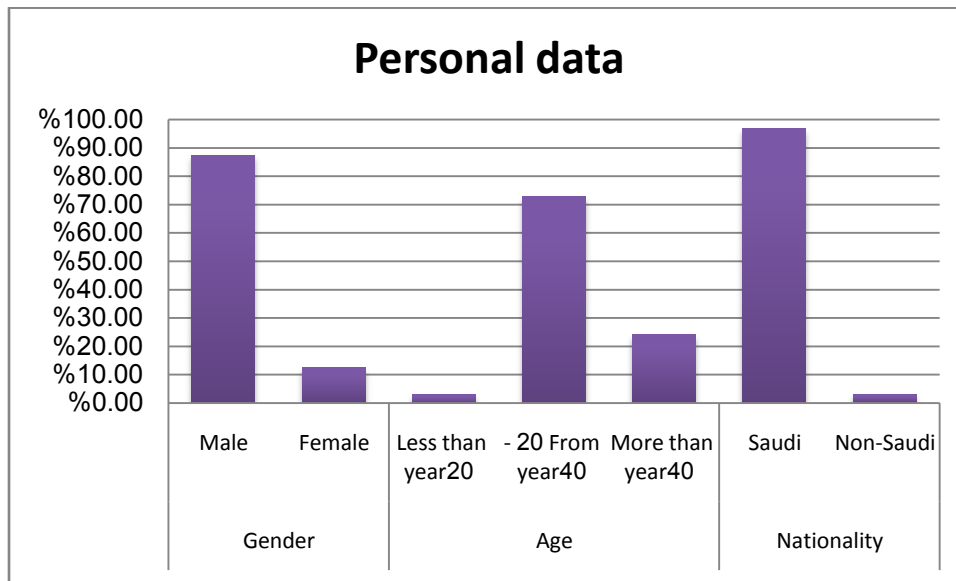
#### **Population & Sample of the Study:-**

The study population includes all KINGDOM OF SAUDI ARABIA population, the sample was (658) randomly chosen persons, they answered the electronic questionnaire through social media websites and WhatsApp application, 87.5% of them were males, while 12.5% of them were females. Most of them were Saudi.

And according to their ages; 72.9% of their ages were between (20 -40) years old, while 24.2% of them were more than (40) years old, and 2.9% of them were less than (20) years old. The next table illustrates that.

**Table (1):-** Personal data for the study sample. (N= 658).

Personal Data		Frequency	Percent
Gender	Male	576	87.5
	Female	82	12.5
Age	Less than 20 year	19	2.9
	From 20 - 40 year	480	72.9
	More than 40 year	159	24.2
Nationality	Saudi	637	96.8
	Non-Saudi	21	3.2



**Diagram (1):-** Personal data for the study sample.

**Results:-**

**Table (2):-** shows the participants’ distribution according to their commitment to the visits dates of oral health to follow up gum infections.

	Frequency	Percent
Yes	87	13.2
No	351	53.3
Sometimes	220	33.4
Total	658	100.0

We notice that more than half of the participants don’t commit to the visits dates of oral health and following gum infections.

**Table (3):** shows the participants distribution according to the type of the dental center they visit.

	Frequency	Percent
Private	339	51.5
Governmental	129	19.6
Private & Governmental	190	28.9
Total	658	100.0

We notice that more than half of the participants have the oral health care in private centers, while 19.6% of them visit governmental centers.

**Table (4):-** shows the participants' distribution according to whether the oral health specialist have talked to them or not.

	Frequency	Percent
Yes	205	31.2
No	273	41.5
Sometimes	180	27.4
Total	658	100.0

We notice that 41.5% of the participants haven't talked to their specialist about their oral health, while the others have talked to their oral health specialist about that. The next table shows the participants (who had a talk with their oral health specialist about some cases which it is supposed to be spoken by a specialist oral and dental health of the patient, and the extent of doing so) distribution.

**Table (5):-** shows the participants' distribution according to having a talk with their oral health specialist about some cases which it is supposed to be spoken by a specialist oral and dental health of the patient, and the extent of doing so. (N = 385)

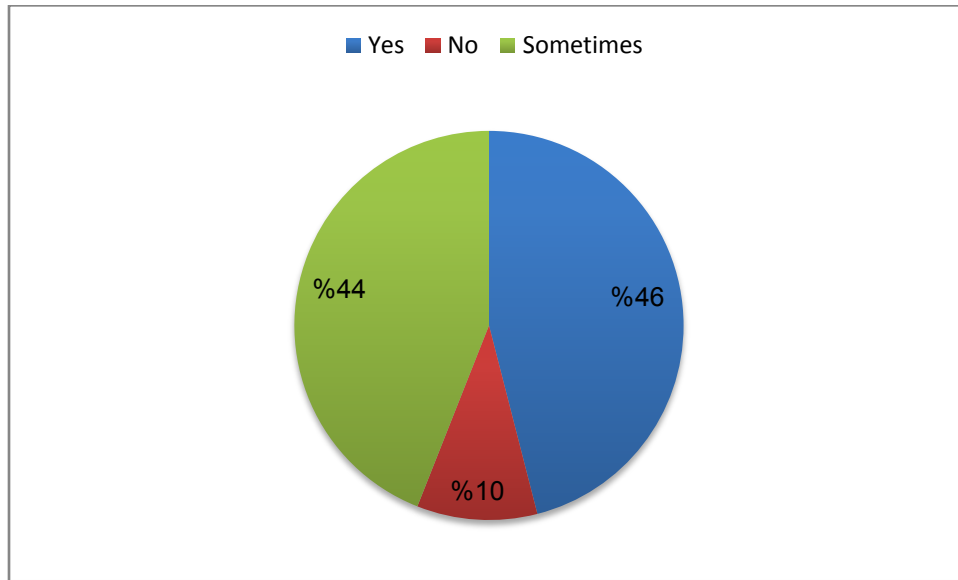
The question	Yes		No		Sometimes		P-value
	#	%	#	%	#	%	
Did your oral health specialist explain the causes of gum infections and how they relate to following the different methods of keeping oral health in a good case?	179	46.5	96	24.9	110	28.6	0.000**
Do your oral health specialist teach you the right and suitable way to brush your teeth?	178	46.2	134	34.8	73	19.0	0.000**
Do your oral health specialist explain the impact of smoking and tobacco types on the oral and dental health?	176	45.7	157	40.8	52	13.5	0.000**
Do your specialist teach you the necessity and how to use the dental floss?	114	29.6	208	54.0	63	16.4	0.000**
Do your oral health specialist explain the role of fluoridated toothpaste to keep the oral health in a good case?	131	34.0	168	43.6	86	22.3	0.000**
Do your oral health specialist explain the impact of oral diseases on your body and your heart?	108	28.1	229	59.5	48	12.5	0.000**

\*\* Chi square test significant at the 0.01 level.

We conclude from the previous table that 46.5% of the participants who had a talk with their oral health specialist, he explained the causes of gum infections and how they relate to following the different methods of keeping oral health in a good case, and 46.2% of them were taught about the right and suitable way to brush your teeth, 45.7% of them said that the impact of smoking and tobacco types on the oral and dental health was explained to them by the specialist.

While we find that 43.6% of the cases weren't taught the right and suitable way to brush their teeth, and 54% of them weren't told by their oral health specialist about the necessity and the way to use the dental floss, also 59.5% of them didn't have the impact of oral diseases on their body and heart explained.

**Diagram (2):-** shows the participants commitment extent in following the specialist's advices related to their teeth and oral health.



**Table (6):-** shows the participants distribution according to whether their dentists advised them with special toothpaste for teeth sensitivity if it happened after cleaning.

	Frequency	Percent
205	31.2	205
453	68.8	453
658	100.0	658

We notice that 60% of the participants' dentists didn't describe them special toothpaste for teeth sensitivity if it happened after cleaning.

**Table (7):-** the participants' distribution according the dentist advice about the number of time they should brush their teeth a day.

	Frequency	Percent
Once before sleeping	41	6.2
Twice, when getting up and before sleeping	286	43.5
After every meal	129	19.6
He didn't advise me to do that	202	30.7
Total	658	100.0

We notice that 43.5% of the participants were advised to brush their teeth twice a day, once before sleeping and once after getting up.

**Table (8):-** the participants' distribution according the dentist advice about the time they should replace their toothbrushes.

	Frequency	Percent
When the bristles begin to fade out	62	9.4
After 3-6 months of use	135	20.5
After flue infection or any infectious disease	20	3.0
He didn't tell me about that	441	67.0
Total	658	100.0

We notice that 67% of the participants weren't told about the suitable time to replace their toothbrushes, while 20.5% of them were advised to replace it after (3- 6) months of using it.

**Table (9):-** shows the participants distribution according to their agreement that using siwaak obviates using toothbrush and toothpaste.

	Frequency	Percent
Yes	291	44.2
No	265	40.3
I don't know	102	15.5
Total	658	100.0

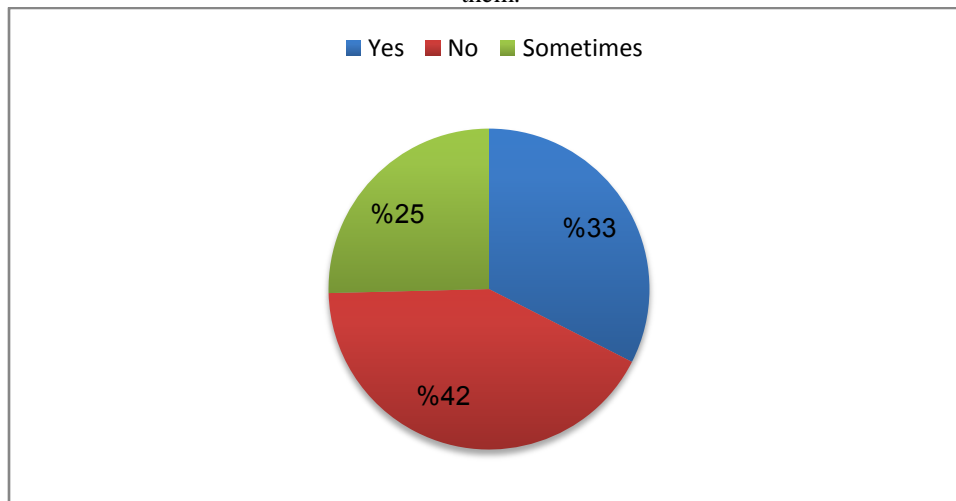
We notice that 44.2% of the participants belief that using swiaak obviates using toothbrush and toothpaste, while 40.3% of them didn't believe so.

**Table (10):-** shows the participants distribution according to whether they believe that they can use another family member's brush in the case of losing theirs.

	Frequency	Percent
Yes	21	3.2
No	599	91.0
I don't know	38	5.8
Total	658	100.0

We find that 91% of them told that they believe that it is wrong to use others toothbrushes in case they lost theirs.

**Diagram (3):-** shows the participants' distribution according to whether the suffer teeth sensitivity after cleaning them.



We notice that 42% of the participants don't suffer teeth sensitivity after cleaning them, while 33% of them suffer from that, and 25% of them sometimes suffer from that.

**Table (11):-** shows the participants' distribution in terms of doing some special oral hygiene and preventive measures.

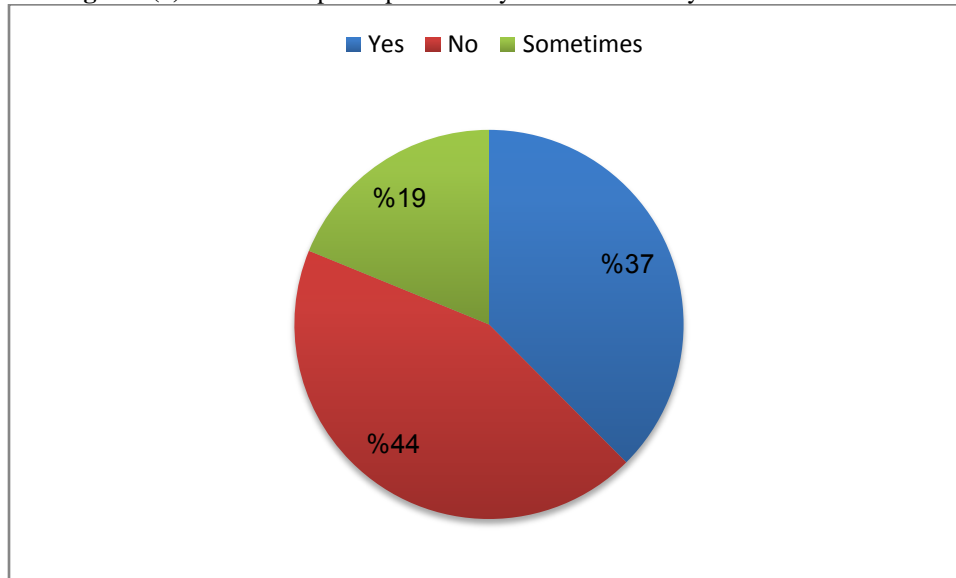
The question	Yes		No		Sometimes		P-value
	#	%	#	%	#	%	
Do you use special toothpastes for sensitivity?	169	25.7	361	54.9	128	19.5	0.000**
Do you periodically check your gum's health state (inflammation, bleeding and inflation or landing that causes tooth sensitivity)?	114	17.3	383	58.2	161	24.5	0.000**
Do you follow the specialist instructions to use mouth rinse or antiseptic oral solution?	224	34.0	229	34.8	205	31.2	0.481

\*\* Chi square test significant at the 0.01 level.

We conclude from the previous table that 54.9% of the participants don't use special toothpastes for sensitivity, 58.2% of them don't periodically check their gum's health state (inflammation, bleeding and inflation or landing

that causes tooth sensitivity, also we notice that 34.8% of them don't follow the specialist instructions to use mouth rinse or antiseptic oral solution, while 34% of them do, and 31.2% of them rarely follow the specialists instructions to do that.

**Diagram (4):-** shows the participants worry extent when they visit the dental clinic:



We notice that 44% of the participants don't feel worried when visiting the dental clinic, while 34% of the do, and 19% of them sometimes feel worried when visiting the dental clinic.

**Table (12):-** shows the participants' distribution in terms of smoking and mouth cleaning habits.

The question	Yes		No		Sometimes	
	#	%	#	%	#	%
Do you smoke or use any tobacco types?	249	37.8	364	55.3	45	6.8
Do you suffer any bad mouth smell?	138	21.0	284	43.2	236	35.9
Do you use toothbrush for other purposes as tongue cleaning or massage your gum?	230	35.0	320	48.6	108	16.4

We notice that 55.3% of the participants are not smokers and don't use any other types of tobacco, also we conclude that 43.2% of them don't suffer any mouth bad smell, while 35.9% of them sometimes suffer from bad mouth smell, and 21% of them already suffer from bad mouth smell.

Also we notice that 48.6% of the participants don't use their toothbrushes for other purposes, while 35% of them do.

**Discussion:-**

Oral health is an integral part of overall health and well-being. And oral disease is one of the four most expensive preventable chronic diseases (17). Dental hygienists are trained to assess risk, educate and help patients manage and reduce risk for oral diseases (6). So dental hygienists, as the primary preventive specialists of the dental team (20).In these topics data is rather scarce, especially in Saudi Arabia. Accordingly, the study was conducted to assess the performance of dental hygienists for their role at providing preventive advice to patients and assess preventive methods of oral diseases among adults in KINGDOM OF SAUDI ARABIA.

The majority of participants at this study were males. While the bulk of the participants ranged in age from 20 - 40 year old. And the most common nationality was Saudi. More than half of participants visit private dental center. This is a point we need to stop and then find out the cause of direction of most dental patients towards private sector. If there is a failure in the government sector must be dealt with.

Based on our results the dental hygienists didn't their required duty at providing advices to their patients, and provide them with preventive methods to avoid oral diseases. Whereas 41.5% of participants reported that dental hygienists had never talk to them. While only 27.4% reported that dental hygienists talk to them sometimes.

Despite increased access to water fluoridation, widespread use of fluoride toothpaste, and health-promotion efforts, periodontal disease, remain a public health challenge(12).And many previous epidemiological studies estimated that the prevalence of adult gingivitis varies from approximately 50-100% for dentate patients (21). We found from participants whose reported that dental hygienists talk to them about 24.9% reported that dental hygienists didn't explain the causes of gum infections and how they relate to following the different methods of keeping oral health in a good case for them.

Despite dental professionals should encourage patients' self-confidence to brush and floss at recommended levels and discuss strategies that combat barriers to performance(22).from the participants who had spoken to dental hygienists, 34.8% reported that dental hygienists didn't teach them the right and suitable way to brush their teeth. While more than half reported that dental hygienists didn't teach them the necessity and how to use the dental floss. From the participants who had talk to dental hygienists, 40.8% reported that dental hygienists didn't explain the impact of smoking and tobacco types on the oral and dental health for them. Although the Smoking is a risk factor for poor oral health and oral diseases (23).

Daily tooth brushing with fluoridated toothpastes is important for preventing dental caries (24). However 43.6% reported that dental hygienists didn't explain the role of fluoridated toothpaste to keep the oral health in a good case. A large number of publications have suggested that oral infection, especially periodontitis, are a potential contributing factor to a variety of clinically important systemic diseases (25). its mean that good oral health is important not only to prevent oral disease but also to maintain good general health. However 59.5% reported that dental hygienists didn't explain the impact of oral diseases on their body and heart.

Generally only 10% didn't follow the specialist's advices related to their teeth and oral health.

Given that these percentages mentioned previously referto part from the participants who had spoken to dental hygienists not from all participants, If compared with the total number of participants, it will show the extent of the negligence of dental hygienists in providing advice to patients. Ghasemiet al., reported at their study in Iran that dentists' knowledge of and attitudes towards prevention should be improved and updated to enable and encourage them to provide their patients with preventive care (26).

Concerning awareness of prevention methods. Adequate awareness is a necessary enabling factor for self-care which can prevent and/or control many oral diseases (27). The results showed moderate and awareness practice of prevention methods among participants. While Al-Ansari found that preventive methods is not prevalent among Saudi adults.

44.2% of the participants belief that using miswak obviates using toothbrush and toothpaste. When used properly, the miswak is reported to be as effective as a toothbrush (29,30).The mode of transmission of cariogenic bacteria appears to be contact, either direct or indirect. Direct contact is commonly by kissing, so that oral flora is transmitted in saliva; indirect contact occurs via objects such as a cup, utensils, toothbrush, or even shared toys, which are contaminated with cariogenic bacteria (31,32,33).In this study the vast majority believe that they can use another family member's brush in the case of losing theirs.

34% of the participants feel worried when visiting the dental clinic, this finding close to Al-Dosari who found that 35% with dental fear in KINGDOM OF SAUDI ARABIA (34). In Australia, High dental fear affects approximately one in six Australian adults (35).

Smoking is a risk factor for poor oral health and oral diseases (23).One of the reports published about smoking status in Saudi Arabia suggests a wide range for the prevalence of smoking (2.4–52.3%) (36). In the present study, 37.8%were found to be currently smoking. This value is on the higher side of the range mentioned. Oral and dental health care of non-smokers has been found to be better than that of smokers (37).A direct correlation was found to exist between oral hygiene practices and oral hygiene conditions associated with halitosis (38). 21% of the participants suffer any bad mouth smell.

**Conclusion:-**

Dental hygienists didn't their required duty at providing advices to their patients, and provide them with preventive methods to avoid oral diseases. The results showed moderate awareness and practice of prevention methods among adults in KINGDOM OF SAUDI ARABIA.

**Recommendations:-**

- Conduct training for dental hygienists about the importance of and how to provide preventive advice to patients.
- Study the cause of the failure of the dental hygienists, in turn, to provide preventive advice to patients.
- Need to increase the awareness of smoke-related problems and target the smokers group with smoke cessation programs.

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### RESEARCH ARTICLE

## EVALUATION OF PARAMETERS THAT AFFECT MINIMUM MISCIBILITY PRESSURE DURING GAS INJECTION PROCESSES

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#### Abstract

The application of (CO<sub>2</sub>) miscible gas displacement at a minimum miscible pressure causes the reduction of fluid viscosity and lowers the interfacial tension between the reservoir fluid and injected gas thereby enhancing maximum fluid recovery at the time when the reservoir energy is stunted.

There are usually parameters that affect the minimum miscibility pressure (MMP) in such way that gas and reservoir fluids are mixed together in single homogeneous phase. These parameters as discussed herein are analyzed using PVTi, Eclipse 300 simulation software. The software utilized Peng-Robinson equation of state model (PR3) to create an injection environment and analyze necessary parameters that affect MMP.

The simulation results showed that MMP increases as temperature increases and decreases as reservoir fluid composition moves from light to heavy fluid. Observations also showed that MMP increases with increase in mole percent of injected gas (CO<sub>2</sub>). It is therefore important to effectively analyze and control parameters affecting MMP in order to achieve maximum recovery of reservoir fluid, dependent on operators' discretions.

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#### Introduction:-

Several schemes are usually considered and or adopted to improve oil recovery from reservoirs at times when the primary energy of the reservoir can no longer support economic recovery. The term 'Enhanced Oil Recovery' principally refers to the recovery of oil by any method beyond the primary stage of oil production through processes that help to increase the primary reservoir drive. These processes may include pressure maintenance, injection of displacing fluids or other methods, such as thermal techniques. Therefore, by definition, EOR techniques include all methods that are used to increase the cumulative oil produced (oil recovery) as much as possible.

In immiscible gas injection, flooding by gas is conducted below MMP. This low pressure injection of gas is used to maintain reservoir pressure to prevent production cut-off, and thereby increase the rate of production. The combination of light crude, relatively high reservoir temperature and relatively low reservoir pressure favours immiscible gas injection.

In miscible gas injection, the gas is injected at or above MMP, which causes the gas to be miscible in the oil. This study focused more on the miscible gas injection (Carbon dioxide injection).

It is well known that the amount of GHG (greenhouse gases) especially CO<sub>2</sub> in the atmosphere has resulted in climate change and global warming which are big concerns for human comfort in recent years. There are number of ways to reduce the amount of CO<sub>2</sub> in the atmosphere, one of which is CO<sub>2</sub> geological sequestration in oil reservoirs. Researchers have discussed that this method cannot only minimize the concentration of CO<sub>2</sub> in the atmosphere, but can also improve additional oil recovery by CO<sub>2</sub> flooding as a method of Enhanced Oil Recovery.

The main mechanisms of oil recovery by CO<sub>2</sub> injection has been identified as;

- Reducing viscosity of oil
- Swelling the crude oil
- Lowering the interfacial tension between the oil and the CO<sub>2</sub>/Oil phase in the miscible regions
- It also produces miscibility since it has lower MMP and solubility process.

The basic parameter for determining if Carbon dioxide injection can be applied for an oil field is its minimum miscibility pressure (MMP) which can be estimated through computations and experiments such as slim-tube experiments, mixing-cell experiments, rising bubble/falling drop experiments, and vanishing interfacial tension experiments. The MMP is the lowest pressure for which a gas can develop miscibility through a multi-contact process with a given reservoir oil at the reservoir temperature. Miscibility can be either be in form of first contact miscibility (FCM) or multi contact miscibility (MCM). First contact miscibility (FCM) refers to the state when the fluids reach miscibility with the first contact between them; while MCM refers to the state which fluids reach miscibility after several contacts.

Gardner in 1981; Holm and Josendal in 1982; Harmon and Grigg in 1988; Turek in 1988; Creek and Sheffield in 1993 had established that MMP depends on the composition of the crude oil and injected gas, and temperature of the fluids. In 2012, Yan further noted that pressures higher than minimum miscibility pressure achieves recovery expected to reach 100% in microscopic scale.

#### **Study Objective:-**

- The study aimed at investigating the parameters that affect the lowest pressure (minimum miscibility pressure) which gas (CO<sub>2</sub>) will be miscible when injected into a reservoir fluid for optimum fluid recovery while using PVTi software/ platform.

#### **Scope of Study:-**

Reservoir fluid properties and phase was established on PVTi platform

#### **Research Approach:-**

Generally, the injection of gas into the reservoir results in an increased production. However different parameters affect the rate of miscibility of gas with oil such as reservoir fluid composition, injection gas composition, temperature, density of the reservoir fluid and C+ mole weight. In this study, these parameters were evaluated to determine its effects on MMP.

#### **Fluid Characterization and Generation of PVT Tables:-**

To obtain the PVT properties of different hydrocarbons, PVTi software based on Peng-Robinson Equation of State Model was used. Multiple Equation of State (EOS) models exist defining the pressure, temperature and volume (PVT) relationship of fluids but Peng-Robinson equation of state model generates MMP at multi-contact miscibility. The PVT data was added to the main simulator for injection study experiment, i.e., Eclipse 300 as the simulation software package then PVTi as sub program for carrying out injection study.

Different gas compositions were used to perform these simulations at a multi-contact test. For each gas composition the simulations were performed with a specific temperature to obtain the effects of gas composition and temperature variation on MMP.

Different pure hydrocarbons were also used to perform injection study simulations at multi-contact to obtain the effects of reservoir fluid variation.

**Injection of gas into Reservoir Fluid at Different Temperature:-**

Gas was injected into the reservoir fluid in a multi contact miscibility test at different temperature to obtain the effects of temperature on MMP.

The properties of CO<sub>2</sub> and the hydrocarbon used in this simulation are shown in Table 1.0 below at temperature of 500° k, 450° k, 400° k, 380° k, 350° k, 330° k, 300° k, 250° k, 200° k, 150° k and 144°

**Table 1.0:-** Reservoir Fluid and Injected Gas Composition.

COMPONENT	RESERVOIR FLUID MOL %	INJECTION GAS MOL %
N <sub>2</sub>	2.81	12.5
CO <sub>2</sub>	0.51	75.4
C <sub>1</sub>	75.5	6.5
C <sub>2</sub>	7.92	4.6
C <sub>3</sub>	4.82	1
IC <sub>4</sub>	1.13	0
NC <sub>4</sub>	1.54	0
IC <sub>5</sub>	0.59	0
NC <sub>5</sub>	0.52	0
C <sub>6</sub>	0.50	0
C <sub>7</sub>	1.51	0
C <sub>8</sub>	0.79	0
C <sub>9</sub>	0.73	0
C <sub>10</sub>	0.23	0
C <sub>11</sub>	0.20	0
C <sub>12</sub>	0.18	0
C <sub>13</sub>	0.13	0
C <sub>14</sub>	0.12	0
C <sub>15</sub>	0.07	0
C <sub>16</sub>	0.05	0
C <sub>17</sub>	0.04	0
C <sub>18</sub>	0.03	0
C <sub>19</sub>	0.02	0
C <sub>20+</sub>	0.06	0

**Different Gas Composition injected at Constant Temperature:-**

Injecting different gas composition in the same fluid composition at a constant temperature of 490° was performed to check the effect of gas composition on MMP.

**Table 2.0:-** Summary of different Gas Composition Injected at Constant Temperature of 490° k.

COMPONENT	RESERVOIR FLUID (MOLE %)	INJECTION GAS (MOLE %)								
		M1	M2	M3	M4	M5	M6	M7	M8	M9
CO <sub>2</sub>	38	32	56.5	64.5	72	76	85	92	98.5	100
C <sub>1</sub>	26	29.8	19.6	9.2	12.8	5.5	6.3	2.1	0.2	0
C <sub>2</sub>	3	22.4	12.5	18.8	4.1	6.5	2.1	1.1	0.2	0
C <sub>3</sub>	3	12.6	2.2	4.3	4	3.5	1.1	2.4	0.1	0
C <sub>4</sub>	3	3.1	6.2	2	4.1	2.5	3.5	1.4	0.5	0
IC <sub>4</sub>	3	0.1	3	1.2	3	6	2	1	0.5	0
NC <sub>4</sub>	3	0	0	0	0	0	0	0	0	0
IC <sub>5</sub>	3	0	0	0	0	0	0	0	0	0
NC <sub>5</sub>	3	0	0	0	0	0	0	0	0	0
C <sub>6</sub>	3	0	0	0	0	0	0	0	0	0
C <sub>7+</sub>	15	0	0	0	0	0	0	0	0	0

From Table 2.0, it can be seen that all the gases were injected at the same reservoir fluid and the resultant density of fluid, mole weight of fluid and concentration of CO<sub>2</sub> were tabulated and plotted to check the effect of these parameters on MMP as will be shown in the result.

#### Different Reservoir Fluid Simulated at Constant temperature and Injection Gas:-

Different pure hydrocarbons also were used to perform injection test at multi-contact miscibility to obtain the effects of reservoir fluid variation at constant temperature of 550° k. See Tables 3.0 and 4.0 below.

**Table 3.0:-** First Reservoir Fluid and Injected Gas Composition at Temperature of 550° k.

COMPONENTS	RESERVOIR FLUID MOLE %	INJECTED GAS MOLE %
N <sub>2</sub>	3.42	0.2
CO <sub>2</sub>	0.62	98
C <sub>1</sub>	38.2	0.6
C <sub>2</sub>	18.2	0.1
C <sub>3</sub>	16.1	0.4
IC <sub>4</sub>	3.62	0.7
NC <sub>4</sub>	2.42	0
IC <sub>5</sub>	1.32	0
NC <sub>5</sub>	2.50	0
C <sub>6</sub>	1.50	0
C <sub>7+</sub>	12.1	0

**Table 4.0:-** Second Reservoir Fluid and Injected Gas Composition at Temperature of 550° k.

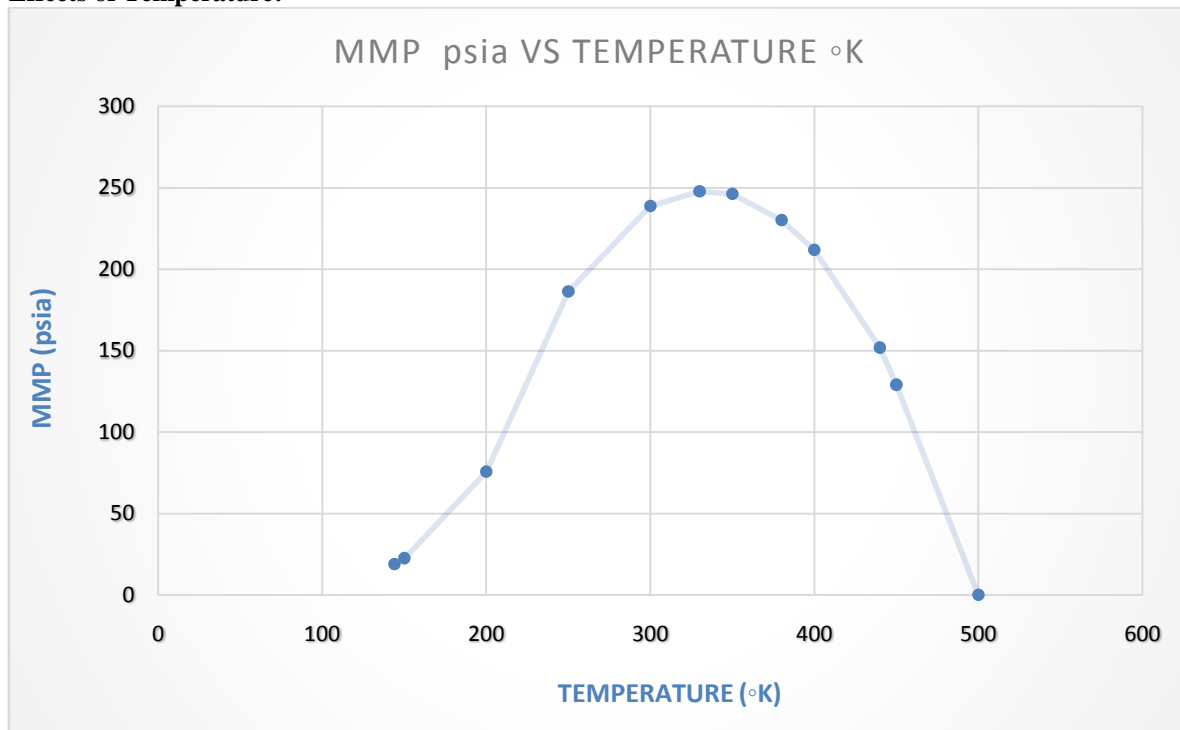
COMPONENTS	RESERVOIR FLUID MOLE %	INJECTED GAS MOLE %
N <sub>2</sub>	0.10	0.2
CO <sub>2</sub>	0.62	98
C <sub>1</sub>	44.99	0.6
C <sub>2</sub>	16.64	0.1
C <sub>3</sub>	13.41	0.4
IC <sub>4</sub>	0.82	0.7
NC <sub>4</sub>	3.05	0
IC <sub>5</sub>	2.51	0
NC <sub>5</sub>	1.37	0
C <sub>6</sub>	1.85	0
C <sub>7+</sub>	14.64	0

**Table 5.0:-** Summary of Reservoir Fluid and Injected Gas Composition

COMPONENTS	RESERVOIR FLUID MOL %			INJECTION GAS MOL %
	Z <sub>1</sub>	Z <sub>2</sub>	Z <sub>3</sub>	
N <sub>2</sub>	3.42	0.10	2.38	0.2
CO <sub>2</sub>	0.62	0.62	0.57	98
C <sub>1</sub>	38.2	44.99	52.49	0.6
C <sub>2</sub>	18.2	16.64	8.10	0.1
C <sub>3</sub>	16.1	13.41	8.18	0.4
IC <sub>4</sub>	3.62	0.82	2.64	0.7
NC <sub>4</sub>	2.42	3.05	3.42	0
IC <sub>5</sub>	1.32	2.51	1.33	0
NC <sub>5</sub>	2.50	1.37	1.05	0
C <sub>6</sub>	1.50	1.85	0.89	0
C <sub>7+</sub>	12.1	14.64	18.95	0

#### Results and Analysis:-

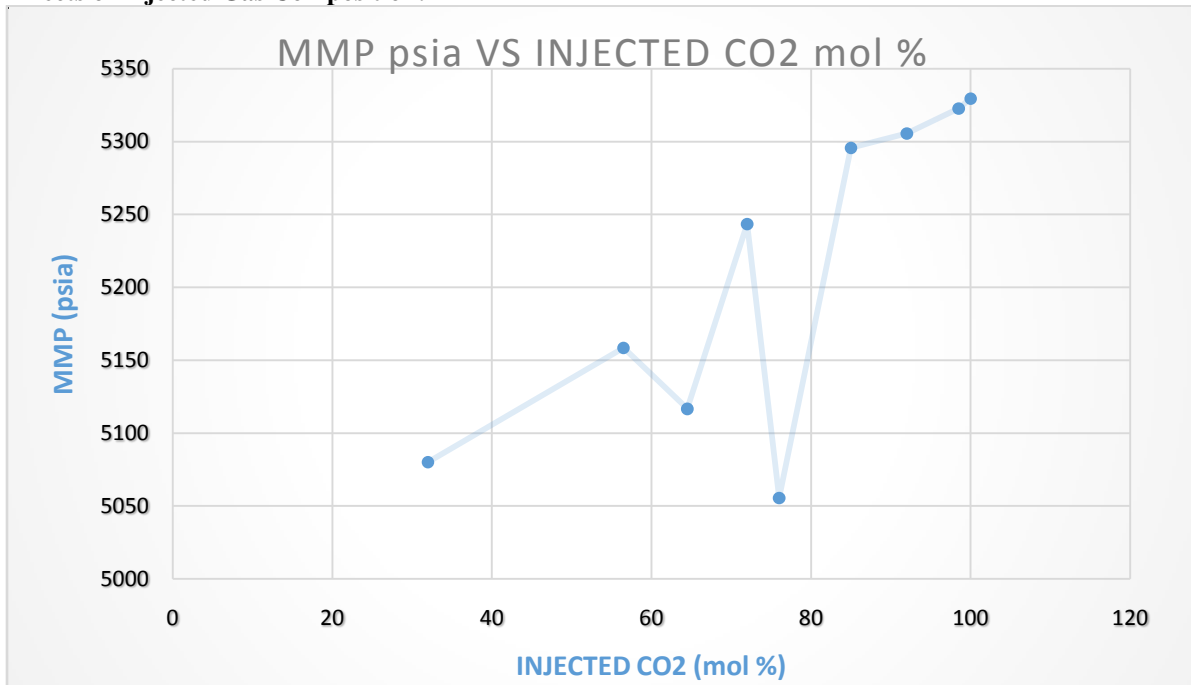
After the simulation runs and considering its sensitivity nature to temperature, injected gas composition, reservoir fluid composition and C<sub>7+</sub> mole weight the results obtained are as shown below;

**Effects of Temperature:**

**Figure 1:-** The Effect of temperature on MMP

From the graph, at temperature below 144°k and above 500°k the MMP is equal to zero or cannot be determined. At temperature of 330°k MMP have its maximum value of 247.7751psia. This thereforeshows thattemperature has great effect on MMP and can be altered in order to increase or decrease MMP.

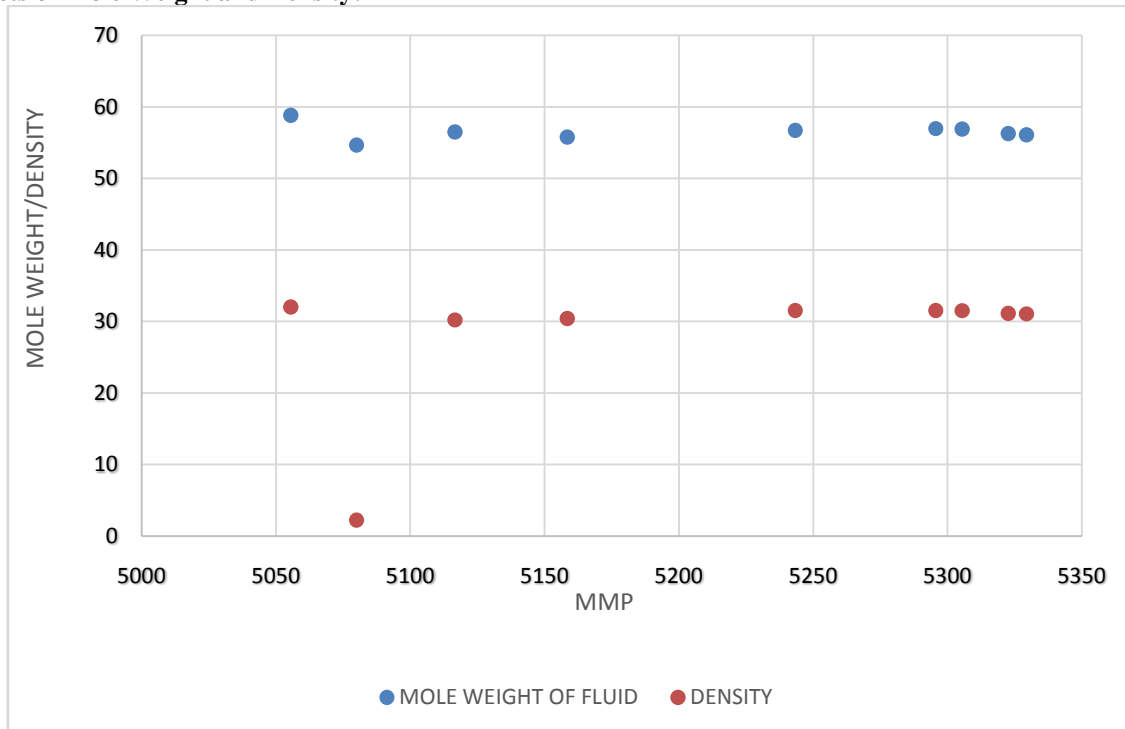
**Effects of Injected Gas Composition:**



**Figure 2:-** The Effect CO2 Composition on MMP

There is an observed sudden drop of MMP at 76% mole concentration of CO2 and continuous increase until 100% CO2 concentration. It implies that at 100% concentration of injected gas, highest value of MMP is achieved.

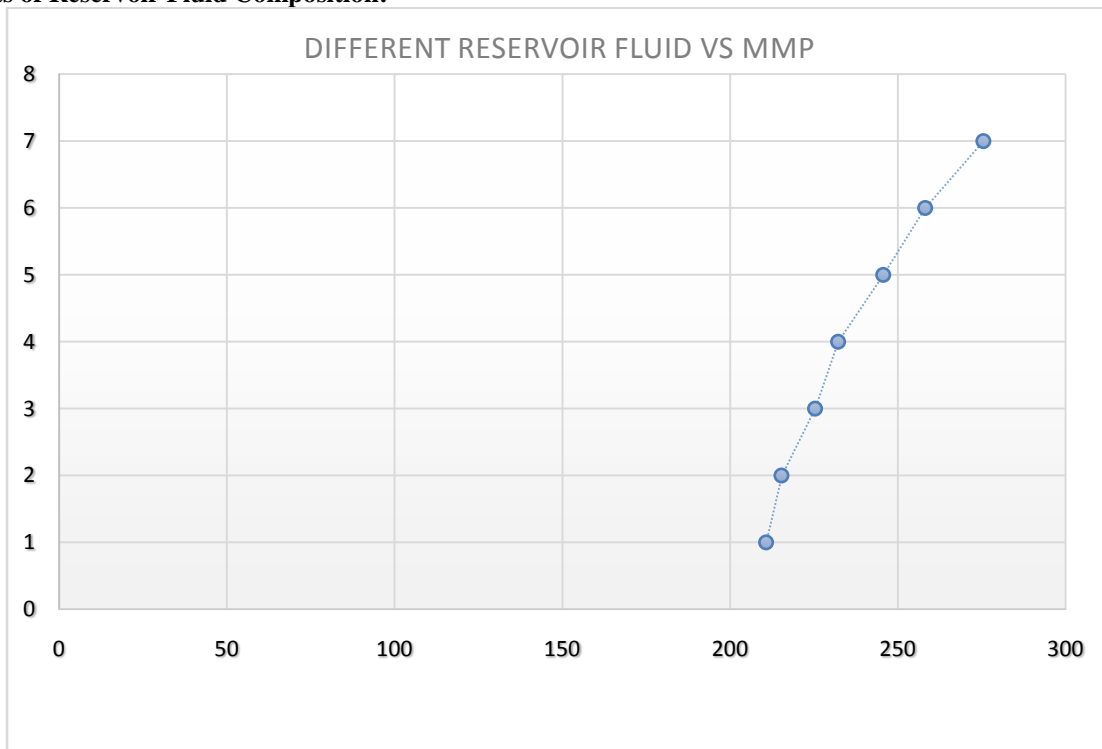
**Effects of Mole Weight and Density:**



**Figure 3:-** The Effect of Fluid Mole Weight and Density on MMP

From the graph it shows that fluid mole weight and density have low effect on MMP, as both parameter increases as MMP increases.

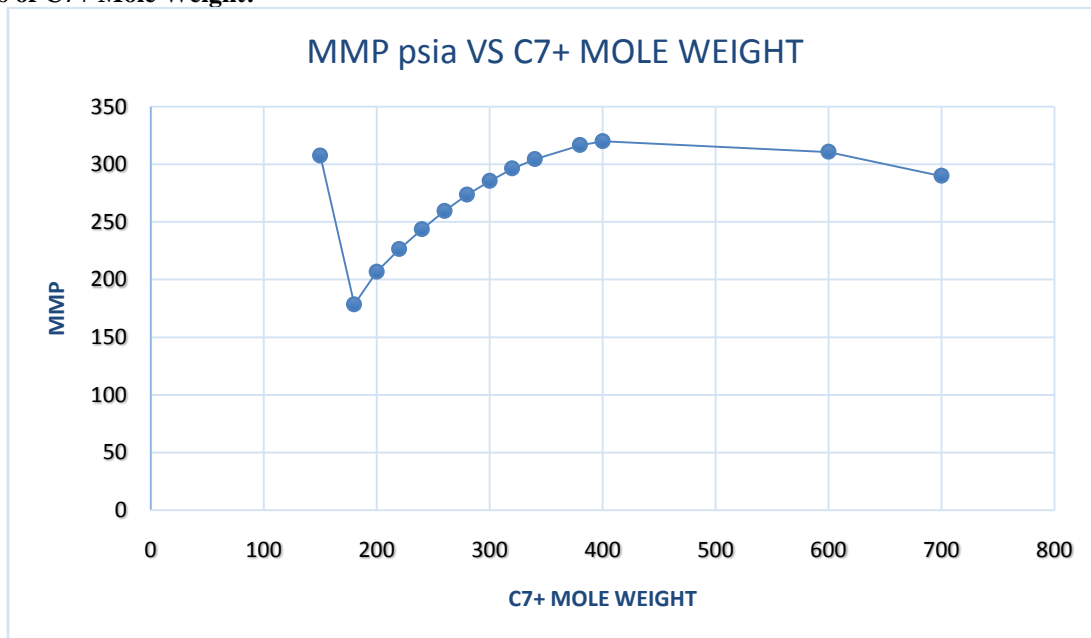
**Effects of Reservoir Fluid Composition:**



**Figure 4:-**Effects of Reservoir Fluid Composition on MMP

Reservoir fluid injected ranges from crude with C1 of 38.2 to 75.6 mole percent which implies heavy fluid to more volatile or light fluid. This implied therefore that lighter fluid has higher MMP than heavy crude. There will be higher CO<sub>2</sub> displacement in lighter fluid.

**Effects of C7+ Mole Weight:**



**Figure 5:-** The Effects of C7+ Mole Weight on MMP



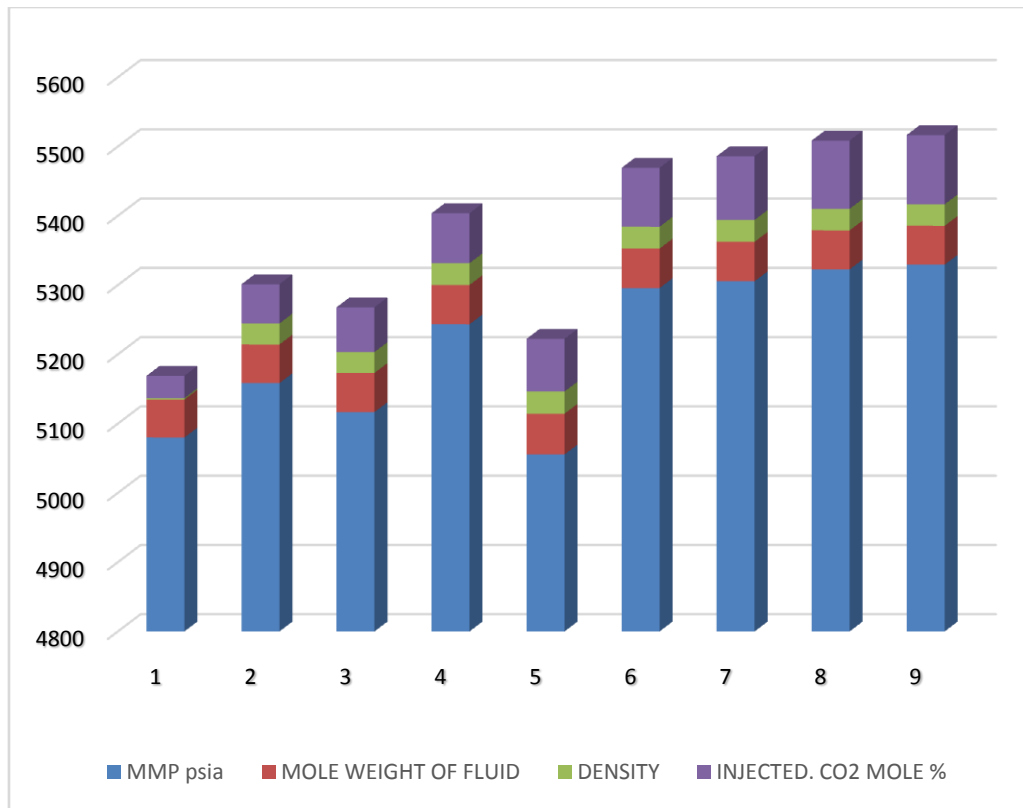


Figure 6:- The Combined Effect of Mole Weight of Fluid, Density and Injected Gas

### Conclusion:-

From this study, it has been established that:-

- ❖ Temperature has high effect on the minimum miscibility during CO<sub>2</sub> injection
- ❖ Composition of the injected gas affects the MMP
- ❖ Composition of the reservoir fluid affects the MMP
- ❖ C<sub>7+</sub> mole weight affects the MMP
- ❖ Density and reservoir fluid mole weight have row effects on MMP

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## RESEARCH ARTICLE

### EFFECT OF PREVIOUS PCI ON RESULTS OF CABG IN MULTIVESSEL DISEASE PATIENTS

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#### Abstract

The number of percutaneous coronary interventions (PCI) prior to coronary artery bypass grafting (CABG) increased drastically during the last decade. Patients are referred for CABG with more severe coronary pathology, which may influence postoperative outcome.

**Methodology:-**Outcomes of 200 CABG patients were compared (mean follow-up: 3 months). Group I (n = 100) underwent primary CABG and group II (n = 100) had prior PCI before CABG.

**Result:-** Morbidity, were significantly higher in patients with prior PCI but no difference in mortality. Postoperative echo emphasize lower benefit from CABG in patents coming with recurrence CAD post PCI.

**Conclusion:-** With the growing evidence that previous PCI adversely influences the outcome of subsequent CABG, we may expect that prior PCI emerges as a risk factor in new outcome prediction and risk stratification models in cardiac surgery

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#### Introduction:-

With technological advances and changes in clinical practice, the respective values of coronary artery bypass surgery and percutaneous coronary intervention needed to be reassessed. The SYNTAX randomized trial is an attempt to provide an evidence base to determine the best treatment option for patients in a real-world population seen by the surgeon and the interventional cardiologist in their daily practice. (1)

The previous comparative studies clearly demonstrated that there was no difference between the two therapeutic modalities regarding mortality and non fatal myocardial infarction but patients treated with stenting whether bare metal stent or drug eluting stent required more often repeating revascularization procedures related to restenosis (2, 3).

It is supposed that patients with a previous PCI are at higher risk for CABG, however, only a few studies are available and contradictory: some authors suggest that initial PCI may complicate the operation and may increase postoperative morbidity and mortality. Others describe no difference in postoperative morbidity and mortality. (4).

The objective of this study is Comparing the outcome of patients who undergoes primary CABG and those who had primary PCI as first line of treatment before CABG and come back for CABG due to instent restenosis.

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## Patients and Methods:-

Two hundred patients underwent CABG in the period between May, 2009 and January 2011 in NHI (National heart institute), they were prospectively divided to two groups, Group I ( non stent group) and Group II ( stent group), Our study was built on the guidelines of STS database and Euro score calculation. Group I (n = 100) and group II (n = 100,) with mean number of stents 1.98, 51% of them were Drug eluting stents (DES)). The mean time between PCI and CABG was  $11 \pm 9$  months.

Patients with single vessel disease, combined CABG with other procedure except treatment of ischemic Mitral incompetence, redo CABG and emergency CABG as well as patients after PCI due to dissection or tamponade were excluded from the study to avoid there un predicted effect on the outcome of CABG.

Patients were evaluated by history and physical examination, routine labs, ECG, Carotid Doppler and duplex, study of their coronary angiography SYNTAX score was calculated.

Operative data included OPCAB versus on pump, type of myocardial preservation on pump, time of aortic cross clamp and extra corporeal circulation time, number of grafts, arterial and venous grafts and total or incomplete revascularization.

Post operatively data were inotropic supports (dose and duration), use of IABP, ventilation time, Perioperative MI, reopening for bleeding, arrhythmias and its type, post operative organ failure, signs and symptoms of heart failure, superficial and deep wound infection including dehiscent sternum, ICU and Hospital stay, in addition to mortality. This was followed by echo pre-operative and 3 months post operative Echocardiographic examination was conducted using a Wingmed Vivid 9 echocardiography device (GE Medical System, Horten, Norway).

Statistical analysis ; was done by collecting the data, revising and verifying it then it was edited on PC. Data was analyzed by Microsoft Office 2003 (excel) and Statistical Package for Social Science (SPSS) version 10.

## Results:-

Extracardiac arteriopathy, preoperative planned valvular surgery (repair or replacement), in addition to CABG (4 vs 0. P value = 0.043) were higher in the first group while unplanned CABG {patient was not admitted for CABG but the decision was made in hospital in a hemodynamically stable patient} (0 vs 8. P value = 0.004) and Previous MI (25 vs 69. P value = 0.00001) were higher in the second group.

Preoperative Coronary angiography showed no statistical difference in number of patients with left main disease or number of diseased vessels. The old therapeutic CA was studied also and showed that mean number of stents was 1.98, 51% of them were DES. 30% of the PCI group had multiple interventions.

SYNTAX score was calculated for group II before therapeutic CA and before surgery for group I and II preoperatively. The mean SYNTAX score for group II before stent was 10.96 but it increased to be 18.77 preoperatively which was not significant when compared to group I which was 20.69. Group II before stent had 92% low score, 8% intermediate score and 0% high score while pre operatively 72% were only low score, 24% intermediate score and 4% have become high score. On the other hand group I had 63% low score, 29% intermediate score and 8% high score. **(Table 1).**

Total revascularization is significantly higher in the non PCI group, where 79 patients were totally revascularized compared to only 50 patients in group B (P value=0.00001). **(Table 2).**

In fact hospital stay was longer for group II ( $9.30 \pm 3.80$  days vs  $11.23 \pm 3.80$  days) (P value 0.000595). Total morbidity was significantly higher in the second group than the first group (40 vs. 66 P value=0.001).. Mortality rate was the same between the two groups (7 vs 6 P value=0.774). **(Table 3).**

On comparing between preoperative echo and the post operative echo of each patient there were statistical significance towards group I in all criteria which included improvement of dimensions, and EF **(Graph1).**

**Table 1:-**Demographic data and preoperative variables

	Group I	Group II	P value
Mean Age	57.20	53.25	0.000851
MALE/FEMALE	91/9	82/18	0.494
Smoking	48	49	0.887
Diabetes	61	61	1.000
Hypertension	27	37	0.130
Dyslipidemia	47	40	0.318
Family history	9	15	0.933
WBCS (X1000/CCM)	7.42	7.56	0.719954
Hb (gm. %)	14.69	13.44	0.102066
PLTS (x1000/ccm)	270.96	203.65	1.5209
Blood sugar (mg%)	166.42	183.63	0.11298
INR	1.07	1.05	0.413713
Urea (mg/dl)	36.10	32.70	0.134877
CR. (mg/dl)	0.99	1.01	0.770131
SGOT (U/L)	29.34	27.02	0.260144
SGPT (U/L)	27.56	26.08	0.436577
CCS1	37	19	0.016
CCS2	25	46	0.013
CCS3	21	28	0.317
CCS4	17	7	0.041
NYHA1	4	10	0.109
NYHA 2	59	42	0.091
NYHA 3	17	19	0.739
NYHA 4	20	29	0.199
Heart failure.	2	0	0.155
Cardiogenic shock	0	2	0.155
Unstable angina	14	14	1.000
Previous MI.	25	69	<0.0001
Recent MI	7	6	0.774
Previous cardiac surgery	2	2	1.000
Extra cardiac arteriopathies	16	7	0.046
Mean ESD PRE(cm)	3.87	3.66	0.09195
Mean EDD PRE(cm)	4.95	5.21	0.02134
Mean EF PRE	55.59	56%	0.09195
Mean EURO score (logistic)	2.95	2.28	0.245961
LT main patients	10	18	0.103
Mean No of diseased vessels	3.34	3.28	0.35849
SYNTAX score (preoperative	20.69	18.77	0.069177

**Table 2:-**Operative data variables

	Group I	Group II	P value
OPCAB	26	35	0.167
Mean ACC time (min.)	69.49	61.81	0.099376
Mean Bypass time (min.)	102.07	91.47	0.092623
Mean No of grafts	3.12	2.46	0.000001
Mean No of arterial grafts	1.24	1.07	0.00688
Mean No of venous grafts	1.89	1.39	0.000001
Total Revascularization	79	50	<0.0001

**Table 3:-** postoperative variables

	Group I	Group II	P value
Inotropes	40	62	0.002
IABP	11	13	0.663
Hours of ventilation	10.22	12.31	0.19888
ICU stay(days)	3.30	2.89	0.391887
Hospital stay(days)	9.30	11.23	0.000595
Clinical symptoms of HF	11	11	0.919
Reopen for bleeding	9	25	0.002
Dehiscent sternum	9	5	0.303
Superficial Wound infection	17	38	0.001
Deep Wound infection	2	12	0.004
Arrhythmias	10	21	0.023
Post operative organ failure	2	2	0.967
Peri operative MI	18	18	1
Total Death	7	6	0.774

**Table 4:-** 3months postoperative echo

	Group I	Group II	P value
ESD POST(cm)	3.46	3.50	0.714769
EDD POST(cm)	4.45	5.09	0.3107
EF POST	60.20	58%	0.0001
RSWMA POST	16	43	<0.0001

**Discussion:-**

The interventional efficacy and relative benefits have been compared in several randomized and observational studies. However, patients who undergo successful myocardial revascularization may subsequently require repeat invasive cardiological or surgical intervention. (5).

When a patient is eligible for both procedures, PCI is often preferred than surgery. The initial choice of PCI is reinforced by the perception that patients can safely be referred to surgery after PCI. (6). However in the *SYNTAX study*, 3-year MACCE rates were significantly higher for PCI than CABG; this was mainly driven by higher incidence of the need to repeat revascularization in the PCI arm, in addition to increase number of MI among patients of PCI group, compared to CABG (1,7).

Patients in the PCI group showed higher CCS classification which may signify more clinical deterioration and the more severity of the lesions in the arteries post stenting. Also this may be due to the closure of collateral circulation which close after PCI and don't have enough time to reopen during stent thrombosis or restenosis, especially with DES patients, this theory may also emphasize the cause of increase numbers of MI in the PCI group also which was the same as other relative studies. (8,9).

Although the PCI group has higher incidence of previous MI, yet there was no difference between the two groups in the recent MI (within 30 days) before surgery and this was reflected on equal percentage between the two groups in critical preoperative state, but the PCI group has higher number of patients who underwent unplanned CABG. This may be due to the fear of progression of the chest pain to MI in the PCI group which was not the condition with the non PCI group. This also may be due to coronary stents specially DES which are causing arterial wall injury, leading to dysfunctional and denuded coronary endothelium with chronic inflammatory response and platelet and neutrophil adhesion, which in turn are causing adverse cardiovascular events.(7)

The non PCI group in our study showed higher percentage of patients having extra cardiac arteriopathy, this finding may be related to the older age of the non PCI group. This doesn't coincide with other studies which showed no significant difference between both groups. (7, 9, 10, 11)

Regarding the **pre operative echo** it was found that although the preoperative ESD and EF showed no difference yet the EDD was higher in the second group which indicates that previous PCI may have a hidden effect on the myocardium which was noticed by higher incidence of previous MI in the same group. By further evaluation of the preoperative EF by dividing it into good (more than 50%), moderately impaired (30-50%) and severely impaired (less than 30%), no difference was found between the two groups. There was no difference in the preoperative resting segmental wall motion abnormality also. Other studies found no difference between PCI and non PCI group regarding the EF nor RSWMA, ESD, EDD. (12).

Angiographically, some studies exclude left main disease (13), but in the present study patients with left main stenosis more than 50% were equal in both groups as well as mean number of diseased vessels ( $3.34 \pm 0.52$  vs  $3.28 \pm 0.45$ ). This is due to the fact that the study includes only multivessel disease patients, however all PCI group patients with left main stenosis had their left main stenosis post PCI, usually during the first year.

In this study there is approximately equal percentage in group II for DES and BMS, where 51% of them were DES and 49% were BMS, The use of DES didn't expand the time for the patients before needing subsequent CABG ( $11 \pm 9$  months) but on the contrary its closure with acute thrombosis increased the number of MACCE in the PCI group preoperatively. (14)

The two groups were found uniform regarding the mean Euroscore, and mean SYNTAX score (20.69 VS. 18.77) but on comparing the SYNTAX score of group II before stent with preoperative score, we found that it was only 10.96, which was nearly half of its preoperative score. This finding denotes that previous PCI worsen the SYNTAX score preoperatively and hence worsen the vessel more. This could be the effect of the previous PCI or simply a progression of the native disease.

The mean number of distal anastomoses was significantly higher in group I ( $3.12 \pm 0.73$ ) than in the PCI group ( $2.46 \pm 0.85$ ) and it was higher also for venous grafts ( $1.89 \pm 0.7$  vs  $1.39 \pm 0.90$ ) and arterial grafts ( $1.24 \pm 0.54$  vs  $1.07 \pm 0.33$ ).

Strangely, although the mean number of diseased vessels was equal preoperatively, the number of grafted vessels was higher in the non PCI group, this is due to higher number of non graftable vessels in the PCI group. This was also found in other comparative studies. (2).

These non graftable vessels are due to either propagation of post stent thrombosis to occlude the vessel totally, which is more common, or due to the propagation of atherosclerosis in previously diseased vessel left without intervention (less common). This made the anastomosis more challenging and risky for the surgeon. But it doesn't affect the choice of the surgical technique as OPCAB was equally used in both groups the same as other studies (15).

In spite the higher numbers of distal anastomoses in group I, There were no statistical difference between the two groups in the ACC time (69.49 minutes  $\pm$  24. vs 61.81 minutes  $\pm$  28.40) nor CPB time (102.07 minutes  $\pm$  29.79 vs. 91.47 minutes  $\pm$  41.49). This may be explained by the less maneuvers done on the vessels in group I such as endarterectomy and/or on lay patch anastomoses due to better target vessels as we noticed. (16).

Postoperative inotropes were found to be used more with the previous PCI group rather than group I, however for IABP usage, it was the same in both groups. The higher usage of inotropic support may be related to the lower incidence of total revascularization, higher preoperative EDD and higher incidence of preoperative MI. Other studies showed higher use of both inotropic support and IABP as well. (6, 10)

Overall morbidity was very high in the second group as other studies. (6, 9, 12, 13), the reasons for a higher post operative morbidity in the prior PCI group are not clearly understood however the PCI group patients were presented for surgery with more advanced symptoms and greater urgency. On further analysis of morbidity, the PCI group showed higher incidence of re-exploration, superficial and deep wound infection, but other postoperative parameters were the same in both groups.

Reopening for bleeding was due to the more number of unplanned CABG in group II, with continuous use of clopidogrel for long time preoperative (and till the operation in case of emergency operation). In the PCI group,

asprin was not discontinued until the morning of the operation as a precaution against total stent occlusion and perioperative MI (specially that 51% was DES).

The total hospital stay was longer for the PCI group but the ICU stay was not different. This was the contrary with other studies which had longer ICU stay but same hospital stay for group B. (9). The difference in the hospital stay in this study was due to the difference of the morbidity specially wound infection which prolong the hospital but doesn't affect ICU stay, but on the other hand mortality was almost the same between both groups and all of them were in hospital mortality (7 vs. 6). Other studies had the same results (14) while others stated that PCI group had higher mortality. (16, 17).

All the patients of the study were subjected to follow up for 3 months after the operation. During this period no MACCE happened for any patient of both groups, at the end of this period a postoperative echo was made.

We found that the non PCI group was better than the PCI group in all criteria which included improvement of dimensions, RSWMA.

#### **Study limitations:-**

The number of enrolled patients limits the explanatory power of our study. Selection of patients for both groups may introduce an underlying bias. We could not elaborate on the factors influencing the surgeons' decisions for number of grafts or conduit selection. It is plausible to study the long term outcome to complete the results of short term outcome.

Although focussing on the SYNTAX score give us better understanding for the severity of the coronary pathology, analysis of the types of the stents, methods of deployment may give more insight on the impact of PCI on subsequent CABG.

#### **Conclusion:-**

Patients with prior PCI presented for CABG with more severe CAD as evidenced by higher CCS classification score, higher incidence of previous MI, unplanned CABG, and higher mean EDD.

With the growing evidence that previous PCI adversely influences the outcome of subsequent CABG, we may expect that prior PCI emerges as a risk factor in new outcome prediction and risk stratification models in cardiac surgery.

#### **Recommendations:-**

Percutaneous Coronary revascularization should be carefully considered against the higher risk it provides for subsequent CABG. The guidelines for intervention should be strictly followed especially in patients with complex coronary lesions who have higher incidence to be referred for CABG.

Surgical scoring systems as EURO score should include an item for previous PCI especially if multiple as one of the factors that increases the risk of subsequent CABG.

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### RESEARCH ARTICLE

#### HEPATOPROTECTIVE EFFECT OF *NIGELLA SATIVA* ON DIABETIC MICE.

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#### Abstract

Diabetes mellitus is a major health problem for the people of the world. Diabetes is a chronic metabolic disorder resulting from a variable interaction of hereditary and environmental factors and it is characterized by abnormal insulin secretion or insulin receptor affecting  $\beta$  cells of pancreas. It is associated with a number of chronic complications including nephropathy, neuropathy, retinopathy and cardiovascular diseases. Diabetes mellitus affects a large number of people throughout the world and India also. Experts estimate that diabetic population will grow from 195 to 360 million by 2030 almost 4.5 percentage of the global population. Present study included histological and biochemical parameters of mice. Three groups of mice were prepared for comparative study on control, diabetic, and *N. sativa*. Diabetic models were prepared in mice by intraperitoneal administration of single dose of alloxan@120mg/kg b.w. Alcoholic extract of *Nigella sativa* was administered @100 mg/kg b.w/day for four and eight weeks. In diabetic group of mice glucose, creatinine, urea and SGPT were increased. Effective restoration was observed in glucose, SGPT, urea and creatinine of *N. sativa* administered diabetic group of mice. Liver also shows effective restoration in *N. sativa* administered group of mice. Thus, it is concluded from study that alcoholic extract of *N. sativa* restores glucose level to normal. *Nigella sativa* acts effectively on diabetes mice on biochemical and histological parameters.

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#### Introduction:-

Incidence of diabetes is increasing worldwide at an alarming rate. Diabetes is on a rapid rise in developing nations<sup>1</sup>. People suffering with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030<sup>2</sup>. The past two decades have seen an explosive increase in the number of people diagnosed with diabetes worldwide<sup>3</sup>. The World Health Organization has predicted that the diabetic patients will occur in the developing countries and increase 42% in the developed countries and 170% increase in the developing countries. The countries with the largest number of diabetes patients are India, China and United States<sup>4</sup>.

India has the largest number of people with diabetes in the world. Diabetes is a group of common metabolic disorders that share the phenotype of hyperglycemia<sup>5</sup>. Diabetic hyperglycaemia indicate that plasma levels of urea

and creatinine which are considered as perfect markers of renal dysfunction<sup>6</sup>. Adults with DM have cardiovascular disease death rates that are 2–3 times higher than adults without DM<sup>7</sup>.

Medicinal plants used in India has been practiced for more than 5,000 years. Medicinal plants used for prevention of disease, rejuvenation of our body systems, and extension of life span through lifestyle and natural therapies<sup>8</sup>. According to the WHO, over 80% of the world's population relies on traditional forms of medicine, largely plant based to meet primary health care needs.

*Nigella sativa* has been used for medicinal purposes for centuries *N. sativa* traditionally used for a variety of conditions and treatments related to respiratory health, stomach and intestinal health, kidney and liver function, circulatory and immune system<sup>9</sup>. *Nigella sativa* possess biological, pharmacological and biochemical actions, including antibacterial bronchodilator and anti-parasitic<sup>10</sup>. *Nigella sativa* oil has the ability to protect testis against oxidative stress possibly through antioxidant effects of its bioactive compounds<sup>11</sup>. After the treatment of *Nigella* which decreases the elevated lipid peroxidation, liver enzyme levels and increases the reduced antioxidant enzyme levels<sup>12</sup>. *Nigella* oils has gastro protective activity against gastric mucosal injury<sup>13</sup>.

Present study is designed to evaluate effect of *Nigella sativa* on histological and biochemical parameters of liver in diabetic mice.

### Materials and Methods:-

**Animals:** - The mice (*Mus musculus*) were reared in animal house. The mice were selected for the study was 12 weeks old with  $30 \pm 2$  gm body weight (b.w). The mice were housed at controlled environmental conditions  $22 \pm 2^\circ\text{C}$ , relative humidity  $50 \pm 10\%$ , and 12h dark-light cycle. All experimental were conducted as per the guidelines of CPCSEA (Committee for the Purpose of Control and Supervision of Experiments on Animals).

**Chemicals:** - Alloxan, purchased by Loba chem Pvt. Ltd., Mumbai was utilized for the experimental design.

**Medicinal plant used:** - Alcoholic seed extract of *Nigella sativa* is orally administered to diabetic group of mice. Fresh seed of *Nigella sativa* was purchased from herbal store in Patna, India.

**Study groups & sampling:-** The control group of six mice received distilled water orally. The 'treatment' groups (n=6) received alloxan 120 mg/kg b.w by intra-peritoneal method for diabetic model preparation. *Nigella sativa* (100 mg/kg/b.w/day) administered to diabetic mice orally through Gavage method. Mice were sacrificed after the scheduled treatment. Serum was collected for SGPT, glucose, creatinine and urea estimation. The Liver from all the mice were removed and washed three times in isotonic saline (0.85 v/w %) and fixed in neutral formalin for Light Microscope (LM) study.

### Results:-

Fasting level of glucose was observed in every group of mice. Level of glucose in control group was  $99.00 \pm 2.30$  mg/dl. In diabetic group it was  $201.3 \pm 12.55$  mg/dl. While it was  $135.0 \pm 3.46$  mg/dl and  $106.3 \pm 2.18$  mg/dl in *Nigella sativa* 4 weeks and 8 weeks administered group of mice (Graph: I).

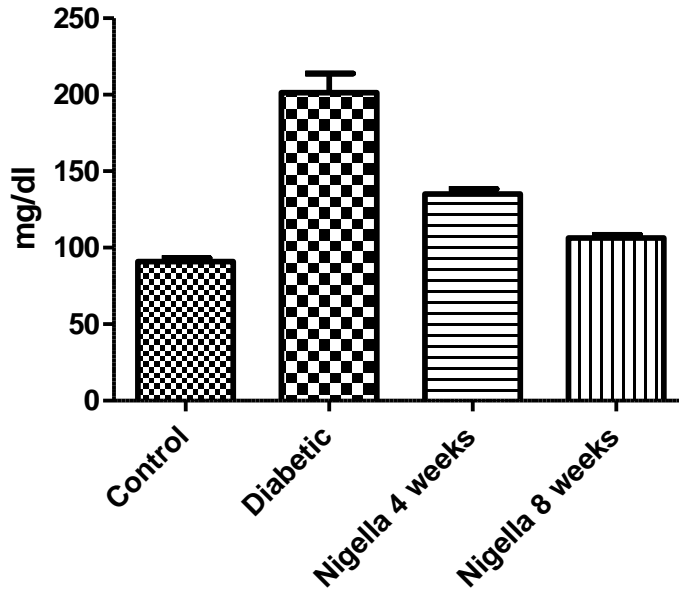
Serum Glutamate-Pyruvate Transaminase (S.G.P.T) level in control group of animal was  $22.00 \pm 3.21$  U/ml. Diabetic group of mice S.G.P.T level was  $312.3 \pm 4.09$  U/ml. While it was  $255.0 \pm 3.78$  and  $192.3 \pm 7.44$  U/ml in *Nigella sativa* four weeks and eight weeks administered group of mice (Graph: II).

Level of Creatinine in control group of mice was  $0.74 \pm 0.06$  mg%. In group of diabetic mice creatinine level was  $1.97 \pm 0.04$  mg%. Creatinine level was  $1.71 \pm 0.01$  and  $1.42 \pm 0.02$  mg% in *Nigella sativa* four weeks and eight weeks administered group of mice (Graph: III).

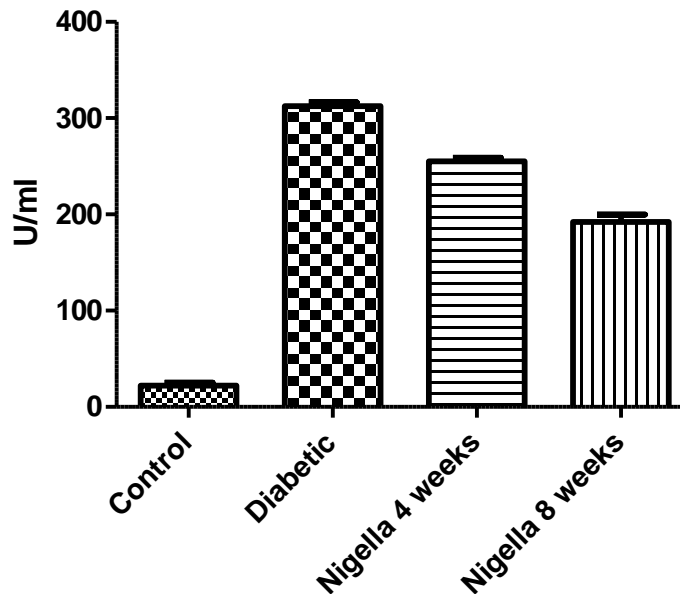
Urea value in control group of mice was  $20.33 \pm 2.33$  mg/dl. While in diabetic group of mice was  $46.73 \pm 0.079$  mg/dl. Urea level was  $39.37 \pm 0.33$  and  $32.40 \pm 1.29$  mg/dl in *Nigella sativa* four weeks and eight weeks administered group of mice (Graph: IV).

In control group of mice, well-organized hepatic cells were observed. Distinct cytoplasmic and nuclear material was also observed. Central vein was well organized with its intact cell wall (Figure: 1). Liver of diabetic mice shows vacuolization. Clustered and multilobed nuclei were observed. Degenerated cytoplasmic materials were observed. Clustered nuclei were also shows on periphery on central vein (Figure: 2). Diabetic mice followed by four weeks of *Nigella sativa* administration shows vacuolization in hepatic cells. Clustered nuclei were shows in hepatic cells. Many vacuolated spaces were observed with degenerated central vein (Figure:3). Diabetic mice followed by 8 weeks of *Nigella sativa* administration shows restoration in nuclear material were observed to least extend. Restored cytoplasm was observed in liver cells. Least vacuolization were also observed (Figure: 4).

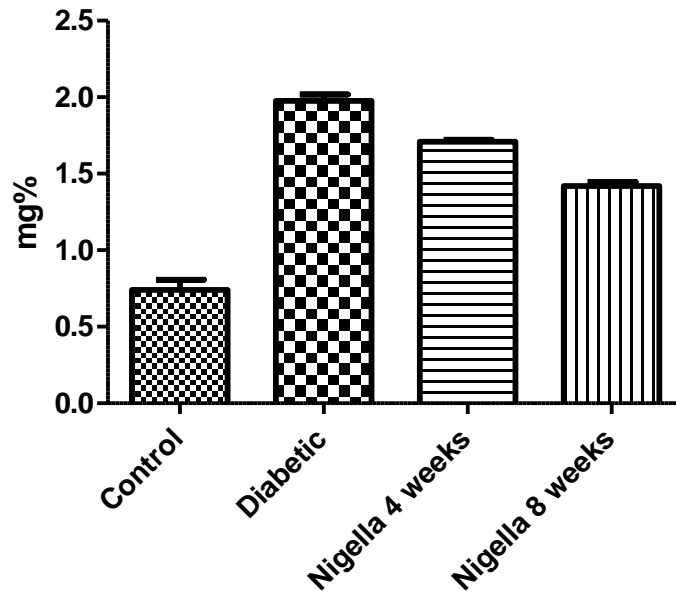
**Graph - I: Glucose level in serum of mice**



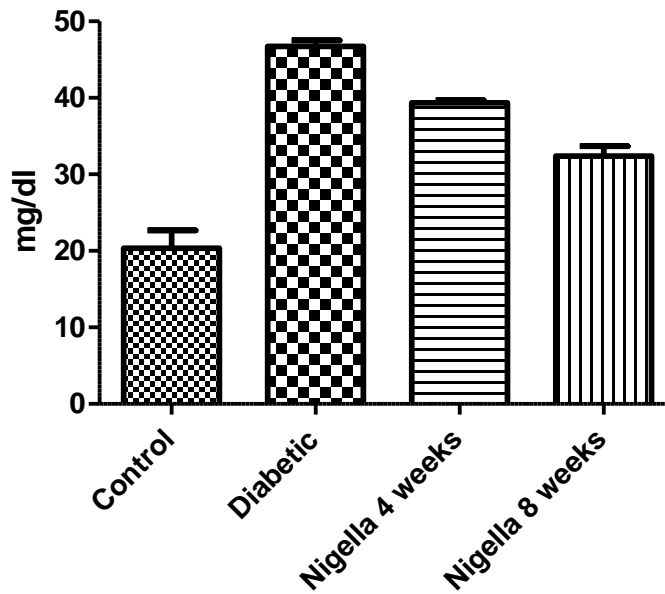
**Graph - II: SGPT level in serum of mice**

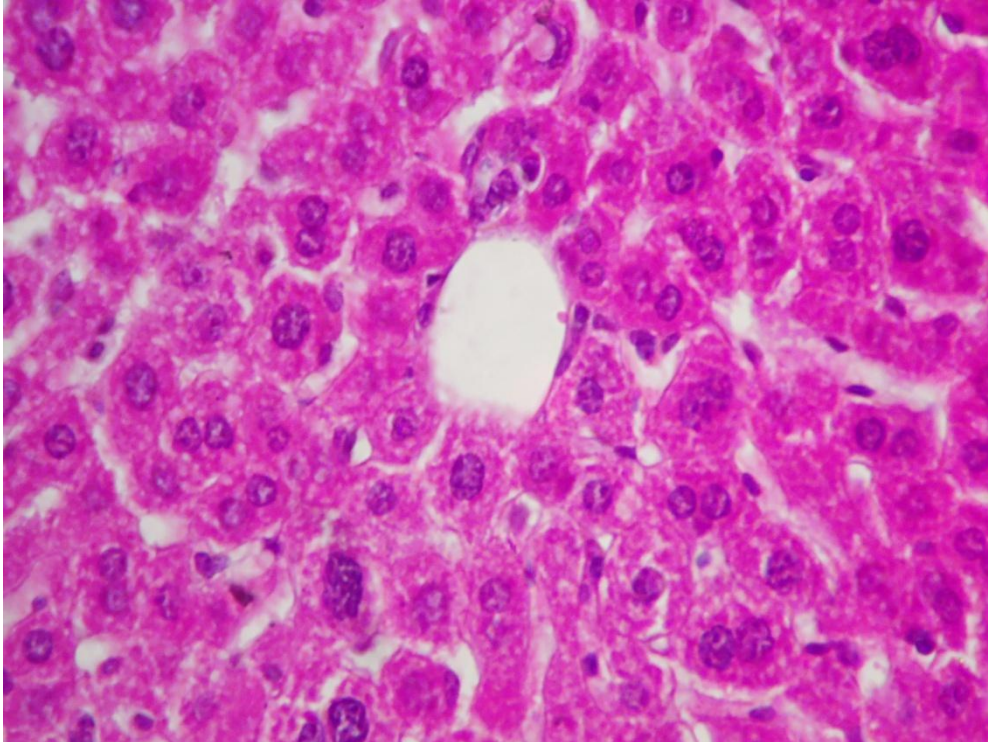


**Graph - III: Creatinine level in serum of mice**

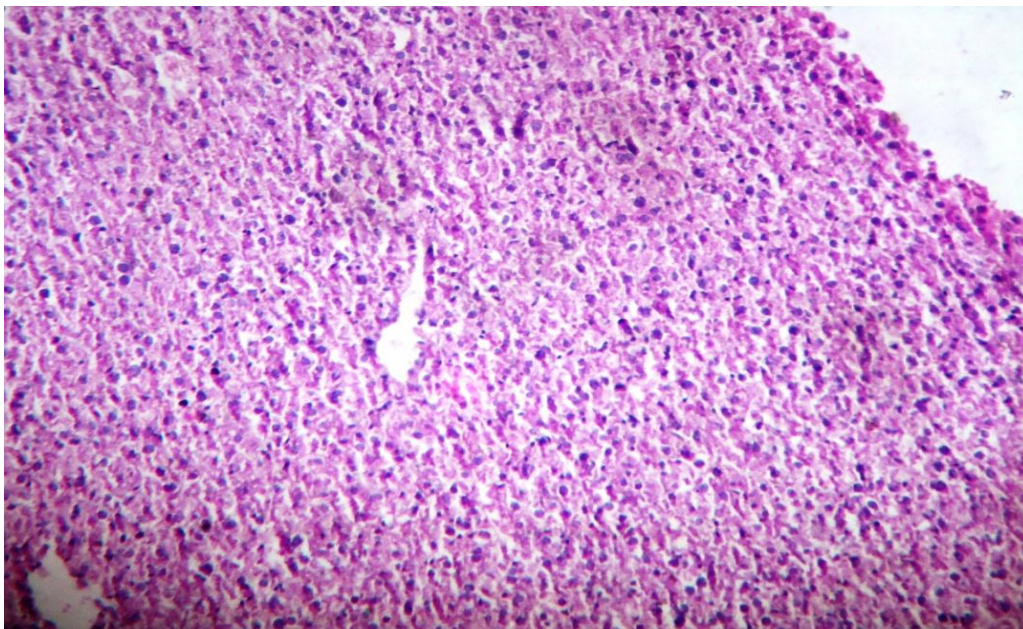


**Graph - IV: Urea level in serum of mice**



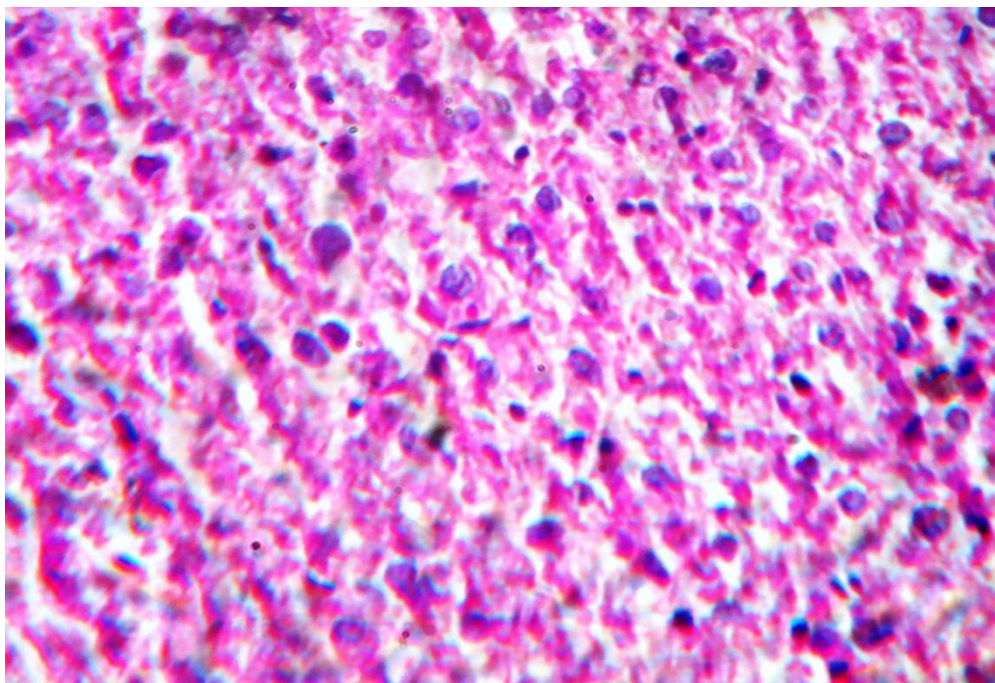


**Figure 1:-** In control group of mice well organized hepatic cells were observed. Distinct cytoplasmic and nuclear material was also observed. Central vein was well organized with its intact cell wall. X 600.

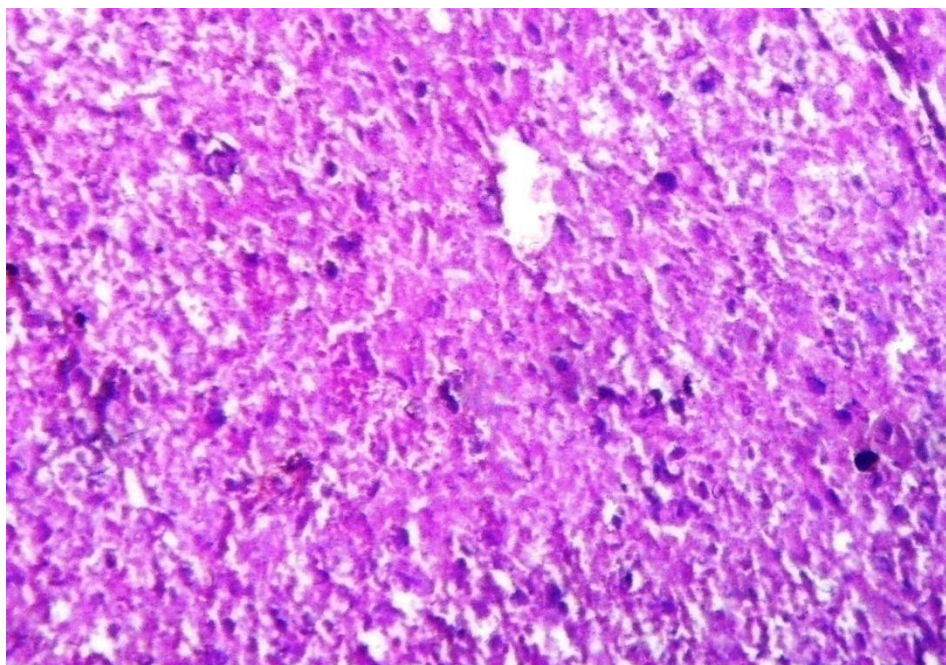


**Figure 2:-** Liver of diabetic mice shows frequent vacuolization. Clustered and multilobed nuclei were observed. Degenerated cytoplasmic materials and Clustered nuclei were also observed on periphery on central vein. X 200.





**Figure 3:-** -Liver of diabetic mice followed by four weeks shows degenerated hepatic cell. Many vacuolated spaces were observed degenerated cytoplasm. Fragmented nuclear materials were observed. Vacuolization were also observed nuclear material of liver cells. X 600.



**Figure 4:-** Liver of diabetic mice followed by eight weeks of *N.sativa* administration shows many vacuolated spaces with degenerated nuclei of hepatic cells. Multilobed and vacuolated nuclear materials were observed. Central vein was also observed in degenerated condition. X 200.

### Discussions:-

Diabetic hyperglycemias induce certain biochemical parameter such as increased blood urea production in diabetes by enhancing catabolism of liver & plasma protein. Recent scientific investigations have also confirmed the efficacy of plant preparations, few of which are most effective against diabetes<sup>14</sup>. In diabetes, Oxidative stress was thought to be a result of free radicals generated during autoxidation of glucose<sup>15</sup>. In diabetes blood urea level increases & reason behind this is due to increased catabolism of both liver & plasma proteins. This elevation of plasma level of urea & creatinine is marker of renal dysfunction<sup>16</sup>. In our study we have observed in urea and creatinine level about threefold increases in diabetic group of mice.

Another study based on carbon tetrachloride induced rats has shown that CCl<sub>4</sub> treatment increased the lipid peroxidation and liver enzymes, and decreased the antioxidant enzyme levels and furthermore, *Nigella sativa* treatment decreased the elevated lipid peroxidation, liver enzyme levels and increased the reduced antioxidant enzyme levels<sup>17</sup>. In present study S.G.P.T increases 13 folds in diabetic group of mice. Hepatic cells were observed in degenerated condition with elongated and fragmented nuclear material. Many vacuolated spaces were also observed in cytoplasm of hepatic cells in diabetic group of mice.

NS alcoholic extract maintained the levels of AST, ALT and ALP close to normal against D -Galactosamine induced toxicity<sup>18</sup>. In present study *Nigella sativa* causes effective restoration in urea and creatinine level. S.G.P.T. level was restored effectively in *N. sativa* administered group of mice.

*Nigella sativa* causes effective restoration in malathion induced increases in AST, ALT, and lipid peroxidation. *Nigella sativa* also improvement role in liver function tests, lipid peroxidation, and antioxidant enzymes alteration induced by malathion<sup>19</sup>. *Nigella sativa* administered group of mice shows effective restoration in SGPT level up to normal. NS showed hepatoprotective effects against isoniazid induced hepatotoxicity in rabbits and there are no histopathological or biological abnormalities were observed<sup>20</sup>. *Nigella sativa* is efficient cytoprotective against CCl<sub>4</sub>-induced hepatotoxicity, possibly via inhibition of the production of oxygen free radicals that cause lipid peroxidation<sup>21</sup>. In present study *Nigella sativa* causes restoration in hepatic cells. Central veins and sinusoids were also restored effectively. Restoration is observed in both cytoplasmic and nuclear material.

### Conclusions:-

It is concluded from study that *N. sativa* acts effectively on SGPT level. Urea, uric acid and creatinine level were almost normal after *N. sativa* administration. It maintains normal morphology of hepatic cells with least vacuolization. *Nigella sativa* is effective cytoprotective agent on hepatocyte of diabetic mice as well as maintains biochemical parameters to normal level. It is evident from study that *Nigella sativa* acts well against diabetes.

### Acknowledgement:-

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### **RESEARCH ARTICLE**

## **REVIVAL AND REJUVENATION STRATEGY OF WATER BODIES IN A METROPOLITAN CITY: A CASE STUDY OF NAJAFGARH LAKE, DELHI, INDIA.**

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Rainwater harvesting, Ecosystem services, Water quality, Groundwater recharging, Wetlands, Revival, Integrated water resource management (IWRM).

#### **Abstract**

Urban Indian cities are facing a water crisis due to loss of watershed, increasing pollution levels, deteriorating water balance, encroachment, illegal constructions and a dire lack of groundwater recharge. Although there are sufficient polices and acts for protection and restoration of water bodies they remain insufficient and ineffective in the face of such complexities. To meet the rising demand for water augmenting and improving the health of water bodies is of utmost importance. Revival and rejuvenation of water bodies in cities is especially important from a public health perspective as they provide various ecosystem services that are required to manage microclimate, biodiversity and nutrient cycling. This paper looks at Najafgarh Lake, in South-West Delhi that occupied more than 300 km<sup>2</sup> in the 1960s and was a biodiversity hotspot. Currently it stands as a topographical depression brimming with overgrown grass and garbage. The lake's disappearance has stolen a chunk of Delhi's culture and its use as a dumping ground has raised health concerns for the local population. This can be countered by rejuvenating the Najafgarh Lake through rainwater harvesting and bio-intensive farming. Most of Delhi's precipitation falls during the monsoon in July and August and can be harvested using simple, locally adoptable and eco-friendly low-cost technologies such as creation of ponds. Implementation of community water management schemes with maximum people's participation is crucial to mitigate the ill effects of drought and urbanisation. Similar studies across India and the world lay precedent for such practices and can ameliorate the water shortages faced at a micro level.

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#### **Introduction:-**

Urban Indian cities are facing a water crisis due to loss of watershed, increasing levels of pollution, deteriorating water balance, lowering of water table and a dire lack of groundwater recharge(Singh, 2012). Such issues have become a great concern in the Indian context which motivated the Indian Government's Twelfth Five Year Plan to launch a completely revamped programme on Repair, Renovation and Restoration (RRR) of water bodies(Shah, 2013).

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Water determines the full potential of any country (Samuel & Mathew, 1997). Optimum development and efficient utilization of water resources becomes paramount in a country like India which has an ever-rising populace and a seemingly insatiable water demand. The biodiversity of lake and pond ecosystems is increasingly threatened by anthropogenic activities – may it be due to industrialization by-products, pollution or urbanization (Christer & Hansson, 2002); which poses the question can development and sustainability coexist?

In 2001, the Honourable Court ordered a field survey to be conducted by INTACH in association with the several government agencies enjoying jurisdiction over the various water bodies of Delhi. The survey established that there were 508 water bodies in Delhi. Other surveys carried out by Government of National Capital Territory of Delhi (GNCTD) placed the number of water bodies at 629 and by Tapas along with Court Commissioner at over 900 (Govt. of NCT of Delhi, 2013).

The major issues faced by water bodies in the National Capital Territory (NCT) of Delhi are lack of action plans, encroachments and violations of laws, solid waste deposit and polluted water (Govt. of NCT of Delhi, 2013). Through an intensive revival strategy, these water bodies can be brought back to health. Further, through improvement of water quality and groundwater recharge using rainwater harvesting the native ecosystems of the area can be reestablished over time which is crucial for provision of ecosystem services and for the biodiversity of the area (Singh, 2012).

### **Literature Review:-**

Delhi has several surviving ancient structures like baolis (stepwells), small check dams and tanks that display the traditional wisdom of storing water where it falls. These days households are supplied water through technological networks leading to the decline of the old water storage structures (Roy, 2016). These facts when viewed along with a decrease in availability of water resources point to a systemic flaw that can be tackled in a manner of ways.

To ensure sufficient water its uses like municipal, industrial, and agricultural must be integrated into the overall water management of any region. Sustainability, public health, environmental protection, and economics are key factors of consideration. Further, increased storage of water in aquifers via artificial recharge is necessary to save water in times of water surplus for use in times of water shortage (Bouwer, 2002). The above information helps formulate an appropriate solution for Delhi's current scenario – by integrating traditional knowledge into the overall water management of the city.

### **Rainwater Harvesting:-**

Rainwater harvesting essentially means harvesting and storing water in days of abundance for use in lean days. Storing of rainwater can be done in two ways; (i) storing in an artificial storage and (ii) in the soil media as groundwater (Samuel & Mathew, 1997). Rainwater harvesting can be implemented as a viable alternative to conventional water supply or on-farm irrigation projects since any land anywhere can be used to harvest rainwater.

Water demand has increased tremendously globally and water bodies like ponds and lakes are reliable and economical solutions to provide water and provide ecosystem services - benefits people obtain from ecosystems like access to food and water; flood and disease control; cultural services such as spiritual, recreational, and cultural benefits; and supporting services such as nutrient cycling, that maintain living conditions on Earth (Alcamo & Bennett, 2003).

Further, ponds are reliable mechanisms to store water underground via artificial recharge of groundwater (Bouwer, 2002). Rainwater harvesting besides helping to meet the increasing demand for water, helps to reduce surface runoff, avoid flooding of roads, reduces groundwater pollution, improves quality of groundwater and reduces soil erosion (Ngaachan, 2005).

### **Rainwater Harvesting in India:-**

The practice of rainwater harvesting and reusing the stored water for domestic purpose has been prevalent in India since ancient times (Ministry of Water Resources, 2013; Samuel & Mathew, 1997). Historically in India, settlements grew around temples, and over time temples and tanks became nearly inseparable. Evidence of tank irrigation in Tamil Nadu dates back to the Sangam period of 150 BC to 200 AD, and by the early medieval period (750–1300), tank irrigation was thriving throughout the region (Van Meter, Basu, Tate, & Wyckoff, 2014).

Efficient management of water in traditional farming systems like Kattas and Surangams in North Kerala and Karnataka, Zabo system of Nagaland and Bamboo drip irrigation of Meghalaya and Apatani valley in Arunachal Pradesh can be found all through India (Narain & Agarwal, 1997), where rainwater harvesting and water resource management has been an integral part of communities since centuries.

Usage of rainwater harvesting in recent times in areas like North East India (Ngaachan, 2005) and Kerala (Samuel & Mathew, 1997) have shown immense potential for its applications in other parts of the country and proven its importance in ecosystem revival (Armar-Klemesu, 2000). In fact, rainwater harvesting in South Asia differs from the rest of the world as it has a history of continuous practice for at least the last 8000 years (Pandey, Gupta, & Anderson, 2003). Further an integrated perspective of traditional knowledge on adaptation strategies, such as the rainwater harvesting system is particularly useful to comprehend vulnerability and adaptation to environmental stresses at the local scale, which makes it appropriate for wide application in NCT of Delhi, which is an ecologically sensitive area.

Further, rainwater harvesting and storage are important mechanisms for adapting to climate change and are in use in parts of Africa that are currently experiencing high variability of rainfall (Boelee et al., 2013). Climate change stands to affect India adversely in the coming years due to our sizable population and rising demand for resources and hence revival and rejuvenation of water bodies in Indian cities is crucial.

#### **Rainwater Harvesting Potential of Delhi:-**

Delhi's groundwater occurs in confined and semi-confined conditions, with depths varying from 1 - 10 m below ground level (Jain, 2009). The average annual rainfall is approximately 714 mm (Kumar et al., 2015). However, recharge of ground water is limited due to decreased availability of permeable surfaces owing to urbanization and runoff diversion. As of 2011, the annual rainwater harvesting potential has been assessed at 900 billion liters per day (Jain, 2009).

The water consumption in Delhi has been rising over the past few years (Planning Department at Government of NCT of Delhi, 2011) and this can be associated with a rise in the population of the area. Of the 47.0% growth in population in Delhi between 1991-2001 migration constituted 18.7% (Census of India 2001, 2001) and this trend has been noted to continue as Delhi's population has been rising since. Increase in population places pressure on Delhi's natural resources and necessitates a strategy to provide more water storage.

**Table 1:-** Water Supply of NCT of Delhi (Source: Planning Department at Government of NCT of Delhi, 2012)

S. No.	Water Supply	2008 - 09	2009 - 10	2010 - 11	2011 - 12
1	Water Consumption (lakh K L)	13257	13671	15012	17220
1. a)	Domestic	11997	12413	13754	16242
1. b)	Commercial/Industrial	1260	1258	1258	978
2	Per capita consumption of water (L/day)	189	189	189	193

#### **Water Bodies of NCT of Delhi:-**

A large number of the traditional water bodies in the form of ponds, lakes, etc. have been encroached or have otherwise become defunct in the national capital (Jain, 2009). Between 1998 and 2009, 22.26 km<sup>2</sup> of Delhi's wetlands were lost (Singh, 2012), which intimately support the survival of water bodies. As of 2013, of the 1011 known water bodies across 10 districts, only 971 could be traced. 40 have been lost. South West Delhi, the area where Najafgarh lake used to be was found to have majority of the water bodies that could be traced – 264 in all. 35.8% water bodies were found to be dry, while 17.8% were found to be encroached, of which 58.3% were fully encroached. 12.4% were built upon, where one-third were illegal built upon (Govt. of NCT of Delhi, 2013).

Pilot projects in the region to revive water bodies have been tested, such as DDA-INTACH Project which was started in 2003 where New Delhi based non-governmental organization (NGO) Indian National Trust for Art & Cultural Heritage (INTACH), along with the Delhi Development Authority (DDA), which controls most of urban governance in the city, came up with a plan to revive HauzKhas Lake with treated sewage water. Treated water was taken from a nearby Sewage Treatment Plant (STP), cleaned further through biological processes, and was transported to the dry lake (Roy, 2016).

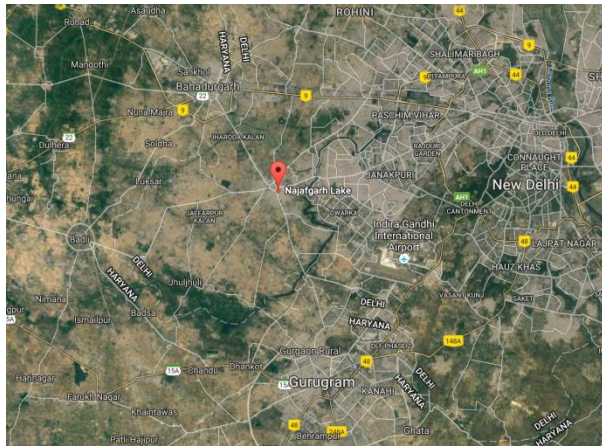
Field visits yielded the following observations: the project scored well on all three fronts viz. economic, environmental and social but there was scope for improvement particularly on the social front for which it was recommended that there should be better publicity of the environmental benefits of the project and enhancing environmental awareness, especially among the local community.

**Table 2:-** Distribution of the water bodies of NCT of Delhi (Source: Delhi Parks & Gardens Society, Department of Environment, Govt. of NCT of Delhi, 2013)

S.No.	District	Traceable	%	Non-Traceable	Total	%
1	East	50	5.15	3	53	5.24
2	North East	47	4.84	2	49	4.85
3	North	151	15.55	5	156	15.43
4	North West	165	16.99	1	166	16.42
5	South	115	11.84	5	120	11.87
6	South East	30	3.09	9	39	3.86
7	South West	264	27.19	6	270	26.71
8	West	71	7.31	4	75	7.42
9	New Delhi	55	5.66	3	58	5.74
10	Central	23	2.37	2	25	2.47
11	Total	971	100.00	40	1011	100.00

### Najafgarh Lake:-

Despite a mention in the Delhi Gazetteer of 1883 and the Survey of India Map of 1911, currently the Delhi Government says that the Najafgarh Lake (Lat. 28°36'38.67"N, Long. 76°59'12.18"E, Alt. 216 m) no longer exists in Delhi. Prior to its draining post 1960s, Najafgarh Lake in South-West Delhi occupied more than 300 km<sup>2</sup> and was a biodiversity hotspot, home to various water birds and local wildlife. The fact that a vast lake ever existed here in the region came as a surprise to most residents of the area and the need for resurrecting it is not a popular topic of discussion.



**Fig. 1:-** Najafgarh Lake in Delhi (Map)



**Fig. 2:-** Status of Najafgarh Lake, as of 2016

### Status of Najafgarh Lake:-

Currently the lake stands as a topographical depression brimming with overgrown grass and garbage. As of 2015, the erstwhile lake like many other traditional water bodies has been removed off Delhi's map instead of reviving them (Jain, 2009). The lake's disappearance has stolen a chunk of Delhi's culture and its use as a dumping ground has raised health concerns for the local population who are migrants from neighbouring states of Delhi.

The land owned by Delhi Development Authority (DDA) has been loaned to the Government Girls Senior Secondary School (II) in Dharampura with intentions to convert it into a park. Despite erection of benches and swings and placement of a fence around the area the land suffers from poor maintenance. Pollution is rampant in the area and Najafgarh drain previously known as Sahibi River with its origination near Najafgarh lake is now one of the most polluting sources contributing the death of river Yamuna (Ratnani, Gurjar, Suruchi, & Manish, 2015).

Before introduction of the sewerage system, the lake used to be the outlet for the local communities' sewage. After the nearby area became connected to the sewerage system, the lake fell into disuse. Lowering of ground water table, encroachment and concrete constructions have led to the lake drying up due to absence of proper water resource planning and scientific management by involved authorities. Residents reported presence of fish up to 10 years back and placed the drying of the lake 5 years hence.

### Strategy for Rejuvenation of Najafgarh Lake:-

Rejuvenation of Najafgarh Lake will help accomplish the following objectives:

1. Environmental Education and Awareness: This effective management method is increasingly popular in conserving pond environments in urban areas (Christer & Hansson, 2002) and is essential to keep the lake protected after the revival and rejuvenation processes get completed. The project will help educate the local populace of the need to conserve existing water bodies.
2. Creation of a pond through rainwater harvesting (Ngaachan, 2005): Ponds can be created in a cost-effective manner and don't require a sizable initial investment. They play an important role in providing ecosystem services and help improve the life quality of residents around them.
3. Revival of the area's original wetland ecosystem through set-up of bio-intensive beds to help the growth of indigenous plants and trees: Local plants take easily to an area and do not require a lot of maintenance which makes them ideal for cultivation. They also help in improving the water and air quality of the area where they are planted (Gottschall, Boutin, Crolla, Kinsley, & Champagne, 2007).

The protection of the area can be accomplished by creating a water council. People's participation which focuses on the revival of traditional drainage systems, banning of construction activity and prevention of wastes entering the compound will help ensure the area remains protected (Griffin, 1999). Clear definition of the roles and responsibilities of the people in-charge and the maximization of people participation has been identified as one of the solutions to tackle institutional impediments to effective basin governance management with context to the Tonle Sap Lake in Cambodia and can also be implemented in this region (Sokhem & Sunada, 2006).

### Strategy and its Amenability to the area:-

Rainwater harvesting is considered an ideal solution to tackle water problems where there is inadequate groundwater supply or where surface resources are not sufficient as in the case of NCT of Delhi (Samuel & Mathew, 1997). The rainwater collected from the site was found to be bacteriologically pure and free from organic matter, as per the Drinking Water Standards followed in India (Bureau of Indian Standards, 2012).

Analysis of the water sample collected from site showed that it was nearly neutral and had TDS slightly above the permissible drinking quality limit of 500 mg/l. Other water parameters showed that the rainwater was amenable for harvesting and can be used for revival and rejuvenation of the lake without a lot of treatment.

**Table 3:-** Water Quality Parameters for Water Sample

S. No.	Water Quality Parameters	Trial 1	Trial 2	Trial 3	Mean	Standard
1	Electrical Conductivity ( $\mu$ S)	828	823	795	<b>815.33</b>	-
2	pH	7.31	7.33	7.33	<b>7.32</b>	<b>6.5 – 8.5</b>
4	Total Dissolved Solids (mg/l)	520	536	536	<b>530.67</b>	<b>500</b>
5	Dissolved Oxygen (ppm)	0	0	0	<b>0</b>	-

Date of Sampling: 20.05.2016

### Methodology:-

The amount of runoff that can be expected annually from a given watershed depends on many interrelated factors such as relief, soil infiltration, plant cover, and surface storage which can be identified after further research into the characteristics of the area. Site selection is a pre-requisite for creating a pond and the preexisting depression will be ideal for pond creation as maximum storage volume can be obtained with least amount of earth fill (United States Department of Agriculture, 1997). This also ensures maximum economy.

The methodology to prepare the area consists of three stages. The first stage focuses on preparing the site for the creation of the pond and the wetland development around the area. To do so the area needs to be cleared of the

garbage, the grasses need to be removed and the depression needs to be dug out in a uniform manner. Channels for the drainage system need to be set in the area after which the pond can be created.

The second stage focuses on the creation of the pond, for which the pond's boundary needs to be clearly demarcated and liners need to be laid on the bottom surface to limit the percolation losses. Connections between households around the area and the inlet of the pond need to be constructed. Further, recharge trenches around the pond need to be set up to recharge the ground water level of the area. The final stage will be the development of the wetland area around the pond for which bio-intensive beds can be used. Carefully selected native trees and plants can be planted, as they will help revive the area's biodiversity.

#### **Budget Plan:-**

The running, operation and maintenance costs of such a project are minimal. Once the initial construction is carried out, the pond ecosystem sustains itself through natural nutrient and water cycling (Gottschall et al., 2007). The costs associated with various rejuvenation components like digging and clearing the area, the pond construction, set up of the bio-intensive farm, awareness and education tools and the creation of the drainage system along with the rooftop piping are not cost-intensive as established through market analysis. The ecosystem services that this project will provide for the given area include cultural, recreational and environmental benefits such as water regulation, improvement in the water quality, etc. Further, such a project includes intangible benefits, which cannot only be viewed only from a monetary perspective. Therefore, the benefits of this project would far exceed the cost when viewed holistically.

**Table 4:-**Ecosystem Services Valuation (Source: The Value of the World's Ecosystem Services and Natural Capital, R.Constanza, 1997)

<b>Cost (INR) by Market Analysis</b>		<b>Benefit (INR)</b>	
Digging and Clearing Area	85,500	Ecological Services provided each year -Cultural -Recreation -Habitat -Water Supply -Water Regulation, etc.	9,38,159.26
Construction of Pond	60,000		
Bio-intensive Farm	10,000		
Awareness and Education Tools	15,000		
Drainage System + Rooftop Piping	1,50,000		
<b>Total Costs</b>	<b>(-)3,20,500</b>		<b>(+)9,38,159.26</b>

#### **Conclusion:-**

As new environmental threats are predicted to become threats to all freshwater systems, it is necessary to augment the water quantity available in urban cities through natural methods like rainwater harvesting. For a model like this to work, it is crucial for local people to collaborate with other stakeholders to successfully utilise resources and ensure the protection and conservation of green and blue spaces in cities. Further, implementation of integrated water resource management strategies are essential to maintain, augment and manage India's water resources. Reviving the Najafgarh Lake and rejuvenating it will help shape the future of the NCT of Delhi. Usage of rainwater harvesting to rejuvenate erstwhile waterbodies is unique as it not only recharges groundwater but also aids in enhancing the habitat and ecosystem of the area. Water bodies sustain all kinds of life forms and a project like this can be a medium through which the general populace can be educated about the need to revive water bodies. Such initiatives are easy to plan and implement and can spark an environmental revolution in urban cities which is the need of the hour.

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### RESEARCH ARTICLE

#### ROLE OF NANOTECHNOLOGY IN EPIRUBICIN FOR BREAST CANCER THERAPY IN TAIF CITY

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 Breast cancer, nanoparticle, multi wall  
 carbon nanotubes.

#### Abstract

**Background:** According to Breast Cancer Screening Programs in 26 Countries, 19.0% of females have breast cancer. The aim of our study is assessing the role of nanotechnology in breast cancer therapy. Epirubicin drug was selected as an example of the pharmaceutical nanosystem.

**Method:** A cross sectional study was conducted among 300 women in Taif city and the data were collected using a self-administered questionnaire. The questionnaire determines the knowledge of risk factors and the disease stages (breast cancer). The patients also interviewed to determine the duration, the response and the feeling of any harmful symptoms after using of Epirubicin in the therapy. The answers were scored; frequencies and percentages were used for describing data. Chi-square test and a P value of (0.05) were used to determine the significant association between the participants' variables.

**Results:** Most patients respondents were between 21 to above 70 years old. About 28.1% breast cancer patients discover the disease by the chance, while 46.9% by self-examination. 43.75% of breast cancer patients use Epirubicin drug. The effectiveness of therapy takes about 3 -9 months. 15.6% only have a serious common side effect and 18.7% have any side effect. Therefore the number of patients who accepted the therapy by Epirubicin was 78.6%

**Conclusion:** Participants had poor knowledge about the disease and management. Using Epirubicin had a good attitude in managing time and compliance of the disease. The nanoparticle system presented in Epirubicin drug considers the solving of most common patient incompliance.

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#### Introduction:-

The body is made up of trillion of living cells. Normal body cells grow, divide to make new cells, and die in an orderly way (apoptosis). During the early years of person's life, normal cells divide fast to allow the person to grow. After the person becomes an adult, most cells divide only to replace worn-out or dying cells or to repair injuries<sup>(1)</sup>.

When an abnormal cell growth occurs with the potential to invade or spread to other parts of the body these cells are called cancerous cells Fig.1-

1. It's become a cancer cell because of DNA (Deoxyribonucleic acid) damage. When DNA is damaged the cell either repairs the

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damage or dies. In cancer cells, the damaged DNA is not repaired, but the cell doesn't die like it should. Instead, the cell goes on making new cells that the body doesn't need. These cells are called cancer cells. In most cases, the cancer cells form a tumor. Over time, the tumors can replace normal tissue, crowd it, or push it aside <sup>(2)</sup>.

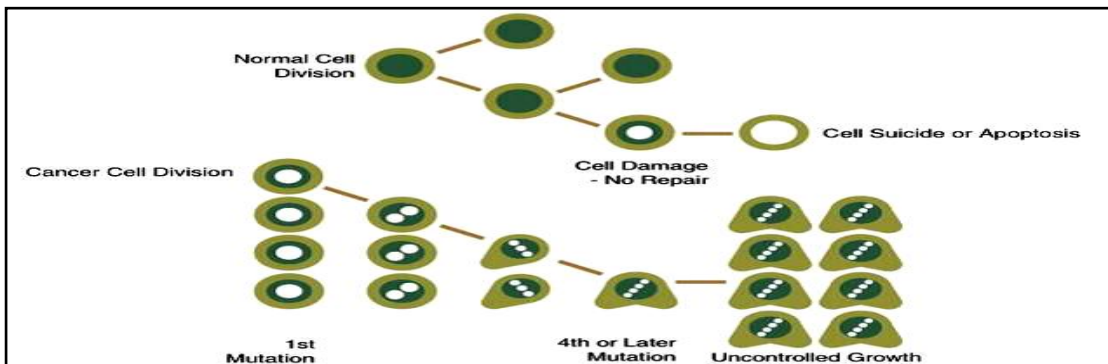


Fig I-I:-Normal cell and cancer cell growth

Cancer remains one of the most common causes of mortality in the world. According to the Cancer Incidence Report Saudi Arabia 2010 and Saudi Cancer Registry cancer is one of the leading causes of death in KSA. About 13,706 cases of cancer patients were in KSA. The breast cancer is the most prevalence and the most common which ranked first by 27.4% Fig(I-II)<sup>(3)</sup>.

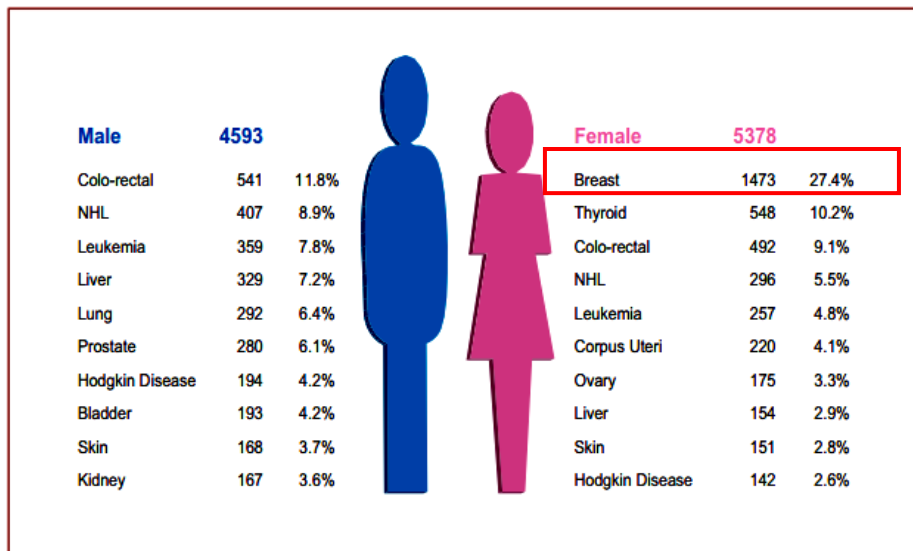
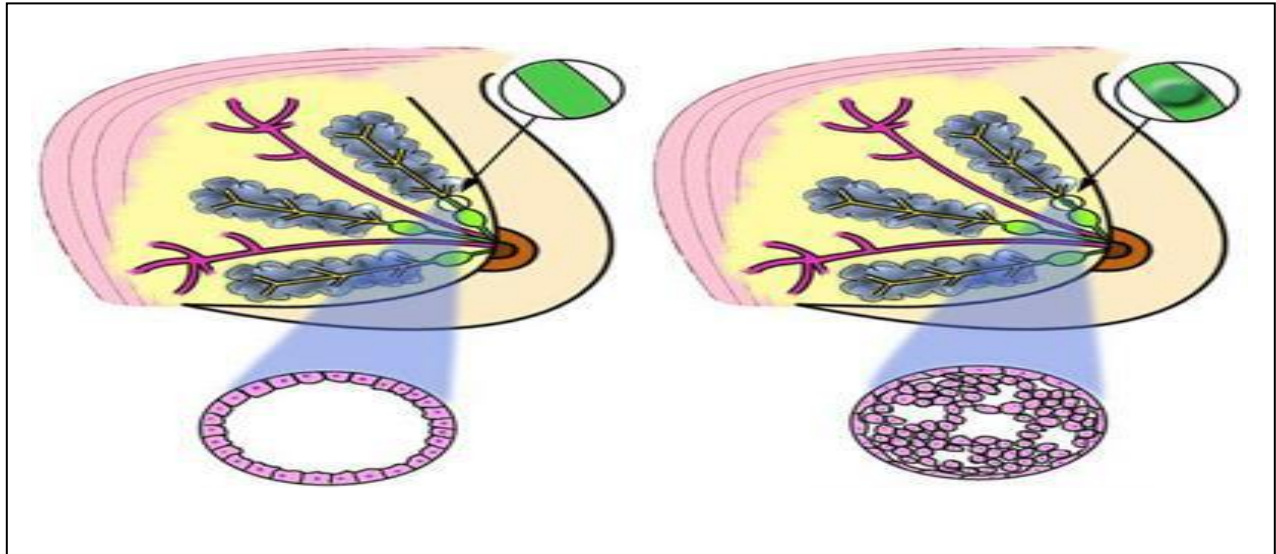


Fig I-II:-Mortality of cancer among KSA population,2010

And according to Breast Cancer Screening Programs in 26 Countries , 2012 : Organization , Policies , and Program Reach when screened 6200 in KSA ; 19.0 % of females have breast cancer <sup>(4)</sup>.

Breast cancer begins in the breast tissue that is made up of glands for milk production , called lobules , and the ducts that connect the lobules to the nipple . The remainder of the breast is made up of fatty , connective , and lymphatic tissues .

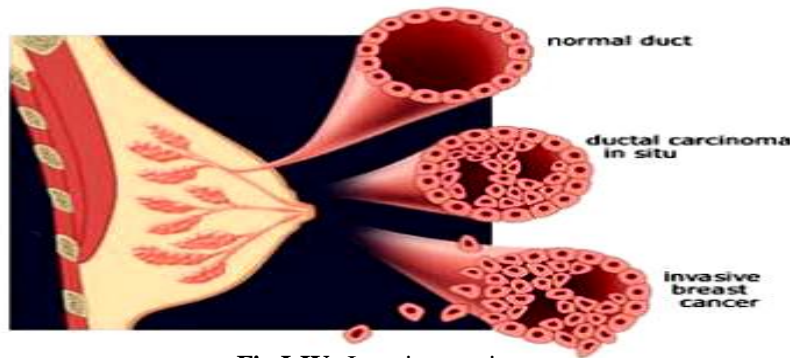
Breast cancer may be Ductal carcinoma in situ (DCI) or non-invasive breast cancer which they are abnormal cells. The atypical cells have not spread outside of the ducts into the surrounding breast tissue. Ductal carcinoma in situ is very early cancer that is highly treatable, but if it's left untreated or undetected, it can spread into the surrounding breast tissue (Fig.I-III) <sup>(5,6)</sup>.



(A) Normal duct (B) ductal carcinoma In Situ (DCIS)

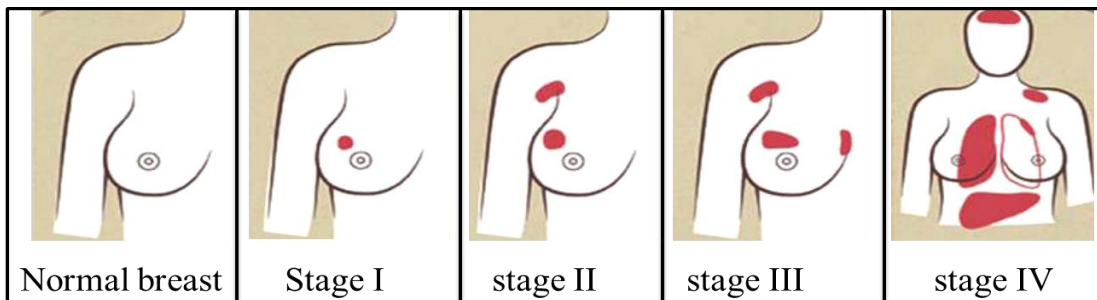
**Fig I-III:-** Ductal Carcinoma In Situ.

Another type of breast cancer is invasive duct carcinoma which the cancerous cells broken through the ductal or glandular walls into surrounding breast tissue or spread to other parts of the body Fig. IV , It's consider the most pronounced type and it's dangerous on its stage.



**Fig I-IV:-** Invasive carcinoma.

Especially The prognosis of invasive breast cancer is strongly influenced by the stage of the disease. Cancer have many stages, Stage I; This is usually a small cancer or tumor that hasn't grown deeply into nearby tissues and hasn't spread to the lymph nodes or other parts of the body. It is often called early stage cancer, Stage II and III these stages indicate cancer or tumors that are larger in size, have grown more deeply into nearby tissue, and have spread to lymph nodes, but not to other parts of the body and Stage IV this stage means that the cancer has spread to other organs or parts of the body. It may also be called advanced or metastatic cancer. Fig(I-V)<sup>(7)</sup>.



**Fig I-V:- stages of breast cancer**

There are many factors that help in increasing the probability of the breast cancer disease. There are many studies to determine them, According to American cancer society risk of developing breast cancer increases as getting older. About 1 out of 8 invasive breast cancer are found in women younger than 45, while about 2 of 3 invasive breast cancer are found in women age 55 or older<sup>(8)</sup>.

About 5% to 10% of breast cancer cases are thought to be hereditary, meaning that they result directly from gene defects (called mutations) inherited from a parent. Breast cancer risk is higher among women whose close blood relatives have this disease, less than 15% of women with breast cancer have a family member with this disease.

This means that most (over 85%) women who get breast cancer do not have a family history of this disease. The probability increases as a woman with cancer in one breast has a 3 – to 4 – fold increased risk of developing a new cancer in the other breast or in another part of the same breast<sup>(9)</sup>.

According to American Institute for Cancer Research and World Cancer Research Fund lifestyle is the major cause of cancer related illness. This finding was expressed after examining people across the globe and looking at half a million cancer related studies. They found that Sixty percent of cancer can be attributed to lifestyle choices of smoking, poor diet and obesity.

Changes in hormone levels can interfere with this process and that can lead to cancer, the exposure to toxic chemicals in our daily lives from a wider range of sources can increase cancer risk, sunlight, radiation and infectious agent (bacteria, virus) can cause cancer, While the hereditary factors account a 6% of causes<sup>(10)</sup>.

**Cancer therapy:-**

Cancer treatment is currently a major focus of investigation which have many treatment options that include Surgery, Radiation therapy, Chemotherapy and Targeted therapy.

Treatment decisions are made by the patient and the physician after consideration of the optimal treatment available for the stage and biological characteristics of the cancer, the patient's age and preferences, and the risks and benefits associated with each treatment protocol.

Treatments like radiation and surgery are considered local treatments, they act only on the infected area such as the breast, lung, and prostate, However, they targeted the cancerous cells directly.

Because of that chemotherapy is the doctor's choice in case of spreading cancer.

Chemotherapy is one of the most common ways in cancer treatment. Chemotherapy is using specific chemical agents or drugs that are destructive to malignant cells and tissues in order to cure patients. Chemotherapy cannot differentiate between normal cells and cancer cells; which means the chemotherapy targets cell whether normal or cancerous cells. The later lead to harm the healthy cells which have a high rate of growth and multiplication include cells of the bone marrow, hair, GI mucosa and skin. These side effects may be because of cardiotoxicity and pulmonary fibrosis, Severity of side effects varies between drugs<sup>(11)</sup>.

There are other ways for treatment as exercise. Exercise is an effective intervention to improve quality of life, cardiorespiratory fitness, physical functioning and fatigue in breast cancer patients and survivors. Larger trials that have a greater focus on study quality and adverse effects and that examine the long-term benefits of exercise are needed for this patient group. Pre-to post-test analyses revealed that women who exercised had significantly less depression, state and trait anxiety over time compared to controls. After the crossover, the control group demonstrated comparable improvements in both depressive and state anxiety scores. Self-esteem did not change significantly. Subjects who received exercise recommendations from their physicians exercised significantly more than subjects who received no recommendation<sup>(12)</sup>.

Researchers worldwide have been searching for an optimal cancer treatment without afflicting significant morbidity. Recent advances in cancer cannot

chnology have raised exciting opportunities for specific drug delivery by an emerging class of nanotherapeutics that may be targeted to neoplastic cells only<sup>(13)</sup>.

The Nano sized drug delivery systems allow deposition of medications in the desired areas of the body as cancer cells. It helps in information of target therapy which improved the cancer therapy<sup>(14)</sup>.

Several nanoparticle technologies are currently progressed to clinical use. Currently, FDA approved some drug products employing this technology Table I-I.

**Table I-I:-FDA approved some drug products employing this technology**

Table 1: FDA-approved products utilizing nanotechnology			
Agent	Sponsor	Use/ Technology	Approval date
Megace ES	ParPharmaceuticals	Appetite stimulant/Elan's NanoCrystal technology	July 2004
Abraxane	APP	Breast cancer/Albumin-bound paclitaxel	January 2005
Doxil	Alza Corporation	Ovarian cancer and Kaposi's sarcoma/STEALTH technology	February 2005
Emend	Merck & Co.	Antiemetic for chemotherapy/Elan's NanoCrystal technology	March 2003
TriCor	Abbott Laboratories	Cholesterol-lowering/Elan's NanoCrystal technology	December 2004
Estrasorb	Novavax, Inc.	Severe vasomotor symptoms/Novavax's micellar nanoparticle drug-delivery platform	October 2003
Rapamune	Wyeth	Immunosuppressant/Elan's NanoCrystal technology	August 2000
Articoat	Smith & Nephew	Antimicrobial dressing/Silver-containing SIL-CRYST Nanocrystals	May 2005
SilvaGard	AcryMed, Inc	Antimicrobial (silver) surface treatment/SilvaGard	December 2005
Zirconium oxide	Altair Nanotechnologies, Inc.	Dental applications/Nano-sized zirconium oxide is strong and transparent to light, but opaque to x-rays	September 2003

One of these technologies is Carbon nanotubes. Carbon nanotubes are hexagonal networks of carbon atoms, 1 nm in diameter and 1–100 nm in length, as a layer of graphite rolled up into a cylinder. There are two types of nanotubes: single-walled nanotubes (SWNTs) and multi-walled nanotubes (MWNTs) as represented in Fig VI which differ in the arrangement of their graphene cylinders. These are small macromolecules that are unique for their size, shape, and have remarkable physical properties<sup>(15)</sup>.

Some distinct advantages of carbon nanotubes over other drug delivery and diagnostic systems were their very interesting physicochemical properties such as ordered structure with high aspect ratio, ultra-light weight, high mechanical strength, high electrical conductivity, high thermal conductivity, metallic or semi-metallic behavior and high surface area<sup>(16)</sup>.

Epirubicin is a drug depending on MWNTs, The Combination chemotherapy and Nanoparticle drug delivery are two areas that have shown significant promise in cancer treatment. Combined therapy of two or more drugs promotes synergism among the different drugs against cancer cells and suppresses drug resistance through distinct mechanisms of action. Nanoparticle drug delivery, on the other hand, enhances therapeutic effectiveness and reduces side effects of the drug payloads by improving their pharmacokinetics.

Multi-wall nanotubes (MWNTs) are coaxial assembly of SWNTs have diameter close to 5nm to 50 nm, The interlayer distance in MWNT is close to the distance between graphene layers in graphite<sup>(17)</sup> Fig (I-VI).

Epirubicin is an Anthracycline drug used for chemotherapy. It can be used in combination with other medications to treat breast cancer, Anthracyclines are considered to be among the most active available agents to treat breast cancer and have become core components of adjuvant regimens. Epirubicin-taxanes combinations are active in treating breast cancer and do not appear to be associated with any pharmacokinetic interactions.

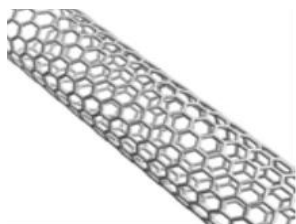
According to table I-II Epirubicin Hydrochloride use MWNTs (Fig. I-VI-B) technology which are layers of graphite with an enormous surface area and an excellent electronic and thermal conductivity<sup>(18)</sup>.



**Table I-II:- Carbon Nanotube as DDS**

Type of nanotubes	Drug	Method of immobilization
MWCNTs	Cisplatin	Encapsulation <i>via</i> capillary forces
f-CNTs	Amphotericin B	Conjugated to carbon nanotubes
SWCNTs	Gemcitabine	Encapsulation
MWNTs	Epirubicin hydrochloride	Adsorption
MWCNTs@poly(ethylene glycol- <i>b</i> -propylene sulfide)	Doxorubicin	Adsorption
f-CNTs	Sulfamethoxazole	Adsorption
SWNTs-PL-PEG-NH <sub>2</sub>	Pt(IV) prodrug-FA	Covalent amide linkages
SWNTs	Cisplatin – EGF	Attachment to carbon nanotubes <i>via</i> amide linkages
MWCNTs	Dexamethasone	Encapsulation

MWCNTs multi walled carbon nanotubes; f-CNTs functionalized carbon nanotubes; SWNTs-PL-PEG-NH<sub>2</sub> amine-functionalized single-walled carbon nanotubes.



(a) Singlewalled(SWNTs)



(b) Multiwalled(MWNTs)

**Fig I-VI. Carbon nanotubes**

Epirubicin acts by intercalating DNA strands. Intercalation results in complex formation which inhibits DNA and RNA synthesis. It also triggers DNA cleavage by topoisomerase II, resulting in cell death. Binding to cell membranes and plasma proteins may be involved in the compound's cytotoxic effects. Epirubicin also generates free radicals that cause cell and DNA damage <sup>(19)</sup>.

Epirubicin is also involved in oxidation/reduction reactions by generating cytotoxic free radicals. The anti-proliferative and cytotoxic activity of Epirubicin is thought to result from these or other possible mechanisms. All these mechanisms improve its anticancer activity <sup>(20)</sup>.

Epirubicin Hydrochloride for Injection is an Anthracycline cytotoxic agent, intended for intravenous administration. Epirubicin Hydrochloride for Injection is supplied as a sterile, orange-red, lyophilized powder in single-dose vials containing 50 mg or 200 mg of Epirubicin hydrochloride. Each 50 mg and 200 mg vial contains 250 mg and 1000 mg inactive ingredient, lactose, respectively <sup>(21)</sup>.

Following intravenous administration, Epirubicin is rapidly and widely distributed into the tissues. Binding of Epirubicin to plasma proteins, predominantly albumin, is about 77% and is not affected by drug concentration. Epirubicin also appears to concentrate in red blood cells; whole blood concentrations are approximately twice those of plasma <sup>(22)</sup>.

Epirubicin is extensively and rapidly metabolized by the liver and is also metabolized by other organs and cells, including red blood cells. Epirubicin and its major metabolites are eliminated through biliary excretion and, to a lesser extent, by urinary excretion. Common side effects; Nausea, vomiting, diarrhea, abdominal pain, flushing, or skin/nail color changes may occur, Temporary hair loss. Serious side effects; bone marrow suppression; including leucopenia, thrombocytopenia and anemia, Myocardial toxicity; including heart failure<sup>(23)</sup>.

#### **Management:-**

- Measurements of CBC, ECG , Liver function test , serum creatinine , and electrolytes
- premedication with an antiemetic may be useful because Epirubicin is emetogenic .
- Infusion site must be monitored closely to prevent extravasations ; sever local tissue necrosis will result if extravasations occur .
- Monitor for acute nausea, vomiting, anemia, infection, bleeding, and cardiotoxicity<sup>(24)</sup>.

The aim of our study is to determine the prevalence of breast cancer in Taif city Also we study the risk factors which increase the prevalence of the disease. Most studies were done on Europe women. We do our study on Saudi women as all risk factors were variable. We also try to assess the role of nanotechnology in breast cancer therapy. Epirubicin drug was selected as an example of the pharmaceutical nanosystem which is very effective in breast cancer therapy .

#### **Methodology and Design:-**

##### **Purpose and Research objectives:-**

- The primary purpose is to determine the prevalence of breast cancer in Taif city.
- The secondary purpose is to determine the role of Nanotechnology in breast cancer therapy.
- The third is to determine the Efficacy of Epirubicin drug in breast cancer therapy.

##### **Setting:-**

The oncology and pharmacy departments of the hospital.

##### **Study design:-**

A cross-sectional study allocated for breast cancer female patient, to determine the role of nanotechnology in breast cancer therapy during the period from September 2014 till December 2015

##### **Settings and Duration:-**

The study was conducted in departments of oncology and pharmacy of the hospital. The study was carried out for over a year (From September 2014 till December 2015).

##### **Sample volume and selection:-**

A sample composed of 300 women in Taif city , ages was between 21 to above 70 years old

##### **Tool of data collection:-**

A structured questionnaire was designed for data collection by the researchers based up on review of literature. It includes three parts, The first part: the socio-demographic data, such as: age; residency, occupation, age at menarche, marital status; age of bearing the first baby and the age of married as the later increases the probability of breast cancer.

The second part; the way of discovering the disease and the risk factors increase the prevalence of breast cancer

The third part; type of treatment that patient has, like; radiation therapy, chemotherapy or surgery. Also the effect of using Epirubicin in her therapy or not was studied.

The role of nanotechnology in treatment appears by using Epirubicin as a model drug. We study the effectiveness of using this drug in enhancing the therapy, and reducing or inhibition any side effects from the therapy .

##### **Method:-**

we conducted cross sectional study, the data was collected from face to face interview and the patient files presented in oncology department or computerized in patients files of the hospital. Data also collected by asking nurses,

doctors and pharmacists. All are answered the questionnaire and their answers were collected. All data has been statistically analysis to specify a recommended answer.

#### **Ethical considerations:-**

Official permission on this study was obtained from the previous sponsors. Hospital , doctors , nurse and pharmacist were informed about the nature of the study. Oral consent obtained from doctors nurse and pharmacist who agreed to participate in the study. We accessed patients' files from the pharmacy department after an official permission.

#### **Inclusion criteria:-**

- Adult female no matter the nationality
- Female patients with breast cancer
- Age between 21 years and above 70 years.
- No matter any other disease condition
- Patient using Epirubicin in there therapy
- New or recurrence case
- Benign or malignant tumor .

#### **Exclusion criteria:-**

- Female patient under 21 years old
- Non-breast cancer patients
- Male cancer patient
- Pregnant and nursing women
- Patient who are not using Epirubicin in there therapy .

#### **Statistical Analysis:-**

All data in this study are expressed in the form of mean. Frequencies and percentages were used for describing data, chi-square test was used with a significance level of  $P < 0.05$  . Statistical analysis was used to determine the prevalence of breast cancer in Taif city, and role of nanoparticles in Epirubicin in breast cancer therapy by measuring the efficacy and harms of the drug.

#### **Research end point:-**

**The primary end point:-**was the effectiveness of the drug in the therapy

#### **Secondary end point:-**

1. Reducing the most common side effect
2. Frequencies of the patient hospital income

#### **Results andDiscussions:-**

This study aimed to assess the prevalence of breast cancer in

Taif city and to determine the role of nanotechnology in Epirubicin drug in breast cancer therapy. A cross sectional study was conducted among 300 women in Taif city. Data were collected using a self-administered questionnaire which included questions about the socio-demographic data, knowledge of risk factors that may cause the breast cancer, way of discovering the disease, kind of therapy that the patient received, use of Epirubicin drug in therapy, duration and response of therapy and if the patient feels any harms symptoms.

#### **The prevalence of the breast cancer in Taif city:-**

Three hundred participants were interviewed in this study. Males were excluded from that survey. The breast cancer was more predominant in female patients. Also the breast cancer patients only are included in the survey. Only 32 women have breast cancer in the period of the study September 2014 till December 2015 were take their medication in the hospital (From September 2014 and followed up the patient condition until December 2015 ). The percent of the breast cancer women is more than 10% in 15 months from September 2014 till December 2015. This result was approximately matched with the results of cancer centers survey which found that approximately 12.3 percent of women will be diagnosed with breast cancer at based on 2009- 2011 data. For this reason, the World Health Organization considered breast cancer, one of the most important causes of death in women <sup>(25)</sup> .



**Demographics:-**

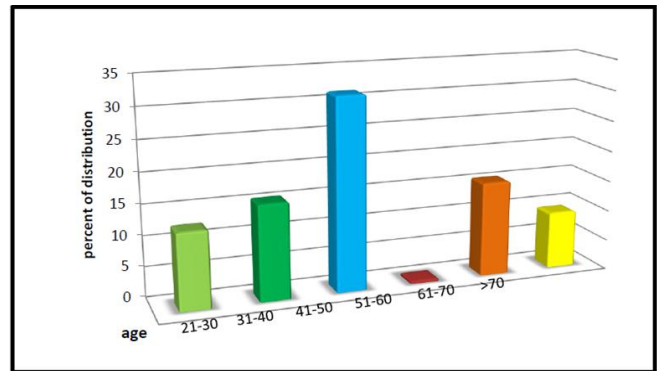
**Sample distribution by agevariable:-**

There was a variation in the interviewed age group. The data were illustrated in table (1-A) and Fig. (1-A). The highest percentage of women with breast cancer are in the age group (41-50), they reached up to 31.3% while the lowest percentage was at the age group (>70%), which reached (9.4%). That indicates that women between age 41-

50 years old are more susceptible to the disease from others. Statistical analysis found that there was no significant increase in the risk observed in the adult age and younger age women. These results were in agreement with the previously reported by Ahmed in Jemal, 2007 et al and Shahbazi R, 2015 et al<sup>(26,27)</sup>

**Table 1-A:-** Sample distribution by age variable

Age	number of patients	Percent%
21-30	4	12.5 %
31-40	5	15.6 %
41-50	10	31.3 %
51-60	5	15.6 %
61-70	5	15.6 %
>70 years	3	9.4 %
total	32	100%



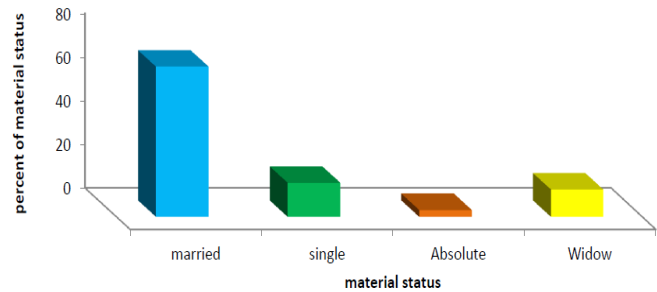
**Fig.(1-A )**Sample distribution by age variable

**Distribution of the sample by material status:-**

Table (2-A) and Fig. (2-A) show that the most of the respondents were remarried women, amounting to (68.8%) . From the results we suggest that married women are more susceptible to breast cancer than single ones. Croft L, 2014 et al also found that, those who are married have higher optimism scores than their unmarried ones<sup>(28)</sup> .

**Table 2-A:-**Distribution of the sample by material status

Marital Status	Number	Percent %
married	22	68.8 %
single	5	15.6 %
Absolute	1	3.1 %
Widow	4	12.5 %
total	32	100%



**Fig. (2-A)** distribution of the sample by material status

**Distribution of sample by variable profession**

Supreme percentage of women with breast cancer in the sample; 43.7% were housewives. The lowest percentage is students, reaching to 18.6 %, as shown in table (3-A) and figure (3-A). The lack of movement is likely to be an important factor in increasing breast cancer. Women have to go outdoors at least an hour a day because walking helps to renew the body's cells<sup>(29)</sup> .

**Table 3-A:-** sample distribution by variable profession

Occupation	Numbe	Percent %
student	6	18.7%
employee	12	37.5%
Housewife	14	43.75%
total	32	100%

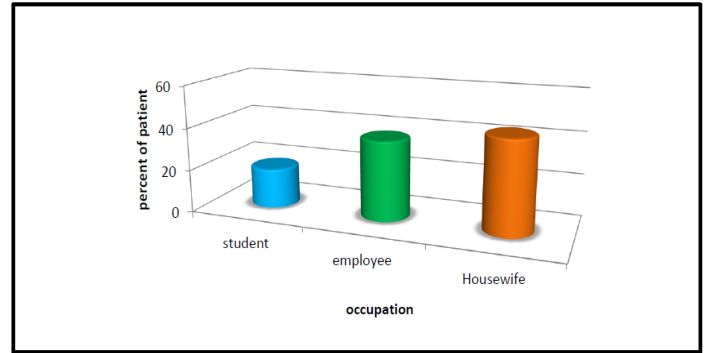


Fig. (3-A) sample distribution by variable profession

**Sample distribution by number of pregnancies**

The results were shown in table (4-A) represent the effect of pregnancy on the prevalence of the breast cancer. The highest percentage of women with breast cancer in the study sample was with 1 to 5 times of pregnancy and breastfeeding regularity (37.5%). The mother after giving birth needs two years to recover her body from the effects of pregnancy and also increase the number of pregnancies reduce the incidence of breast cancer because in this case hormones would be at a constant level in the normal activity<sup>(30)</sup>. Except governing always ask for reducing the reproductive rate.

**Table 4-A:-** sample distribution by number of pregnancies

No. of pregnant times	No. of patients	Percent of
non	7	21.9
1 to 5	12	37.5
6 to 10	8	25
10 to 15	5	15.6
total	32	100

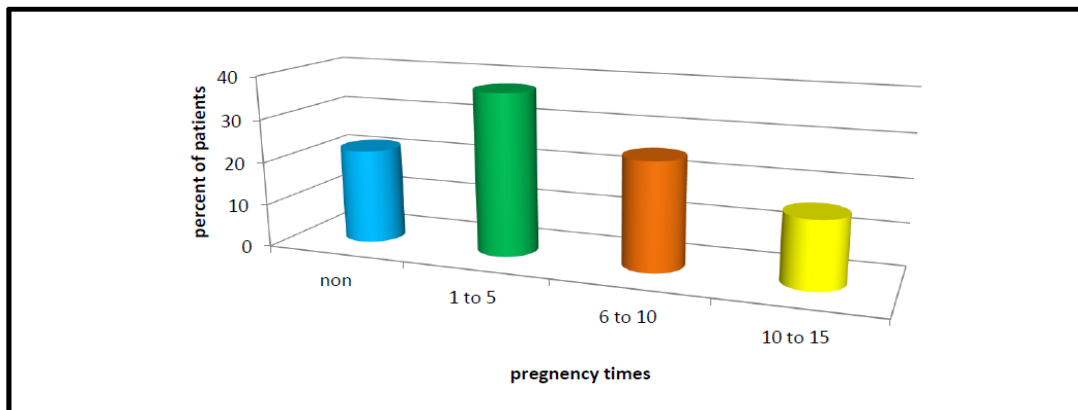


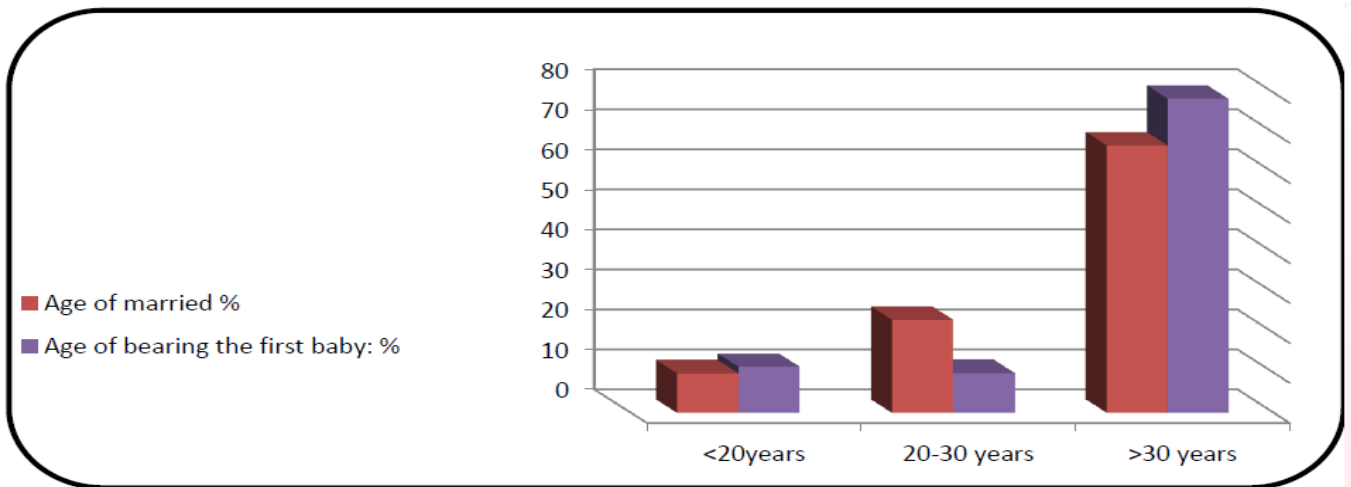
Fig. (4-A) sample distribution by number of pregnancies

**Age of married and bearing the first baby:-**

The older age of marriage and bearing the first have a greater effectiveness in causing the breast cancer. Both events at age 30 or older increase the risk up to 7.0 times relative to when both events occurred younger than age 20. Where as the corresponding risk was 1.4 times when age between 20-30 years. These results were in agreement with the previously reported result <sup>(31)</sup>.

**Table 5-A:-** Age of married and bearing the first baby.

	Age of married		Age of bearing the first baby:	
	No.	%	No.	%
<20 years	3	9.87	4	11.53
20-30 years	8	23.29	3	9.96
>30 years	21	66.84	25	78.51



**Fig. (5-A) Age of married and bearing the first baby**

**B-The way of discovering the disease and the risk factors increase the prevalence of breast cancer**

**Sample distribution by risk factors**

**Table 1-B:-** risk factors in breast cancer from the perspective of patients

cause	percent	number of patient
Age	40.6	13
hereditary	15.6	6
Cigarettesmoking	3.13	1
Changes in hormone levels	9.38	3
Toxic chemicals	9.38	3
radiation	6.25	2
diet/obesity	12.5	4
Total	100%	32

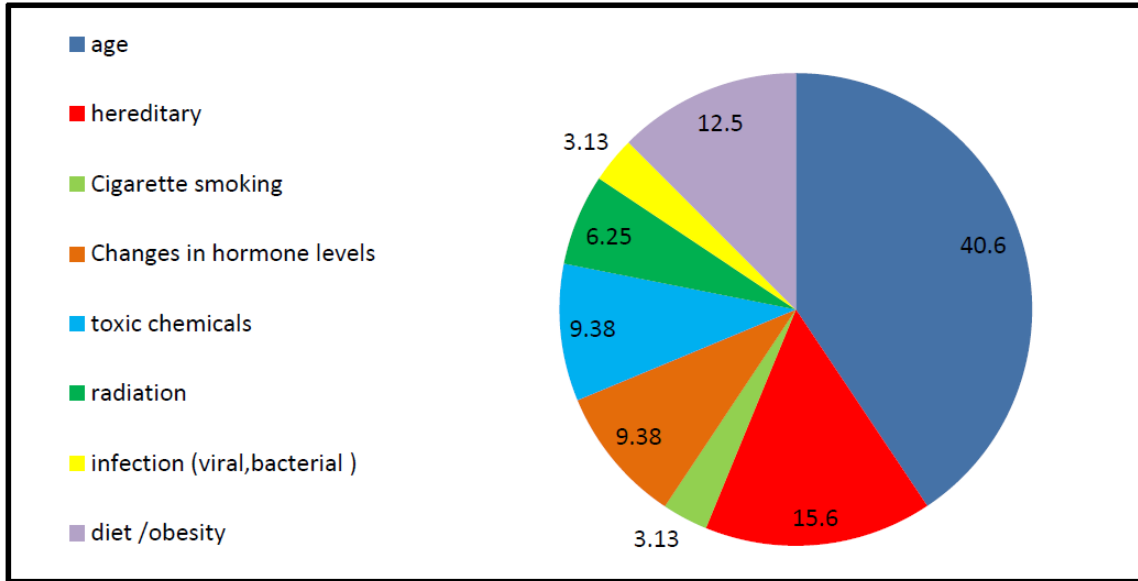


Fig. (1-B) sample distribution by risk factors .

We found in our questionnaire table (1-B); the risk of breast cancer increase by ageing (40.6%), the hereditary factors develop risk by (15.6%). It was reported that a family history of breast cancer had little effect on the risk in women with non-proliferative lesions.

However, the risk in women with atypical and a family history of breast cancer was eleven times that in women who had non-proliferative lesions without a family history <sup>(32)</sup>.

The change in hormone levels and the toxic chemicals increase risk by 9.38% only. Statistical analysis shows no significant difference between the results of both risks ( $p > 0.05$ ). While the changing in lifestyle considered a second cause of disease (12.5%). The increase of the body fatness increase the risk of breast cancer. There The World Cancer Research found that evidence increase the relative risk \postmenopausal breast cancer <sup>(33)</sup>.

because adipose-associated with the obesity increase the conversion of androgen to estrogen, mammary adipose tissue is thought to be an important source of local estrogen production. Estrogen is a potent mutagen for mammary cells, has long been implicated in the development of mammary tumors <sup>(34)</sup>. statistical analysis shows a clear significant difference ( $p > 0.05$ )

**1- personal history of breast cancer**

**Table 2-B:-** Recurrence of breast cancer.

Recurrence	percent	Patient no
Yes	40.6	13
No	59.4	19
Total	100	32

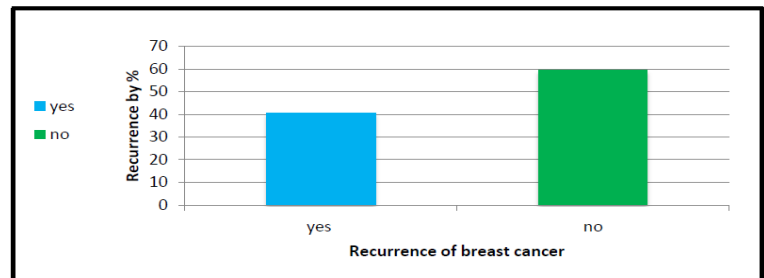


Fig. (2-B) Recurrence of breast cancer

Table (2-B) and figure (2-B) shows that the patient with a new cases of breast cancer is 59.4%; That means the lack of awareness of the breast cancer or increase the probability of the disease. The increment of the risk factor may be one of the main causes. The increase awareness of breast cancer risks and detection is necessary <sup>(35)</sup>.

**Time of Menstruation:-**

The early age of menstruation was one of the main causes of the breast cancer disease. As shown in table 4 patient who have menstruation before age 12 have a higher risk to get breast cancer <sup>(36)</sup>.

**Table 3-B:- Menstruation time .**

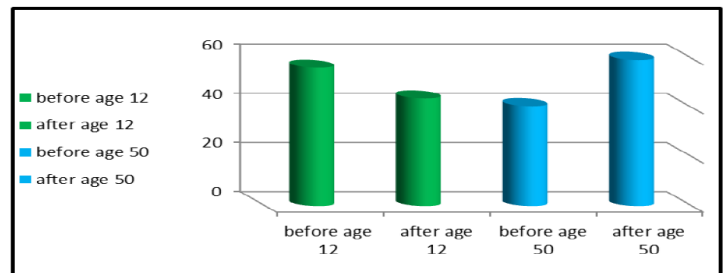
Menstruation	Percent %	PatientNo.
before age 12	56.25 %	18
after age 12	43.75%	14
total	100%	32

**Menopause time:-**

As shown in table (4-B) patient who have menopause after age 50 have a high risk to get breast cancer. By asking those women most of them take a hormonal replacement therapy. Importantly, breast cancer risk elevations appear to be higher among women who initiate treatment at the menopause, compared to women who do not have a menopausal treatment <sup>(37)</sup>. Menopausal hormone was a combination of reproductive hormones; estrogen and progesterone hormones. Reproductive hormones are thought to influence breast cancer risk by increasing cell proliferation, thereby increasing the likelihood of DNA damage, as well as promotion of cancer growth. Women should consider the increased risk of breast cancer associated with the use of estrogen and progesterone when evaluating treatment options for menopausal symptoms.

**Table 4-B:- Menopause time**

Menopause time	Percent %	PatientNo.
before age 50	40.6%	13
after age 50	59.4%	19
total	100%	32



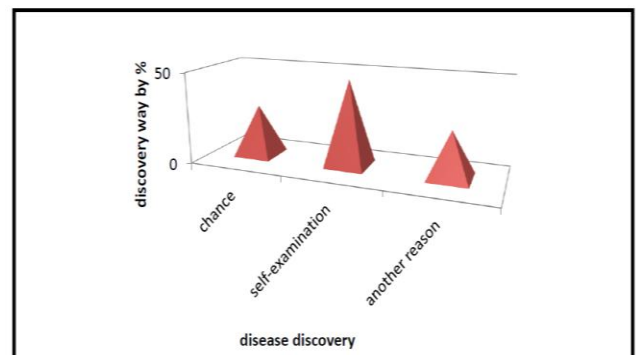
**fig. (4-B) Menstruation/Menopause**

**Discovery of The disease:-**

Table (5-B) shows that most common way of discovering the disease. The highest percentage of patient discover the disease by self-examination tests (46.9%). This indicates increasing the patients' awareness which as a great importance in the breast cancer screening. It also increases the healing rate <sup>(38)</sup>.

**Table (5-B) discovery of the disease**

discover the disease	number of	percent %
Chance	9	28.1
self-examination	15	46.9
Another reason	8	25
total	32	100%

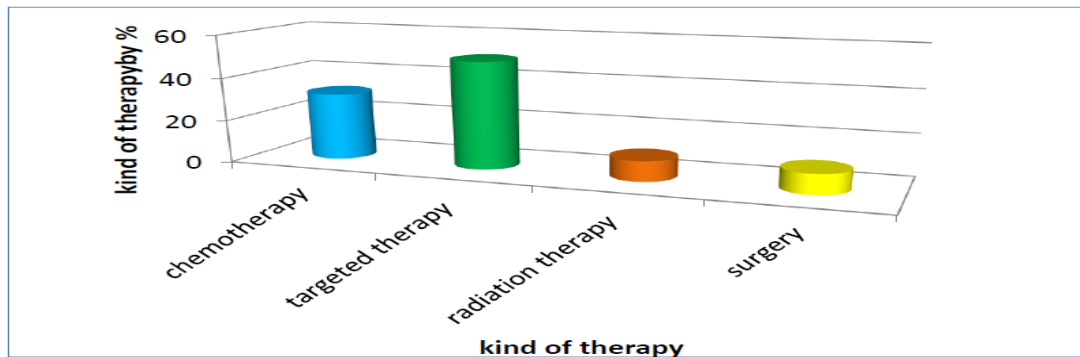


**Fig . 5-B discovery the disease**

**The role of nanotechnology in the treatments:-  
Sample distribution by kind of therapy.**

**Table 1-C:-**Sample distribution by kind of therapy

kind of therapy	Percent%	PatientNo.
chemotherapy	31.25%	10
Targeted therapy	50%	16
Radiation therapy	9.38%	3
surgery	9.3%	3
Total	100	32



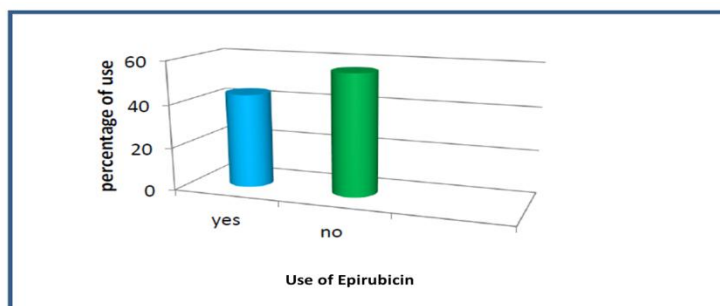
**Fig. (1-C) kind of therapy**

Fifty percent of patient have a targeted therapy which indicates the importance role of nanotechnology in breast cancer therapy table (1-C). A malignancy has become a serious threat to human health, and morbidity and mortality rates have been rising in recent years. Recent studies challenge and interesting is to develop effective therapy for cancer. <sup>(39,40)</sup>

**Sample distribution of the usage of Epirubicin and its influence in therapy.** Although the percentage of patient using Epirubicin in their therapy (43.75%) is less than who does not use it (56.25%) as shown in table (2-C) Table (3-C) but patients who influence a good effectiveness from Epirubicin HCl is 78.6%. the patients who have an appropriate therapy with Epirubicin HCl are only 21.4%.

**Table 2-C:-**Sample distribution by use of Epirubicin.

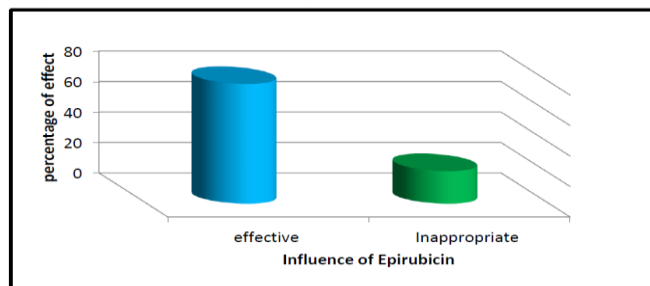
Use Epirubicin	PatientNo.	Percent %
Yes	14	43.75
no	18	56.25
Total	32	100



**Fig. (2-C) . Sample distribution by use of Epirubicin**

Influence of Epirubicin	PatientNo.	percentage of effect
effective	11	78.6 %
Inappropriate	3	21.4%
total	14	100%

**Table 3-C:-influence of Epirubicin**



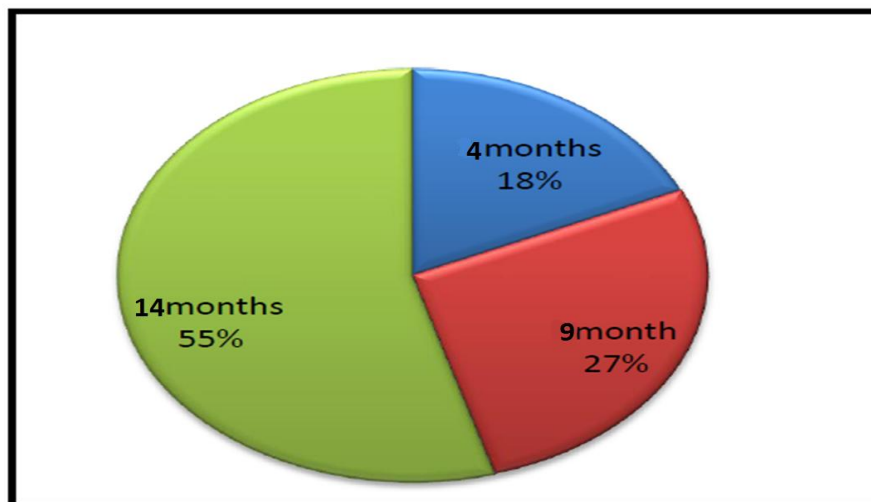
**Fig. (3-C) influence of Epirubicin**

**The duration of using Epirubicin to give an effective therapy inpatients:-**

The influence and effectiveness of the medication starts within 3 months of starting treatment, some patients need only to 3 months to show the therapeutic effect of the medication they are 18.2 % but the most patients shows the therapeutic effect of the drug in 9 months 54.5 % as table (4-C) shows. The results were agreement with the previously reported by Baldini E. 2002, et al who found that using Epirubicin in breast cancer therapy especially in combination with cyclophosphamide reduce the duration of therapy upto 6 months<sup>(41)</sup>.

**Table 4-C:-Time that Epirubicin takes to give effect of in patients.**

Effective of therapy in/month	Number of patients	Percent %
4 months	2	18.2%
9 month	3	27.3%
14 months	6	54.5%
total	11	100%



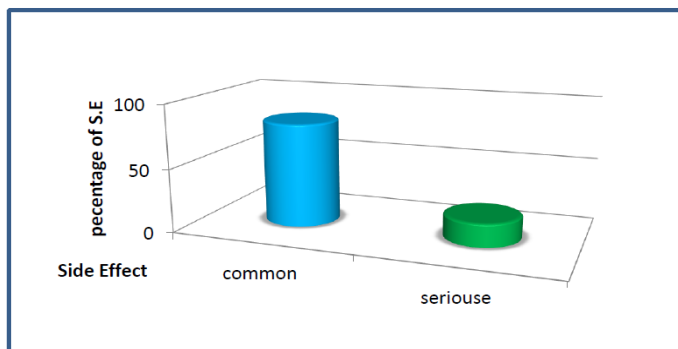
**Fig. (4-C) effective of therapy in /month**

**Side effect of Epirubicin:-**

Epirubicin HCl depends in its nanoparticles form to targeting the cancerous cells so it's not effecting on normal cells; that's why the side effects present by 18.2 % as a serious while a 81.8 % is common side effects.

**Table 5-C:-Side effect of Epirubicin.**

Sideeffect	Number ofpatients	percent
common	9	81.8
Serious	2	18.2
Total	11	100

**Fig. (5-C)side effect of Epirubicin**

Generally chemotherapy targets cell whether normal or cancerous cells; which leads to harm the healthy cells which have a high rate of growth and multiplication include cells of the bone marrow. However; the reducing of the serious side effect and duration and the highly effectiveness of the drug can be related to its nonstructural. Using multiwall carbon nanotubes (MWCNTs) in Epirubicin drug which depend on adsorption ionization methods as antineoplastic agent help to be one of the most available drugs in treating breast cancer efficiently and effectively. It allows the medication to transport and target the drug to be effective Nano-carriers for anti-tumor therapies.

Epirubicin has a favorable safety profile and less side effect after short duration of the treatment. Several studies were done to identify the expanding role of Epirubicin in the treatment of breast cancer. These studies were matched with our study in the following point: first; Epirubicin has advancement in breast cancer treatment. After studying its effect across a range of subgroups of women with breast cancer including premenopausal and postmenopausal women, women with axillary lymph node-positive and -negative tumors, and women with either hormone receptor-positive or -negative tumors of Epirubicin have been observed.

As previously reported it is being equally effective and better tolerated than Doxorubicin in women with metastatic breast cancer and has generally improved relapse-free and overall survival compared with standard adjuvant therapies, including CMF.

Trials of Epirubicin-based regimens in the adjuvant setting are ongoing, and combinations with newer cytotoxic agents such as the Taxanes, Trastuzumab, and Bisphosphonates are also being explored in an effort to continue to improve outcomes for patients with breast cancer<sup>(42)</sup>.

Epirubicin also has potential advantage in increasing rate on breast-conserving surgery especially in combination with Paclitaxel. They enabled lumpectomy in a substantial proportion of women who were previously deemed to not be suitable candidates for breast-conserving surgery<sup>(43)</sup>.

Epirubicin is favorable in the case of the risk of developing congestive heart failure is low<sup>(44)</sup>.

Epirubicin is active in metastatic breast cancer patients who have previously received Anthracyclines treatment in the adjuvant setting<sup>(45)</sup>, in advanced breast cancer<sup>(46)</sup> and has marker efficiency of Epirubicin in primary breast cancer therapy<sup>(47)</sup>.



It improves disease-free and overall survival in node-positive breast cancer patients<sup>(48)</sup> and it is extensively and rapidly metabolized by the liver and also metabolized by other organs and cells, including red blood cells. Epirubicin and its major metabolites are eliminated through biliary excretion and, to a lesser extent, by urinary excretion. The results indicated the reduced its accumulation in the body<sup>(49)</sup> which lead to reducing the serious side effect.

#### **The study end point:-**

##### **Primary endpoint:-**

The effectiveness of the drug in the therapy was more than other chemotherapy. The drug rates were significantly higher with low duration.

##### **Secondary endpoint:-**

- Reducing the most common side effect occurs with all other chemotherapies.
- Frequencies of the patient hospital income were decreased because of fast progression in patient health in less duration.
- Effectiveness of the therapy was highly observed with patients treated with Epirubicin HCl drug

#### **Conclusion:-**

The present study aimed to assess the prevalence of breast cancer in Taif city, the risk factors cause the disease and the effectiveness of Epirubicin HCl drug in the treatment as an example of nanosystems drug by screening 300 women. From all the previous results we concluded that:

- More than 10% of the patients have breast cancer in period about 15 months indicating the highest probability of breast cancer diseases. Breast cancer considered one of the most important causes of death in women.
- Risk of breast cancer disease increased by aging; Since the samples of the study were taken for patients in 21 ages and above 70 years, and by comparing between patients in their age; we found that the risk of breast cancer increased by aging 40.6% as present in the study and highly distributed at the ages between 41 to 50 years old.
- The personal history of breast cancer increased the risk to develop a new lesion or recurrence to the first one, we record in this study a 46.9% patient has recurrence disease
- Breast cancer is the most prevalent among married women; we found in our distributed questionnaire the prevalence of breast cancer disease in married woman (68.8%).
- The lack of movement is one of the contributing factors and important to develop breast cancer; therefore housewives developed the highest risk of breast cancer 43.7%, and this risk decreased if she takes a walk at least for one hour in outdoors like student or employed who show the least distributed by 18.7 and 37.5% respectively.
- Increased number of births will reduce the risk of breast cancer; especially among women have 1 to 5 times of pregnancy and breastfeeding regularly (37.5%).
- If there is a family member having breast cancer this will increase risk of it; especially if he is a very close family member like a mother or sister.
- A longer lifetime exposure to the hormones estrogen and progesterone as a hormonal supplement therapy increases the risk of breast cancer. In this study that results appear in patients how started menstruating before age 12 by and those how continued through after 50 years old or who was using supplement hormonal therapy.
- Environmental chemical compounds found around us in cosmetics, personal care products and pesticides has low effect in increasing the risk of breast cancer.
- High-fat diets can lead to being overweight or obese, which is a breast cancer risk factor
- the patients who exposed to radiation because nature of their work enhanced risk of getting breast cancer, they are presented in this study by 6.25%.
- Cigarette smoking cause many cancer types one of it causing breast cancer in smoked patients or exposed to smoke, a 3.13% from patients in this study have breast cancer due to smoking even though the low percent.
- The high awareness of breast cancer and how to discover the disease, improve the early detection of the disease and enhance recovery chances. In this study 46.9% of patients discover the disease by self-examination.
- Highly awareness from doctors of using targeted drug in breast cancer therapy is very effective in managing the disease. In our study we found that a 50% patients use targeted drug in their therapy.

- Epirubicin is a special type of chemotherapy; due to its dependence on nanoparticles in its composition so it's preferred by doctors and patients in its use. This what we demonstrated in this study ; the percentage of patients who are using Epirubicin in their therapy is 43.75 %.
- The effectiveness of Epirubicin being between 3-9 months. As 54.5% patients have the therapeutic effect of the drug in 9 months.
- Epirubicin as a targeted cancer therapy has less toxic effect than traditional chemotherapy drugs because it's targeting on cancer cells more than normal cells. However, targeted cancer therapies can have substantial side effects, but because it's containing nanoparticles for targeting the cancerous cells we found that 81.8% patients have a common side effects, while 18.2 % was serious side effect.
- Epirubicin is an Anthracycline drug using Nanoparticle in the therapy which represents advancement in breast cancer treatment. In addition it is being equally effective and better tolerated than other chemotherapy, due to its dependence on nanoparticles for targeting the cancerous cells. This explains why it has the highest efficacy and the lowest side effects than other chemotherapy agents.

### Recommendation:-

- Spread awareness about breast cancer detection , and how it's important to discover the disease and increase effectiveness of therapy if the disease detected early.
- Work on the preparation of educational programs by radio, television, social media and other media on the risk factors that cause breast cancer so that people can prevent this disease early
- Encourage mothers to continue breastfeeding their children even after providing additional food because breastfeeding reduces the incidence of breast cancer.
- The role of health and media organizations around the initial actions of infected women and about how to note and examine any abnormal swelling through health education for the family.
- Encourage doing exercises or at least a walk in outdoors for one hour daily , because exercises and fresh air reduces risk of getting breast cancer
- Continuous checkup and self-examination for women having high risk to get breast cancer, e.g. family or personal history of breast cancer.
- Stay away from taking hormonal medications and contraception without consulting your doctors.
- Checkup the environmental chemical and make sure it's not carcinogenic factors especially in work area.
- Balancing foods and diet intake , to regulate the exercise and reducing the chances in getting breast cancer
- Protect people who work in the fields of radiation by:
  - Distance: the radiation intensity decreases as we move away from the source, and this means we should keep a suitable distance away from the radiation source.
  - Time: commensurate dose radiation directly proportional to the exposure time so it must perform work in the region where there is a radiation as soon as possible and efficiently.
  - Armor: The armor is a protective barrier placed around the radioactive source or a source of radiation device.
- Increase the awareness of doctors, healthcare providers and patients about the role of medications that contain nanotechnology in its composition e.g., Epirubicin drug and how it reduces the side effects and increase the effectiveness of the therapy.
- We should use a suitable simple and safe nanosystem preparation technique, method of preparation and the polymer among the various possible methods to produce nanoparticles with desired size range with targeting effect and depending on the physicochemical characteristics of a drug.
- Using of Epirubicin in treatment of breast cancer therapy for 3-9 months is recommended.

### Summary:-

This study has been done to assess the prevalence of breast cancer in Taif city and the role of Nanotechnology in Epirubicin drug in its therapy we done this study period from 21 Sep. 2014 to 25 Dec. 2015 by taking samples from patients presented to the hospital in 2014 only. By screening 300 women in Taif city presented to the hospital in 2014 then followed up the cases to Dec. 2015 and analysis the results statistically using SPSS to achieve the objectives of the research. We found that the patients who have breast cancer is 10.7 % in 32 cases. The highest percentage of women with breast cancer is in the age group (41-50). Married women are more susceptible to breast cancer than single women (68.8%). The highest percentage of women with breast cancer in the sample is housewives and the lowest percentage is students. Risk of breast cancer increases by ageing , family history and changing the hormone levels. High

awareness of breast cancer screening allowed to 46.9% of patient to examine themselves and helped them to discover the disease. Reducing the pregnancy age, marriage age and pregnancy numbers (1 to 5) and breastfeeding help in reducing the probability of breast cancer disease. Nanotechnology has great importance. Nanoparticles presented in the Epirubicin HCl shows high effectiveness and less side effects in a period between 3-9 months due to targeting the cancerous cells.

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**Abbreviations:-**

1. BC : Breast cancer
2. CNT : carbon nanotubes
3. DCI : Ductal carcinoma in situ
4. DLT : dose-limiting toxicities
5. DNA : Deoxyribonucleic acid
6. EPI : Epirubicin hydrochloride
7. f-CNTs : functionalized carbon nanotubes.
8. GRAS : generally recognized as safe
9. HIV : human immunodeficiency virus.
10. IV : intravenous
11. LUVs : large unilamellar vesicles
12. MLVs : Multilamellar vesicles
13. MSNs : mesoporous silica nanoparticles
14. MTD : maximum-tolerated dose
15. MWCNTs : multi wall carbon nanotubes.
16. NNI : National Nanotechnology Initiative
17. PCL : polycaprolactone
18. pCR : pathologic complete response
19. PEG : polyethylene glycol
20. PEI-PEG : polyethylenimine-polyethylene glycol
21. PFS : progression-free survival
22. PLA : poly lactic acid.
23. Ppy : polypyrrole
24. RNA : Ribonucleic acid.
25. SLN : Solid lipid nanoparticles
26. SUVs : small unilamellar vesicles
27. SWCNT : single wall carbon nanotubes.

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### RESEARCH ARTICLE

#### DENTAL PATIENTS PERCEPTIONS AND KNOWLEDGE ON TOOTH BLEACHING.

Mufareh AlAmri, Abdula krim AlShamrani, Mohammed Al Ali, Abdulfatah Abu-Khashab, Abdul Qadir Abdul Wahid and Syed Hammad Ahsan.

#### Manuscript Info

##### Manuscript History

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#### Abstract

**Aim:** The main aim of the study is to assess the perceptions and knowledge on tooth bleaching among patients visiting various dental health care centers in Riyadh. KSA

**Materials & Methods:** A cross sectional survey based study was conducted at four dental health care centres in Riyadh. The survey was based on face to face interview which utilized a structured questionnaire. The data obtained was analysed utilizing frequency distribution and chi square test.

**Results:** No statistically significant relationship was found between knowledge / perception regarding teeth bleaching and age ( $p= 0.250$ ), gender ( $p=0.189$ ), ethnic group ( $p= 0.966$ ), level of education ( $p= - 0.843$ ) or marital status ( $p= 0.552$ ). 80% of the subjects were dissatisfied with the appearance of their teeth, colour being the main reason. 70% of the dissatisfied patients stated that B1 – vita shade was the shade which they preferred. The main source of information regarding tooth bleaching was advertisements, while, the commonest method of tooth bleaching was bleaching toothpaste. 23% subjects didn't consider bleaching treatment safe.

**Conclusion:** Majority of the patients were aware about tooth bleaching as a treatment. Tooth color was the main reason for seeking bleaching treatment. Tooth color was the main reason for seeking bleaching treatment and shade B1 was the whitest and the most chosen color.

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#### Introduction:-

Tooth discoloration is of two main types, namely, intrinsic tooth discoloration and extrinsic tooth discoloration. Intrinsic tooth discoloration usually occurs due to intake of certain teratogenic drugs such as tetracycline or exposure to high levels of elements such as fluoride and certain heavy metals during the phase of tooth formation (Hannig and Joiner, 2006; Alshara et al., 2014). While, extrinsic tooth discoloration occurs after the tooth formation and is usually caused by certain dietary products such as tea, coffee and social habits such as tobacco (Hannig and Joiner, 2006; Alshara et al., 2014).

Since tooth discoloration is directly associated with the esthetics of patients, thus, numerous studies have tried to evaluate the level of satisfaction of individuals in relevance to dental esthetics (Azodo and Ogbomo, 2014; Mehl et al., 2014, 2015). A study comprising of 235 Malaysian individuals showed that the 52.8% were dissatisfied with their dental appearance, while, 56.2% were not happy with their tooth color (Tin-Oo et al., 2011). Another study

conducted in Poland showed that 61.0% of the subjects were dissatisfied with the appearance of their teeth (Wisniewski et al., 2004). It is also important to observe the relationship of various factors with the individual's level of satisfaction in regards to dental esthetics. Thus, a New Zealand based study conducted on general dental practitioners (GDPs) showed that according to GDPs females were more demanding regarding tooth whitening as compared to males (Theobald et al., 2006). Similarly, a Hong Kong based study showed that age was an important predictor for increased demand of tooth whitening (Chan et al., 2013). Two other studies reported that general satisfaction with tooth appearance was influenced mainly by tooth color, followed by malalignment and caries. Therefore it was suggested that when planning treatment, dentists should consider, patient's esthetic objectives in addition to function, structure and biology. This can lead to a higher level of patient satisfaction (Gili R. Samorodnitzky-Naveh, 2007; Tin Oo et al., 2011).

Today the cosmetic dentistry has become an important part of restorative dentistry as the patients perception of teeth appearance is associated with their general health and well being (BA Matiset al, 2007). Recent advancement in restorative and esthetic dentistry has led to the emergence of various tooth bleaching agents (Dahl and Pallesen, 2003). The level of trustworthiness of these products has increased globally because of their application under professional care and supervision (Nora Nomay, 2016). In addition to that, these bleaching agents are considered to be the least invasive method to treat the discolored teeth (R Zekonis et al., 2003). This upscale in the demand of tooth bleaching is evident in an American study which showed a 300% increase in demand of bleaching agents amongst adults (Morley, 1999). The New Zealand based study on GDPs also showed that 77.8% of the patients desired dental bleaching (Theobald et al., 2006). Another study showed that the popularity of teeth whitening has increase many-fold with the availability of over the counter bleaching agents (Dimitrios Tortopidis et al., 2007).

Limited studies of such nature have been conducted in Saudi Arabia. A study conducted in 2000 showed that 25.6% of the dental patients used saline and 10% used lemon as home based dental whitening agents (Almas et al., 1999). Another study was conducted recently in Saudi Arabia which assessed the attitude and awareness of tooth bleaching among general population attending shopping malls in Riyadh city, Saudi Arabia (Nora Nomay, 2016). Patient's perceptions and expectations from tooth bleaching must be assessed before the patients undergo the treatment. The expected outcome must be made clear to the patient as discrepancies between the patient's and dentist's perceptions of esthetic treatment needs have been reported (R Ahmad et al. 2005).

This study aims to assess the dental patient's perceptions and knowledge on tooth bleaching so that the discrepancies between the patient's and the dental surgeon's perception regarding tooth whitening are identified and a comprehensively better dental care is delivered to the dental patients.

### **Materials and Methods:-**

It was a cross-sectional survey based study. The samples were selected based on a two stage convenience sampling technique. The first stage comprised of selection of study sites. The study sites were Muneseyah campus of Riyadh Colleges of Dentistry and Pharmacy, Ministry Health Hospital (Eastern Branch), Sigal Clinics and Suleman Alhabib (Olaya branch) which are located in Riyadh (capital of Kingdom of Saudi Arabia). The second stage comprised of selection of subjects. The subjects were dental patients arriving in the above mentioned dental clinics. The sample size was 300. The subjects were interviewed face to face in the waiting area of the respective clinics. An informed consent was taken before interview. The interview was structured, based on a questionnaire which was available with the interviewer. The questionnaire was based on a study published by R Ahmad, E.H.Z.M. Ariffin, I. Vengrasalam, N.H.A. Kasim et al 2005 (R Ahmad et al. 2005).

The questionnaire had been modified and translated to meet the requirements of our study. The questionnaire comprises of three parts.

Part A is based on socio-demographic questions

Part B is based on patient's perception of their oral health

Part C is based on their knowledge of dental bleaching agents.

### **The questions of the questionnaire are as follows:-**

A :

Age : .... Gender : M/F Nationality : ..... Marital status : Married / Single

Occupation : ..... , Level of education : No education / Primary/intermediate/High school / University

B:

1-What do you think about your oral health?

Excellent. Good. Not good

2-Are you happy about your teeth appearance ?

Yes .No: why ?( Color, Appearance, Size, Decay)

3-Are you satisfied about your teeth color ?

Yes. No: so, which color you prefer? Shade?

4-Are you a smoker ?

No. Yes : which type : \*Cigarette \*Shisha \*Tobacco chewable \*Cigar \*Other .....  
how many times per day :

5-Do you drink tea or coffee ?

No. Yes. How many cups per day :  
C:

1. Have you heard about tooth bleaching? Yes. No.

2. How did you know about tooth bleaching?

dvrtisments articles dentist Family/friends

3. Have you ever tried using bleaching productsor undergone tooth bleaching treatment indental clinics?

No. Yes. Where? In-clinic. In-home

4. If yes in-home , which of the listed products you have used .

- a. Toothpaste :Synsodyne-true white , Colgate-optic white , Blanx-whiteShock other : .....
- b. 3D Crest white strips other : .....
- c. iWHITE Gel with trays other : .....
- d. Miradent Oxygen Whitening Pen other : .....
- e. Others.....

5. What are the reasons for using the bleachingproducts / treatment?

Coffee/tea Cigarette Stain Trail Improve esthetic

6. How long did you use the products / treatment before you noticed the results? Hours, Days, Weeks, Months

7. How often do you use the bleachingproducts / how often do you visit your dentistfor the bleaching treatment?

8. How would you rate your satisfactionregarding the results of using the bleachingproducts/ treatment?

Highly satisfied satisfied not satisfied Don't know

9. Do you think the bleaching products/treatment are safe?

Yes. No. why? ..... Not sure.

10. Do you intend to use any bleaching products/ treatment in the future?

Yes. No.

11. What do you think about the prices of these teeth bleaching treatment options?



Expensive.Reasonable.cheap

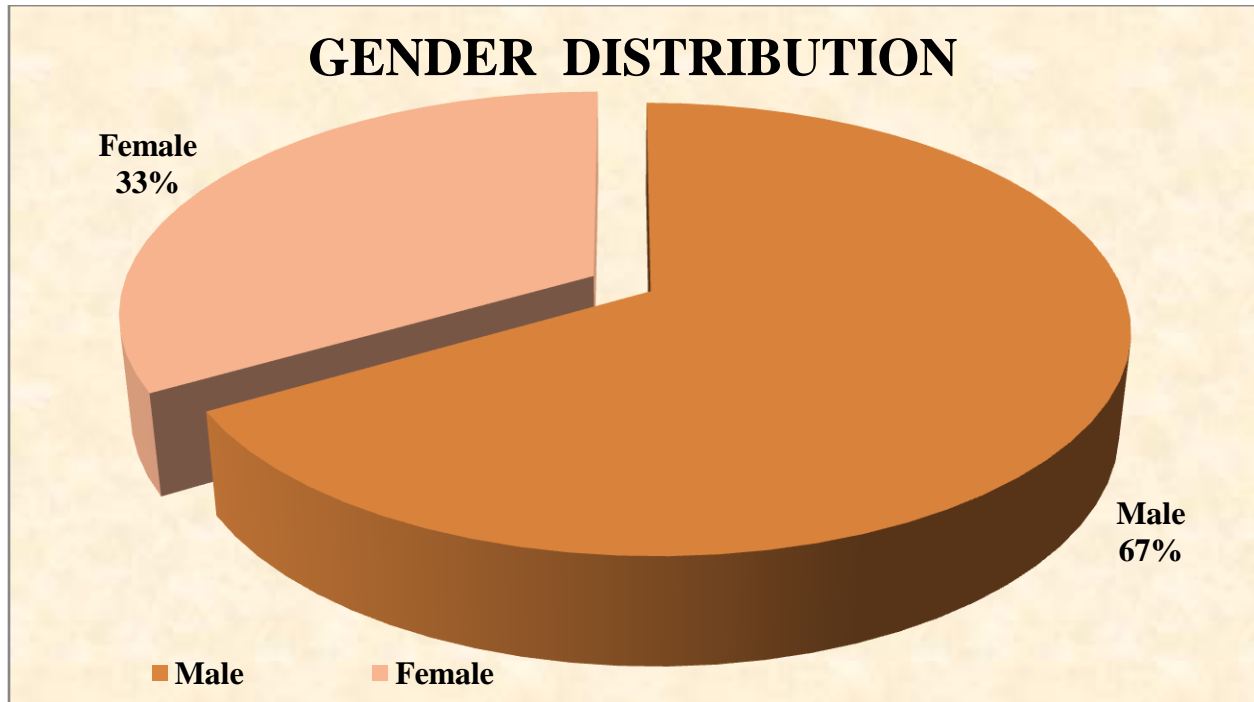
12. Would you recommend to your friends and family to use these bleaching products /treatment?

Interviewers were level 12 dental students. The average time of the interview was 10 minutes. The interview comprised of showing the patient Vita Shade Guide to aid them in selecting the desired shade for themselves. Statistical analysis was conducted by SPSS Version 20. Pearson chi square and Fisher's exact test were performed for statistics.

**Results:-**

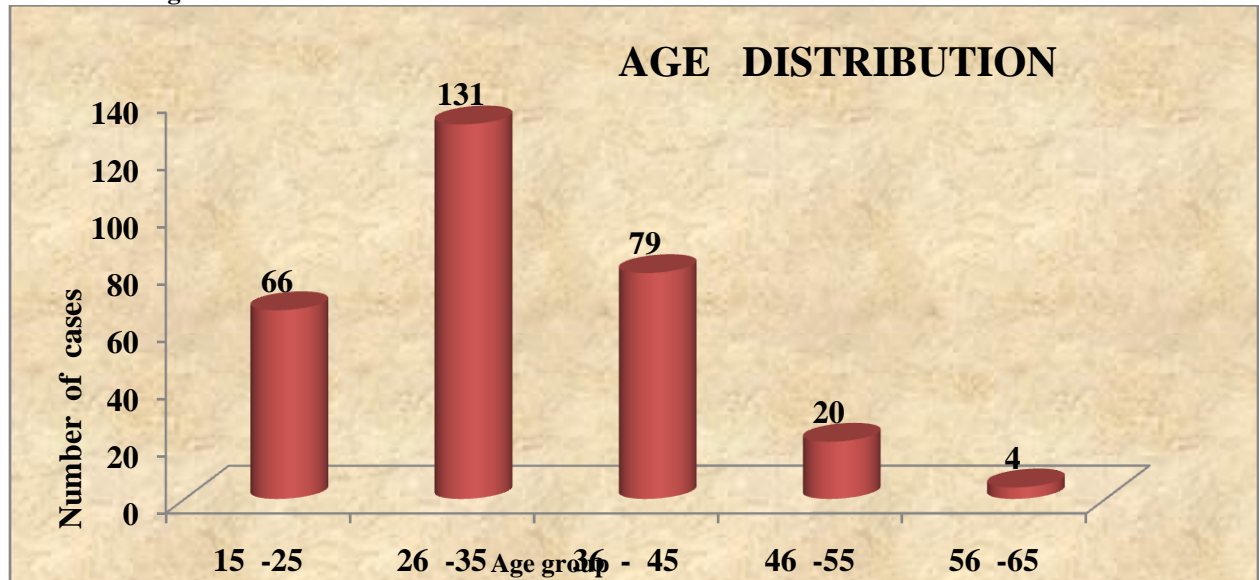
**Results 1**

**Pie Chart:- Gender Distribution.**



Results 2:-

Bar Chart:- Age Distribution.



Results 3:-

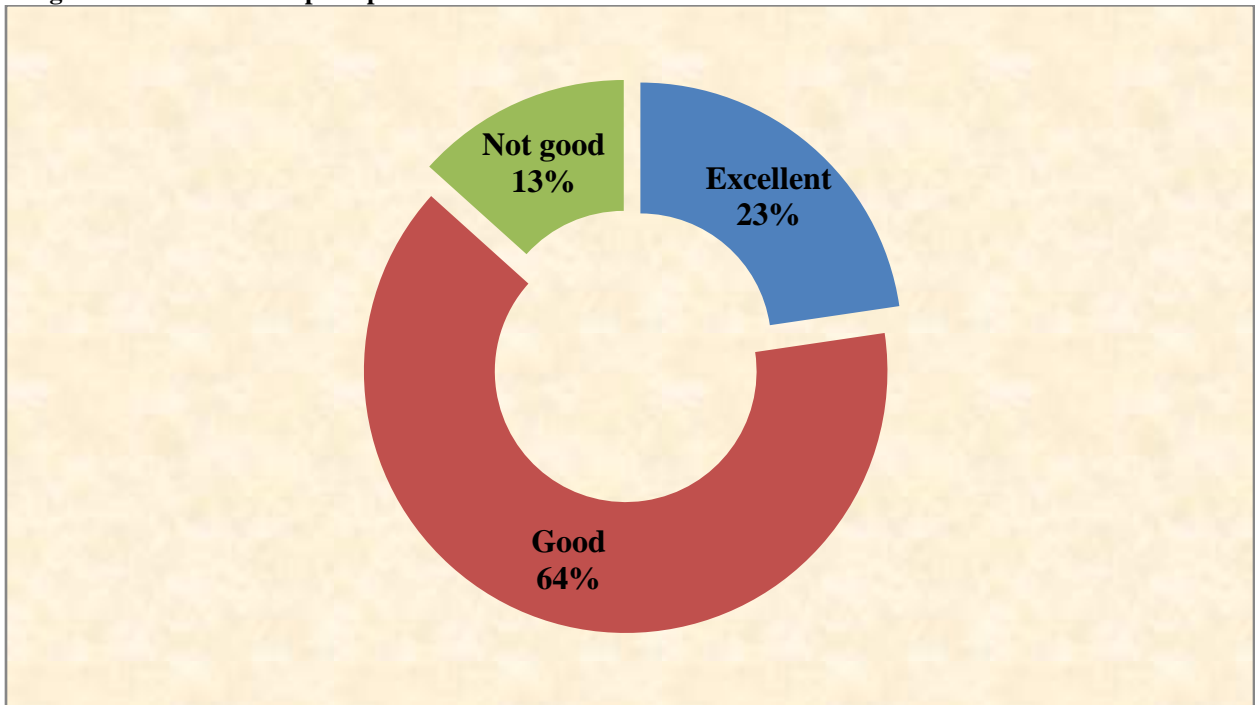
Education.

**EDUCATION**

	Frequency	Percent
highschool	80	26.7
intermediate	17	5.7
primary	3	1.0
university	200	66.7
Total	300	100.0

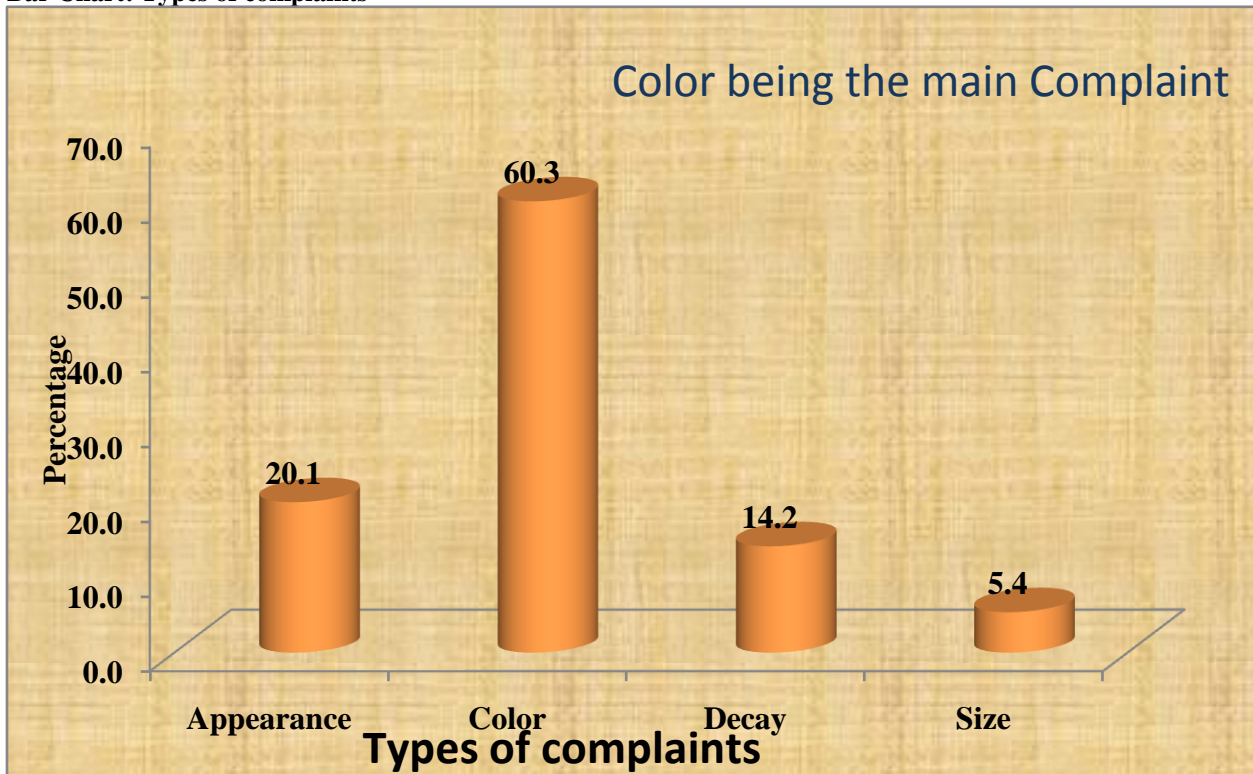
**Results 4:-**

**Doughnut Chart: Patients perception about their Oral Health.**



**Results 5:-**

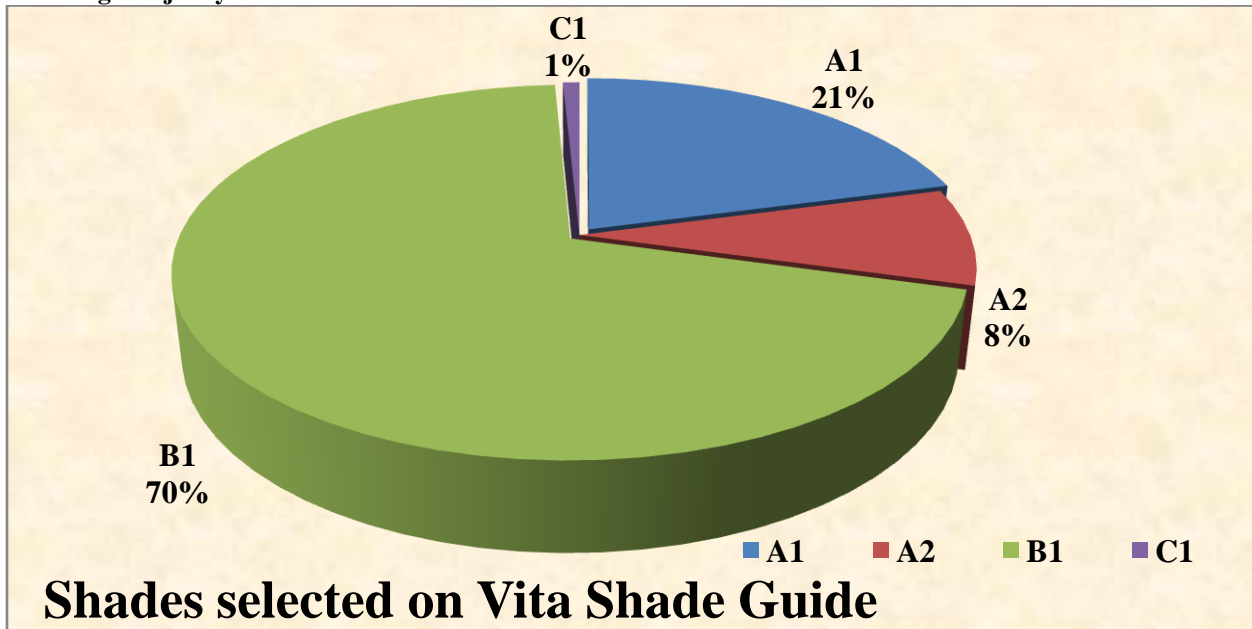
**Bar Chart: Types of complaints**



**Results 6:-**

**Pie Chart: Patient’s satisfaction with the color of their teeth**

- Only 17% were satisfied
- Large majority selected B1 as their desired shade



The Vita Shade Guide that was shown to patients for shade selection.



**Results 7:-**

In our study, there was no statistically significant relationship between the patient’s knowledge / perception regarding teeth bleaching and age ( $p= 0.250$ ), gender ( $p=0.189$ ), ethnic group ( $p= 0.966$ ), level of education ( $p= 0.843$ ) or marital status ( $p= 0.552$ ) of the subjects.

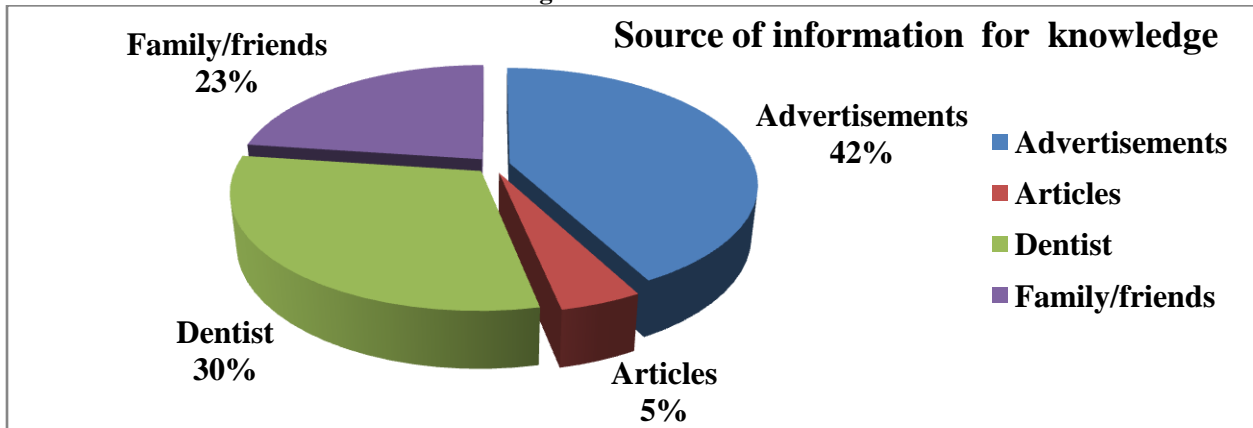
**Results 8:-**

**Patients Knowledge about Bleaching treatments availability.**

98% of the patients knew that bleaching is a treatment option to improve dental aesthetics

Results 9:-

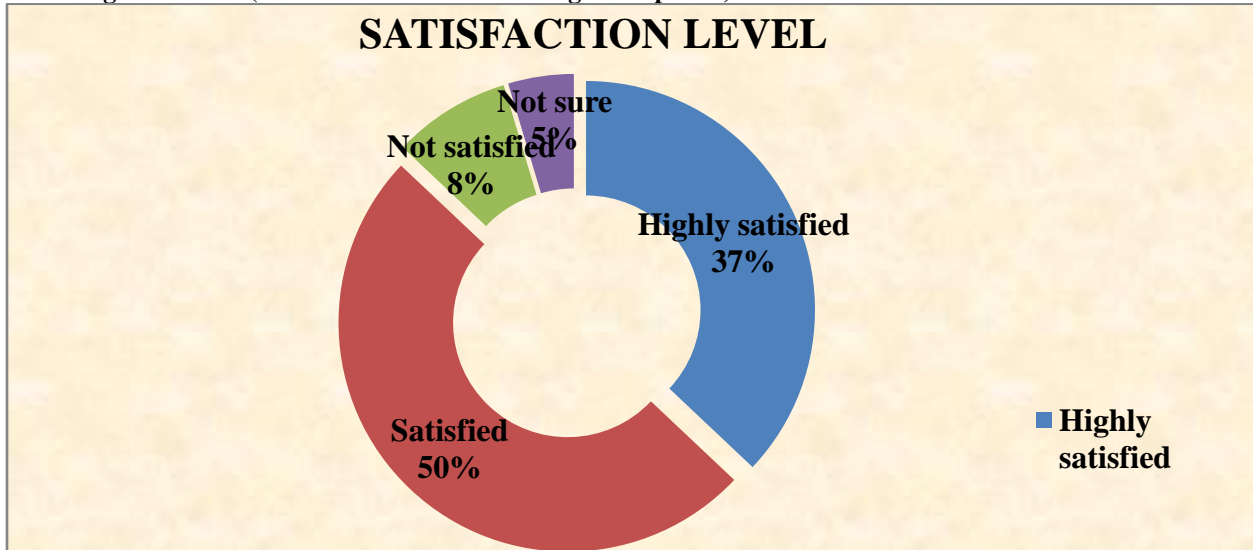
Pie Chart: Source of information for knowledge.



Results 10:-

Doughnut Chart: Satisfaction Level.

Those who had the knowledge about Bleaching treatments Only 50% from them had tried some type of bleaching treatment (of them 97% used whitening tooth pastes).



**Results 11:-****Reasons for bleaching**

85% for improving aesthetics followed by Tea/Coffee and Cigarette stains

**Reasons for bleaching :-**

	Frequency	Percent
Cigarette	4	3.7
Coffee/tea	9	8.3
Improve Esthetics	91	84.3
Trail	4	3.7
Total	108	100.0

**Results 12:-****Patients perceptions about safety of bleaching treatments**

- 49% considered it a safe treatment
- 23% did not consider it a safe treatment
- 28% were not sure about the safety of treatment

**Safety of dental bleaching:-**

	Frequency	Percent
Yes	53	49.1
No	25	23.1
Not Sure	30	27.8
Total	108	100.0

**Discussion:-**

In our study, there was no statistically significant relationship between the patient's knowledge / perception regarding teeth bleaching and age ( $p= 0.250$ ), gender ( $p=0.189$ ), ethnic group ( $p= 0.966$ ), level of education ( $p=0.843$ ) or marital status ( $p=0.552$ ) of the subjects.

This is in line with similar studies conducted in Malaysia, Sweden and China , which showed that the patient's knowledge and perception regarding teeth bleaching was not associated with age, gender, ethnic group or marital status of patient except for, the level of education of the patient (R Ahmad et al. 2005). However one Saudi study reported that female gender's perception about teeth bleaching is significantly higher than the male gender. (Nora Nomay, 2016). This reported difference may be because of the reason that her study was conducted with general population in shopping malls while our study was conducted in dental patients visiting different dental health care centers in Riyadh.

In our study, 80% of the patients were dissatisfied with the appearance of their teeth. This percentage is higher than other similar studies conducted in Saudi Arabia 67.4%, Poland 61% and two Malaysian studies 53.5% and 56.2%. (Nora Nomay, 2016; Tin Oo et al., 2011; R Ahmad et al. 2005; Wisniewski et al., 2004).

In our study, tooth color was the primary reason behind the dissatisfaction of the appearance of the teeth. This finding is again similar to some of the other studied conducted in Saudi Arabia, Malaysia and New Zealand. (Nora Nomay, 2016; Tin-Oo et al. 2011; Theobald et al. 2006). Amongst those who were dissatisfied, 70% stated that B1 was the shade which they preferred for their teeth (Based on Vita Shade Guide). B1 is the whitest shade in the Vita guide which shows that the patients perception of aesthetics is very different from that of the dental professionals, as the later considers many aspects like patient's skin tone/color, colors and shades of patient's other teeth and position of teeth in the oral cavity etc. This question was not asked in any of other similar studies published. 98% of the patients knew that bleaching is a treatment option to improve dental aesthetics. The result is comparable to other studies. Although it's a surprise that even as majority of the patients were not satisfied with the color of their teeth only 50% of them had tried some type of bleaching treatment. Amongst those who knew about the availability of bleaching agents, 42% comprised of those who got the information from advertisement, while, 30% got the information from dentist.

Similarly, another study showed that majority of subjects got knowledge of bleaching agents from advertisement (R Ahmad et al. 2005). It is therefore necessary for the dental professionals to educate their patients more effectively about the availability and benefits of various in office bleaching treatments. In our study, main reason for seeking dental bleaching was to improve the aesthetics.

Surprisingly, stains from tea/coffee and tobacco were only miniscule reasons, suggesting that, most of the patients do not perceive that bleaching can treat such stains. This information also must be delivered to the patients by the dental professionals. In our study, almost all the patients who were using bleaching agents had only tried the bleaching tooth pastes, most patients were not motivate enough to try other products like gels, pens and strips etc. While, in another study, majority knew about bleaching gel (R Ahmad et al. 2005). Therefore, further research needs to be done to ascertain why the patients do not choose other products.

In our study, those who used the bleaching toothpastes had high satisfaction levels (87%) which suggests that most of the commercial products available in the market are very effective. In contrast another study showed that only 13.3 % of the subjects were highly satisfied with the results obtained from bleaching agents (R Ahmad et al. 2005). The difference in the satisfaction level in between the two studies, might be due to the variability in products used by subjects. Further research can be conducted to compare the effectiveness of different products.

In our study, 17.7% of the respondents thought that bleaching products are safe to use, while, 1.6% of respondents in another study believed that bleaching products are safe to use (R Ahmad et al. 2005). In our study, 17% of the respondents stated that bleaching agents are expensive. 23.7% of the respondents stated that they would recommend bleaching treatment to others.

### **Conclusion:-**

- 80 % of the patients were not happy with the appearance of their teeth, the main complaint being the color.
- When given choice to select the desired shade large majority picked the shade B1 (The whitest shade!)
- Knowledge of bleaching among dental patients in Riyadh was not related to age, gender ethnic group, level of education or marital status .
- 98% of the patients knew that bleaching is a treatment option to improve dental aesthetics, and those who knew of them only 50% had tried some form of treatment.
- Bleaching toothpastes were the preferred method (97%) and it also showed very high satisfaction levels (only 8% were not satisfied)
- Patients do not prefer In-office bleaching treatments and/or other over the counter bleaching treatments.
- Dentists must consider educating their patients more comprehensively regarding the availability of in-house bleaching treatments.

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### RESEARCH ARTICLE

#### PROGNOSTIC SIGNIFICANCE OF SERUM CALCIUM LEVEL IN A SAMPLE OF EGYPTIAN PATIENTS WITH INTRACEREBRAL HEMORRHAGE.

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#### Manuscript Info

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##### Key words:-

Serum calcium , intracerebral hemorrhage , outcome

#### Abstract

**Introduction:** Calcium (Ca), which is an essential factor for human life, could play a role in pathophysiology of spontaneous intracerebral hemorrhage (ICH). This prospective study was conducted to assess serum Ca level in a cohort of Egyptian patients with ICH and searching for a possible association between serum Ca and both of hematoma volume and short-term outcome after ICH.

**Patients and Methods:** This study was conducted at intensive care units (ICU) of neurology department, Zagazig University Hospitals, Egypt. We included ninety patients with spontaneous ICH. All patients were subjected to thorough history taking, general and neurological examination. National Institute of Health Stroke Scale (NIHSS) was done on admission to assess stroke severity. Initial Computed Tomography (CT) scans were done for all patients within the first 24 hours of admission to calculate the hematoma volume. Serum Ca level was measured on admission for all patients. Short-term outcome was assessed using the modified Rankin scale after one month of ICH onset.

**Results:** Among the ninety cases of ICH, (14.4%) had low serum Ca on admission. Patients with low serum calcium level had a significantly larger initial hematoma volume and higher scores on NIHSS in comparison to ICH patients with normal Ca level. Serum Ca was inversely correlated with hematoma volume ( $p < 0.001$ ), stroke severity ( $P < 0.001$ ) and stroke outcome according to modified Rankin scale.

**Conclusion:** low serum Ca level on admission was associated with large initial hematoma volume and unfavorable outcome in patients with spontaneous ICH.

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#### Introduction:-

Spontaneous intracerebral hemorrhage (ICH) is considered as the most catastrophic stroke, it accounts for approximately 15- 20% of all cerebrovascular strokes<sup>1-2</sup>. Being associated with higher morbidity and mortality, it is considered a major public health problem and needs an effective therapy<sup>2</sup>. Accurate identification of predictors of outcome may help optimal beginning time for immediate intervention and management, which might influence early mortality following ICH. Earlier studies have investigated great associations between clinical, laboratory and

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radiographic factors on one hand and outcomes in patients with ICH on the other hand<sup>3-4</sup>. One of these factors is the initial Large hematoma volume which could be considered as an independent predictor of mortality and poor neurologic outcome after acute ICH<sup>5</sup>.

Serum calcium (Ca) is an essential factor for human life, it plays a role in the pathophysiology of cerebral ischemia and influences the molecular pathways of ischaemic neuronal death<sup>6-7</sup>. Previous researchers<sup>6-8</sup> had reported an association between serum Ca level and ischemic strokes as it was observed that a high serum Ca level was associated with a small infarct size and less severe ischemic stroke<sup>7</sup>. In addition, Appel et al.,<sup>9</sup> observed that ischemic stroke patients with high Ca level had a favorable outcome in comparison to those with low Ca level. Moreover, others demonstrated in a previous study that individuals with high dietary Ca intake had a reduced stroke risk<sup>10</sup>.

Data from experimental studies showed an association between Ca levels and changes in bleeding and clotting time<sup>11-12</sup>, thus it was suggested that Ca could play a role in haemostasis in the setting of acute ICH<sup>13</sup>. Recently, few data were published on the relation between serum Ca level and the initial hematoma volume<sup>14</sup> as well as outcomes after ICH<sup>13-15</sup>. However, the underlying mechanisms are poorly understood<sup>14</sup>.

The aim of the current study was to assess serum Ca level in patients with primary ICH and searching for a possible association between baseline Ca level and both of hematoma volume and short-term clinical outcome.

### **Patients and Methods:-**

This study was conducted on 90 patients with primary intracerebral haemorrhage (ICH) who were admitted in Intensive Care Unit (ICU) and stroke Unit of Neurology Department, Zagazig University Hospitals during the period from July 2015 till April 2016. Patients were selected according to the following criteria: patients with ICH who were admitted within 24 hours of symptoms onset. Intracerebral haemorrhage was defined as a new and acute (< 24 hours) neurological deficit with compatible brain imaging showing the presence of intracerebral bleeding<sup>16</sup>. Patients with ICH secondary to trauma, tumor, vascular malformation, current use of anticoagulation and those with haemorrhagic transformation Excluded from the study.

All patients were subjected to the following: detailed medical and neurological history taking from either patients or relatives with stressing on stroke risk factors, complete general and neurological examination with assessing stroke severity using National Institute of Health Stroke Scale (NIHSS)<sup>17</sup> which was done on admission. Brain Computed Tomography (CT) scans was done within the first 24 hours of symptom onset to diagnose ICH and to calculate the volume of intracerebral hematoma. Hematoma volume was measured on the initial head CT scan with the use of the ABC/2 equation<sup>18</sup>, in which A is the greatest diameter on the largest hemorrhage slice, B is the diameter perpendicular to A, and C is the approximate number of slices with hemorrhage multiplied by the slice thickness.

Laboratory investigations including Complete Blood Count, blood glucose level, liver and kidney functions, lipid profile. Assessment of total serum calcium level was done on admission for all patients from venous blood samples. Low calcium level was considered when total serum calcium was less than 8.6 mg/dl according to the reference range of our laboratory. Informed consent from patients or their relatives about the study were obtained. This study was approved by the local ethical committee of Zagazig university hospitals.

Short term outcome was evaluated for the surviving patients after one month from ICH onset using modified Rankin scale<sup>19</sup> which estimates the patient disability with a score ranging from 0 to 6 patients with a score of 0-2 had a favorable outcome. Those with a score of more than 2 considered unfavorable outcome.

### **Statistical Analysis:-**

We used SPSS version 20 software package<sup>20</sup> for data analysis. Quantitative variables were expressed as mean  $\pm$  SD whereas qualitative variables were expressed as number and percentage. Comparison between groups was done using Chi-square test ( $\chi^2$  test) or Fisher exact for categorical variables and Student t-test for continuous variables. Correlations between continuous variables were assessed by Spearman correlation coefficient. P-value < 0.05 was considered significant.

**Results:-**

A total of ninety patients with a mean age of  $68.11 \pm 10.79$  years were included in this study, Fifty –six were men and thirty-four were women. According to the serum Ca level, we had two main groups: a group of ICH patients with low calcium level  $< 8.6$  mg/dl which included 13 patients (14.4 %). The other group consisted of patients with Ca level  $\geq 8.6$  mg/dl. Baseline demographic and clinical characteristics according to Ca levels were listed in Table 1. There was no significant difference between those with low and normal calcium level groups as regard sex, age or stroke risk factors. Mean hematoma volume was significantly higher in hypocalcemic than did the normocalcemic group ( $68.23 \pm 7.54$  versus  $24.07 \pm 19.52$  respectively). The mean NIHSS scores at admission was higher in those with low Ca level than normocalcemic groups denoting that patients with low serum Ca had a severe stroke and more neurological deficit ( $27.38 \pm 5.0$  versus  $12.23 \pm 7.06$  respectively).

There was a significant inverse correlation between serum Ca levels in all cases of ICH and the following: hematoma volumes ( $r = -0.778$ ,  $P < 0.001$ ); stroke severity ( $r = -0.698$ ,  $p < 0.001$ ); short-term outcome assessed by modified Rankin scale ( $r = -0.707$ ,  $p < 0.001$ ).

**Table 1:-** Demographic and clinical Characteristics of the studied patients:

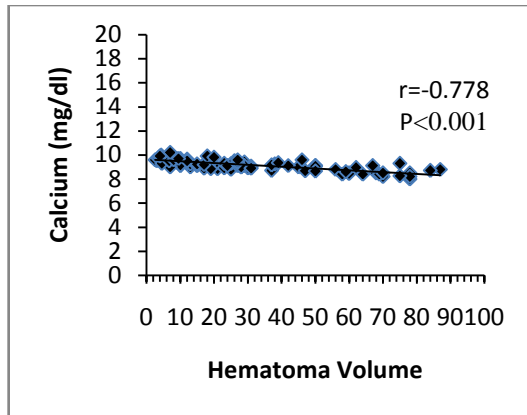
Variables	ICH with Ca $< 8.6$ (N= 13)	ICH with Ca $\geq 8.6$ (N= 77)	P- value
Age	$67.85 \pm 10.52$	$68.37 \pm 11.06$	0.87
Sex (M\ f)	7/6	41/36	0.96
Risk factor:			
HPN, n	8	30	0.12
DM, n	6	26	0.38
Dyslipidemia, n	6	30	0.62
Smoking, n	5	28	0.33
At admission :			
Systolic Bl .p	$170.43 \pm 20.12$	$168.79 \pm 23.54$	0.86
Diastolic Bl. P	$95.78 \pm 10.51$	$94.95 \pm 11.64$	0.79
Laboratory findings:			
TG	$130.80 \pm 41.28$	$122.40 \pm 36.57$	0.49
T. cholesterol	$190.66 \pm 33.50$	$194.34 \pm 27.40$	0.71
HDL	$37.64 \pm 11.92$	$39.15 \pm 12.57$	0.67
LDL	$117.48 \pm 40.82$	$123.83 \pm 35.63$	0.29
INR	$1.12 \pm 0.8$	$1.10 \pm 0.57$	0.93

**ICH:** intracerebral hemorrhage; **HPN:** hypertension; **DM:** diabetes mellitus; **BL.p:** blood pressure; **TG:** triglycerides; **HDL:** high density lipoproteins; **LDL:** low density lipoproteins; **INR:** international normalized ratio

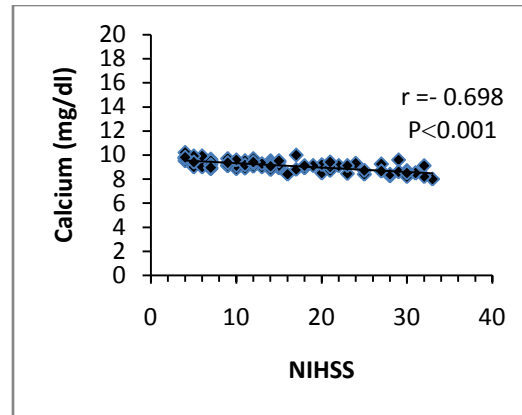
**Table 2:-** Relation of serum Ca level with hematoma volume, stroke severity and short-term outcome.

Variables	ICH with Ca $< 8.6$ (N= 13)	ICH with Ca $\geq 8.6$ (N= 77)	P
<b>Hematoma volume:</b>	$68.23 \pm 7.54$	$24.07 \pm 19.52$	0.000*
<b>Baseline NIHSS:</b>	$27.38 \pm 5.04$	$12.23 \pm 7.06$	0.000*
<b>m. Rankin scale (mRS):</b>			
Favorable outcome ( $< 3$ ):	4 (30.8%)	35 (45.5%)	0.37
Poor outcome ( $\geq 3$ ):	9 (69.2%)	42 (54.5%)	

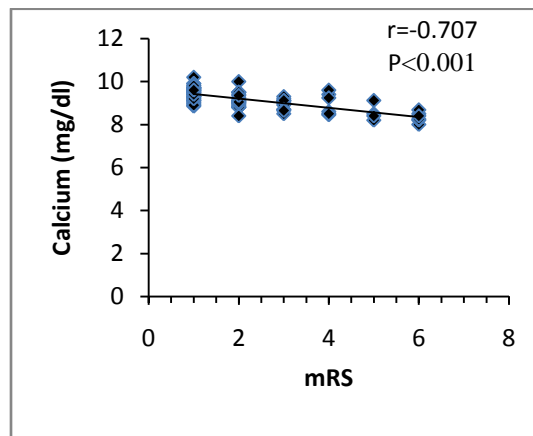
**ICH:** intracerebral hemorrhage, **Ca:** calcium, **NIHSS:** National Institute of Health Stroke Scale



**Figure 1:-** Correlation between Ca and Hematoma volume.



**Figure 2:-** Correlation between Ca and NIHSS.



**Figure 3:-** Correlation between Ca and mRS scale.

### Discussion:-

Primary ICH has been reported to be the most devastating form of stroke. It has no proved specific therapy to improve the outcomes according to the results of randomized clinical trials <sup>21</sup>.

Prognostic laboratory biomarkers have the potential to predict endpoints like complications, mortality, or poor functional outcome in the setting of ICH and therefore may enable preventive and therapeutic interventions <sup>22</sup>.

In the current study we investigated the relation between serum Ca level and both of the initial hematoma volume and the short-term outcome in the setting of ICH, as we included (90) patients who were presented with symptoms and CT evidence of ICH and admitted to ICU units of zagazig university hospitals within 24 hours of symptom onset.

This study demonstrated that patients with low Ca level had large initial hematoma volume than did those with normal serum Ca. Furthermore, On studying the correlation between serum Ca in patients with ICH and hematoma volume a significant inverse correlation was observed. Also, the stroke severity was significantly higher in the hypocalcemic than did the normocalcemic group according to the results of admission NIHSS scores. In addition, a negative correlation was observed between serum Ca level and stroke severity scores as assessed by NIHSS.

These findings were matched with the finding of Morroti et al., <sup>14</sup>, who conducted a cohort study of 2123 consecutive patients with ICH, 10.9% of their Patients were hypocalcemic and had a higher baseline hematoma volume than did those with normal serum Ca level. Also they observed a significant inverse correlation between serum Ca and baseline hematoma volume.

Similarly, in (2013) Inoue et al.,<sup>13</sup> conducted their study on 273 patients with primary ICH and classified their patients into four quartiles according to serum Ca levels. They reported an association between low serum Ca level on admission and initial hematoma volume in patients with acute ICH. Moreover, they demonstrated that the NIHSS scores were higher in patients with the lowest Ca quartile than did patients with the highest Ca quartile group.

Apart from these studies that concerned with ICH, there are similar observations published recently in support of the association between low Ca level and the extent of bleeding. Ho et al.,<sup>23</sup> found that hypocalcemia was associated with increased mortality among patients who were bleeding severely. Another recent study conducted by Ho and Yip<sup>24</sup> demonstrated a decreased clot strength in hypocalcemic patients who were either bleeding or at risk of bleeding and they suggested that hypocalcemia could worsen the existing coagulopathy.

Several mechanisms had been postulated to explain the association between low Ca and the extent of intracerebral hematoma. Inuo et al.,<sup>13</sup> stated that Ca is a cofactor in the coagulation cascade and involved in platelet activation, hence low Ca level is associated with large initial haematoma volume through impaired coagulation.

The second postulated mechanism is that Ca might play a role in vascular reactivity, as stated previously that hypocalcaemia could lead to higher blood pressure. As calcium in its normal levels was reported to induce vascular relaxation of isolated arteries through activation of calcium receptors in the perivascular nerves<sup>25</sup>. The last proposed mechanism that explains the association between Ca and ICH is that lower serum Ca could reflect a poor liver function as stated by Inuo et al.,<sup>13</sup> who observed in their study a higher percentage of ICH patients having poor liver function and hence poor coagulation resulting in the large hematoma volume.

The relation between serum Ca and stroke outcomes has been studied previously. It was observed that poor outcome in patients with ischemic stroke was related to lower serum calcium on admission<sup>6,8,26</sup>. Moreover, previously D'Erasmus and colleagues<sup>27</sup> recorded that low serum Ca was associated with in-hospital mortality among ischemic stroke patients. Furthermore, data from large epidemiological studies<sup>10, 28</sup> had showed that dietary calcium intake was associated with reduced mortality after stroke.

In the current study we assessed the relation between serum Ca and short term outcome after one month of stroke onset using modified Rankin scale, we observed that ICH patients who had a low serum Ca developed a high score on mRankin scale than did those with normal Ca levels. In addition, an adverse correlation was observed between serum Ca and modified Rankin scores that means patients with higher serum Ca at admission had an excellent outcome after ICH.

This result was matching with a study conducted by You et al.,<sup>15</sup> in (2015). They studied a total of 365 patients with primary ICH and assessed the relation between serum Ca on one hand and short and long-term outcomes on the other hand. They demonstrated that elevated admission serum Ca level was positively associated with excellent outcome at both discharge and three months after acute ICH.

In line with the current study, Appel and colleagues<sup>9</sup> had studied 784 consecutive patients with acute strokes including both ischemic and hemorrhagic types. They demonstrated an association between the baseline serum Ca level and stroke severity and outcome. In addition, they concluded that serum calcium concentrations could be considered as a marker of mortality in acute stroke patients.

The exact mechanisms that lie beneath the association between high serum Ca and favorable outcomes are unclear although several hypotheses were suggested. Foley et al.,<sup>7</sup> suggested that in the setting of neuronal injury that resulted during cerebral ischemia, a more calcium is shifted to the brain from the blood hence Ca could play a neuroprotective role by enhancing the antiapoptotic pathways. Any subtle increase in Ca in the extracellular space leads to activation of intracellular second messenger and initiation of the antiapoptotic mechanisms<sup>29</sup>. Previously, it was reported that moderate increase in Ca may promote the cell survival programs and potentiates resistance to hypoxia or ischemia through activated protein kinase B and mitogen activated protein kinase extracellular regulated protein pathways<sup>30-31</sup>. Another suggested hypothesis was that Ca had a role in maintaining the blood brain barrier integrity, as reported previously that low calcium levels disturb adhesion and tight junctions<sup>32-33</sup> resulting in cerebral edema which in turn leads to poor outcomes<sup>34-35</sup>.

**Conclusion:-**

Low Serum Calcium level in the setting of ICH is an indicator of large hematoma volume. There is an relationship between serum Ca level and short-term outcome in patients with ICH, hence serum Ca level could be one of the laboratory biomarkers of prognostic significance in the setting of primary ICH. Thus this study recommends starting modifying calcium levels of patients with ICH arriving in the emergency department as soon as possible to improve the clinical outcome.

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### RESEARCH ARTICLE

#### COMMUNICATION AND AUDIOVISUAL: UNDERSTANDING THE METAPORE.

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#### Abstract

The development of communication and information technology has resulted in a new spatiotemporal perception that determines new social, political and economic dynamics. The press has been part of this scenario as a boost for an ideal education. According to this logic, audiovisual can be comprehended way beyond daily limits, being more than just educative. This article shows the possibilities of this new horizon for an audiovisual educational understanding assuming that every audiovisual can be educative and more than that, these materials enable the individual the freedom to feel, think and incite new understandings adding teacher's and screenwriter's understandings. In a way to develop this logic, the article shows the relation between audiovisual and education seeing that the sensitive provides a new way of communication. Lastly, the metapore that is different from the classical method is showed as a way to comprehend audiovisual respecting the dynamics of these phenomena and how they work and develop all around the world.

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#### Introduction:-

Audiovisual has been used as a way of providing an approaching feeling among the subjects involved in the teaching-learning process as well as facilitates the dissemination of concepts and simulations of several experiences and moreover, audiovisual allows different ways of thoughts as a communicative message through different forms. Audiovisual allows to imagine different ways of communicational message appropriation through different meanings and such potential has been even more intense in several contexts. The idea of an audiovisual education as a produced and used material to teach even if they have been used for noble purposes but they have been underutilized. This article shows that any audiovisual can be educative overcoming the assumed antagonism created between audiovisual education and non-audiovisual education.

This focus presupposes to comprehend that such assumption is connected with the occidental thought that rationalized the world and established dubious relations in order to comprehend the knowledge as a division between idea and fact, subject and object, soul and body. Trying to direct the eyes of an individual that was labeled as educative shows the first way to deny all the potential of these materials. These materials show their textures, folds, cracks as they are. From a phenomenological perspective that explanation means label and fit them in categories created by us (artificial act) and therefore, out of the object. Instead of this it is need to describe the phenomenon. Describe in this case means "approach the men perspective that they experience as well as the way it is showed to the conscience" (Carmo, 2004:22). It is needed to feel and be the perspective. Merleau-Ponty says that to have knowledge an individual must be sensitive, linking the subject and the object. It is needed to value the

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unconscious. Everything that existed as knowledge in our conscious passed through our perception first. The feeling does not follow the rules of the individual so unconscious acts predominate above the conscious. Before reflecting about everything it is good to realize, to think. First feel then open to the world. The thought is always before the lived experience and to feel it is necessary to ignore the rules, the preestablished scripts. Audiovisual presents the potential to reach and awake sensitivity and this way helps in the hard work of letting loose from senses externally preestablished. This happens because audiovisual as an art represents a way of freedom of looking and meaning and the individual can feel and know not because it is external from the other but because it is actually the other and it not possible to distinguish between psych and visible. In this perspective this approaching occurs through communication. Communication is much bigger than this, devoid of materiality. It is something that establishes with the alterity principle. According to this and implying that Communication – as science – reaches what Marcondes Filho (2011) calls majority, a specific space of communication and it is needed to admit that communication is only possible by achieving a fact that is featured through a break paradoxically able to introduce life in a relation because it implies a radical change in what it was and what becomes after this break.

The facts are unique and imply in natural situations that enable real freedom of movement. The construction of an audiovisual narrative in a metapore communication reflects in dynamic facts without previous scripts, only following the natural flow. From this perspective, audiovisual ends up being underutilized and educative methods did not have a value in favor of a wider and emancipatory education. This article shows the useful use of audiovisual under the perspective of communication as a break (Marcondes Filho, 2010).

### **Audiovisual and Education:-**

The wide potential of means of communication was too early recognized and used for several purposes from manipulative and persuasive advertising to direct target as education. This acknowledgment became more evident at first with the radio, then cinema and telecommunication consecrated the power of influence and persuasion of these means. In the beginning of the 20th Century, after the invention of cinema the movies started being used pedagogically in schools. From this moment, many researches started being developed to verify the pedagogical potential in movies that besides offering a new way to see the world also enabled new ways of learning (Wittich; Shuller, 1979).

As the time goes, it was clear that the problem was not in the materials, but in its educational context use. Two sides ended up appearing related to the participation of audio visual in teaching-learning process. The American side disseminated an intuitive conception, seeing that the main exponents, Wittich and Schuller, defended a sensorial feeling as a learning method and in this case stood out only the teacher. Audio visual materials need to be comprehended by the teacher (being teacher's resources but not necessarily students' resources). It is possible to research from Kieffer and Cochran (1962) because of their guides of audio visual techniques. Audio visual could be efficiently used if they were resignified by the teachers. The french side had in Robert Lefranc (1980) its main diffuser. In many aspects the French side was better than the American side, mainly by its self image study and its meaning methods. This tradition becomes evident when during a long time the Image Theory studies were focused on Roland Barthes' studies but this work did not overcome that the messages should be decoded by the teachers inside the classroom and a few space is allowed for the students. It is important to highlight Dieuzeide (1965) that put the teacher as a moderator allowing certain space for the apprentice.

Until then, being French or American side, the researchers comprehended that the messages were an abstraction process derived from sensation and perception. The audiovisual experts had this understanding about the image and received a lot of criticism. The image is not a copy – less precise – of the reality. This conception was getting even more clear as long as the means of communication were developing and the researchers overcame the passive recipient idea. The media messages started being a part of the students and demanded more studies about it. Audiovisual could be efficiently used in classrooms and the focus turned in the way or the mechanisms that make the learning possible through media messages.

In Brazil, the dynamic use of audiovisual as educative purposes were not different. According to Franco (2010), image projections with movement have already arrived in 1896. The integration between cinema and education were already in movement and it was needed a renovation in education, for example the “New School Movement” consolidated by the pioneers. In this context, this integration was seen as an important boost for the development and progress in Brazil. These movements wanted a fair and egalitarian for men and women and ended up creating

the National Institute of Educative Cinema (INCE)<sup>1</sup> in 1937. The INCE activities were closed in 1990 after several changes and initiatives that did not value the art and the culture.

The use of audiovisual in classroom (Brazilian context) was marked by the repetition logic and not necessarily by the potential of esthetic appropriation that these materials could offer. Audiovisual and the cinema were even more adapting as tools (technical sense) by the teacher and the students were supposed to learn the content showed. Trained teachers using these means of communication in classroom started being incentivated by many governmental, federal and municipal programs from the '90s when the internet enabled new social, cultural and economic dynamics. An esthetic appropriation continued being ignored to give place to a guided media insertion that Franco (2013) describes as a repetitive/accumulative paradigm. The context of contemporary societies imply changes in the way of learning and appropriation. According to the author, it does not exist a necessity of collecting knowledge and the current scenario (marked by connectivity) demands new abilities on selecting/articulating paradigms. This means to know how to search and select contents.

The Brazilian context exposed until here allows to comprehend the reasons that made audiovisual creativity in classroom be gone. The proposal of this use of language and its technological support had already followed by manuals that showed themes, running time, equipments and these rules blocked the cinematic creativity and turned out blockers and boring educative movies (Franco, 1988:46). The comprehension and the respect about the affective and sensorimotor (cinematic language) to associate with education themes were constantly ignored to give place to proposals that guided monological repetition of contents. Audiovisual in this case was just the support for the conservatism in classrooms. The intuitive particularities of the audiovisual language that would allow new appropriations and perceptions were summarily ignored. There may be added the early prejudice of many teachers that used these materials in educative contexts and did not exist public policy that incentivated the teachers to use these materials and only with them it would be possible to associate cinema and education.

Changing the discussion to the production of audiovisual it is possible to verify that mainly because of new technologies and high use of connectivity in Brazil that it has been led to an even more collaborative context. The emergency of new formats and contents not always contemplated with a good esthetic quality but with high access for example homemade videos on *Youtube* shows that there is a big curiosity to know what other people produce and because of that there are many websites that allow the users to upload their own content be them personal, educative or professional blogs.

It is interesting to learn the certain point where audiovisual communicates something. The exposed material above corroborates the idea that the biggest challenge of these produced materials is to find a way to rethink and comprehend this communicative phenomenon Buttons that respond to stimuli are daily classified as “interactive”, as though the single fact of signaling an action coincided with the complex process that entails the communication, therefore signal is not communication (Marcondes Filho, 2010).

### **Thinking about a new theory of communication:-**

Communication is much bigger than this, devoid of materiality. It is something that establishes with the alterity principle. According to this and implying that Communication – as science – reaches what Marcondes Filho (2011) calls majority, a specific space of communication and it is needed to admit that communication is only possible by achieving a fact that is featured through a break paradoxically able to introduce life because it implies a radical change in what it was and what becomes after this break. The facts are unique and imply in natural situations that enable real freedom of movement.

The construction of an audiovisual narrative in a metapore communication reflects in dynamic facts without previous scripts. This dynamic was expressed in *Chronique d'un été*<sup>2</sup> when Edgar Morin and Jean Rouch developed that showed a single question for different people. The answers and discussions were based on a metapore view. In

<sup>1</sup> “About the legacy left by the INCE, Franco (2010:14) says:” Unlike many renewing initiatives that last a few and close without traces, the INCE left a production of more than 500 movies about several themes and different formats with so many genius creations by Humberto Mauro and uncountable productions from other filmmakers”.

<sup>2</sup> *Chronique d'un été* (1960) documentar fulfilled in Paris by Edgard Morin and Jean Rouch and became a reference to what it is called “true cinema”.

this way, this logic entails a new scientific dynamic research polarized between objectivity and subjectivity, transmission and reception, signification and meaning (Marcondes Filho, 2010). Assuming this perspective implies to understand that communication occurs in a logical search to reach the sensible, the unique, the irreproducible of each experience.

In educative situations, audiovisual is usually useful to stimulate the learning and potentiate the communicational process. However, communication can be too far. The constant search for the “ideal format” created a situation that does not privilege the execution of effective communicational proposals but it privileges theories connected to technical progress. A lot of money has been spent in audacious technological projects that has not been influencing the reality of the people. There are a lot of materials that cannot even reach pedagogical objectives proposed because they ignore the basic meaning. It is needed to consider that there is an intangible point in the comprehension of this problem because it is important to identify the sensible and culminates in the necessity of causing a break. It is needed to touch and influence the individual in their cognitive-affective structure to establish a genuine communication and the conception of communication assumed by Marcondes Filho (2010) that when invoking the emitter/receiver the first is able to transmit signals that is going to be called communication from the receiver’s point of view.

A movie or an educative audiovisual movie can communicate something if it destabilizes the people and forcing them to reflect. In this way, besides allowing a renewing esthetic experience also enables the alterity exercise and its reorganization. Assuming this perspective presupposes that communication cannot be massified from a single and ample meaning and this meaning is related to a semiotic conception. It is discussed the meaning that link together with the communicational fact and this fact is unique and no human can transfer it because only the individual that experiences the communication is able to know the provoking amplitude that this act has caused.

### **Metapore and communication research:-**

Unlike the classical or traditional research, the research that assumes the communication as a fact that shows the necessity of rewriting the ways and revisits the themes as a function of a new context but especially as a function of the moment. Communication passes through this moment so the idea of preestablished methods and constantly applied do not fit in the perspective of audiovisual comprehension. This thought becomes more evident when it is possible to comprehend Marcondes Filho’s saying (2008:151-152) that communication must be felt, experienced and it is needed to participate to investigate it and this communication is history, sociology, anthropology therefore, something dead.

The “live” is precisely in the absence of a fixed, final, closed and aseptic method. The researcher needs to find ways of looking and studying the object. The comprehension of this object is in a context and how many times it is observed the same object, how many times it is needed to rebuild and rediscover distinct ways of observing. The mind must be open to the constant movements of the world and such movements are unique, irreproducible and likely of perceptions that are unique as well. In this logic, more than the reception of these contents by touchable means (typical vision of empirism) it is important to highlight the perception of the meaning defended by Merleau-Ponty and the perception is not a cold representation but still an existence fact with body characteristics. This perception is seen when the individual looks at the object and feels and becomes part of this object and the body notices the perception of the movement and the immobility keeps it confused, stunted, stuck (MERLEAU-PONTY, 1994).

When a person looks at the object it is showed that the person wishes this object and the sensations are linked to movements and every object influences the realization of a gesture. It is not a representatio but a creation, new possibilities of interpretation (Nóbrega, 2008:142). The work of art it is the local that enables a space for more intense perceptual perspectives and it is important to realize the visible and invisible notion. According to the philosopher the unoccupied spaces are important, seeing that they are part of the whole context and they are able to accelerate the curiosity.

To Merleau-Ponty, the objects, the things only exist when the individual notices it and the perception cannot be conceived according to Science. The perception is felt and there are no previous methods established, there is not a rule to be followed. The person notices and feels the way they want it therefore audiovisual will only exist if the person perceives it and this perception is only possible by seeing the sensible. To Merleau-Ponty there is no way to

observe the phenomenon from the outside and the perception is only seen as long as the individual becomes a part of this object and when it is not possible to separate them. The audiovisual has the ability to reach deeper layers and enables other ways of learning. The perception is unique and inalienable and it is possible to realize that every human being is able to conquer it by freedom of spirit.

Watching these movements presupposes to comprehend the communication as a break that leads to a qualitative boost. Audiovisual can be noticed when it is possible to communicate something, when you can touch the person and the researcher needs to comprehend and not to apprehend. Not everything can be comprehended because of the subjectivity. It is clear that the classical method conception does not offer mechanisms of apprehension, while the metapore imprisons, the metapore releases the researcher to feel and capture the fact. The metapore's researcher needs to get rid of a preestablished thought and be open to observe new movements, assuming the role of a world spectator (Dantas, 2012). This spectator is the world and it is surrounded by lines, vectors and unique sensations in unique situations. The body in this case needs to be open, unfinished to have conditions to be able to receive and allows new thoughts (MERLEAU-PONTY, 1994). This relation builds the object and not the contrary. The base is the communicational fact and can be comprehended by new characteristics and by ephemerality, movement and unpredictability.

If the meaning of metapore enables researches that were impossible without this view on the other hand imposes challenges from an uncontrolled object. "The object is neither known nor conceptualized; it does not remain for a long time; it is not stuck, parked or frozen; it does not show when it is going to happen again" (Marcondes Filho, 2008:1). Even so there are ways of operating the metapore, a terminology utilized to replace the method that entails a determined way that must be followed. The metapore functions by a space, passage that allows a communicational fact. The researcher does not focus on learning, capturing or dissecting but on experiencing and feeling it. The researcher does not have a specific method but operational formats that in essence guide the path of the researcher through the object. Their search is not the meaning but the sense that is only awake before a communicational break. The event that is the essential condition so that this occurs does not have a sense but it is felt when studying the event regardless of the duration. The researcher must accept this phenomenon (devoid methodological bonds). The sensibility, looking and opening to think are essential to go through a metapore's research and this researcher needs to have a great ability to describe and report the events. The language in this case can be an obstacle once not everything it is experienced can be expressed in words, texts, etc.

It is needed to be open to an instantaneous apprehension. This necessity resets the importance of intellectual intuition or "events that precede and succeed the sensitive intuition" (Marcondes Filho, 2010:254). It is up to the temporality of the metapore defined by the author as an "extended temporality marked by peaks of bliss". These peaks correspond to sensitive intuition and the turning moment, the moment of the occurrence of this phenomenon that justifies the statement of a genuine communication that enables the break and the impression of something that marks, forces, shocks and breaks the individual.

This transformation that shocks, forces can happen in the first moments of the event (like a strong emotion or even at the movies) and the effects will be felt in previous moments. In this case, the intellectual intuition processes afterwards, in a way that remains resonating in the subject and transforming after a movie for example. But in educative situations the meaning is different, because "the informations are exposed creating an intellectual intuition until a sensitive intuition that creates the sense, therefore the intuitive peak occurs in the end when the changes are expressed through persistence and continuity of the elements" (Dantas, 2012, p.12).

Audiovisual has the potential of enabling peaks of bliss in the beginning (while a movie) and in the end (while educative process). It is important and needed to investigate under a new view that allows to comprehend as more than just technical elements of teaching. Furthermore it is about an enlightenment and point of resistance to break the cold logic of production and broadcasting of these materials. In the 80s, Franco (1988) had already expressed how boring was the educative audiovisual and maybe this is the possibility of learning what establishes communication in these expensive materials, enabling another ways of noticing and effectively feel them in all

**Final considerations:-**

The investigation of the metapore consists in feeling, experiencing and recording. It is needed to let the sensible intuition touch the person and this marks the event so that there is an opening that allows the researcher to record elements that were ignored by the strict methodological logic.

For not having fixed steps, the different does not need (and must not) be ignored. On the contrary, it helps to understand the phenomenon. Study procedures of communicative events must halt the examination of its own occurrence. It does not exist a goal oriented to be achieved or path to be taken. Conceive the reason investigation through metapore and free the researcher to exercise the look and redemption of his own subjectivity. Knowledge is always temporary and the route is eternal. The land is flat, characterized by unique gathering of wires, lines and vectors into a single point of the existence of human beings. For this reason, unlike what proclaimed the classical theories, the communication is not something that can be transferred, shared and communed by everybody. There must be a specific moment of opening between them. That particular time cannot be frozen and it is possible to feel the other, grasp the ungraspable and overcoming the logic of the material body to achieve a deeper climax, eclipsing in the immaterial. The purpose of the identification of the event is not grasp or understand. It is to experience something radically new that is capable of providing qualitative leaps in the relationship, allowing to identify and describe an event which is possible to see and observe in a single occurrence.

During many years the potential of audiovisual (the cinema for excellence) for education was considered a hostage of educative appellation. This designation was (and in many countries are) connected to a produced material with specific purposes and followed by a manual or pedagogical strategies. This formatted and antiquated conception reveals proposals that confine you instead of releasing the human creativity.

It is important to highlight that in the Brazilian context Franco has been developing for 40 years the conception that any audiovisual can be educative independent of the formatted idea that was previously thought and closed. The educative aspect is in the unique relation that is established in the exhibition of the audiovisual corroborating with the idea that "what is educative is not a movie, the cinema. Educative is the moment of the connection between the movie and the spectator and the result of this interaction is going to depend on the condition, the psychological and emotional moment of this spectator" (Franco, 2013). While watching, the individual suffers transformations and this is educative and it does not matter how many times this movie will be watched because the work is always new, "the soul of a man and the society are revisited and reinterpreted in every exhibition" (Franco, 2013).

In this sense, audiovisual provides a discovery of the subject itself, a move that could culminate in a communicational event that entails a qualitative leap from the point of view to communicational education. Regarding to the research involving educational audiovisual, the proposed metapore enables an opening never before displayed: the researcher can be sensitive and understand the phenomenon, being the communication event during an exhibition or even during the production of an educative material. The transformation occurs to the producer and the the spectator of these materials as well so it is not a cold production or even chronologically dated seeing that "the great and eternal cinematographic work regardless of being older or futuristic films they have a philosophical tone because they make an individual stimulus to think and understand the past and the future" (Franco, 2013). Therefore, the author's statement establishes a direct connection with the ultimate goal of education that is to enable the men, clarifying the understanding of the past and future, envisioning and experiencing the freedom.

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### RESEARCH ARTICLE

#### INFLUENCE OF TEMPERATURE & RELATIVE HUMIDITY ON THE SURVIVAL OF *Daphnis nerii* (LEPIDOPTERA: SPHINGIDAE) AND ITS FOOD EFFICACY ON HOST PLANT IN ARID AND SEMI-ARID REGION.

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#### Abstract

Arid region is characterized by high temperature and high evaporative demand that has made survival of insects difficult. The lepidopterous fauna of India with particular reference to arid and semi-arid region is relatively diverse and has received a very little attention by the scientists. The knowledge of food efficacy of lepidopterous species in a particular ecosystem, pertaining to their life-stages and effect of abiotic factors, is essentially required for their effective conservation.

Lepidoptera normally feed on horticultural plants. The *Daphnis nerii* is a lepidopterous moth usually found on the host plant *Nerium oleander*. They defoliate the leaves, leaving veins and veinlets. An experiment has been laid down in the lab as well as in field condition, where *Nerium* leaves were provided to starving fifth instar larvae of *D. nerii* and the food efficacy were evaluated. The coefficient of digestibility (C.D.), the efficiency of conversion of ingested food to the body weight (E.C.I.) and the efficiency of conversion of digested food (E.C.D.) of *D. nerii* larvae, fed on the leaves of *Nerium oleander* were recorded as 80.43%, 13.21%, 15.01% respectively. The *Nerium oleander* is found as a most suitable host plant for the rearing of *D. nerii*. There are 4 to 5 overlapping generations in a year. There are five instar larvae. The incubation period is about 25 to 28 days. The pupal period lasts for 20 days.

The influence of abiotic factor like temperature and relative humidity on the survival of *D. nerii* has been studied. The most suitable period for *D. nerii* is from August to October with temperature ranges from 25° to 30°C and relative humidity ranges from 55 to 60 %.

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#### Introduction:-

Hawkmoths (Sphingidae) are one of the few lepidopteran groups to have been well inventoried and documented on every continent (Kitching and Cadiou 2000). Backed by a wealth of information and their biology, life histories, and morphology, the Sphingidae have played significant roles in a variety of research programs. Examples include pollination biology (Inoue 1986, Kato et al. 1991, Willmott and Burquez 1996, Maad 2000, Ando *et al.*, 2001), biogeography (Holloway 1983) and conservation biology (Holloway 1991, Kitching 1996). The sphingid fauna of

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India with particular reference to arid and semi-arid region is relatively diverse and has received a very little attention by the scientists.

The single family, Sphingidae is most diverse in tropical regions, but the large, fast-flying moths are familiar insects throughout the world (Daly et al., 1998). Sphingidae is a family of moths commonly known as Hawk Moth, sphinx moths and horn worms that includes about 1,200 species (Grimaldi & Engel, 2005). The hawk moths are medium to large-sized, heavy-bodied moths with characteristics of bullet-shaped bodies and long, blade-like wings.

Species of *Daphnis nerii* mainly feed upon oleander (*Nerium oleander*). *Nerium oleander* is a very toxic plant but *Daphnis nerii* is immune towards its toxicity. The adults feed on nectar of a variety of fragrant flowers like petunia, jasmine and honeysuckle. They are active in the night time, visiting the flowers after the sunset. They are common throughout the year; the monsoon season brings the increase in their population size. Summer months were the quiescent period of the reproduction of *Daphnis nerii*, and monsoon season promotes the reproduction activity, which was studied in detail (i) life history length (ii) Population index and the rate of development of life stages of *Daphnis nerii*. This knowledge is useful in the conservation management of the Lepidoptera: moth. Adults of *Daphnis nerii* breed throughout the year. Due to its habit as a strong flier, *D. nerii*, has been observed to have been migrated from one region to the other within a short span of time. The adult moth is one of the most beautiful patterned moths in the arid ecosystem. The studies were conducted during from 2010 -2011.

The rate of development of insects has a strong nutritional component. Food intake by larvae, as well as the quantity of food ingested, affects growth rate, development time, final body weight and survival (Slansky & Scriber, 1985). The larval instars are prolonged and the relative growth rate of insects is reduced (Carvalho, 1996). Besides an adequate level of ingestion of nutrients, assimilation and conversion of food into energy and biomass are also related to insect growth (Reese, 1978). The assimilation of ingested food (digestibility), as well as the ability to convert ingested and digested food into growth, was evaluated by means of bi-coordinate plots (utilization plots) associated with analyses of covariance developed by Raubenheimer & Simpson (1992, 1994).

Temperature is the most important environmental factor affecting poikilotherms and has a pervasive effect on physiological processes and on almost all aspects of organism's performance. Growth of caterpillars is strongly temperature dependent (Sharpe and DeMichele, 1977; Scriber & Slansky, 1981) and the degree of temperature dependence varies from species to species and optimal temperature for growth is also variable (Taylor, 1981).

The temperature- dependent developmental rate curve of an insect is an important feature of its life history (Taylor, 1981). Using degree – day accumulation to predict a wide variety of events such as egg hatch, adult emergence, or migratory flights may be feasible for pest management. Degree day accumulation needs knowledge of both insect developmental response to temperature and lower developmental threshold (Woodson and Jackson, 1996).

### Material and Methods:-

An extensive collection of larvae of *D. nerii* were made from *Nerium oleander* plants in and around Jodhpur, by hand during the course of these investigations. The larvae were brought to the Entomology laboratory in Arid Forest Research Institute, Jodhpur in small fine meshed wooden cages (20 x 20 x 15 cm.). The larvae were sorted out in laboratory and only those measuring about 80-85 mm (final instars) were utilized for investigation. The test larvae were starved for a period of 24 hours in order to prevent excretory deposition on excrementitious filaments. The larvae were kept at 28°C ± 2°C temperature and 56.0 % relative humidity. Whatever excretory matters were given out during this period, the same was removed and discarded. After 24 hours three batches of 10 larvae each were weighed and supplied with about 87.328 gm. (net weight) of *N. oleander* and allowed to feed on them for 24 hours. After this period food was withdrawn. Excrementitious matter produced subsequent to feeding was collected and its wet weight was determined. The weight of larvae was also recorded to determine gain in weight during the 24 hours period. The unconsumed leaves were weighed to find out the amount of leaf matter consumed.

The coefficient of digestibility (C.D.) was calculated as:

$$C.D. = \frac{\text{Dry wt. of food ingested} - \text{Dry wt. of excreta}}{\text{Dry wt. of food ingested}} \times 100$$



The efficiency of conversion of ingested food to body wt. (*E. C. I.*) is measure of the overall ability of an animal to grow on a given food. It was calculated as:

$$E.C.I. = \frac{\text{Dry wt. gained by animal} \times 100}{\text{Dry wt. of food ingested}}$$

The efficiency of conversion of digested food to body wt. (*E. C. D.*) is calculated as:

$$E.C.D. = \frac{\text{Dry wt. gained by animal} \times 100}{\text{Dry wt. of food digested}}$$

### Results and Discussion:-

The period of development from egg to adult emergence spanned over 24 (□ □ 5) days. The result obtained on the quantity of food eaten in relation to the gain in the body weight and quantity of excrement of produced is presented in the table 1.

The coefficient of digestibility (*C.D.*), the efficiency of conversion of ingested food to the body weight (*E.C.I.*) and the efficiency of conversion of digested food (*E.C.D.*) of *D. neri* larvae, fed on the leaves of *Nerium oleander* were recorded as 80.43%, 13.21%, 15.01% respectively.

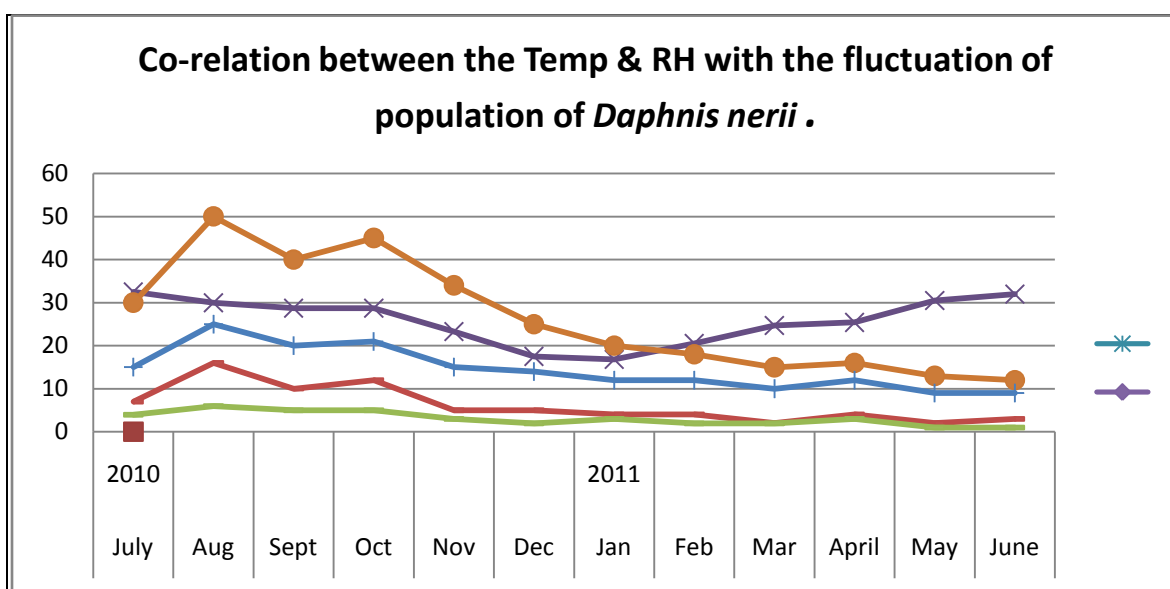
**Table 1:-** Food eaten in relation to the gain in the body weight

S.No.	Particulars	values
1.	Fresh Weight of leaves provided to batch of 10 larvae (gm.)	87.328
2.	Dry weight of leaves provided to batch of 10 larvae (gm.)	16.373
3.	Fresh weight of unconsumed leaves (gm.)	54.063
4.	Dry weight of unconsumed leaves (gm.)	09.836
5.	Fresh weight of consumed leaves (gm.)	29.536
6.	Dry weight of consumed leaves (gm.)	5.979
7.	Initial weight of batch of 10 larvae (gm.)	6.8
8.	Final weight of batch of 10 larvae after 24 hours (gm.)	7.59
9.	Weight gained by 10 larvae after 24 hours (gm.)	0.79
10.	Fresh weight of fecal matter excreted during 24 hours (gm.)	2.273
11.	Dry weight of fecal matter excreted during 24 hours (gm.)	1.170
12.	Dry weight of food digested	5.26

The assessment of the Population index and the rate of development of life stages of *Daphnia neri* in laboratory in relation to Temperature and Relative Humidity indicated that, all the life stages are evident during the entire year, with higher frequency during August – October. Development from egg hatch to the adult stage occurred at all temperature tested: survival declined above 30°C or below 25°C. There was a decrease in developmental time with increasing temperature for most life stage. The rate of development of these life stages leading to the formation of adults as studied in the laboratory is varies with the change in temperature and humidity as presented in table 2. The extreme of temperature had detrimental effect on immature growth and caused high mortality. The mortality was also caused by unable finishing larval stage, unable pupating or by deformed adults with misshapen wings, common during November – April and less common during May- June. All the life stages are evident during the entire year, with higher frequency during August – October. The rate of development of these life stages leading to the formation of adults as studied in the laboratory is also varies with the change in season, as it is maximum after monsoon season *i.e.*, during the month August – October and declines towards the month of May.

**Table 2:-**Population index and the rate of development of life stages of *Daphnis nerii* during 2010–11 in laboratory in relation to Temperature and Relative Humidity.

Life stage	July 2010	Aug	Sept	Oct	Nov	Dec	Jan 2011	Feb	Mar	April	May	June
	Temp (°C) & R H (%)											
	32.5/ 63	30/ 75	28.7/ 67	28.7/ 43	23.3/ 57	17.5/ 50.5	16.8/ 44.5	20.5/ 49.5	24.7/ 55	25.4/5 7.4	30.5/ 50.2	32/ 60
No. of eggs incubated	30	50	40	45	34	25	20	18	15	16	13	12
No. of larvae hatched	15	25	20	21	15	14	12	12	10	12	9	9
No. of pupae formed	7	16	10	12	5	5	4	4	2	4	2	3
No. of adults emerged	4	6	5	5	3	2	3	2	2	3	1	1

**Fig:-** Graph showing relationship between Population of *D. nerii* with Temp. and Humidity**Acknowledgement:-**

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### RESEARCH ARTICLE

## ROLE OF DIFFERENT PULSE SEQUENCES FOR BETTER CONTRAST USING MAGNETIC RESONANCE IMAGING.

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##### Key words:-

Pulse sequence, Contrast study, Image quality, Contrast to noise ratio (CNS), MW study

#### Abstract

This research study aimed to compare the image quality and contrast using different pulse sequences and to evaluate practical impact and efficacy of altering imaging parameters on image quality using magnetic resonance imaging. A tissue equivalent dosimeter gel system by using Xylenol orange dye with Fricke-Benzoic solution was developed and the gel system was irradiated using 6MV photons. Conventional spin echo (CSE), Fast spin echo (FSE), gradient recalled echo (GRE) and fluid attenuated inversion recovery (FLAIR) pulse sequences were used to analyze the effect of TR (repetition-time) and TE (echo-time) on contrast to noise ratio (CNR). The calculated percentage increase of contrast to noise ratio (CNR) for TR using pulse sequences CSE, FSE, GRE and FLAIR was 8%, 10%, 6% and 4% and the percentage decrease for TE is 3%, 4%, 5% and 11% respectively. The qualitative analysis include the effect of TR and TE on contrast to noise ratio according to which the increasing repetition time gives good contrast to noise ratio especially for conventional and fast spin echo sequence. It is better to keep echo time lower but this is an imperceptible parameter for contrast to noise ratio for T1-weighted images.

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#### Introduction:-

MRI is a non-invasive method with diverse pulse sequences to measure doses in dosimeter gels and was first proposed by Gore et al in 1984.(Gore and Kang 1984) It is well known for its high contrast and ability to generate 3D images.(De Deene 2009) The basic factors considered to determine the image quality includes, spatial resolution, tissue contrast and signal to-noise ratio (SNR). Due to the co-dependency of these factors their simultaneous progress is complex.(Riddell, Richardson et al. 2014) Excellent tissue contrast relies on optimal selection of appropriate pulse sequences (spin echo, inversion recovery, gradient echo, turbo sequences and slice profile). Important pulse parameters are TR (repetition time), TE (time to echo), TI (time for inversion), and flip angle.(Yamada, Wisner et al. 2002) T1 and T2 weighted images depend on a good selection of TE. Tissues vary in their T1 and T2 times which are manipulated in MRI by selection of TR, TI and TE, respectively. A contrast-to-noise ratio (CNR) is a summary of both SNR and contrast. It is the difference in SNR between two relevant tissue types (A and B):

$$CNR = SNR_A - SNR_B$$

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Recent developments in MRI technology have led to improvements in contrast and SNR by the optimization of imaging parameters to achieve best possible image quality.(Bucholz, Ghaghada et al. 2008) Due to the T1 and T2 relaxation properties in magnetic resonance imaging differentiation between various tissues in the body is possible.(Damadian 1971) Contrast of the image (pathological areas of the tissue) can be improved by the selection of one of the above parameters however with the possibility to reduce the MR image excellence by the effect of other parameters.(Bartusek and Smekal 2006)

In recent years different MRI techniques and pulse sequences have been reported for the clinical use which has the ability to enhance image quality and consequently improve diagnostic accuracy.(Li and Mirowitz 2003) Nevertheless pulse sequences with ideal optimum values for a specified body tissue are still intangible. This research work is an attempt in this direction in which different parameters affecting CNR in various clinical MRI sequences have been considered.

The Fricke gel dosimeter has been used as a reliable chemical radiation dosimeter for more than eighty years.(Maeyama, Fukunishi et al. 2014) Fricke gel dosimeters are tissue equivalent over a large range of photon energies (Sullivan, Adalsteinsson et al. 2006) having the ability to stabilize the spatial information of radiation induced oxidation and a step towards modern gel dosimeter.(Maeyama, Fukunishi et al. 2014) The aim of this study was to compare the image quality and contrast using different pulse sequences, and a quantitative evaluation of impact and efficacy of altering imaging parameters on image quality. Contrast to noise ratio is the focal point to be discussed in this work. The CNR is most likely the most decisive factor affecting image quality as it directly determines the eye's ability to distinguish regions of high signal from area of low signal.

### **Method and Materials:-**

In this research work a series of images were obtained to observe the effect of variation of imaging parameter TR and TE using spin-echo, fast spin echo, Gradient Recalled echo and Fluid Attenuated Inversion Recovery sequences on image quality. A dosimeter gel was prepared using Xylenol Orange dye with Ferrous-Benzoic solution for this purpose which was exposed to a beam of 6MV X-rays with field size  $5 \times 5 \text{cm}^2$ . The absorbed dose was 20Gy at its iso-centre. All the images were acquired with a matrix of  $256 \times 256$  and flip angle 120, FOV of  $200 \times 200 \text{mm}^2$ . For each scan four numbers of slices were obtained.

### **Results and Discussion:-**

#### **Conventional Spin Echo Images:-**

The scanning was performed with spin echo sequence with echo time (TE) of 12ms, repetition time (TR) of five different values as 400, 500, 600, 700 and 800ms, slice thickness of 4mm, and FOV was  $200 \times 200 \text{mm}^2$ .

The contrast between the area which was exposed to ionizing radiations and the area away from the beam target can be seen but it is not much clear. By analyzing the image while drawing different region of interest (ROI) in the slice at different positions as shown in the *figure (1a)* with equal area it was observed that the mean value of signal intensity in the area at the centre of the slice (the area which was exposed to radiations) was 883 whereas the mean value of signal intensity in the area away from the centre (the area at the ends) was observed to be 705.

The transverse slice of the image obtained with TR of 400ms and TE of 16ms is shown in the *figure (1b)*. The mean value of signal intensity calculated in the area of beam target and away from the beam target was 528 and 402 respectively. A good CNR can be obtained with a greater value of TR and less value of TE for a spin echo image as calculated in table ( I & II) respectively.

#### **Fast Spin-Echo Images:-**

The scanning was performed with fast spin-echo sequence with echo time 12ms and repetition time with five different values as 400, 500, 600, 700 and 800ms. Images were also taken with repetition time 400 and five different values of echo time as 12, 25, 37, 49 and 62ms.

The image of a transverse slice was obtained with sequence parameters, TR and TE to be 800 and 12ms respectively.

The contrast obtained from this image by selecting different ROI in the beam area and away from beam area showed the mean value of signal intensity to be 831 and 664. Another slice of image with sequence parameter TR of 400ms and TE of 37ms, the mean value of signal intensity calculated was 490 and 385 in the beam area and away from the target area respectively.

For fast spin echo the contrast to noise ratio obtained is inconsistent with spin echo for the choice of TR but there would be a careful attention would be taken for the choice of TE.

#### **Gradient-Recalled Echo Images:-**

The scanning was performed with Gradient recalled echo sequence with echo time 12ms and repetition time with five different values as 80, 90, 100, 110, and 120ms. Images were also taken with repetition time 80ms and five different values of echo time as 10, 12, 14, 16 and 18ms.

The image of a transverse slice was obtained with sequence parameters, TR and TE to be 120 and 12ms respectively.

By taking different ROI in the slice at the beam path and at a place far away from the beam path it can be clearly visualizing the contrast between these two areas. The mean value of signal intensity calculated at the centre of the slice was 399 and away from the centre were 317.

Another slice with sequence parameters TR of 80ms and TE of 18ms with signal intensity values 290 and 212 at the beam targeted area and away from beam area respectively, is shown in the *figure 3(a & b)*. A good CNR is obtained at higher value of TR in Gradient Recalled echo but for TE its behavior is unstable.

#### **Fluid Attenuated Inversion Recovery images:-**

The results from MR imaging performed by applying inversion recovery pulse sequence are given below. The same gel composition was used for this sequence also. A set of images of five TR values as 2000, 2100, 2200, 2300 and 2400ms was obtained with sequence parameters TE and TI of 12ms and 600ms respectively. The image acquired with maximum contrast was by applying TR of 2100ms and TE of 12ms. The mean value of signal intensity for the beam targeted area calculated was 316 and away from the beam area was 134.

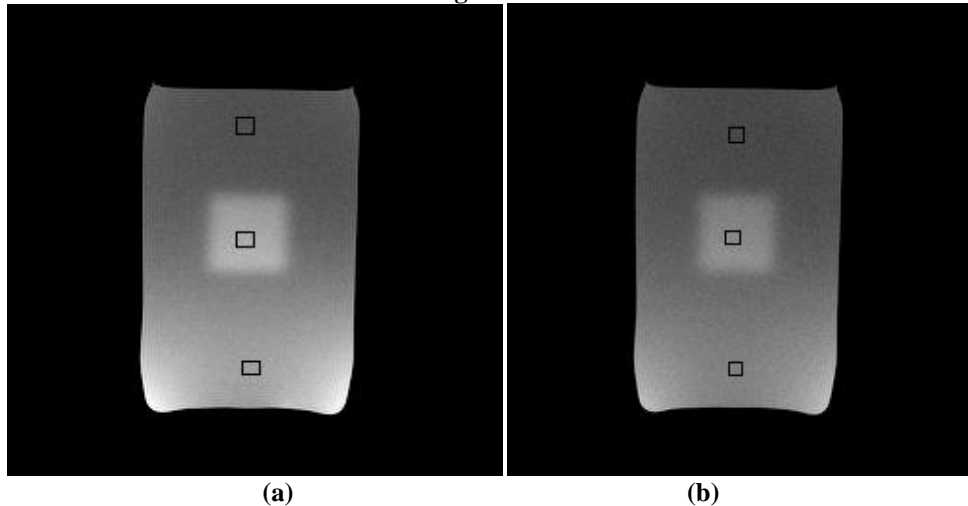
Some images were acquired while applying inversion recovery pulse sequence with a set of five different values of TE as 12, 25, 37, 49 and 62ms. Repetition time and inversion time were chosen to be 2000ms and 600ms respectively. The maximum contrast obtained by applying parameters, TR of 2000ms, TE of 37ms and TI of 600ms having mean values of signal intensity as 341 at the beam path and 153 at the area away from the beam.

In CSE, however with the increase of TR, CNR increased between the tissues (from 38% from 400 to 800 (ms). In FSE, CNR is created between tissues and this ratio is comparable to CSE. Contrast between tissues is high as TR moves from 400 to 500 (ms) though CNR moves up 49 % from TR 400 to 800 (ms). With the moderate signal intensity difference amongst tissues 25-0 Gray the contrast between signal strengths is evident even at small TR 80 ms in GRE. CNR increased through 27% as TR increases from 80 120ms. Within FLAIR signal strength of tissues is relatively higher than CSE, FSE and GRE at all values of TR. There is 18% increase in CNR as TR is increased from 2000 to 2400 ms. FLAIR turns out higher CNR even at lesser value of TR 2000 (ms). CNR between tissues is almost alike at all values of TR and 27% increased CNR obtained from TR 2000 to 2400 (ms). The numerical difference between two small intensities can be well differentiated in FLAIR. CSE creates CNR with the variation of TE for tissues have trivial signal strength Signal strength decreased with the rise of TE but this decrease is not tremendous .We have average 3% decrease in the signal strength i.e. CNR. However more appropriate TE is desirable to produce excellent contrast between tissues. Choice of TE in FSE is analogous to CSE to develop contrast among tissues. Signal intensity 4% decreased from TE 25 to 62 msec. GRE the percentage decrease of CNR is 5% but FLAIR creates maximum contrast between tissues of minute signal intensity difference. FLAIR can be a good choice to differentiate tissues of infinitesimal signal intensity. There is 11 % average decrease in signal intensity with the selection of high value of TE.

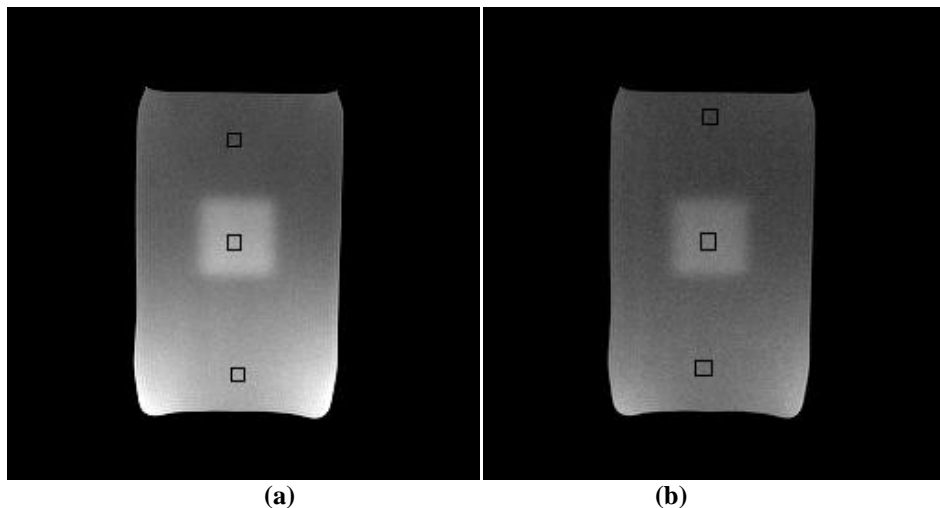
### Conclusion:-

This research work demonstrate the impact of variation of key imaging parameters TR and TE on image quality for the frequently used pulse sequences CSE, FSE, GRE and FLAIR at diagnostic level. Inappropriate selection of parameters is able to build an insignificant image. This analysis showed that the role of TR and TE in T1-weighted images is crucial to maintain the image quality. With the choice of TR and TE in T1-weighted images CNR results of CSE and FSE are equivalent for the tissues of comparable signal intensities and for entities have moderate difference between signal intensities CSE provides remarkable contrast between tissues because of signal intensity difference is extremely high in T1-weighted study. FLAIR which is explicitly preferable for T2-weighted images also analyzed its importance in T1-weighted images. FLAIR gives better contrast to noise ratio at lower values of TR and higher values of TE. Results strongly suggested that it can also be used for diagnostic purpose with fine image quality of high T1/T2 weighted tissues in T1-weighted study as well.

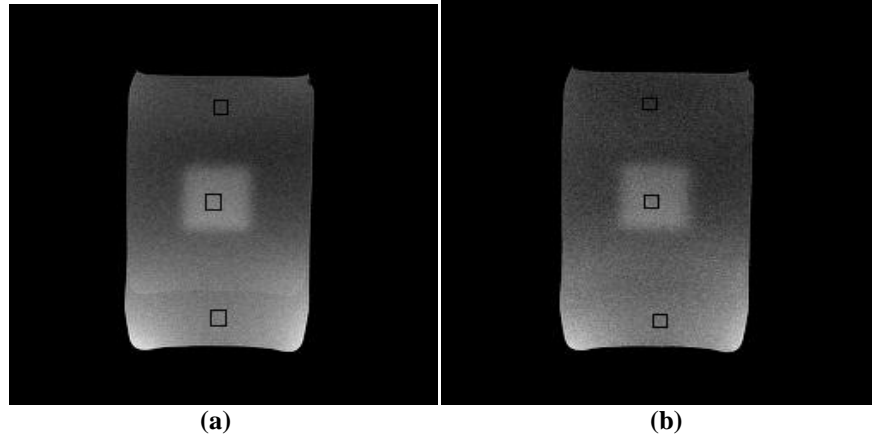
**Figure 1:-**



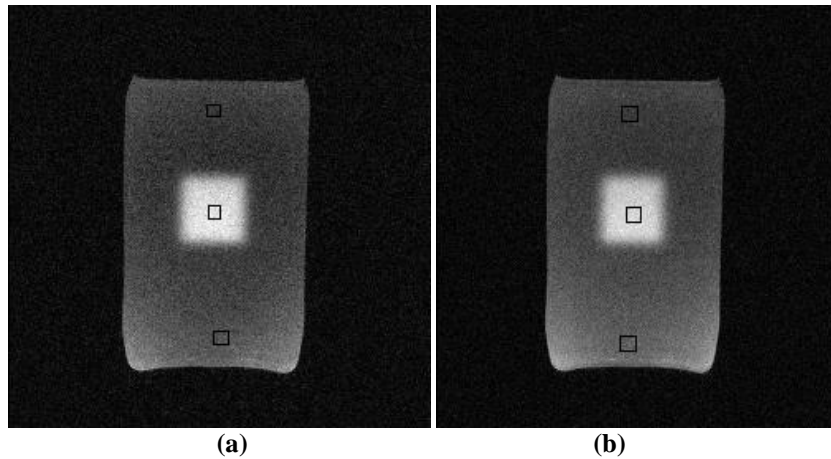
**Figure 1(a&b):-** An MR image of transverse slice of gel phantom after exposing to 6MV X-rays. The image was acquired by applying spin-echo (SE) pulse sequence with TR of 800ms and TE of 12ms (a) and TR of 400ms and TE of 16ms (b), matrix size 256×256, slice thickness 4mm and FOV 200mm<sup>2</sup>.



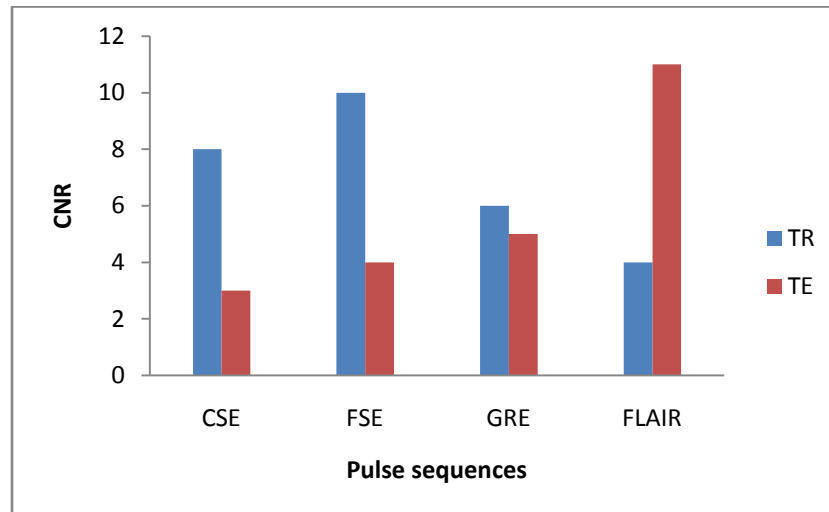
**Figure 2(a&b):-** An MR image of transverse slice of gel phantom after exposing to 6MV X-rays. The image was acquired by applying fast spin-echo (FSE) pulse sequence with TR of 800ms and TE of 12ms (a) and TR of 400ms and TE of 37ms (b), matrix size 256×256, slice thickness 4mm and FOV 200mm<sup>2</sup>.



**Figure 3(a&b):-** An MR image of transverse slice of gel phantom after exposing to 6MV X-rays. The image was acquired by applying gradient- recalled echo (GRE) pulse sequence with TR of 120ms and TE of 12ms (a) and TR of 80ms and TE of 18ms (b), matrix size 256×256, slice thickness 4mm and FOV 200mm<sup>2</sup>.



**Figure 4 (a&b):-** An MR image of transverse slice of gel phantom after exposing to 6MV X-rays. The image was acquired by applying inversion recovery (IR) pulse sequence with TR of 2100ms and TE of 12ms (a) and TR of 2000ms and TE of 25ms (b) and TI of 600ms, matrix size 256×256, slice thickness 4mm and FOV 200mm<sup>2</sup>.



**Figure 5:-** CNR between two tissues of deliver dose 20 and 0 Gray of T1/T2 relaxation time is 653/81 (msec) and 812/166 (msec) respectively at the selected values of TR and TE in T1-weighted images.



Table 01:-

<i>Sr. No</i>	<i>Pulse sequences</i>	<i>TR (ms)</i>	<i>CNR</i>	<i>Percentage increase in CNR %</i>	<i>Average increase %</i>
1	CSE	400	32	12	8%
		500	36	11	
		600	40	5	
		700	42		
		800	44	4.7	
2	FSE	400	26.4	22	10%
		500	34	3	
		600	35.2	10	
		700	39	7	
		800	42		
3	GRE	80	17.5	9	6%
		90	19.3	8	
		100	21	8	
		110	23	1	
		120	23.2		
4	FLAIR	2000	18.7	10	4%
		2100	20	3	
		2200	19.3	1	
		2300	19	2	
		2400	18.5		

Table 02:-

<i>Sr. No</i>	<i>Pulse sequences</i>	<i>TE (ms)</i>	<i>CNR</i>	<i>Percentage decrease in CNR %</i>	<i>Average decrease %</i>
1	CSE	12	32	1	3%
		14	31.7	1	
		16	32	6	
		18	30	5	
		20	31.5		
2	FSE	12	26.4	0	4%
		25	26.4	11	
		49	29.4	0	
		37	29.4	5	
		62	31		
3	GRE	10	17.4	9	5%
		12	17.5	1	
		14	19.3	7	
		16	18	4	
		18	17.2		
4	FLAIR	12	18.7	12	11%
		25	21	14	
		49	18.4	8	
		37	20	13	
		62	23.5		

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### RESEARCH ARTICLE

## CONSERVATION OF BIODIVERSITY WITH PARTICULAR REFERENCE OF BUTTERFLY FAUNA OF GIR PROTECTED AREA, GUJARAT.

Anchal Sharma, Dr. S. I. Ahmed and Dr. Sandeep Kumar.

#### Manuscript Info

##### Manuscript History

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#### Abstract

A detailed study on the butterfly species diversity was carried out during 2011 and 2014 using Pollard walk method in the Dry Deciduous Teak forest of Gir National Park in Junagadh District of Gujarat State, India to assess the protected species under various schedules of the Wildlife (Protection) Act, 1972.

#### Key words:-

Gir National Park, Indian Wildlife (Protection) Act 1972, Pollard walk, Species diversity.

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#### Introduction:-

India with only 2.3% of the total land mass has around 91,206 animal species comprising 7.43% of the total (Ramakrishna and Alfred, 2007). Taking cognizance of the alarming situation of the depletion of natural habitats, the Government of India took significant steps in establishing the Indian Board for Wildlife in 1952 followed by the Indian Wildlife (Protection) Act, 1972. India also became signatory to the CITES, IUCN and world-wide Fund for nature. The Government of India has so far protected more than 4% of the geographical area, with 99 National Parks, 513 Wildlife Sanctuaries, 41 Conservation Reserves and 4 Community reserves (Anonymous, 2008) with a forest cover of 20.64% (Anonymous, 2003).

The Government of India under Indian Wildlife (Protection) Act, 1972 provided protection to 452 species of butterfly in three Schedules (out of six) as in Schedule I, Part IV, 128 species of butterfly; in Schedule II, Part II, 305 species and in Schedule IV (Secs. 2,8,9,11 and 61), 19 species (Anonymous, 2003). Due to advancement in taxonomy, the names of species and their families changed. Sharma and Ramamurthy (2010) have updated the list of 452 butterfly species and their families as per Indian Wildlife (Protection) Act, 1972 updated. The export of butterflies (dead or alive) and decorative articles from them are prohibited. As per Section-40 (92) of the Act, no person can acquire, receive, to keep in control, custody or possession, any of the species included in the above schedule without previous permission in writing of the Chief Wildlife Warden or his authorized officer.

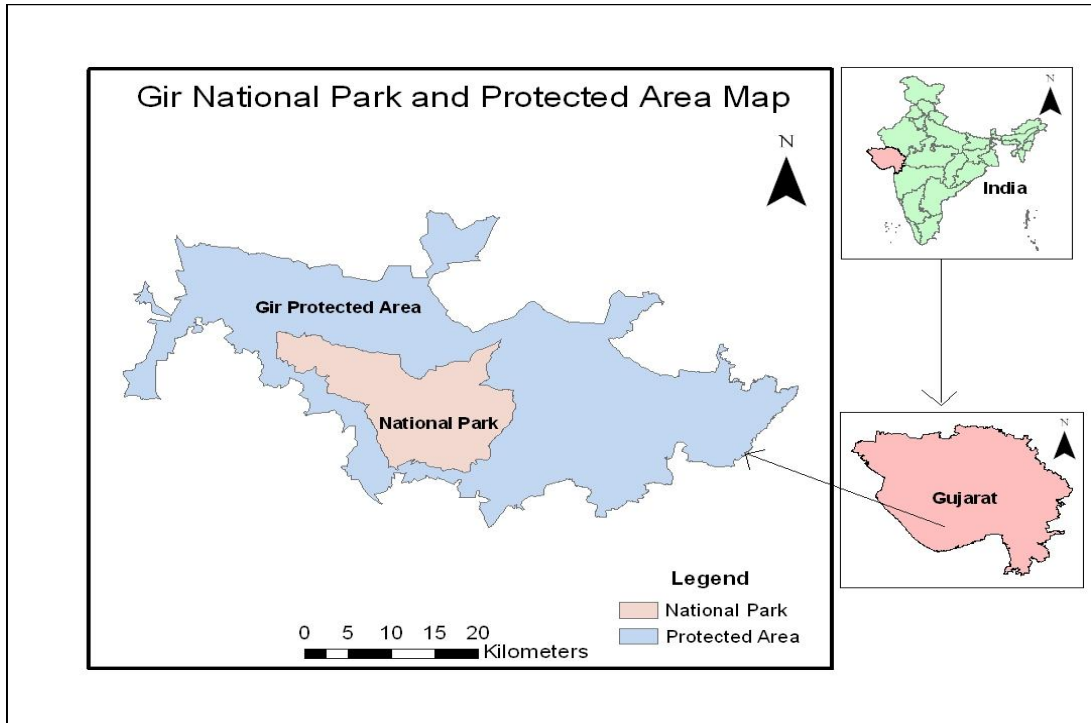
The available information on the conservation importance of Indian butterfly's species and sub-species is very meagre. Though, some earlier authors (Sharma and Ramamurthy, 2010 and Kunte, 2008) have published various accounts on the insects, to be included in the WPA, 1972. During the course of the present investigation, an attempt has been made to assess the protected species of butterflies of Gir National Park under various schedules of the Wildlife (Protection) Act, 1972.

#### Material and Methods:-

The survey was conducted during 2011-2014 using Pollard Walk on fixed transects as per the methodology adopted by Pollard and Yates (1993) in order to enumerate the butterfly species in ten different habitats of Gir PAs. Existing

patrolling paths were used as transects for surveys. All flying butterflies on these selected transects were recorded between 9.00 am to 4.00 pm.

For the purpose of collection of samples, a data sheet was designed following the techniques developed and adopted by Pollard and Yates, (1993) which is comprised with all the variables such as abiotic factors, GPS factors, host plants *etc.*(separately) , collected from each of the study - sites in Gir PA Gujarat.



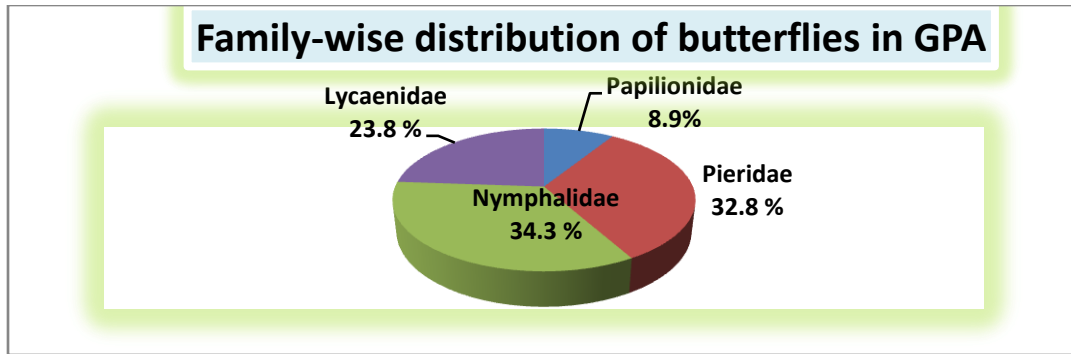
### Results and Discussion:-

A total of 67 species belonging to all 42 genera, representing 4 families, have been recorded from GPA. The family Nymphalidae was found dominant with 15 genera and 23 species followed by family Pieridae representing 10 genera and 22 species. Family Lycaenidae is comprised of 14 genera and 16 species whereas Papilionidae with 3 genera and 6 species.

**Table 1:-** Distribution of butterfly species family- wise in GPA

S.No.	Family	Common Names	Genera	Species
1.	Pailionidae	Swallowtail butterflies	3	6
2.	Pieridae	White and yellow butterflies	10	22
3.	Nymphalidae	Brush-footed butterflies	15	23
4.	Lycaenidae	Blues, hairstreaks & gossamer-winged butterflies	14	16
		Total	<b>42</b>	<b>67</b>

The existing check- list containing 44 species of butterfly as presented by Kiran and Ahir (2005) from GPA has been updated to 67 species, thus 23 species has been added to the earlier recorded checklist which was comprised of only 44 species.



Among the 67 species recorded from GPA during the study of two years, four species of butterflies *Pachiliopta hector*, *Hypolimnasmisippus*, *Castaliusrosimon* and *Dendoryxepijarbas* are included Schedule -I and another four species namely *Charaxesfabius*, *Ceporanerissa*, *Euchrysopsnejus* and *Lampidesboeticus* are included under Schedule -II, while remaining only one species *Euploea core* comes under Schedule – IV as per Wildlife protection Act (1972).

**Table 2:-** List of butterflies with their status (Wild Life Protection Act- 1972) in GPA.

S.No	Family	Species	Status as WPA (1972)
1.	Papilionidae	<i>Pachiliopta hector</i>	Schedule – I (WPA- 1972)
2.	Nymphalidae	<i>Hypolimnasmisippus</i>	Schedule – I (WPA- 1972)
3.	Nymphalidae	<i>Charaxesfabius</i>	Schedule – II (WPA- 1972)
4.	Nymphalidae	<i>Ceporanerissa</i>	Schedule – II (WPA- 1972)
5.	Nymphalidae	<i>Euploea core</i>	Schedule – IV (WPA- 1972)
6.	Lycaenidae	<i>Euchrysopsnejus</i>	Schedule – II (WPA- 1972)
7.	Lycaenidae	<i>Castaliusrosimon</i>	Schedule – I (WPA- 1972)
8.	Lycaenidae	<i>Lampidesboeticus</i>	Schedule – II (WPA- 1972)
9.	Lycaenidae	<i>Dendoryxepijarbas</i>	Schedule – I (WPA- 1972)

While sampling in the GPA, eight species of butterflies e.g., *Graphiumnomius*, *Ariadne merione*, *Bybliailithiya*, *Paronivaleria*, *Tarucustherophrastus*, *Azanusjeasons*, and *Spindasisictis* were rarely encountered in a very less numbers and as such these species have been given a status of rare species in respect of GPA.

**Table 3:-** Status of rare - species in GPA as per the revised and updated check-list of GPA

S.No	Family	Species	Status in GPA
1.	Papilionidae	<i>Graphiumnomius</i>	Rare
2.	Nymphalidae	<i>Ariadne merione</i>	Rare
3.	Nymphalidae	<i>Bybliailithiya</i>	Rare
4.	Pieridae	<i>Paronivaleria</i>	Rare
5.	Lycaenidae	<i>Curetisthetis</i>	Rare
6.	Lycaenidae	<i>Tarucustherophrastus</i>	Rare
7.	Lycaenidae	<i>Azanusjeasons</i>	Rare
8.	Lycaenidae	<i>Spindasisictis</i>	Rare










 <p><i>Pachiliopta hector</i></p>	 <p><i>Hpolimnasmissipus</i></p>	 <p><i>Charaxesfabius</i></p>
 <p><i>Ceporanerissa</i></p>	 <p><i>Euploea core</i></p>	 <p><i>Euchryopsnejus</i></p>
 <p><i>Castaliusrosimon</i></p>	 <p><i>Lampidesboeticus</i></p>	 <p><i>Dendoryxepijarbas</i></p>

Fig:- Species of butterflies protected under Wild Life Protection Act- 1972 in GPA.

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### RESEARCH ARTICLE

#### IDENTIFYING CHARACTERISTICS OF EFFECTIVE LEADERSHIP BASED ON VALUES OF LOCAL ETHNIC CULTURE: A COMPARATIVE STUDY.

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leadership, local culture, Korean, Bugis, Māori

#### Abstract

The power of culture in each country is very influential in shaping the characters of people in organization especially leader. A good leadership will affect the organizational performance. This study aims to identify the values of local ethnic culture and its role in shaping characteristics of effective leadership in South Korea, Indonesia and New Zealand. The method was adopting qualitative method by analyzing literatures on local culture of Korean in South Korea, Bugis in Indonesia, and Māori in New Zealand. The study found that similar characteristics of the three local ethnic cultures are the basic characteristics in forming characteristics of effective leadership especially in the region of Asia Pacific.

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#### Introduction:-

Culture resides at multiple levels, from nations, civilizations, organizations to groups (Schein, 2004) and it is generally defined as “the enduring sets of beliefs, values, and ideologies underpinning structures, processes, and practices that distinguishes one group of people from another” (Walker & Dimmock, 2002, p. 16). Murray & Kluckhohn (1953) also stated that culture may offers a lot of potential life for an unforgettable experience to every human being. Therefore, Hofstede (1997) believed that culture as a software of mind of every people.

Each country has a clearly difference of culture and character which is obtained through a process of exploration and discovery of its identity (Hofstede, 2001). Hence, the cultural identity of the nation can affect the characters, attitudes and behavior of individual in society, especially the leaders.

The leaders are called as cultural heroes because leadership reflects the dominant culture of a country (Hofstede, 2001). Global world now requires the contemporary leaders to work across cultures and nationalities without compromising their own values (Katene, 2010). The leaders who have an excellent mindset, good behavior, holy life, elate, foresight and courage to make changes, will succeed in protecting and maintaining the social values of the cultural community as well as forming a great nation and civilization (Jusoh, 2009).

The cultural differences are mainly reflected in terms of its values (Hofstede, 1997). An anthropologist Kluckhohn (1967) defined "value" as a concept, explicitly or implicitly, the specificity characteristics or features of either individuals or groups, who want to influence the selection of the mode, meaning and the appropriate action. While

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Rahim (2012) interpret "value" in all the standards which is used as decision-making, intangible, or abstract, such as customs, normative habits, moral, ethics, self-esteem, ideas, knowledge and so on.

The advantages of local culture's values in shaping the leadership can be considered among some of the world community. As with South Korea, a country that is able to generate and maintain its unique culture and traditions. Although the Western culture is strong enough to affect people's lives in South Korea, especially in urban areas, but the ethics-based culture of Koreans such as honesty, hold promise, appreciate and respect the elders are stillexist. In Indonesia, the implementation of local cultural traditions which indeed contain positive values has brought much success to the leadership both nationally and locally. Meanwhile, in New Zealand, the culture has been expanded through globalization. But in fact, even most of the population now are living in urban, a lot of their literatures and arts are still rural theme.

#### **Objective of the Study:-**

The purpose of this study is to identify the values of local ethnic culture and its role for shaping the characteristics of effective leadership in selected countries of Asia-Pacific region such as Korean in South Korea (East Asia), Bugis in Indonesia (Southeast Asia), and Māori in New Zealand (Oceania).

#### **Methodology:-**

In this study, qualitative method approach was adopted by analyzing the related literatures with the local ethnic culture of Korean, Bugis, and Māori.

#### **Findings:-**

##### **Leadership characteristics in Korean culture**

South Korea is among the countries in East Asia that the most attracted the world today. It includes as one of the attracted countries in the world which has shown and proven its success, particularly in the field of art, culture and technology. It is not surprising when the country is among the countries that are considered to be successful in business management. In business management, each elements of the organization certainly has the role, particularly the efficiency of its leaders. Upholding the spirit of hard work consistently is one of the factors of the success in South Korea.

Although South Korea is regarded as a country that is the most internationalized in Asia, but many Koreans who still maintain their traditional culture, the traditions, customs and cultural practices which still appeared very significant in business and government organizations (Lee, 2012). Traditional culture has been considered as the root of Korean cultural identity (Yim, 2002).

South Korea with almost 99 percent of the population are Korean ethnic (Rini, 2012), has the principles of cultural values that are still practiced everyday in society. Through these practices, the country managed to showcase the rich cultural heritage. One of the Korean culture principles which is very effective in their personality is *inhwa*. *Inhwa* refers to "harmony". *Inhwa* is one of fundamental values in Korean culture which very effective for the leadership in South Korea.

According to Widyahartono (2008), the Confucian influences practicing organizations in South Korea both in business and government. From Confucian beliefs, *inhwa* was drawn. *Inhwa* is one of Korean culture principles that emphasize the harmony among human (Lee, 2012). *Inhwa* showed the following characteristics:

1. Loyalty to a hierarchical structure.
2. Obedience, loyalty, love and gratitude to parents, especially the mother as a symbol of sacrifice and kindness who always unselfish.
3. The harmony within and between groups.
4. Leaders are role models.
5. Moral values are more appreciated than merely skill and competence.

On the whole organization in South Korea emphasizes the harmony among human, loyalty, cooperation, a sense of unity or solidarity, responsibility, dedication, hard work, creativity, originality, and personal development (Widyahartono, 2008). Korean people are very loyal to their parents, the elders, and the authority figures such as the kings, the leaders of the organization, and all the people in the highest position of hierarchical structure. Koreans usually like to give a positive answer and show reluctance by giving direct refusals to maintain a harmonious

environment as reflected of *inhwa*. In organizations, subordinated loyal to the leaders and the leaders is concerned with the welfare of subordinates. Leaders who base their leadership with *inhwa* is always willing to sacrifice to prioritize public interest over private interests alone. Here we see that the *inhwa* usually exist in an unequal rank (hierarchical structure), prestige and power. *Inhwa* also teaches the value at which each party has a responsibility to support the other party or people and make them happy. Therefore, Lee (2012) in his study concluded that by understanding and practicing the culture, customs and traditions of Korean, the effectiveness and success will be reached.

#### **Leadership characteristics in Bugis culture:-**

Indonesia, as one of eleven countries in Southeast Asia, has approximately thousands ethnicities. Each ethnic has pure cultures and traditions with positive values inside. This country which consists of 34 provinces, has characteristics are marked by the diversity of its local ethnic culture. One of them is culture of Bugis ethnic.

Bugis people or called as Buginese is the biggest population in the eastern area of Indonesia which originally comes from and largely stay in South Sulawesi province, Indonesia. They had a core and original culture that has existed since a long time ago until today that is called *siri'*. *Siri'* reflects the character and personality of Buginese (Hamid, 2003).

The concept of *siri'* is difficult to be translated into the other languages, including the Indonesian language. Although no single word is perfectly suitable and appropriate to translate and make sense of *siri'* but it was often interpreted generally as shyness and self-esteem (dignity) by most of society in South Sulawesi. Andaya (2004) also argued that aspects of shame and dignity in *siri'* culture must always be balanced and complementary. More described by Marzuki (1995) that aspects of shame and dignity in *siri'* are like two chemical components which are soluble and belong each other in compounds and melting together in symbiosis. Hence, Hamid (2003) stated that *siri'* is a system of attitudes that cause embarrassment when the honor or dignity has been dropped.

*Siri'* is abstract and very sensitive to the Buginese. It is ideology and symbol of cultural value that are applicable in all class of society (Fahmid, 2012). *Siri'* places human on the level of respect and noble position in the life of world (Abdullah, 1985). The higher of person's status and position in all kinds of organizations (e.g. family, society, company, government, etc.), the stronger of *siri'* attached to him/her (Hamid, 2003). Behaving well and properly, and also avoiding bad morals in social and law are a symbol of the establishment of *siri'*. Therefore, *siri'* demands honesty, loyalty, and discipline.

*Siri'* which is inherent in personality of Buginese already contains values, either generally or specifically. Hamid (2003) stated that, common values of *siri'* include: recognizing the equality of rights and obligations among people, wise and caring people, uphold humanitarian, brave stand for truth and justice, love and proud of nation, working hard. Meanwhile, specific values in *siri'* are emotional vocabularies which are tied to social community as something complex of tastes. Rahim (2011) concluded that the values embodied in *siri'* include: honesty, trustworthy or responsibility, fairness, intellectuality or intelligence, tactful, traditionalism, diligence or hard work (so as not poor), and bravery.

Bugis leadership is limited by the rules of the local wisdom (culture), especially the cultural values of *siri'*. Buginese were boosted by *siri'* to be a wise leader, persevere in the struggle, never give up when faced with a tough challenge, and must be fair and honest with everyone in any business (Abdullah, 1985).

#### **Leadership characteristics in Māori culture:-**

New Zealand is considered as the last island that inhabited by humans because of its remoteness. It is an island nation that located in the southwest of Pacific Ocean and the southeast of Australia.

New Zealand's native people are called Māori. The lives of Māori has been much influenced by traditional cultures from the earlier generations (Katene, 2010). At this time, Māori have been living together with the other ethnic groups in building modern New Zealand and advanced the concept of diversity. However, Māori is still developing its own distinct culture. Culturally, Māori people live communally, sharing, and strongly maintaining traditional values.

In Māori culture, leadership is determined by a combination of leaders who is legalized by collective input (Marsden, 1988). To understand the leadership of Māori in New Zealand society, it is necessary to understand the principles relating to the interpretation of traditional leadership. Leadership in Māori is still hierarchy and according to the class system, but traditional Māori society still expects that the leader is appeared of the group (Rito, 2006). Therefore, the community work together with leaders or their principals for the same purpose.

Katene (2010) argued that traditional and contemporary Māori leadership is characterized by leaders who share the vision, mission and actions agreed upon and respected for their loyalty and confidence of his followers, both individually and as a group through their inspiring leadership. Therefore, the future leaders of Māori that is needed is must be educated, politically wise, sophisticated, qualified, strong, committed to their people, and well-grounded in basic of Māori culture (New Zealand Te Puni Kōkiri, 1992).

One of the cultural values that form the basis of life for Māori is called as *wairua*. *Wairua* is interpreted as the spirit or soul. It is a cultural beliefs, practices and values that exist in daily life and cultural vitality that is embedded in the services and program of Māori (Kennedy et al., 2015). There are seven principles of *wairua* which include: 1) the feelings associated with it (*mauri*); 2) respect to others (*aroha ki te tangata*); 3) generosity and sharing with others (*manaaki ki te tangata*); 4) care (*kaitiakitanga*); 5) concern (*kia tūpato*); 6) cleaning spirit (*whakanoa*); and 7) knowledge, collective wisdom, and enlightenment (*mōhiotanga, mātauranga, and māramatanga*). Kennedy et al. (2015) expect the exploration experience in research will give support to other Māori's evaluators to reflect on how *wairua* woven into their culture responsive assessment practices.

Based on the traditional culture of Māori, New Zealand Te Puni Kōkiri (1992) identified the key elements in the leadership for leader of new Māori which are summarized as follows: 1) the strength of a leader reflects the strength of the group because a strong leader is within or close to his people; 2) a leader is the servant of people (servant leadership) which means people oriented leadership, mandate from people and responsible to the people, often seen among the people, serve the people, care for the people, and speak on behalf of the people; 3) a leader strives to ensure, enhance, and strengthen the integrity, continuity and development of Māori society and culture; 4) modern leader needs to consult frequently with the *iwi* (social organization unit in community fraternal of Māori) and dependant upon reliable information and advice; 5) leadership requires cooperation between traditional leaders and specialists.

Katene (2010) found that the leadership system of Māori is still relevant until today. Māori have built considerable capability and competitive advantage through leading and managing cultural diversity. The mark of leadership success for a Māori is providing leadership based on traditional principles while managing the interface (Mead, 2006). Therefore, Harmsworth et al. (2002) believed that the leaders of Māori who often occupy several positions, roles and different responsibilities are to meet the needs of culture and organization for the development of a sustainable future.

## Discussion:-

Based on our findings, it was identified the leadership characteristics contained in each local ethnic culture of Korean in South Korea, Bugis in Indonesia and Māori in New Zealand, as listed in Table 1.

**Table 1:-** Leadership characteristic of local ethnic culture (Korean, Bugis, Māori)

Korean South Korea	Bugis Indonesia	Māori New Zealand
loyalty	dignity	fairness (in sharing)
discipline	morality	generosity/caring
respect	honesty	traditionalism
morality	loyalty	cooperation
solidarity/cooperation	tactful/wise	servant (for people)
trustworthy	trustworthy/responsibility	intelligence
bravery (in sacrifice)	diligence (hard work)	responsibility (trustworthy)
intelligence	bravery	hard work
creativity	fairness	boldness/bravery
traditionalism (originality)	intellectuality/intelligence	honesty
fairness	traditionalism	integrity
dedication/diligence/hard work	discipline	

The list of leadership characteristics of three local ethnic cultures that has been shown by Table 1. particularly showing the similar characteristics such as: trustworthy, diligence (hard work), bravery, intellectuality (intelligence), fairness, and traditionalism. These six characteristics, as the result of comparison of the local ethnic culture in South Korea, Indonesia, and New Zealand, are the basic characteristics for shaping effective leadership. Each characteristic can be described as follow:

1. **Trustworthy** means responsible leader in carrying out the duties, interests and aims of the organization; using the power and authority to the decent and correct things according to the rules; and strengthen the loyalty and responsibility for people.
2. **Diligence** refers to a leader who is hard-working; diligent; enterprising; conscientious in carrying out his activities; and never feel tired or bored to seek knowledge and continue the studies.
3. **Bravery** mentions to a leader who is bold; fearlessness; bravely face the challenges as well as threats; will not withdraw in facing the adversity (not a coward); and volunteer their time, energy and material for common aims.
4. **Intellectuality** is also called as intelligence which means that a leader should be educated; has intellectual ability, mental capacity, and understanding; has balance of logic, emotional, and spiritual.
5. **Fairness** means leader who is not arbitrary; does not favor any party or person; putting things in the right places like the appointment of the expert officers in the field; keeping one's right or something like employees receive services and benefits commensurate with their sacrifices and performance in an organization.
6. **Traditionalism** refers to the upholding or maintenance of tradition which means that leaders establish an activity with positive values grounded indigenous cultural traditions to be adapted and implemented within the leadership without conflict with the related law.

Nurfitri et al. (2015) found that the basic values to be a leader are diligence, bravery, intellectuality, and fairness. However, to be an effective leader, the basic values of leadership must be developed. Each leader should not be satisfied and limited only with a common leadership, but must act more effectively to increase the level to become effective leader which then finally achieving best performance and can become successful leader. Therefore, the six characteristics (trustworthy, diligence, bravery, intellectuality, fairness, and traditionalism) as listed and described above are the initial and main values as leadership characteristics that must be held to be effective in leading an organization.

According to Likierman (2009), effective leadership is viewed through the achievement of organization. Meanwhile, Widodo (2008) believed that successful leadership is viewed through the achievement and maintenance of organization. Hence, it can be concluded that effective leadership is not necessarily successful leadership but successful leadership is certainly effective leadership. However, effective leadership is the key step before achieving the successful leadership.

### **Conclusions:-**

The most important characters of leadership may vary in different cultures and countries. The values of local ethnic cultures have given much influences in forming characteristics of leadership to be effective for reaching great performance. Finally, the great performance will produce the success of leadership as the main objective of every leader. The successful leadership reflects the successful organization where the leader leads.

Every culture has its unique characteristics which contains positive values that can be developed. Therefore, the other study can explore more about the uniqueness and distinctiveness of culture in each country especially that are considered as successful countries. Identifying the culture's characteristics, role and influence in every community life and especially in leadership is proposed to be studied, investigated and disclosed in greater depth continuously.

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### RESEARCH ARTICLE

## SINGLE CRYSTAL GROWTH AND CHARACTERIZATION OF ZINC DOPED MAGNESIUM THIOUREA ACETATE CRYSTALS.

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#### Abstract

A semi organic nonlinear optical single crystals of zinc magnesium thiourea acetate (ZMTA) were grown from slow evaporation technique at room temperature. The unit cell parameters were determined from single crystal X-ray diffraction studies. FTIR studies were performed to identify the functional groups present in the compound. The UV-Vis spectrum indicates the grown crystal has good transparency in the entire UV-Vis region spectrum suggesting the suitability of the material for NLO applications. The thermal studies show that the crystal is thermally stable up to 120°C. The relative second harmonic efficiency of the compound is found to be 1.64 times greater than that of KDP.

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#### Introduction:-

In recent development of research in nonlinear optical phenomena are involved in scientific and industrial applications. The property of second harmonic generation are focused in electro optic modulation, optical switching and also it involves in the domain of optoelectronic and photonics. Especially organic and inorganic materials are given increasing attention due to its rapid technological advances in various fields, such as laser technology, fibre optics, telecommunication, optical computing and optical data storage technology [1-3]. To overcome the limitation of these materials, interests have been focused on semi-organic crystals. In which it leads to explore the combined properties of both inorganic and inorganic crystals like high damage threshold, wide transparency range, less deliquescence, higher mechanical strength and thermal stabilities are obtained for device fabrication [4, 5]. Recently effort has been made on metal complexes of thiourea and analogues. Inorganic matrix of thiourea molecules are an interesting material plays important role due to their large dipole moment and ability to form an extensive network of hydrogen bonds with metals [6, 7]. The NLO properties of some complexes of thiourea, such as bis (thiourea) cadmium sulphate (CTS) [8], potassium thiourea bromide (PTB) [9] and zinc thiourea sulphate (ZTS) have been reported elsewhere [10]. In the present investigation, the effect of Zinc doped MTA crystals have been studied using single crystal XRD, FT-IR, UV-Vis, thermal and microhardness of the grown crystals have been carried out. The NLO property of as grown crystal has been confirmed by Kurtz powder technique.

#### Synthesis and crystal growth:-

Single crystal of zinc doped MTA material was synthesized using AR grade of Thiourea, Magnesium acetate and Zinc acetate. Double distilled water was used as a solvent. Calculated amount of (3: 0.9: 0.1) the above materials were dissolved in 100 ml of water and stirred well using magnetic stirrer. Well defined single crystals of good transparency were harvested after a period of 15 days and shown in Fig.1.

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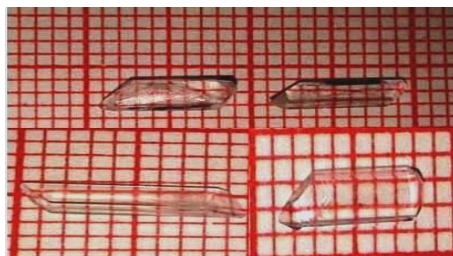


Fig 1:- Photograph of ZMTA crystals

## Result and Discussion:-

### Single crystal XRD studies:-

The grown crystals were analyzed by single crystal X-ray diffraction to confirm the crystallinity and also to estimate the lattice parameters. From the single crystal X-ray diffraction data, it is observed that the ZMTA crystal is Monoclinic in structure. The morphology of the grown crystal seems to be different when compared with Zinc magnesium tris thiourea sulphate (ZMTS) and Magnesium doped tris thiourea zinc sulphate (TTMZS) [11, 12]. The calculated unit cell parameters are given below in Table 1 and their values are compared with the reported values.

Table 1:- Unit cell parameters of grown and reference crystals

Crystal systems	a(Å)	b(Å)	c(Å)	Volume (Å <sup>3</sup> )	Crystal structure
ZMTA	7.113	17.694	11.111	1363.9	Monoclinic
ZMTS	7.74	11.08	15.42	1337	Orthorhombic
TTMZS	15.57	6.315	5.549	545.4	Orthorhombic

Changes in the lattice parameters may be due to incorporation of dopant which causes the increase in volume. However, for ZMTA crystal, changes in the lattice parameters have been observed with respect to ZTMS and TTMZS crystals which confirm that the doped crystal exhibits different structure as that of parent material.

### Optical absorption studies:-

An optical absorption spectrum of ZMTA crystals were recorded in the wavelength range 200-800 nm using PerkinElmer Lambda 650 UV-Vis spectrometer and is shown in Fig. 2. The UV spectrum shows a wide transparency window with the lower cut off wavelength of grown crystal is 235 nm. Absence of absorption in the region between 260-800 nm is the essential property for the NLO material. The less absorbance behavior in the entire visible region also confirms the colorless nature of the crystal.

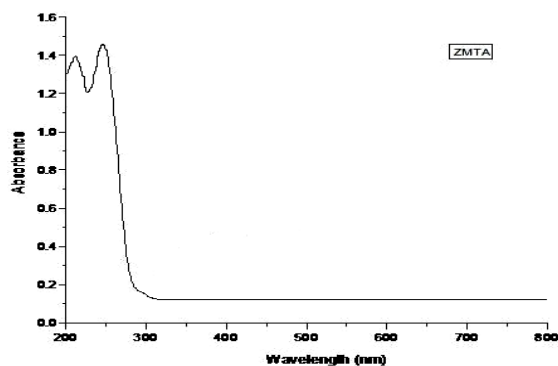


Fig 2:- UV-vis absorption spectrum of ZMTA crystal.

It is observed that the grown crystal has good transparency in the UV-Visible and IR region. While doping Zinc acetate with MTA crystal alter the lower cut off wavelength increase when compared to the reported values [11, 12].

**FTIR studies:-**

The FTIR spectrum of ZMTA crystal displayed in Fig.3 were recorded in the range of 400 – 4000  $\text{cm}^{-1}$ . The vibrations at 3378 and 3304  $\text{cm}^{-1}$  are reported as vibrations due to  $\text{NH}_2$  asymmetric stretching vibrations and the C–H stretching vibration is observed at 2349  $\text{cm}^{-1}$ . The peak at 1635  $\text{cm}^{-1}$  is due to N–H bending vibration [13]. The C=O stretching vibration is observed at 1571  $\text{cm}^{-1}$ . The peak at 1389  $\text{cm}^{-1}$  is reported as vibration due to C=S asymmetric stretching vibration [14]. The  $\text{NH}_2$  rocking vibration is observed at 1131  $\text{cm}^{-1}$  [11]. The absorptions at 931 and 475  $\text{cm}^{-1}$  are reported as the vibrations due to N–C–N symmetric stretching vibrations [11, 12]. The vibrations around 600 and 1030  $\text{cm}^{-1}$  are reported as clear conformation of presence of zinc acetate in the coordination sphere [15]. Based on the observations, it is confirmed that FTIR spectra indirectly establish the presence of zinc acetate in lattice of MTA crystal.

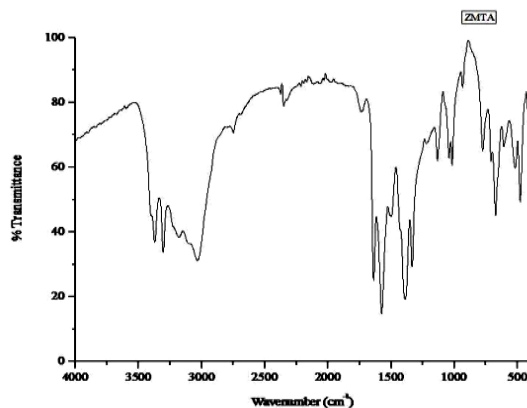


Fig 3:- FTIR spectrum of ZMTA crystal.

**TG/DTA studies:-**

TG/DTA curves of ZMTA crystal displayed in Fig.4. From the result, the crystal is thermally stable up to 120°C and it is observed that DTA curve show endothermic peak at 210 °C for ZMTA crystal. This value can be considered as the decomposition or melting point of the sample. From the result, it is noticed that ZMTA crystal has slightly less thermal stability than reported value of ZMTS crystal and it may due to decrease in bond energy caused by the incorporation of dopant's anion  $(\text{CH}_3\text{COO})_2^-$  in the lattice of the ZMTA crystal. The TG curve of ZMTA crystal show maximum weight loss occurs in the temperature range 120-348°C, which is due to the decomposition of the samples. The sharpness of the endothermic peak shows the good degree of crystallinity and purity of the sample. Further the absence of water in the molecular structure is confirmed by the absence of weight loss around 100°C.

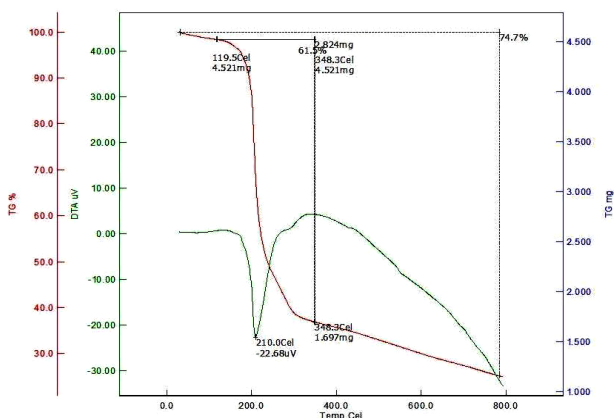


Fig 4:- TGA-DTA curves of ZMTA crystal.

**Powder SHG Studies:-**

The second harmonic generation efficiency of grown crystal has been measured by Kurtz-Perry technique [16]. A Q- switched mode- locked Nd: YAG laser was used to generate about 0.68mJ/pulse at 1064 nm fundamental radiation. The second harmonic signal was confirmed from the emission of green radiation by the crystalline powder



sample. The result of SHG efficiency of the grown crystal is about 14.42 mV. KDP crystal was used as reference material in the SHG measurement. The ZMTA gives an SHG of 14.42 mV, while the KDP gave an SHG signal of 8.8 mV for the same input beam energy. The SHG relative efficiency of ZMTA crystal was found to be 1.64 times higher than that of KDP.

### Conclusions:-

Optically good quality ZMTA crystals were grown by slow evaporation technique. The presence of small amount of zinc acetate altered the unit cell parameters slightly when compared to reported value. The presence of functional groups was determined by FTIR analysis. The optical absorption studies show that the UV cut-off wavelength of grown crystal is 245 nm making it a suitable candidate for NLO applications. The TG/DTA studies show that the grown crystal is thermally stable up to 120°C. The SHG efficiency of ZMTA crystal is 1.64 times higher than that of KDP and it becomes a promising candidate for optoelectronic and photonic device applications.

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### **RESEARCH ARTICLE**

#### **THE IMPACT OF INSTITUTIONAL SUPPORT, TECHNICAL EXPERTISE, AND ATTITUDES TOWARDS THE ACCEPTANCE AND USE OF TECHNOLOGY IN EDUCATION BY FACULTY MEMBERS OF FORENSIC SCIENCES AT THE UNIVERSITIES OF RIYADH.**

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##### **Key words:-**

Institutional support, technical expertise,  
Attitudes, technology in education,  
incentives, training

#### **Abstract**

The institutional support is important for the effective implementation of technology based instruction (Farrell, 1999). The study aimed to find out the impact of the institutional support, technical expertise, and attitudes towards the acceptance and use of technology in education by faculty members of Forensic Science at the universities of Riyadh. The total sample of the study was 310 out of 984 which formed a very reliable sample according to sample calculations and equations. A questionnaire has been distributed and data was collected. The SPSS programme was used to find the ANOVA, Pearson, Linear regression method, and R-Square. The results show the availability of the institutional support for faculty teaching staff of Forensic Science towards the use of educational technology. The Pearson correlation is positive and statistically significant at the level of ( $> 0.01$ ) and this shows that the faculty members accept and use technology in education throughout the institutional support, technical expertise and attitudes. The study proposes that more effective training and more incentives might help faculty members to use technology in education.

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#### **Introduction:-**

There are three key factors for successful integration of technology which are the will (attitude), skill (technology proficiency) and tool (access to technology tools). Regarding to the three factors, the attitude is recognized as essential, but skills appears to be the strongest of all (Agyeyi, & Voogt, 2010). Contrary that, most of teachers and faculty members in developing countries have been introduced to basic technology competencies that need pedagogical skill to use technology in instruction even if they have access to computers and internet (Sife, et al., 2007). Even though instructors are positive regarding the use of technology in education, most of academic staff lack enough knowledge to use technology in teaching. (Nihuka & Voogt, 2011). Generally, despite positive attitude of teachers and students towards technology use in education, it's important to recognize that there are other factors that can influence or affect the practice such as the institutional support, technical expertise and attitudes.

Mitrano (2011) pointed out that policies and plans within the institution provide framework for implementation of day to day activities. Institutional capacity to technological infrastructures is all about teachers and students' access to physical and technological resources to support technology-based instruction within a particular institution. The technologies may include websites, computers, mobile phones, internet, video, radio and television. Sife, et al.

(2007) stated that, in Tanzania's higher learning institutions, teachers and students have access to internet, computers, mobile technology like mobile phones, audio CDs and DVDs; however, that access is very limited. In contrast, in China, about 80% of higher learning institutions had access to computers and internet in the year of 2006. About 76.6% of offices, 42.2% of classrooms, 49.4% of dormitories of all higher learning institutions have connection to internet. It was found that almost every Normal University in China is operating in a dual mode system, of distance and conventional education (Guo & Cai, 2006) such that by 2004, there were 67 universities engaged in distance education plus one Open University in China. Thus infrastructures in these institutions contribute to effective technology instruction and can help to encourage and implement technology-based learning and instruction. Those infrastructures can play roles such as improving communication, uploading and downloading e-learning materials to create more flexible learning environment.

According to technical support, the crash of a computer results in interruptions (Jones, 2004). If there is lack of technical assistance, then the customary repairs of the computer will not be carried out resulting in faculty members not using computers in teaching or instruction. Consequently, if there is no technical support for faculty members, they become frustrated resulting in their unwillingness to use ICT (Tong & Triniada, 2005). Even though, lack of technical support discourages teachers from adopting and integrating technology in classrooms. Korte and Husing (2007) revealed that schools in Britain and the Netherlands have appreciated the significance of technical support to help teachers to incorporate technology into their teaching/learning processes. They argued that ICT support in schools can influence teachers to apply ICT in classrooms without wasting time troubleshooting hardware and software troubles. Though infrastructure support is essential, school technology leadership is a stronger forecaster of teachers' use of computer technology in instruction (Anderson, & Dexter, 2005). Wong and Li (2008) conducted a study on factors that affected transformational integration of ICT in eight schools in Hong Kong and Singapore. The study revealed that leadership promotion of collaboration and experimentation and teachers dedication to student-centred learning affected the successful ICT transformation. Organizations exemplified by executive involvement and decision-making, strengthened by ICT plan, can effectively adopt ICT integration curriculum.

There is shortage in studies that dealt with exploring the effectiveness of institutional support, technical expertise and attitudes in using technology in education by staff members of Forensic Sciences in the world. Steered by this fact, the researcher tried to explore how technology in education can be influenced by institutional support to benefit faculty members of Legitimate Sciences in Saudi Arabia.

### **Problem of the study:-**

The Curriculum domain has been widened with many adopted elements and the traditional concept of knowledge is no longer useful for the implementation of the curriculum elements through traditional pedagogies to enhance educational experiences (Attar, 2011). The role of the faculty member is no longer limited to lectures but he/she afford the responsibility to spread the knowledge by simplifying it for students. He/she need to deal with educational technology to achieve the interaction of the learners with the best that technology has to offer. So it becomes so necessary to upgrade the level of the faculty member scientifically, educationally, and professionally. It should so vital to improve his/her ability to deal with technology and employ them in the educational effectively to manage the process of education maintain a coherent, direct impact on his/her students since the faculty member beholds the most important success factors for university education (Mubarak, 2014; Salam, 2013; and, Mazen 2010; Al-Aqel 1432H; and Salim, 2004). The researcher did not find studies dealt with the fact or factors influencing the use of technology for the faculty members of Forensic Science Technology education. So, the current study attempted to identify some of the factors that affect their use of technology in education which include: Institutional support, technical expertise, and attitudes. Previous studies have shown the low level of technology use for faculty members in the educational process in the Arab region (Shayhob, Abdulghany, and Mohammad, 2014; Qahtany, 2012; Attar 2011). In addition to that, the researcher has many observations in the field of education during his academic studies. As well as, a survey which has been carried out and through this he found that there are still negative indicators towards the use technology by faculty members of Forensic Science signaling of their lack of experience or enough training sessions to use technology. Based on the above, the problem of the study is to identify the reality of the use of technology by faculty members of Forensic Science technology at the Universities of Riyadh, and the impact of some external factors on their acceptance and use. Therefore, the study sought to find out the impact of institutional support, technical expertise, and attitudes to accept and use technology in education through applying model a new model towards the acceptance and use technology called (UTAUT) after adding some factors to this model (Venkatesh et al., 2012).

**Justification of the study:-**

Technology has enriched the field education hugely; which made the developed countries so concerned and attentive towards believing in its benefits in the present and future as well.

There is a need to create positive impression among the members of the teaching staff of Legitimate Sciences towards the use of educational technology in the teaching and learning process which will reflect positively on the acceptance and use of technology.

The Forensic Sciences are so important, and there is a necessity of care about all contributions to provide the best of technology that help inculcate true religion and high values in the individuals of the nation, and to direct their conduct properly, and to highlight high responsibility for the community in serving the potential of the nation.

**Study question:-**

Based on the above, the problem of the study is to try to answer: What is the impact of the institutional support, technical expertise, and attitudes towards the acceptance and use of technology by faculty members of Forensic Science in education at the universities of Riyadh? The chief extracted question of the study can be summarized: what is the availability of institutional support for the use of technology by members of the teaching staff of Forensic sciences in education at the universities of Riyadh?

**The objectives of the study:-**

The main objective of the study was to identify the impact of institutional support, technical expertise, and attitudes towards the acceptance and use of technology by faculty members of Forensic Science in education at the universities of Riyadh. In order to facilitate the possibility of achieving the main goal, the researcher tried to explore quantitatively and qualitatively the availability of institutional support of members of the teaching staff of Forensic sciences in using technology in education at the universities of Riyadh.

**Importance of the study:-**

The importance of this study comes according to the importance of the use of educational technology adopted by many universities in the developed countries, as well as exploring the need of technology by Forensic Sciences. It is considered the first study dealing with the factors affecting the use and acceptance of technology by university members in education. The importance of the study has two domains:

A. Scientific importance can be achieved through the application of the model of (UTAUT) and its consequences in a developing country like Saudi Arabia. The researcher, according to the global data office, King Fahad National library, did not find any regional, Arab, or global layer model aiming to identify the factors that affect the acceptance and use of technology in education by Faculty members of Forensic Sciences. The study, therefore, aims to develop Faculty members of Forensic Sciences and to benefit from the scientific progress in the field of technology in education in order to cope with the use of modern technology in the educational process. Finally, the researcher hopes to find factors and variables that affect technology education.

B. Practical significance: This will provide effective solutions for the members of the Faculty of Forensic Sciences to use technology in education, whether by the members themselves, or those responsible for them at the Ministry of education and different departments of universities. Moreover, this study may enhance future policies to activate and support the use of technology by educational faculty members taking into account the factors that affect their use.

**Review of literature:-**

Srivastava and Lee (2005) maintained that the institutional support of senior management could be achieved by the clarification of the future vision for workers by and giving approval to proceed with the completion of a task or a new idea, and by providing the necessary resources for their task-completion. This material support includes spending money on what it takes to do the task under completion, and to evaluate the financial incentives of cash rewards. The moral support can be fulfilled by the approval and encouragement to perform a task and by providing verbal or written appraisal, such as certificates or letters of thanks and appreciation.

The operational definition of institutional support is to provide senior management to faculty members in various jobs and ranks in order to achieve the highest degree of the use of educational technology and its utilization, through

the provision of education technology innovations, and by giving material and moral incentives to ensure they use it to the fullest.

Definition of institutional support: According Srivastava and Lee (2005), the institutional support (senior management) is to provide and clarify the future vision of the workers, and to give approval for them to proceed in the completion of a task or a new idea by providing the necessary resources for their completed tasks. The material support includes spending money on what it takes to do the task under completion, and evaluate the financial incentives such as cash rewards or through moral support: such as encouragement to perform tasks verbally or in written, such as certificates of thanks and appreciation.

Young and Jordan (2008) defined the administrative institutional support is to value the time for the program information systems commensurate with its costs, and its expected outcomes, review plans, follow up results, to help overcome administrative difficulties relating to the integration of Information Technology and computers in the process of business management.

Subramanian and Lacity (1997) defined the administrative institutional support as the involvement of high managements in projects through the realms of three domains: a role model, presenting resources, and its participation in the project to achieve the intended goals.

The researcher thinks that the institutional support for technology in education is to provide departments and senior university officials or faculty members of various jobs or ranks with all that would push them to achieve the highest degree of the use of educational technology and its utilization through the provision of education technology innovations by giving material or moral incentives to ensure they use it to the fullest.

#### Study population:-

The population is defined by "all subjects of the phenomenon studied by the researcher. So the study population is all the individuals or objects who formed the subject problem" (Obeidat, et al., 2014). Based on the theme of the current study and its objectives the target community consists of all faculty members of Forensic sciences at Saudi universities in Riyadh (King Saud University, Islamic University of Imam Muhammad bin Saud, The Mujamea University, others). The members included teaching assistants or lecturers or doctors (assistant professors, associate professors, professor). The number of members of this community are (984) member of the Faculty of Legitimate Sciences, depending on the data contained in the websites of each University. They are distributed according to the following table:

**Table 1:-** Faculty subjects of Legitimate Sciences at Riyadh

Total	Mujamaa University	Islamic University of Imam Muhammad bin Saud	King Saud University
<b>984</b>	<b>104</b>	<b>735</b>	<b>145</b>

The study sample extracted from the community was summarized in Table 2. The total number of the study was 310 out of 984 which formed a very reliable sample according to sample calculations and equations as well.

**Table 2:-** Study Sample

Percentage	No.	University
<b>%7.4</b>	<b>23</b>	King Saud University
<b>%59.7</b>	<b>185</b>	Islamic University of Imam Muhammad bin Saud
<b>%19.7</b>	<b>61</b>	Mujamea University
<b>%13.2</b>	<b>41</b>	Others
<b>%100</b>	<b>310</b>	Total

#### Results:-

The institutional support items of the questionnaire answers the main question of the study. What is the on-going reality towards the availability of institutional support in the use of educational technology by members of the Faculty of Legitimate Sciences at Riyadh universities. The averages, deviations, and percentages of respondents' answers have been calculated in Table 3.

**Table 3:- Results of subjects' answers about the institutional Support towards technology in education**

Order	Stan. Devi.	Mean Aver.	Level Of Agreement					Statement	Item	
			S/D A	D/A	N	A	S/A			
2	1.05	3.72	10	34	64	128	74	F	The university provides technical assistance related to the use of educational technology	1
			3.2	11	20.6	41.3	23.9	%		
3	1.03	3.65	8	42	65	132	63	F	The University provides the resources necessary to use technology in Education.	2
			2.6	13.5	21	42.6	20.3	%		
4	1.24	3.23	33	64	60	106	47	F	The University gives material incentives for users of technology in education.	3
			10.6	20.6	19.4	34.2	15.2	%		
5	1.19	3.06	27	88	78	74	43	F	The University gives moral incentives for users of technology in education	4
			8.7	28.4	25.2	23.9	13.9	%		
1	1.05	3.73	10	34	61	131	74	F	The university organizes training sessions on how to use technology in education	5
			3.2	11	19.7	42.3	23.9	%		
<b>0.88</b>	<b>3.47</b>	The overall average of institutional support towards the use of technology in education								

Results extracted from Table 3 shows the consent of the respondents on all elements of the domain concerning the availability of the institutional support for faculty teaching staff of Forensic Science towards the use of educational technology. The arithmetic mean was (3.47) and the standard deviation was (0.88). As shown in the table the answers of members of the Faculty of Forensic Sciences towards the availability of institutional support regarding the use of educational technology, the views are divided in terms of degree of approval into two groups: (1) According to the arithmetic average, opinions which (Agree) are those views with arithmetic average of (3.41-4.20), namely, the university organizes ongoing training sessions on the use of educational technology which came in first with an average of (3.73), and the university provides ongoing technical assistance related to the use of technology in education was the second with an average of (3.72), then comes 'the University provides necessary resources for the use of educational technology' in third place with an average of (3.65).

There were also opinions which are divided (Neutral) with arithmetic average of (2.61-3.40), and according to this ranking, the university gives material incentives for uses of technology in education, with an average of (3.23), and the university provides ongoing moral incentives for uses of educational technology with an average of (3.06).

The general question was what is the impact of institutional support, technical expertise and attitudes towards the acceptance and use of technology in education by faculty members of Forensic Sciences at the universities of Riyadh? To find the impact of institutional support, technical expertise and attitudes towards the acceptance and use of technology in education by faculty members of Forensic Sciences at the universities of Riyadh, the researcher used Pearson correlation coefficient (Pearson Correlation) and he also used linear regression model to demonstrate the impact of institutional support, technical expertise and attitudes to accept and use of technology in education by faculty members of Forensic Science at the University of Riyadh. The results came as follows:

**Table 4: Pearson's correlation between the acceptance and use of technology in education by the members of the Faculty of Forensic sciences and all the institutional support, technical expertise and attitudes**

Pearson Correlation	Use and Acceptance Degree Domain
**0.179	Institutional support
**0.362	Technical expertise
**0.179	Attitudes

\*\* Significant at (0.01)

Table 4 shows that the correlation is positive and statistically significant at the level of ( $p < 0.01$ ) and this shows that the faculty members accept and use technology in education throughout the institutional support, technical

expertise and attitudes. It shows that the more the ongoing institutional support, technical expertise and attitudes increased, the more they accept and use technology in education by faculty members of Forensic Sciences. As can be seen from the table, the technical expertise is more closely related to institutional support and attitudes.

**Table 5:- Linear regression method between the acceptance and use of technology in education by of the members of the Faculty members of Forensic sciences and all the institutional support, technical expertise and attitudes.**

Statistics		Factors			
Statistical Value	Statistical Equations	Prop-Value	T-Value	Factor Value	Variable
0.15	$R^2$	*.010	2.60	0.91	Constant
0.72	S.E. of regression	*.025	2.26	0.11	Institutional support
17.52 (0.000)	F-test	** .000	5.73	0.39	Technical expertise
		.688	0.40	0.03	Attitudes

\*\*Significant at 0.01, \*Significant at 0.05

Table 5 shows the results of Linear Regression Model between the dependent variable, which is the acceptance and use of technology in education by faculty members of Forensic Sciences, and the independent variables, namely institutional support, technical expertise and attitudes as follows:

1. The value of determination coefficient of R Square was 0.15 which shows that the institutional support, technical expertise and attitudes explains (15%) of the differences that occur for the use and acceptance of technology in education by faculty members of Forensic Sciences.
2. The standard Error of the estimate was 0.72
3. That the value of (F) is 17.52, and that the calculated significance value was (0.000), and this argue that the linear assumed model demonstrate the validity of the linear model to represent the relationship between acceptance and use of technology in education by the members of the Faculty of Forensic Science as the dependent variable, and the institutional support, technical expertise and attitudes as explained variables.
4. For the test of the coefficient regression observed from the second column of Table 6 (the calculated Sig. value), it seems that:

A- For institutional support and technical expertise, the calculated significance was less than (5%). This indicates that institutional support and technical expertise towards the acceptance and use of technology in education by the members of the Faculty of Forensic Science Technology education are the most influential factors

B- For attitudes, the calculated value is greater than (5%). This indicates that the attitudes do not impact the acceptance and use of technology in education by the members of the Faculty of Forensic Sciences.

### Discussion of Results:-

The study addressed the institutional support, technical expertise and attitudes and their impact on acceptance and use of technology in education by faculty members of Forensic Sciences at the Universities of Riyadh in Saudi Arabia. The study is so focused to answer the main question: What is the impact of institutional support, technical expertise and attitudes to accept and use of technology in education by faculty members of Forensic Sciences at the Universities of Riyadh in Saudi Arabia?

One of the objectives of the study was to identify the different statistical significance in the responses of members of the Faculty of Forensic Sciences, attributable to the variables of personalities and career in association with the systematic objectives of the study, the theoretical and practical importance of the study, concepts and terminology of the study, and limits of human objectivity and spatial and temporal scales.

The new model of (UTAUT) was displayed throughout exploring its features, then clarifying of the amendments made in this study to the model from an Islamic perspective, and how the faculty members can use and accept the model of (UTAUT) from an Islamic and Arabic thought.

The researcher indicated that there is lack of direct studies addressing the factor of institutional support and its availability from the point of view of members of teaching staff of Forensic Science; except the study of Hassanein's (2011), which dealt with members of the faculty at the Sudanese universities on the whole. There are also differences in the results of the current study with the results of Hassanein's (2011). This study showed that distance education programmes in the Faculty of education in Sudanese universities lag behind the reality of technology in education in these programs, which means "weak" institutional support for the programmes of distance learning, with reference here to the different locations of the present study (Saudi Arabia) and of Hassanein's (Sudan), and to the different majors since the present study dealt with (Forensic Sciences) and Hassanein's with (Education).

There are statistically significant differences in the domain of institutional support for the use of technology in education, and technical expertise to use educational technology, and the ease of use of Technology in Education by faculty members of Forensic Sciences attributed to the variable of 'gender' in favor of non-Saudis, while no statistically significant differences in the rest of other domains.

The researcher believes that superiority of faculty members from other nationalities (non-Saudi nationalities) in the domains of the institutional support, technical expertise, ease of use and actual use is primarily referred back to individual differences between the respondents, in terms of taking advantage of the institutional support provided by universities, motivation in training on the use of educational technology, the functional diversity among the members of the Faculty, motivation in job rank, and fixed-term work. Aside of that, the process of qualifying faculty members of non-Saudis in their own country may be distinguished from the programs received by the faculty members of Saudi universities in Saudi Arabia in terms of the presence of courses in English while studying throughout general education or university education which is one of the strongest contributing factors in the use of technology. The technology, in other countries, adopt the English language in their programmes and their applications and they run them significantly, while rarely having these programs and applications in Arabic.

There are statistically significant differences in the domains of institutional support for the use of educational technology by faculty members of Forensic Science at King Saud University and Al Mujamma University in contrast to the members of the Faculty of Forensic Sciences at the Islamic University of Imam Muhammad bin Saud and other universities. There are also statistically significant differences in the domain of the actual use of technology in education for the favour of the members of the Faculty of Forensic Sciences in the University of King Saud and Al Mujamma University in contrast to the Islamic University of Imam Muhammad bin Saud, while there are no statistically significant differences in the rest of the domains attributable to the university to which he/she belongs to.

The researcher believes that the reason why the Faculty members of Forensic Sciences in King Saud University, and Al Mujamma university are more distinctive compared to members of the Faculty of Forensic Sciences at the Islamic University of Imam Muhammad bin Saud in the domains: institutional support, and actual use of educational technology dates back to the establishment of the deanship of special e-learning and distance education in the two universities, with the knowledge that there are deanships for e-learning and distance education at Islamic University of Imam Muhammad bin Saud, except that access to the tasks that the deanship and functions in the three universities, one can note that the deanships of e-learning at King Saud University and Al Mujamma are more active. Both deanships provide more services of e-learning than that at the Islamic University of Imam Muhammad bin Saud. This can be seen also through the websites of those universities.

In addition to that, there are development projects and services that are more diverse at the University of King Saud and Al Mujamma university, such as: the development of digital content, management system of online learning, virtual classroom, SMS, digital library, direct technical support, training courses in the field of smart boards, management of e-learning education, and many other areas (<http://ksu.edu.sa>). These services also attract the human cadres in the field of Information Technology and e-learning, whiteboard, interactive electronic projectors. The deanship of e-learning at Mujamma University has units of e-learning which seeks to spread the culture of e-learning, providing educational hardware in all faculties of the University along with many of other goals ([www.mu.edu.sa](http://www.mu.edu.sa)).

Therefore, after the comparison between the three universities in the present study, one can conclude that the institutional support in relation to the use of educational technology by Faculty members of Forensic Sciences in the



three universities, that there is a diversity of institutional support for the advantage of University of King Saud, and AL Mujamma University in contrast to the Islamic University of Imam Muhammad the Son Saud which limited its support to increase awareness about the importance of e-learning, preparing e-courses, the development of its content, and the observance of quality standards in e-learning and distance learning, contributing to strategic plans for e-learning, training faculty on the best use of technology in education ([www.imamu.edu.sa](http://www.imamu.edu.sa)).

It is already clear that the institutional support is effective and purposeful in these two universities; thus the impact is clear in the use of technology, and therefore the will to change is available, and policies supporting the use of technology are also available, as well as preparing the environment, and ongoing training may have the greatest impact towards the actual use of educational technology by members of the Faculty of Forensic Sciences at University of King Saud and Al Mujamma University. This is in harmony with Mazen;s (2010) who noted that management should include project management, resources, exchange systems, communication management, information management, and organizational sources. These areas can be enhanced by technology in education, along with using diverse means that care about multi-media in education, and educational innovation.

### **Conclusion:-**

To conclude, the results of the study showed a positive statistically significant correlation between the acceptance and use of technology in education by faculty members of Forensic Sciences and the institutional support, technical expertise and attitudes. The more practice on the ongoing institutional support and the technical expertise and attitudes, the more the staff accepts and uses technology in education. It turns out that technical expertise is more closely related to institutional support and attitudes towards the acceptance and use of technology in education by faculty members of Forensic Sciences. As shown by the results of the study that institutional support and technical expertise have spiritual influences towards the acceptance and use of technology by the members of the Faculty of Forensic Science. However, the attitudes do not impact the acceptance and use of technology by the members of the Faculty of Forensic Science.

The researcher explains these results in terms of a positive correlation between institutional support, technical expertise and attitudes on the one hand, and the acceptance and use of technology in education by faculty members of Forensic Sciences on the other hand. He noted that these factors affect each other dramatically. This leads to stratify the acceptance and use of technology in education. Moreover, each one of these factors play a key and essential role in this area. Thus, the institutional support as reported by (Srivastava & Lee, 2005), is to provide the future with a vision for workers, and to give them the approval to proceed with the completion of a task or idea and to also provide the necessary resources for their tasks, including providing material and moral support, and by reviewing the tasks, activities, and goals that are utilized by the three universities through the representative of the deanship of e-learning and distance education. One can perceive the amount of influential institutional support for faculty members to accept and use technology in education.

And finally can you explain the result related to the presence of the impact of the institutional support and technical expertise, while the attitudes have not influenced the acceptance and use of technology in education by the members of the Faculty of Forensic Sciences. The institutional support and technical expertise often come back to things which are perceptible for the individual, in terms of both material support, encouragement and appreciation, or in terms of practical experience that enhance human trust. The attitudes deal with the position of the individual towards a certain thing or a certain event or particular case either of acceptance or rejection as a result of experience (El-Demerdash, 1994). Therefore, attitudes, in nature, have not got the effect that support the institutional support and technical expertise. This does not mean to neutralize and minimize its impact, it is reported here that the researcher did not find studies that examined the relationship between the three factors: institutional support, technical expertise and attitudes, with the exception of a study by (Gogus, et al., 2012) which addressed the efficiency of the computer on workers. The results of the current study were in harmony with the results of (Gogus, A. et al., 2012) which showed an impact to the efficiency of using computers on 'intention to use' and not on 'the acceptance and use of technology' highlighting the importance of the intention on the acceptance of technology.

Evidenced by the results of the Open-ended question with respect to the material and moral incentives that encourage faculty members of Forensic Sciences in the use of technology, the respondents in the three universities under study: King Saud University, the Islamic University of Imam Muhammad bin Saud, and AL Mujamma have highlighted the importance of these incentives With regard to the relationship between institutional support and the use of educational technology, respondents have "neutral" attitudes in relation to the material and moral incentives

for staff members of Forensic Sciences, as the physical and moral incentives were classified in the current study under the factor of institutional support.

The second proposal, as shown from the results of key question was the attention to training; which shows the importance of training for members of the Faculty of Forensic Sciences, being an important factor in facilitating the use of educational technology. They provided their suggestions on some of the specifications and conditions during the process of training, including: flexibility in training commensurate with age, self-training and easy training addressing and dealing with some of technical malfunctions, and linking the training material with functional incentives. The researcher believes that the training process must take into account the previous specifications to be more effectual, as they stem from the needs of the faculty members themselves. This was in accord with the results of Salam's study (2013) and its recommendations in terms of the presence of statistically significant differences between the use of educational technology attributed to the variable 'training courses' offered to faculty members. While there were differences between the results of this study with the results of Al-Seif's (2009), there were no statistically significant differences regarding the variable of 'training' offered to faculty members in universities.

With regard to the proposal to provide special equipment of technology in education and providing technical support such as wireless connection to the internet, this underlines the importance of the availability of these facilities in achieving the optimal use of educational technology. This perhaps what was confirmed by the respondents and the members of the Faculty of Forensic Sciences expressing the degree of "often" in the 'use of e-mail', 'laptops' and 'software (word and excel) in the preparation of lessons', the degree of "sometimes" in 'using electronic programs', 'PowerPoint presentations', 'programs linked to smart phones to interact with students outside the University', and the degree of "rarely" in the 'use of the tablets', and finally the degree of "never" in relation to the 'use of the Smart Boards'.

On the other hand, the researcher believes that the previous proposal to provide the technical equipment confirms what is stated in the literature review about the benefits of using educational technology. Technology in education will increase the effectiveness of the learner's knowledge, enrich the teaching-learning process, assist teachers in the preparation of educational materials, compensate the lack of experience they have, promote learning through the development in the interests of learning, increase the positive engagement of the learner in self-learning, and save time and effort (Mujahed Mazen, 2010; Al-Qahtany, 2012; and Al-Harthy, 2013)

### **Recommendations:-**

The researcher proposes four educational technology support services that might be very helpful for university faculty members of Forensic Sciences, including

1. A faculty teaching/ learning excellence center that provides expertise on IT.
2. Sustained opportunities for faculty members to experiment with emerging learning/teaching technologies in instruction.
3. Training on incorporating students' use of mobile devices such as smart phones and tablets during class.
4. Special grants or incentives for innovative use of instructional technology.

Dahlstrom (2015) maintained that optimizing the use of technology in teaching and learning radically depends on the ability of the institutional and academic leadership to help faculty members develop their digital competence and then to continue to provide learning opportunities to keep their competencies up-to-date. Faculty members need ongoing digital literacy opportunities that enable them to better understand the educational technologies but also the social technologies that affect their everyday lives. 21<sup>st</sup> century students who expect engagement in their instruction and technology can arbitrate engagement. Faculty need to understand instructional technologies and the implications of media as part of their technological means in presenting their knowledge to their students. This is more than just training on a exact technology. It is, as the saying which maintains , 'the difference between giving a man a fish and teaching him how to fish, 'or the saying which goes as ' you can lead the horse to the stream but you cannot force it to drink'.

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**RESEARCH ARTICLE**

**IDENTIFICATION OF ENVIRONMENTAL FACTORS ASSOCIATED WITH *LEISHMANIA*  
 PARASITES IN MARSHLANDS OF IRAQ.**

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**Abstract**

In marshland there are several factors have been associated with a high risk of transmission of parasitic diseases. Environmental factors in Iraq marshlands play an important role in increasing chance of infection with *Leishmania* parasitic disease. It is an influence on the emergence and proliferation of *Leishmania* parasitic disease. The biological cycle and eco-epidemiological relationships among climatic, ecology, vector, reservoir and human are highly variable. This study about risk factors suggest that climatic and ecologic characteristics, and vector, reservoir and human behaviors together effect on the transmission pattern, vectors and reservoir infection, and prevalence of human infection. The biological cycle and eco-epidemiological relationships among climatic, ecology, vector, reservoir and human are highly variable. Iraqi southern marshes which form a triangle region bound by three major southern cities, Thi-Qar to the west, Maysan to the northeast and Basrah to the south. The three major marshes: Al-Hammar, The Central marshes and Al-Huwaiza marshes form the core of the marshlands of southern Iraq.

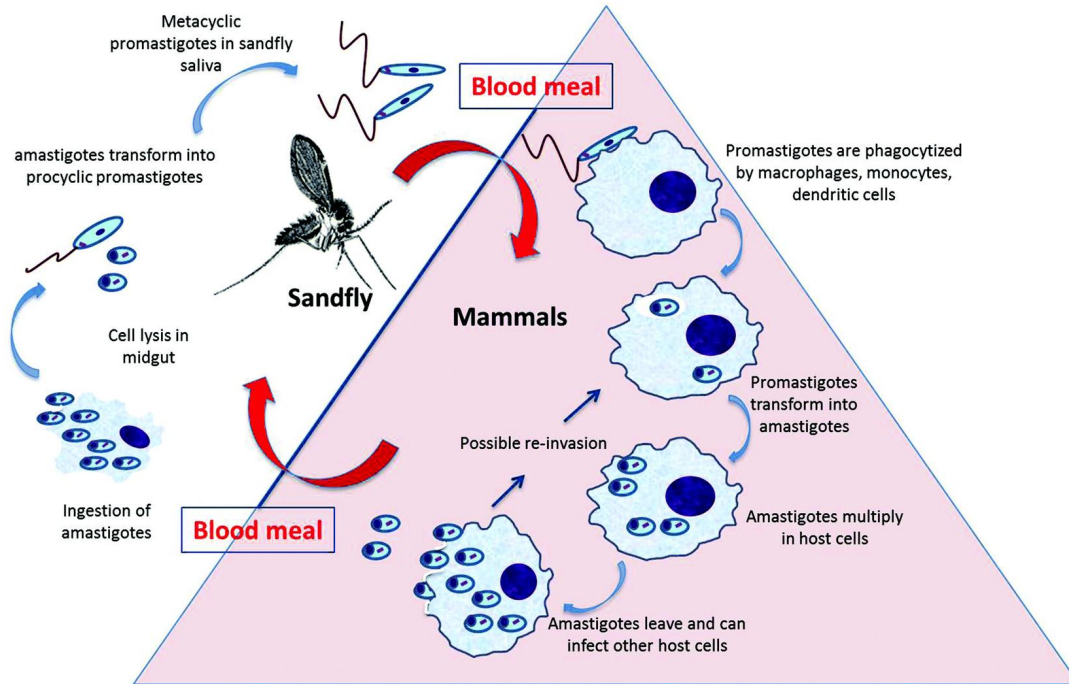
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**Introduction:-**

The leishmaniasis are vector borne diseases, most infections of leishmaniasis are transmitted via vector a female phlebotomine sand fly bite. Dogs are most commonly infected with *L. infantum* (*L. donovani* complex) which is responsible for the viscerotropic disease in people (Slappendel and Ferrer, 1998). In many of the endemic areas, dogs are considered the major reservoir for human disease while in other regions people are the principal reservoir for further human spread. VL is caused by *L. donovani* and *L. infantum* in old world regions while *L. chagasi* is primarily responsible for visceral disease in the new world because *L. infantum* is the primary agent associated with canine leishmaniasis infections in dogs often are regarded as visceral even though they tend to cause both visceral and cutaneous. (Belding, 1965; WHO, 1996; WHO, 2000) The life cycle of *Leishmania* spp is commonly viewed as consisting simply of two different morphological stages: The intracellular amastigote in the vertebrate host including, man and some reptiles and the extracellular promastigotes in the invertebrate host is always a phlebotomine sand fly (WHO, 2000; 2010). Both stages are capable of replication multiplied by binary fission but not within the same host (Assaf, *et al* 2004; Chin 2000). Figure (1).

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**Figure 1:-** Life cycle of *Leishmania* parasite

<http://www.parasitology/intest-protozoa.htm>.

### Geographical Distribution:-

Leishmaniasis is one among the six most important vector-borne diseases worldwide. The disease is endemic in warm tropical and subtropical climatic conditions and has been reported from 88 countries of the world, 66 of which being in the old world (Asia, Africa and Europe) and the remaining 22 in the new world, South and Central America (Paredes *et al.*, 2003; WHO, 2010). leishmaniasis was an endemic disease in Iraq (Herwaldt , 1999; Jarallah, 2009; Jarallah, 2014). About 1-1.5 million cutaneous leishmaniasis and 500000 visceral leishmaniasis new cases are estimated to occur annually worldwide. The leishmaniasis as a whole is prevalent in 12 million people out of 350 million people at risk. Globally, 57000 people die per year due to leishmaniasis, which has diverse clinical manifestations (WHO, 1990; WHO, 2000; WHO, 2010).

### Risk factors and transmission:-

The Leishmaniasis is vector-borne diseases, it has a worldwide distribution, ususally affects the poorest countries. Many foci of the various forms of human leishmaniais have been described in both the new and old world. The diseases are endemic when sutable mammalian reservoirs and phlebotomine vectors are present: both are necessary for the heteroxenous development of flagellated protozoan parasites of the genus *leishmania*. (Herwaldt, 1999; Desjeux, 2001). The studies about risk factors suggest that climatic and ecological characterics, and human, vector and reservoir behaviors together influence the transmission pattern of *leishmania*, vector borne disease (Cox, 2002; WHO, 2010). Figure (2).

### Climatic factors:-

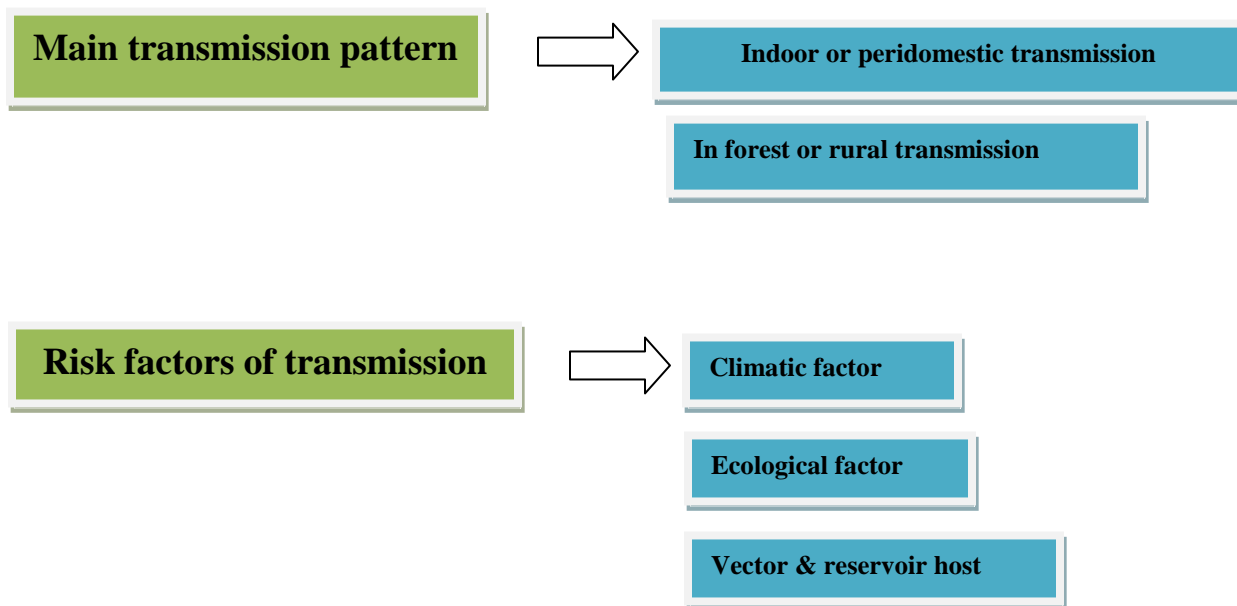
Vectors, pathogens, and hosts each survive and reproduce within certain optimal climatic conditions and changes in these conditions can modify greatly these properties of disease transmission. The most influential climatic factors for vector-borne diseases include temperature and humidity of the soil and vegetation which lead to a change in the composition and density of vector (Robertd and Janovy,1996; WHO, 2010). Temperature may modify the growth of disease carrying vectors by altering their biting rates, as well as affect vector population dynamics and alter the rate at which they come into contact with humans (WHO, 1984; WHO,2010).

**Ecological Factors:-**

Risk factor in the old world is the building of dams with corresponding new irrigation methods and new crops which provoked a sharp change in the reproduction patterns of the animal reservoirs (Desjeux, 2001) dams, can change the temperature and humidity of the soil and vegetation which lead to a change in the composition and density of sand fly species and a change in rodent species, the distribution and prevalence of various species of *Leishmania* parasites differs from region to region because of several environmental, social and geographical factors vegetation which lead to a change in the composition and density of sand fly species and a change in rodent species (Desjeux, 1996). Risk factors associated with the transmission of *Leishmania* infections have been demonstrated in several countries (WHO, 2010)

**Vector & reservoir hosts:-**

Human and wild canidae are the reservoir host of *Leishmania* parasite. The dog is the major reservoir of *L. infantum* in the Middle East and the Mediterranean region and *L. chagasi* in South America (Chin, 2000). Dogs are reservoirs for human infection (Baneth, 2006). Leishmaniasis can be transmitted with different methods such as, Vector – borne transmission. Most infections of leishmaniasis are transmitted via vector sand fly through the bite of infected female phlebotomine sand flies. Figure (3). Sand fly vectors are found in rural regions more than the urban regions that is due to need of sand fly to the organic material in the burrows of rodent and wild animals for the feeding their larvae. The better place for sand fly resting is the trunk of tree, debris (waste), mud-house (WHO, 1984; WHO,2010). The sand fly vector is mainly active during the night and the highest risk for contracting the disease from sandfly bites is therefore between dusk and dawn (WHO, 1990; TDR, 2004). In Iraq the Jackal is the principle reservoir (Jarallah, 2015). In other report that the black rat is the reservoir host for *L. tropica* while the domestic dogs are the reservoir host for *L. donovani* (Rahim and Tatar 1966 ; Sukkar, 1985; Marquardt, 2000). The risk factors are different if the transmission is (indoors or peridomestic) or outside the home in (forests or rural areas). In some endemic areas transmission around the home causes about 80% cases. Requires the parasites to be present in the peripheral blood of the donor, preferably asymptomatic, survive processing and storage in the blood bank, and infect the recipient. (Schreiber *et al.*, 1996 ; Singh, 1999).



**Figure 2:-** Diagram illustrate the transmission patterns and risk factor transmission for vector - borne diseases





**Figure 3:-** Leishmaniasis are transmitted via vector (Vector –borne transmission)

#### **Influence of environmental and climatic factors on disease risk:-**

The leishmaniasis are vector borne diseases, and are highly complex: they are usually zoonotic, a large number of *Leishmania* species infects human, the biological cycles and epidemiological interrelationship between vector, reservoir, humans, climate and ecology are highly variable (Magill, 1995; Singh, 1999). The distribution of leishmaniasis in Europe is significantly less than the distribution of the sand fly vectors. The occurrence of disease transmission within the range of the vectors depends on vector abundance vector survival, vector biting. Temperature and humidity are the two most important climatic factors for sandfly survival, development and activity (Alvar, 1997; WHO, 2010). Populations at risk include people living in rural and periurban areas where both sandflies and reservoir animals are prevalent (Magill, 1995). Sandflies are sensitive to sudden temperature changes and usually prefer regions with small differences between the maximum and minimum temperature (Desjeux, 2001). Sand fly survival can be reduced if the climate gets too hot and dry, even though the flies may rest in cold, humid place during the daytime (McCarthy *et al.*, 2001). The direct association between climate and leishmaniasis transmission, climate has indirect impacts by influencing the distribution of hosts, the local vegetation (important as resting sites and sugar sources) and the patterns of human exposure to sandfly vectors (TDR, 2004).

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## RESEARCH ARTICLE

### ON FIXED POINT THEOREM IN WEAK CONTRACTION PRINCIPLE.

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Banach contraction principle, weak contraction principle, Fixed Point Theorem, complete metric space etc

#### Abstract

The study of Fixed Point Theorem has been widely done in many fields. The Banach Fixed Point Theorem plays important role in this theory. It becomes milestone in the various paths in this field.

In this paper we have discussed existence and uniqueness of fixed point in more general conditions. The concept of weak contraction mapping over contractive metric space is discussed. In general, for a function  $f: X \rightarrow X$  to have a fixed point, weak contraction is not a sufficient condition for function.

Additionally function needs to be a compact to have a fixed point. Banach contraction principle is one of the directive theorems in the analysis of the result.

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#### 1. Introduction:-

The concept of weak contraction principle was firstly noted by Alber and Guerre – Delabriere [3] but in Banach Space. Later Rhoades [5] generalised the result of Banach Contraction Principle as contraction as a special case.

The concept of weak contraction then further developed very interestingly by Boyd – Wong [6] in complete metric space.

#### 2. Preliminaries:-

##### Definition 2.1: Metric Space:

Let  $d: X \rightarrow X$  be the mapping then  $d$  is called metric on  $X$  if

- i)  $d(x, y) \geq 0$
- ii)  $d(x, y) = d(y, x)$
- iii)  $d(x, y) = 0$ , iff  $x = y$
- iv)  $d(x, y) \leq d(x, z) + d(z, y)$ , for  $\forall x, y \in X$

##### Theorem 2.1: Banach Contraction Theorem:

Let  $(X, d)$  be the metric space then  $f: X \rightarrow X$  is said to be a Lipschitz continuous if there exists  $\lambda \geq 0$ , such that

$$d(f(x_1), f(x_2)) \leq \lambda d(x_1, x_2), \forall x_1, x_2 \in X$$

Where  $\lambda$  is called Lipschitz constant

If  $\lambda \leq 1$  then  $f$  is called non expansive,

$\lambda < 1$  then  $f$  is called contraction mapping

Let  $f$  be a contraction mapping on complete metric space  $X$ , then  $f$  has unique fixed point  $x \in X$

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**Definition 2.2: Complete Metric Space:**

If every Cauchy's sequence in  $X$  converges to a limit  $x$  in  $X$ , then such metric space is called Complete Metric Space

**Definition 2.3: Identity Map:**

Let  $f: X \rightarrow X$  and  $n \in \mathbb{N}$ , then  $f^n$  is the  $n^{\text{th}}$  iterate of  $f$  ( $n$  times) then  $f^n$  is called identity map.

**Theorem 2.2:**

Let  $(X, d)$  be a metric space and  $f: X \rightarrow X$  be a mapping. If  $f^n$  is a contraction mapping then  $f$  has unique fixed point  $\bar{x} \in X$ , for some  $n \geq 1$ .

**Theorem 2.3: Weak contraction Principle:**

Let  $(X, d)$  be a metric space. Then  $f: X \rightarrow X$ , is a weak contraction if,

$$d(f(x_1), f(x_2)) \leq d(x_1, x_2), \forall x_1 \neq x_2 \text{ and } x_1, x_2 \in X$$

**Theorem 2.4: Boyd –Wong theorem:**

Let  $(X, d)$  be a complete metric space and  $f: X \rightarrow X$ . Define  $\psi: [0, \infty) \rightarrow [0, \infty)$  as right continuous map such that

$$d(f(x_1), f(x_2)) \leq \psi[d(x_1, x_2)], \forall x_1, x_2 \in X$$

Then  $f$  has unique fixed point  $\bar{x} \in X$ .

Moreover for any  $x_0 \in X$ , the sequence  $f^n(x_0)$  converges to  $\bar{x}$

**3. Main Result:-****Theorem 3.1:**

Let  $(X, d)$  be a compact metric space and  $f$  be a weak contraction on  $X$ . Then  $f$  has unique fixed point  $x \in X$  and  $f^n(x_0)$  converges to  $x$  for some  $x_0 \in X$

Proof: Let  $(X, d)$  be a compact metric space, then by Banach contraction principle

We have

$$f(\bar{x}) = \lim f(x_n) = \lim x_{n+1} = \bar{x}$$

If not, i.e.

$$f(\bar{x}) \neq \bar{x}, \text{ then}$$

$$d(\bar{x}, f(\bar{x})) = \min(x, f(x))$$

$$\leq d(f(\bar{x}), f(f(\bar{x})))$$

$$< d(\bar{x}, f(\bar{x})), \text{ which contradicts to the assumption.}$$

$$\therefore \bar{x} \text{ is unique fixed point of } f \text{ and so of } f^n(x)$$

Now let  $\bar{x} \neq x_0$  and define  $d_n = d(f^n(x_0), \bar{x})$

$$\text{Then } d_{n+1} = d(f^{n+1}(x_0), f(\bar{x}))$$

$$< d(f^n(x_0), \bar{x}) = d_n$$

Which implies that  $d_n$  is strictly decreasing. And now let  $y_k(x_0)$  be a subsequence of  $f^n(x_0)$

Which converges to  $y \in X$  then

$$\text{Define } r = d(y, \bar{x}) = \lim_{k \rightarrow \infty} d_{n_k}$$

$$= \lim_{k \rightarrow \infty} d_{n_{k+1}}$$

$$= \lim_{k \rightarrow \infty} [d(f(y_k(x_0)), \bar{x})]$$

$$= d(f(y), \bar{x}),$$

$$\text{but } y = \bar{x} = f(\bar{x})$$

$$= d(f(y), f(\bar{x}))$$

$$< d(y, \bar{x})$$

$$\therefore \text{subsequence of } f^n \text{ has a limit } \bar{x}$$

Since  $X$  is compact, it implies that  $f^n(x_0)$  converges to  $\bar{x}$

Which prove that imposing the condition of compactness of  $X$ , being a weak contraction of  $f$  becomes sufficient condition in order to have fixed point.

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### RESEARCH ARTICLE

#### RELATIONSHIP BETWEEN APPENDICITIS AND LIFESTYLE; DIETARY AND HYGIENE IN SAUDI ARABIA.

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#### Abstract

Acute appendicitis (AA) is considered as one of the most common causes of surgical emergencies worldwide (1). The gold standard treatment for AA is Appendectomy (2). About 6% of the population during their lifetime, will suffer from acute appendicitis (3,4). Males suffer from acute appendicitis than females (8.6% and 6.7% respectively) (5,6). Acute appendicitis rarely causing death; with a mortality rate ranges from zero up to 2.4% (8). However, more attention has been directed for early diagnosis and intervention. A cross-sectional study was conducted to assess the relationship between appendicitis and lifestyle ; dietary and hygiene in Saudi Arabia. This study showed defects in Dietary life style for acute appendicitis patients including, low consumption of water, a significant decrease in the containment of fiber at the usual food.

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#### Introduction:-

Acute appendicitis (AA) is considered as one of the most common causes of surgical emergencies worldwide (1). The gold standard treatment for AA is Appendectomy (2). About 6% of the population during their lifetime, will suffer from acute appendicitis (3,4). Males suffer from acute appendicitis than females (8.6% and 6.7% respectively) (5,6). Acute appendicitis rarely causing death; with a mortality rate ranges from zero up to 2.4% (8). However, more attention has been directed for early diagnosis and intervention.

Appendicitis secondary to hyperplasia of the appendiceal lymphoid follicles as a result of a bacterial or viral infection is the most common etiology of appendicitis in children. While the appendicitis as a result of fecal material or fecalith occurs more commonly in adults (14, 15). There are different factors are responsible for acute appendicitis perforation in different age groups and this can be explained by the difference in immune status and appendicitis aetiologies (8). The industrialized nations have registered increased happening of appendicitis, constipation, diverticulitis, irritable bowel syndrome (IBS), and colon cancer (16).

In the AA management, the key for successful management is early diagnosis and prompt surgical intervention (9). The late diagnoses of could lead to gangrene and perforation. The perforation occur within 8 - 24 hours in children, while it occur within 36 hours in young children and adolescents (8). Causes of delayed diagnosis include; home remedies, homeopathic, local doctors, quacks, and medical practitioners, (8).

The most common symptom of AA is abdominal pain. According to the National Institutes of Health, the pain begins typically near the belly button, and then it moves to the abdomen lower right side, usually along a period of (12 – 24) hours. The pain gets worse often if the patient moves around, coughs, takes deep breaths, or sneezes (10). There are many other diseases of gastrointestinal tract which mimic AA making it difficult in diagnosis. (11,12). Diagnosis difficulties arise in females at reproductive age , very young, and elderly patients because they are more possible to have an atypical presentation. They also have many other conditions may mimic acute appendicitis (13).

In spite of the fact that the acute appendicitis etiology and many etiologic factors have been subject of discussion and speculation, multiple factors are probably included in the disease pathophysiology are still unknown. These include non-specific factors, as well as bacterial, fungal, and viral infections and dietary regimens with low fiber (16). Therefore this study was conducted to assess the relationship between appendicitis and lifestyle ; dietary and hygiene in Saudi Arabia .

#### **Objectives:-**

- To describe the characteristics of the patient with appendicitis.
- To determine the relationship between appendicitis and life style (dietary and hygiene ).
- To determine the relationship between appendicitis and medical and surgical problems.

#### **Subjects and Methods:-**

A cross-sectional study was conducted to assess the relationship between appendicitis and lifestyle ; dietary and hygiene in Saudi Arabia . During the period from 1, August 2016 to 8, September 2016, in **the following** hospitals; King Fahad university hospital in Al- khobar, Dammam central hospital, Imam Abdurrahman Bin Faisal hospital ( Dammam National Guard), King Fahad specialist hospital in Dammam, king Fahad medical military complex, king Fahad central Hospital in Jizan, Abu Areash General Hospital, king Fahad general hospital in Medina, National Guard hospital Medina, National Guard hospital in Jeddah, Alansar hospital in Medina, Al-rass general hospitals in Qassium, Prince Sultan Armed force hospital in Medina, Qatif central hospital in Qatif, Dammam medical complex, King Khalid hospital, Hail general hospital, King Fahad medical city Qassium, king Fahad hospital in AlHassa, Bin Jalawi Hospital in AlHassa, Dammam medical center, King Fahad Medical City, king Faisal specialist hospital & research center, and King Abdul-Aziz hospital in Jeddah.

Data were collected by data collectors by means of personal interview with the sampled patients, after obtaining their consents and hospital approval to participate in the study, using a predesigned questionnaire. Each patient was interviewed separately, and confidentiality was assured. It has been to maintain the confidentiality of the information for each patient. The questionnaire designed by researchers, its contains four sections. The first section is about socio-demographic characteristics which includes Gender, Age (years), Marital status, Place of residence, Weight (kg), and Length (cm). Second section includes the questions regarding dietary life style. While third section to assess the hygiene life style. And Fourth section is including questions about chronic medical and surgical problems. The study included (923) patients whose diagnosed with appendicitis postoperatively and were attending certain hospitals in Saudi Arabia. The patients more 60 years old or less than 12 years were excluded. Collected data were coded and analyzed using statistical analysis program (SPSS v.22), in addition to using of necessary statistical methods to achieve the objectives of the study including frequencies, percentages, graphs, and chi-square test.

#### **Results:-**

Table (1) shows the appendicitis patients distribution according to their personal data, as 59.4% of them were males, while 40.6% of them were females.

Their ages were distributed according to the following age groups, 39.2% of them were between (18- 25) years old, 25.9% of them were less than (18) years old, while 22.1% of them were between (26- 35) years old.

And their distribution according to their marital status; most of them were not married with a percentage of 64.4%, while 35.6% of them were married.

And according to their weights; 41.4% of them had weights less than (60) K.g, 29.3% of their weights were in the range (61- 75) k.g, 20.1% of their weights were between (76- 90) k.g, and 9.3% of their weights were more than (90) k.g.

And finally their distribution according to their length; 35% of their lengths were between (161- 170) cm, 34.6% of them were between (150- 160) cm, and 20.5% of them were between (171- 180) cm.

**Table 1:-** Personal data for the patients (n = 916).

Variable		No.	%	P-value
Gender	Male	544	59.4	0.00**
	Female	372	40.6	
Age (years)	Less than 18	237	25.9	0.00**
	18- 25	359	39.2	
	26- 35	202	22.1	
	36- 45	75	8.2	
	More than 45	43	4.7	
Marital status	Single	590	64.4	0.00**
	Married	326	35.6	
Place of residence	Eastern Region	255	27.8	0.00**
	Western Region	243	26.5	
	North Region	36	3.9	
	Southern Region	130	14.2	
	Central Region	215	23.5	
	Outside the kingdom	37	4.0	
Weight (kg)	Less than 60	379	41.4	0.00**
	61 – 75	268	29.3	
	76 – 90	184	20.1	
	More than 90	85	9.3	
Length (cm)	Less than 150	53	5.8	0.00**
	150 – 160	317	34.6	
	161 – 170	321	35.0	
	171 – 180	188	20.5	
	More than 180	37	4.0	

\*\*Chi Square test - Significant at the 0.01 level

**Table 2:-** Dietary life style

Question		No.	%	
Daily water consuming	cup, small bottle	141	15.4	
	Less than 6 cups	498	54.4	
	6- 12 cups	243	26.5	
	More than 12	34	3.7	
Total		916	100.0	
How many times do you eat vegetables daily?	Once	756	82.5	
	Twice	122	13.3	
	Three	26	2.8	
	More	12	1.3	
Total		916	100.0	
How many times do you eat fruits daily?	Once	800	87.3	
	Twice	91	9.9	
	Three	21	2.3	
	More	4	0.4	
Total		916	100.0	
How many times do you eat grains daily?	Once	736	80.3	
	Twice	143	15.6	
	Three	26	2.8	
	More	11	1.2	
Total		916	100.0	
Do you prefer adding chili to your	Yes	Every meal	199	21.7

food?	Sometimes	384	41.9
	No	333	36.4
Total		916	100.0
Do you have particular food system?	Yes	55	6.0
	No	861	94.0
Total		916	100.0
Do you eat in bronchial restaurants?	Yes	669	73.0
	No	247	27.0
Total		916	100.0
Do you eat in fast food restaurants?	Yes	808	88.2
	No	108	11.8
Total		916	100.0

We conclude from the above table that 54.4% of Appendicitis patients consuming less than (6) cups of water a day, and 82.5% of them eat vegetables just once a day, and 87.3% of them were consuming fruits once a day, and 80.3% of them eat grains once a day.

As we conclude that 21.7% of Appendicitis patients preferred adding hot sauce to all of their meals, while 41.9% of them prefer that for some of their meals, and 36.4% of them didn't prefer to add hot sauce to their meals.

And also conclude from the above table that 94% of Appendicitis patients didn't follow specific food system, and 73% of them eat from bronchial restaurants, and 88.2% of them eat from fast food restaurants.

**Table 3:-** Hygiene life style.

Question		No	%
Do you wash your hands before eating?	Yes	461	50.3
	No	83	9.1
	Sometimes	372	40.6
Total		916	100.0
Do you eat foods from peddlers?	Yes	224	24.5
	No	313	34.2
	Sometimes	379	41.4
Total		916	100.0
Do you use bathrooms too much ( in public places or in crowded home)?	Yes	424	46.3
	No	492	53.7
Total		916	100.0
What type of bathrooms do you use?	Old ones (Arabian)	427	46.6
	Chair bathrooms	489	53.4
Total		916	100.0

We conclude from the above table that 50.3% of Appendicitis patients they wash their hands before each meal, and 24.5% of appendicitis patients eat foods from peddlers. and 46.3% of them always use public bathrooms or crowded home bathrooms, and 53.4% of them use chair bathrooms, while 46.6% of them used old ones (Arabian).

**Table 4:-** Chronic medical and surgical problems.

Question	Yes No. (%)	No No.(%)
Do you suffer from chronic constipation?	161 (17.6%)	755 (82.4%)
Did you diagnosed for any of this disease before feeling the pain?		
- Chronic inflammatory bowel disease	5 (0.5%)	911 (99.5%)
- Inflammation of the respiratory tract	54 (5.9%)	862 (94.1%)
- Parasitic infection in the digestive tract	40 (4.4%)	876 (95.6%)
- Colon tumor	8 (0.9%)	908 (99.1%)
- Appendix tumor	32 (3.5%)	884 (96.5%)
- Stomach injury(incident, beating or stap)	29 (3.2%)	887 (96.8%)
- A surgery in the right side abdomen	44 (4.8%)	872 (95.2%)



We conclude from the above table that 82.4% of Appendicitis patients didn't suffer constipation, and the 9% of them suffer from inflammation of the respiratory tract, and 4.8% of them had already conduct surgery in the right side abdomen, also 4.4% of Appendicitis patients suffered from parasitic infection in the digestive tract.

Also we conclude from the table that 3.5% of Appendicitis patients suffered from appendix tumor, and 3.2% of them suffered from abdomen injury, and 0.9% of them suffered from colon tumor, finally 0.5% of them suffered from chronic inflammatory bowel disease.

### **Discussion:-**

Acute appendicitis continues to be the commonest cause of surgical abdominal emergency (1). There are different factors are responsible for acute appendicitis perforation in different age groups (8). These include non-specific factors, as well as bacterial, fungal, and viral infections and dietary regimens with low fiber (16). Consequently this study aimed to to assess the relationship between appendicitis and lifestyle ; dietary and hygiene in Saudi Arabia .

In a report for World Health Organization, it was estimated that adult females needed of water 2.2L/day and males 2.5L/day (17). Equivalent to 8-8.5 cups of water daily, but in our study more than half of appendicitis patients consume less than 6 cups of water daily, and the most of them follow this rate of water consumption more than 2 months ago. This low consumption of water contributes at causing the slow bowel movement followed by constipation and thus lead to appendicitis. Case study reported that, Low water intake may also be a causative influence of appendicitis (18).

Concerning fiber consumption, results of this study showed a significant decrease in the containment of fiber at the usual food for acute appendicitis patients. Also there was a significant proportion of acute appendicitis patients weren't going to defecate daily. Our finding compatible with Imanieh et al., found that a high rate of constipation in patients with lower fiber intake, (16).which is consistent with the hypothesis indicating the role of dietary fibers in lowering the incidence of appendicitis. Whereas the water content of dietary fiber is three times its density(16), it forms softer and heavier stools with a larger volume and reduced passage time (19), it also increase mucus production by the intestinal mucosa (20),and to decrease contraction frequency of the cecal circular muscle (21). Thus lowering the probability of contracting appendicitis as compared to stools with lesser fiber (16). Volz was the first to describe the relationship between the presence of fecalith and inflammation of the appendix. The belief that luminal obstruction is an important factor in the pathogenesis of acute appendicitis is based on the finding of fecalith in many patients with advanced disease (22).

Most of our appendicitis patients eat grains only one time daily, Cummings and colleagues 14 found bran to cause the greatest increase in fecal weight of the dietary fibers they studied (23).

A beneficial role of spices has been reported in obesity, cardiovascular and gastrointestinal conditions, various cancers, neurogenic bladder, and dermatologic conditions (24), but spices also exhibit antibacterial activity and affect gut microbiota populations (25). This means that the spices have both beneficial and harmful effects on the digestive system. In the present study most of acute appendicitis patients preferred having spicy meals, But not on a daily basis, or continuously.

Also the most of our participants consume food restaurants, whether bronchial restaurants or fast food. It is known that food restaurants contains high levels of fat and low in fiber and this in turn hinders the process of digestion and aggravate constipation and thus increases the likelihood of suffering from acute appendicitis.

The causes of appendicitis have been hypothesized to be multifactorial, with diet considered to be a major predisposing factor and viral agents, bacteria, or environmental pollutants playing a secondary or precipitating role (26). In our study the participants showed moderate Hygiene life style. It is natural that this moderate Hygiene life style increase the chances of bacteria and viruses infection, which in turn increase the chances of acute appendicitis. Contrary to previous statements there is no evidence that disease rates were greatly influenced by the dietary changes in the second world war. It is concluded that dietary changes do not explain the time trends in appendicitis and that the epidemiology of the disease is more readily explained by a primarily infectious aetiology (27).

Knowing that appendicitis is difficult to diagnose in the steroid dependent patients who are taking steroids for other illnesses like Chronic inflammatory bowel disease and Inflammation of the respiratory tract due to anti-

inflammatory and immunosuppressive effects of steroids. Also steroids Inhibits pain so it hinder the diagnosis of acute appendicitis. The most of our participants didn't suffer from Chronic medical and surgical problems.

### Conclusion:-

This study showed defects in Dietary life style for acute appendicitis patients including, low consumption of water, a significant decrease in the containment of fiber at the usual food. This lead to a significant proportion of acute appendicitis patients weren't going to defecate daily. Also the acute appendicitis patients showed moderate hygiene life style, this could contributes in increasing the probability of appendicitis patients. There was low prevalence of chronic medical and surgical problems among acute appendicitis patients including.

### Recommendation:-

- Work on community awareness of risk factors that increase the chances of acute appendicitis.
- Guidance of children in schools on healthy diet and the importance of drinking water and personal hygiene because they are the most vulnerable to appendicitis.
- Adult females need 2.2L of water per day while males need 2.5L of water per day.
- The daily diet should contain a sufficient amount of fiber.
- Work to avoid constipation and treated as soon as it happens.
- Maintaining personal hygiene as much as possible.

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### RESEARCH ARTICLE

#### THE EFFECT OF A STRUCTURED FIRST AID EDUCATIONAL TRAINING COURSE AMONG SECONDARY SCHOOL STUDENTS IN MAKKAH CITY, AN INTERVENTION STUDY.

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first aid, Knowledge, students, secondary school.

#### Abstract

**Background:** Students' knowledge about first aid is considered a lifesaving and a preventive measure from injuries. As injuries are considered a threat to school students mainly in secondary schools, therefore first aid is vital for them to be able to deal appropriately with such injuries. Aim of the study was to assess the effect of a structured training course on students' knowledge and behavior regarding first aid in secondary schools.

**Methods:** Quasi-experimental pre-post study design including 220 participants selected by multi-stage sampling from all five educational sectors of Makkah, students' knowledge and behavior regarding first aid are assessed prior and after training which includes theoretical as well as practical parts.

**Results:** After the intervention, behavior score was improved significantly from 9.5% to 95.0% while knowledge score was improved significantly from 72.3% to 83.6%. 22.7% of the participants have received previous training. Mean knowledge and behavior score increased significantly from  $69\% \pm 15\%$  to  $75\% \pm 15\%$  and from  $46 \pm 12$  to  $79\% \pm 11\%$  respectively. There was positive correlation between knowledge and behavior.

**Conclusion:** First Aid Courses provided by Medical School Student result in a significant improvement in overall knowledge and behavior scores of the secondary school student. Repeated courses tend to have a significant improvement.

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#### Introduction:-

Injuries between school students are from the most dangerous health problems worldwide today as it can cause significant lifelong disability or even death. So first aid is very important in such injuries. Laypersons are central factor for saving lives in emergency conditions. But, one chief barrier and primary concern of laypersons about providing first aid to injured persons is the apprehension to make mistakes. In Austria 68% stated that they could not

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provide first aid because they feared to carry out something in the wrong way(1). Numerous studies have revealed a clear association between the level of first aid education and the excellence of first aid measures and actions provided (2, 3). This emphasizes the value of first aid training for the public. It is well-known that the school location can be one of the most common locations to witness an emergency (2), Early and appropriate management of such emergencies and injuries can reduce complications and mortality (4). Appropriately administered first aid indicates the discrepancy between life and death, quick versus delayed recovery and short-term versus long term disability (5) so this study was conducted on the grounds of evaluating the outcomes of giving a first-aid course to secondary school students 16 - 18 years old as they are a part of an age group that represent the majority of our population. It is well known that it's the school's responsibility to look after the students and try to avoid these emergencies and to deal with injuries that need appropriate first aid (6), but training the students to do so themselves is much more beneficial and helpful and seemed to be applicable (2, 7). (Burns,wounds,chocking,fractures, convulsions and fainting)are the topics which our training course had a focus on (6). According to a study was conducted in Riyadh, Saudi Arabia, 2012 aiming to evaluate peoples' opinions about receiving a practical first aid training course, their result showed that 50% of those who where interested to learn were between the ages of 15-19 years old.

Thus our main aim was to assess and evaluate students' knowledge and behavior before and after receiving the training, and to identify and correct those common mistakes they perform, that might lead to unwanted complications.

### **Methods:-**

A pre-postquasi-experimental intervention study was conducted on secondary school students from all five educational sectors of Makkah, a total of 14 governmental schools were selected. 6 schools were assigned for male students and 8 were assigned for female students. The final sample size was 220 student (104 male=47.27% and 116 female =52.72%)recruited by is multistage random sample. After that they obtain a written consent from their parents.

Aself-administered questionnaire was developed divided into 3 sections. The first section included socio-demographic background of each student and another two questions were added to assess their general background on first aid training. The second section included questions to assess the knowledge of first aid skills in the most important topics such as burns,wounds,chocking, fractures and convulsions. While the third section included case scenario based questions to assess their behavior towards different emergency cases based on the above-mentionedtopics. 9 questions for the knowledge section were assigned and 19 questions to assess the behavior, 5 of which were labeled as common mistakes questions. The scoring system was as follows: each correct answer was coded as 1 and false answers were coded as 0. Each section was given an individual scoring system in order to pass the training course. The overall passing score was 60% for each section (60% for knowledge and 60% for behavior). Any score that was 60% or above was labeled as good and any score that was less than 60% was labeled as poor.

The study was conducted through the following phases: preparation, assessment, implementation, and evaluation.

- **Preparation phase:** This phase involved:
  - Obtaining an approval from the ethical committee of the college of medicine at Umm Al-Qura University and alsothe ministry of education's approval to address the schools of Makkah was obtained.
  - Each school was visited to provide the students with a written consent for the parents attached to the site map, and a form of the pre-intervention questionnaire.
- **Assessment phase:** This phase involved:
  - Collection of the consents and the questionnaires. The questionnaires were solved under the teacher's supervision.
  - An SMS text message was sent to all included students with the day, place and time for the training course, the setting of the training took place in the skills lab of the college of medicine at Umm Al-Qura University.
- **Implementation phase:** This phase involved:
  - A group of 37 Male and female Undergraduate Well-Trained 6th year Medical students from Umm Al-Qura University have provided free an intensive first aid course for Our Sample, Delivered in one day

made up of two parts Theoretical part presented as a slide show and Role playing practical part focused on Burns, Wound, Fracture , Fainting and Convulsion .

- The students were divided into two groups, each group came in a different occasion to compensate with the number of instructors available and the capacity of the educational classes, and to insure adequate delivery of the information to the students.
  - Each group was given a one-day training course consisting of two parts, a theoretical part that was provided as PowerPoint slide show as well as practical part, which was explained by giving case scenarios of different emergency situations.
  - The training course was given by 6th year medical students who were provided with the same course adapted from the American Heart Association guidelines of 2010.
  - Our scientific material was developed according to the same guidelines of 2010. The topics included were burns,wounds,chocking,fractures, convulsions and fainting.
- **Evaluationphase:** This phase involved:
- A post-intervention questionnaire was provided immediately after the training has been completed to evaluate their knowledge and behavior post intervention.
  - The students were E-mailed with a certificate of attendance.

#### **Statistical Analysis:-**

Data entry and statistical analysis was done using SPSS 20.0 statistical software package. Data was presented using descriptive statistics in the form of frequencies and percentages for qualitative variables, and means and standard deviations for quantitative variables. To assess the differences in percentage on qualitative variables Chi- Square test was used with P value less than 5 %. Correlation between knowledge and behavior was done using spearman's correlation test.

#### **Results:-**

The questionnaire was given to 220 students who completed the questionnaires and got the consent from their parent and were fit to attend the course. Among those, 104 (47.3) were boys and 116 (52.7) were girls. There age 16-18 years. 50 students had attended a first aid course before. 16 were boys and 34 were girls. Total knowledge percentage has increased from 73.3% to 83.6%. (Figure1). There was a significant difference between male and female (P value <0.05) in pre and post knowledge score. Good knowledge increased by 25.9% in females as it changed from 65.5% to 91.4% post intervention. However in males good knowledge surprisingly decreased by 4.8% from 79.8% to 75% after the intervention.

The mean knowledge score increased significantly from  $69\% \pm 15$  into  $75\% \pm 15$  post intervention. The total behavior after the intervention shows statistically significant change as total behavior percentage increased by 85.5% and increased from 9.50% to 95.0% as demonstrated in (Figure2).

The mean behavior score increased significantly from  $46\% \pm 12$  to  $79\% \pm 11$ . There was no significant difference between male and female in pre and post behavior score.

(Table1) shows the most significant result regarding the knowledge and behavior throughout pre and post intervention assessment.

However, there was a significant week positive correlation between knowledge and behavior pre-intervention ( $r=0.132$ ;  $P<0.05$ ). The knowledge and behavior post-intervention changed into significant moderate positive correlation ( $r=0.350$ ;  $P<0.01$ ).

(Table2) demonstrates the wrong answers that be chosen by students which represent the common mistake in our society.

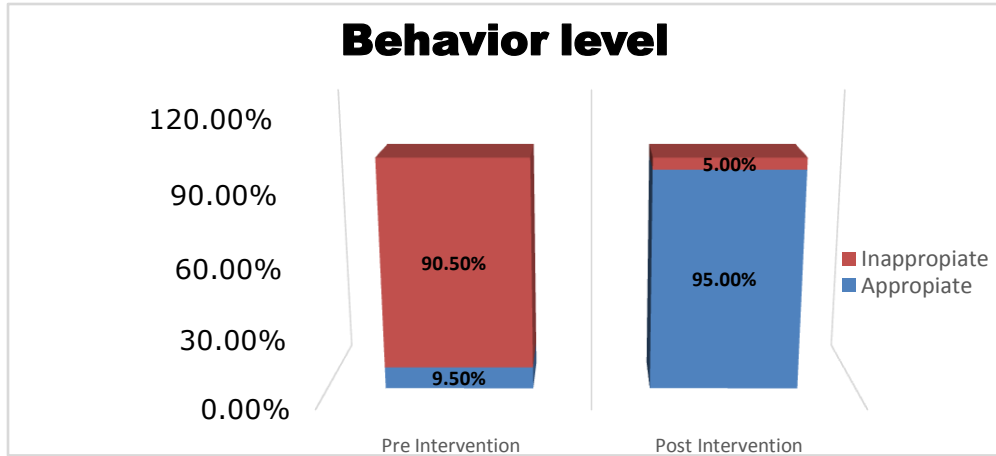


Figure1. Percentage of good and poor knowledge pre and post intervention.

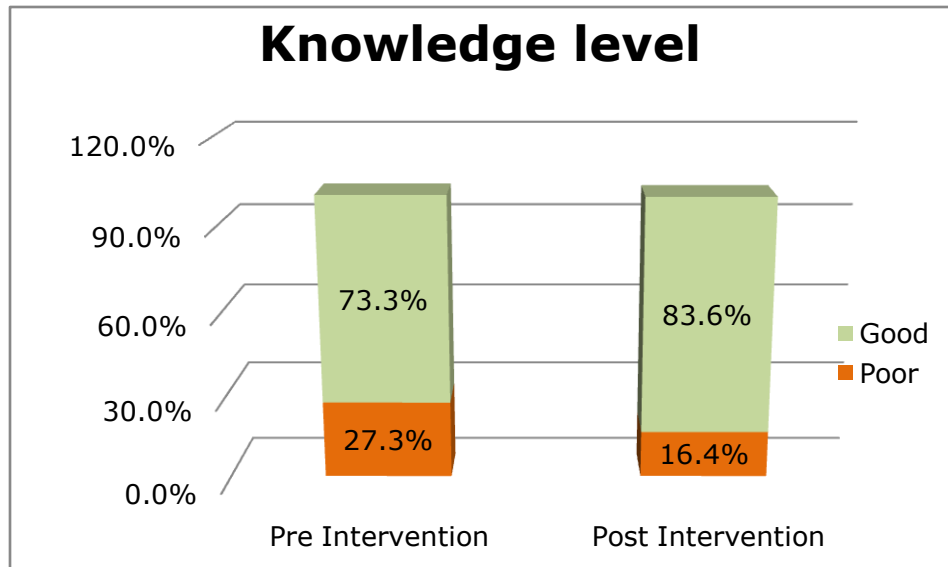


Figure 2:- Percentage of appropriate and inappropriate behavior pre and post intervention.

**Table 1:-** Knowledge and behavior assessment

noitnevretni erP ON %	noitnevretnisop ON %	eulav P
<b>ruvahaB</b>		
103 46.8 %	165 75 %	0.000
138 62.7 %	194 88.2 %	0.000
85 38.6 %	164 74.5 %	0.000
147 66.8 %	212 96.4 %	0.000
68 30.9 %	152 69.1 %	0.000
70 31.8 %	176 80.0 %	0.000
105 47.7 %	139 63.2 %	0.005
200 90.9 %	214 97.3 %	0.016
152 69.1 %	209 95.0 %	0.000
84 38.2 %	206 93.6 %	0.000
<b>Knowledge</b>		
172 78.2 %	211 95.9 %	0.000
34 15.5 %	119 54.1 %	0.000
152 69.1 %	207 94.1 %	0.000
156 70.9 %	186 84.5 %	0.003
177 80.2 %	105 47.7 %	0.000



Ensure safety of the surrounding environment is first step to do in case of a fracture injury
Applying cold packs over the fractured part is the appropriate action in case of a fracture injury
Stopping the bleeding is the ideal action to take if the fractured part was showing through the skin
Applying continuous pressure over the wound site in case of a bleeding wound
Leaving a sharp object that has penetrated the skin in place and calling an ambulance is the appropriate action to take
Covering the injured person with a dry blanket is the next step to do after putting out the flames
Sitting down on the nearest safe place is the appropriate action to take if you felt like losing your consciousness
Asking someone who is choking while eating food to cough forcefully is the appropriate action to take
Placing the child's abdomen on your forearm while his head is facing downwards and tapping gently on the back is the appropriate action to do in a choking child
Ensuring the safety of the surrounding environment in case of a convulsing patient is the appropriate action to take
The number of ambulance in Saudi Arabia is 997
Lose of consciousness inability to response for less than a minute then return to normal
Standing behind the person, press in their abdomen is the action to help person with obstructed airway
The ability to response is not a sign of convulsion
After the convulsion is over what is the best action to check their pulse and put them on their side

**Table 2:-** Percentage of common mistakes

Common mistakes	Pre intervention No %	Post intervention No %	P value
Trying to open the patient's mouth during convulsions	169 76.8%	38 17.3%	<b>0.000</b>
Putting the patient's head back and pressing over the tip of the nose during nose bleeds	114 51.8%	9 4.1%	<b>0.000</b>
Using toothpaste over the area of burned skin from hot boiling water	103 46.8%	4 1.8%	<b>0.000</b>
Using honey over the area of burned skin immediately after the accident	86 39.1%	4 1.8%	<b>0.000</b>
Using coffee beans to stop the bleeding nose if it continues	70 31.8%	3 1.4%	<b>0.000</b>

**Discussion:-**

The Aim of the current study was to assess the effect of a structured training course on students 'knowledge and behavior regarding first aid in secondary schools

The present study findings demonstrated that unexpected percentage of students with Good level of knowledge 73.3% pre-intervention, which increased significantly up to 83.6% post – intervention in both gender. Our results were consistent with, a study conducted in Karachi which showed that only 8.3% medical students had poor knowledge while 63.2% had good knowledge and 28.3% moderate knowledge (8, 9).

The foregoing present study finding is also in agreement with the results of Abd El -Ghany A., etal. (2014) Who reported that 76.5% had already good knowledge about first aid while 23.5% from them didn't have appropriate information about it. The value of medical knowledge in the health education should be noticed because improvement in knowledge is the an essential step in the way of correct practice and behavior modifications (10).

However, in the same Direction with the current study, a study was conducted in Egypt 2014, overall their population only 1 % had satisfactory knowledge at the pre-test phase, compared to 100% school students in the post-and follow up phase.

In addition to other studies conducted about first aid have shown higher result of poor knowledge than good knowledge, even in those was conducted on medical student or medical staff, Like in a Peruvian study that showed out of 52.5% medical students have had prior medical emergencies training, 60.4% had poor knowledge about first aid. A study conducted in Mangalore, India reported 17.8% medical student had poor knowledge, while in a Dutch study 81% junior doctors had poor knowledge about first aid.

This might be attributed to 22.7% of our students have attended to a first aid program before the current intervention as knowledge was improved from 84.0% pre intervention to 90% post intervention in previously trained group and shows statistically significant improvement in their behavior as well .

The foregoing present study finding is also in agreement with the results of Khan F. etal. (2010)(11) as reported that students having received previous training scored better than those who had no previous training but still the mean score itself is quite low emphasizing the need for update courses so as to remain one self-updated with latest improvements.

According to the present study results, After the intervention, percentage of students with appropriate behavior was improved significantly from 9.5% to 95.0%. at the same time as The mean behavior score increase significantly from 46 %  $\pm$ 12 pre intervention to 79 %  $\pm$ 11 post intervention.

Which is Consistent with Ann K., etal (2010)(12) who showed that there was significant increase in mean scores of first aid practice after training, most likely due to an improvement in knowledge after intervention.

As regards to correlation between knowledge and practice among studied students. The study results showed that there were statistically significant positive correlation between total knowledge and behavior right through the study. This may be accredited to the improved knowledge among students raise their awareness and drive to perform first aid properly. This result was in agreement with Kano M., etal. (2005) (13) who revealed that the first aid training significantly increased knowledge and practice as well.

Additionally, Muneeswari B. (2014) (14)revealed that there was statistically significant positive correlation between knowledge performance of the students

**Recommendations:-**

Based on results of the current study the recommendations are; It is necessary that first aid must be an essential part of the curricula in secondary school, Schools should develop process and procedures for first aid for students within secondary school, First aid and training program should be fundamental part of high school programs so that to ensure that students could obtain enough knowledge and have the ability to help the people in emergency circumstances, First aid should be accessible to students at school to reduce the morbidity and mortality of injuries

and accidents, And regular and frequent training courses are crucial for students in to recognize the practical aspects of first aid.

We would also hope to implement a mandatory training course to be included within the educational curriculum of secondary school students by the Ministry of Education based on the promising results of our study. Continuous education is recommended to maintain the gain and for continuous improvement.

#### **Limitations of the study:-**

Transportation was an issue for some students to Umm al-Qura University where the first aid teaching was done especially for females.

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### RESEARCH ARTICLE

## GAMMA-RAY TRANSMISSION COEFFICIENTS FOR COMPOUNDS OF SOME BIOMEDICALLY IMPORTANT ELEMENTS

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EDXRF, transmission coefficients, biomedically important elements

### Abstract

Transmission coefficients for compounds of some biomedically important elements (Na, Mg, Al, Ca and Fe) have been measured by using an extremely narrow collimated-beam transmission method in the energy 59.5 keV. Gamma-rays of <sup>241</sup>Am passed through compounds were detected with a high-resolution Si(Li) detector and using energy dispersive X-ray fluorescence spectrometer (EDXRF). Results are presented and discussed in this paper.

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### Introduction:

The gamma-ray transmission method is important, because give information about light transmittance of material. For example, permeable or less absorbing materials have large transmission coefficients but well absorbing materials have small transmission coefficients. The gamma-ray transmission method is used for many working. Several of these studies are listed. A thickness gauging model of steel plates with build-up treatment, which is based on a gamma-ray transmission technique, has been proposed. It is shown that the calculated values with the new model are in good agreement with experimental data obtained by the gamma-ray thickness gauge in the thickness range from 0 to 10 cm [1]. Gamma-ray transmission methods have been used accurately for the study of the properties of a porous medium such as soil. Different soil parameters are determined by using gamma-ray transmission method. To this end, the soil samples were collected from various regions of Turkey and a NaI (Tl) detector measured the attenuation of strongly collimated monoenergetic gamma beam through soil samples [2]. X-ray transmission factors of some boron compounds (H<sub>3</sub>BO<sub>3</sub>; Na<sub>2</sub>B<sub>4</sub>O<sub>7</sub> and B<sub>3</sub>Al<sub>2</sub>O<sub>3</sub>) have been determined by using an extremely narrow-collimated-beam transmission method in the energy range 15.746–40.930 keV [3]. Measurements of the total porosity of TRe soil, sandstone rocks and porous ceramic samples have been provided. For determination of the total porosity, the gamma-ray transmission method and the Archimedes method (conventional) were employed [4]. Gamma ray transmission measurements have been used to evaluate the water equivalence of solid phantoms. Technetium-99m was used in narrow beam geometry and the transmission of photons measured, using a gamma camera, through varying thickness of the solid phantom material and water. Measured transmission values were compared with Monte Carlo calculated transmission data using the EGSnrc Monte Carlo code to score fluence in a geometry similar to that of the measurements [5]. Transmission factors of main parameters have been determined that affecting the properties of both normal- and heavy-weight concrete in order to increase knowledge and understanding of radiation attenuation in concrete at a later age. Water/cement (W/C) ratio, curing condition, cement quantity and air entraining agent (AEA) have been selected as the main parameters. Eight energy values have been selected within the energy interval of 30.85–383.85 keV to be used in the radiation source [6]. Gamma-ray transmission method has been applied for studying the properties of cultivated soil. Additionally, mass attenuation coefficients, bulk density, moisture content, porosity, and field capacity have been determined. Five soil samples have been collected from

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different agriculture zones in Egypt [7]. The change according to the annealing temperature and time of  $\gamma$ -ray transmission factors or transmissivity of semiconductor crystals have been examined. Gamma rays of Am-241 passed through crystals have been detected by a high-resolution Si(Li) detector and by using energy dispersive X-ray fluorescence spectrometer [8].

According to the literature, there are not experimental data for transmission coefficients of these compounds at 59.5 keV photon energy. This study presents the first experimental data. The aim of this work is to complete this lack of the literature and create a basis for other studies.

### Theory:

When  $\gamma$ -ray beam passes through an absorber, it is attenuated. The degree of attenuation depends on the scattering and various absorption processes. The absorption coefficient  $\mu$  can be derived from the Lambert–Beer law

$$I = I_0 \cdot e^{-\mu x} \quad (1)$$

where  $I_0$  and  $I$  are the unattenuated and attenuated photon intensities, respectively, and  $\mu(\text{cm}^{-1})$  is the linear attenuation coefficient of the material. A narrow beam of monoenergetic photons with incident intensity  $I_0$ , penetrating a layer of material with mass thickness  $x$  (mass-per-unit area) and density  $\rho$  emerges with intensity  $I$  given by the exponential attenuation law,

$$\frac{I}{I_0} = \exp[-\mu x] \quad (2)$$

where  $I/I_0$  is the transmission coefficient ( $T$ ).

### Experimental:

The schematic arrangement of the experimental setup used in the present work is shown in Fig. 1. It consists of a  $3.7 \times 10^9$  Bq (100mCi)  $^{241}\text{Am}$  point source, which essentially emits monoenergetic (59.5 keV)  $\gamma$ -rays. The powder samples were compressed into pellets for 10 s at 15 ton by using a manual hydraulic press. Target had a diameter of 13 mm. The intensities of fluorescent  $\gamma$ -rays were measured using a high-resolution Si(Li) detector (FWHM of 160 eV at 5.96 keV) and the data were collected into 4096 channels of a multichannel analyzer. The spectra were collected for a period of 1000 s. A typical spectrum of 59.5 keV gamma ray transmissions through  $\text{FeCl}_2$  is shown in Fig. 2.

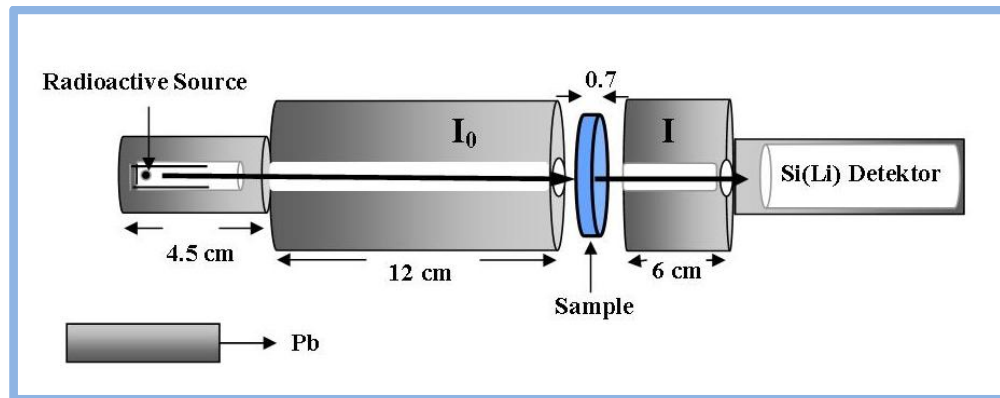
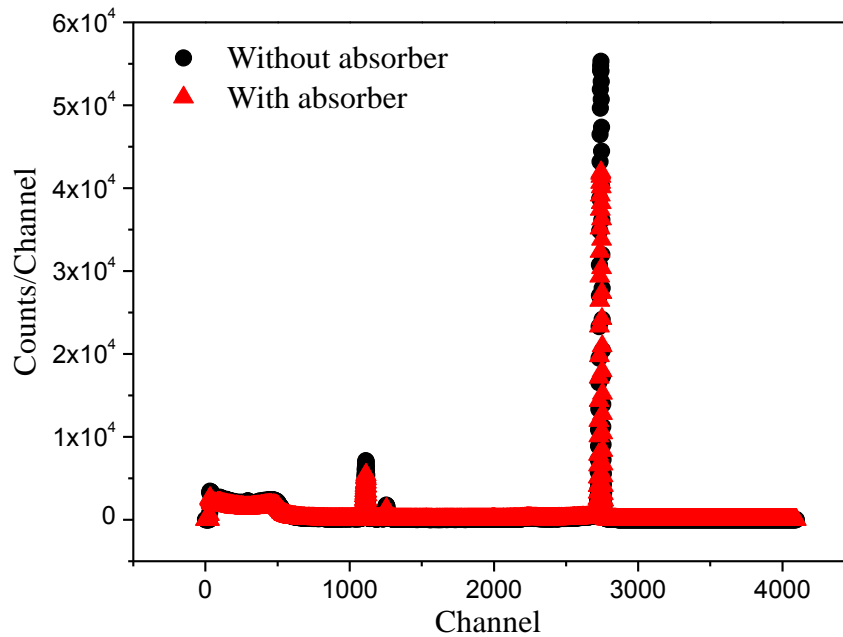


Fig. 1: Experimental geometry.



**Fig. 2:** Spectrum of 59.5 keV gamma rays obtained with absorber ( $\text{FeCl}_2$ ).

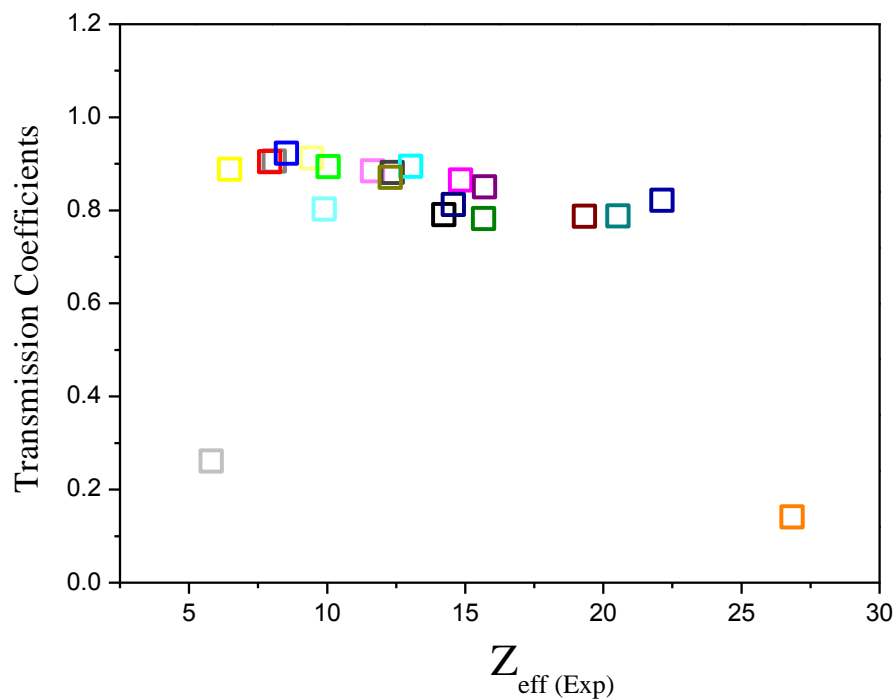
### Results and Discussion:

In this study, transmission coefficients for compounds of some biomedically important elements (Na, Mg, Al, Ca and Fe) have been measured. These compounds can be listed as follows;  $\text{NaO}_2\text{C}_2\text{H}_3$ ,  $\text{NaNO}_3$ ,  $\text{Na}_2\text{CO}_3$ ,  $\text{NaF}$ ,  $\text{Na}_2\text{SO}_4$ ,  $\text{Na}_2\text{SO}_3$ ,  $\text{NaCl}$ ,  $\text{Mg}(\text{NO}_3)_2$ ,  $\text{MgO}$ ,  $\text{Al}(\text{NO}_3)_3$ ,  $\text{AlCl}_3$ ,  $\text{CaO}_6\text{C}_6\text{H}_{10}$ ,  $\text{CaHPO}_4$ ,  $\text{CaF}_2$ ,  $\text{CaSO}_4$ ,  $\text{Fe}_2(\text{SO}_4)_3$ ,  $\text{FeCl}_3$ ,  $\text{FeCl}_2$ . Transmission coefficients ( $T$ ) for compounds are given Table 1. Experimental effective atomic numbers ( $Z_{\text{eff(Exp)}}$ ) show second column in the Table 1 [9]. Additionally, experimental effective atomic numbers with the change of the transmission coefficients for compounds shown in Fig 3.

In composite materials like alloys, soil, plastic, biological material, and so forth, for photon interactions, the atomic number cannot be represented uniquely across the entire energy region, as in the case of elements, by a single number. This number in composite materials is called "effective atomic number," and it varies with energy [10].

**Table 1:** Transmission coefficients for compounds of some biomedically important elements

Sample	$Z_{eff(Exp)}$	$T$
$\text{NaO}_2\text{C}_2\text{H}_3$	5.808	0.26138
$\text{NaNO}_3$	8.086	0.90575
$\text{Na}_2\text{CO}_3$	9.450	0.91214
$\text{NaF}$	9.897	0.80288
$\text{Na}_2\text{SO}_4$	11.648	0.88468
$\text{Na}_2\text{SO}_3$	12.364	0.88144
$\text{NaCl}$	14.230	0.79087
$\text{Mg}(\text{NO}_3)_2$	7.921	0.90430
$\text{MgO}$	10.042	0.89418
$\text{Al}(\text{NO}_3)_3$	8.535	0.92275
$\text{Al}$	13.029	0.89442
$\text{AlCl}_3$	14.832	0.86498
$\text{CaO}_6\text{C}_6\text{H}_{10}$	6.474	0.88790
$\text{CaHPO}_4$	12.290	0.87036
$\text{CaF}_2$	14.569	0.81274
$\text{CaSO}_4$	15.698	0.85019
$\text{Ca}$	19.317	0.78707
$\text{Fe}_2(\text{SO}_4)_3$	15.661	0.78193
$\text{FeCl}_3$	20.537	0.78763
$\text{FeCl}_2$	22.126	0.82135
$\text{Fe}$	26.839	0.14101

**Fig. 3:** Transmission coefficients versus experimental effective atomic numbers of compounds.



In Table 1 and Fig. 3, it is clearly seen that the increase in the effective atomic number with the transmission coefficients of Na and Ca compounds a significant change was't observed, but transmission coefficients decreased of Mg and Al compounds. Unlike them, the transmission coefficients increased for Fe compounds. According to this, Mg and Al compounds than Fe compounds have more absorption. So, Fe compounds have more transmittance. We were informed about the light transmittance of these compounds using the  $\gamma$ -ray transmission method. Furthermore; the method of gamma-ray transmission permits the measurement of several parameters, such as: density, spatial and temporal profiles of moisture and porosity of amorphous materials, and the spatial distribution of the pores in the sample [11].

### Conclusions and Suggestions:

As a result; experimental transmission coefficients for compounds of some biomedically important elements more sensitive measurable used with an extremely narrow collimated-beam transmission method in this study. Compounds of biomedically important can be used elements in different areas especially as medicine study. In the future, studies can be performed different energies, elements, compounds and experimental geometries. In this way, other studies are created basic and lacking will be eliminated in the literature.

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### RESEARCH ARTICLE

## IS CONCENTRATION OF FOAM SCLEROTHERAPY CAN BE DETERMINED PRIOR TO PROCEDURE..?

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Foam sclerotherapy, Varicose vein, STS, USG.

#### Abstract

**Objective:** Numerous methods of injections and compounds are available. The most commonly used are sodium tetradecyl sulphate, these can be foamed or injected in various concentrations presently there is no exact guideline for injection of STS Foam.

**Method:** we reviewed our prospectively complied data of patient who have undergone USGFS for smaller diameter veins with different concentration of STS and clinical outcome were assed.

**Results:** There was extremely high patient satisfaction. 81% registered complete success, and 19% felt that foam had been partially successful. Their QOL (quality of life) improved as they were more ambulant, could stand for longer duration, could work more, no requirement of compression bandage and felt better.)

**Conclusion:** Ultrasound guided foam sclerotherapy is a safe, fast and effective technique of treatment of varicose vein. FST seems to more be beneficial for smaller, recurrent, remnant varicosities.

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#### Introduction:-

The attempts of minimally invasive procedure like sclerosing fluid for the treatment of venous inadequacy have been advancing. At to start with, sclerotherapy was broadly utilized as a trade for surgery, yet it lost enthusiasm after an imminent study, randomized by Hobbs in the 1970. Be that as it may, soon before the start of the 21st century, another technique created by Tessari restored this topic, supporting the late productions by Cabrera concerning the infusion of polidocanol as ultrasound-guided smaller scale froth known as echosclerosis.<sup>(1-3)</sup>

The likelihood of obliterating the vascular destruction through coagulation was described<sup>(4)</sup> in the 1950s. In a different line of exploration, started in France, there was applying cryosurgery for the treatment of varicose veins of the lower limbs.<sup>(5)</sup> From then on, there was a stamped increment in clinical and exploratory perceptions on the impact of low temperatures on the vascular system.<sup>(6-10)</sup> Since 1999, the use of endovascular abalation of the saphenous veins with radiofrequency (RF),<sup>(11-13)</sup> has been concentrated on. Over the previous years, another strategy Endovenous laser photocoagulation indicated promising results for the treatment of varicose veins of the lower limbs.<sup>(14,15)</sup>

Ultrasonography guided foam sclerotherapy has been in use since last 15 yrs, as modern version developed by cabrea et al. But healthcare are in dilemma to offer this t/t because it is tainted with lack of efficacy and needs special skills, so that in this era other minimally invasive treatment gained popularity like EVLA (endo-venous laser abalation) or radiofrequency abalation. But this minimally invasive treatment option is good for main trunks like

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GSV & SSV but when it concerned about smaller diameter and superficial vessels the laser treatment became so difficult and sometime it cause skin pigmentation and other complication and definitely needs skills, and literature also says foam sclerotherapy has adverse effect if injected more than 10cc or if injected in more than 6 to 8 mm vessels diameter, so considering superficial vessels sclerotherapy is the good minimally invasive treatment. But there is no exact guideline how much concentration to be used. So we take into account this subject and studied he 44 cases in which primary varices was taken care by endovenous laser ablation and superficial vein was considered for sclerotherapy.

### Materials & Method:-

All patients came to DYPH hospital with complains of varicose vein, undergoing UGFS for superficial varicose vein, in which truncal varicosities are treated with EVLA between May 2014 to May 2016 were included in study. Our study is a non-randomized assessment of foam sclerotherapy & its concentration.

All treatment were done as day care surgery using ultrasound machine truncal varicosities were marked and ablated by laser then superficial varicosities marked and its diameter measured and STS foam sclerosant injected. Foam was made by Tessari two-syringe method.<sup>(16)</sup> It is done with two 5ml syringe connected by 3 way cannula. 4ml air is filled in one and in other diluted sclerosant is taken. Now with repeated alternate pumping and pistoning the two syringes of air and sclerosant foam gets developed. This foam is then injected in to the vein under USG guidance. The movement of foam is assessed on the screen. The Doppler probe is immediately pressed directly over the vein. At least 1 minute time interval was taken for every separate administration of the foam. Patient was asked to dorsiflex and plantar flex his ankle to clear out any foam which may have entered into the deep vein. When the entire vein segment was seen to be in spasm and foam could be seen occluding the lumen, the needle was removed and compression was applied over the whole limb with leg elevated.

The class II stocking was applied directly along the line of saphenous trunk over padding. Post procedure they were asked to lie supine for 15 min. stocking was left undisturbed with leg elevated for 5-10 days depending upon the size of the vein. Patients were asked to take analgesia (PCM) as per requirement. Patients were asked to walk for 15 min to 1 hour daily.



fig no.1 - USG Guided mapping of varicose vein.

### Statistical analysis

During 2 yr of study we have collected data of 44 pt in which we used different concentration of STS. We discharged pt on next day of procedure, and followed up at 15, 30, 45 days and mentioned their complaints in form of local sign and symptoms like skin pigmentation, phlebitis, pain, cord feeling, induration. We followed our pt at 3 months and at that time follow up colour Doppler was done. Finding noted in terms of sclerosed with minimal local sign and symptoms, moderate symptoms, and partially sclerosed.

### Results:-

Table 1: Concentration of sclerosant (STS) among the study population

Concentration	Frequency	Percentage
0.25%	23	52.27%
0.50%	10	22.72%
0.125%	11	25.00%
Total	44	100%

**Table 2:** Diameter of the treated vein among the study population

Diameter of vein	Frequency	%
1 to 2	11	25.00%
2to3	20	45.45%
3 to 4	7	15.90%
4to5	5	11.36%
>5	1	02.27%
<b>Total</b>	44	100%

**Table 3:** Association between diameter of vein and concentration of STS among the study population

Diameter of vein/ concentration of STS	0.25%	0.5%	0.125%	Total
1 -2	3	1	7	11
2-3	14	3	3	20
3-4	4	3	0	7
4-5	2	3	0	5
>5	0	0	1	1
<b>Total</b>	23	10	11	44

**Table 4:** Association between Local sign & symptoms and concentration of STS among the study population at 45 days

Concentration/ complication	Pain	Induration	Cord feeling	Phebitis	Skin pigmentation
0.25%	2	1	10	0	1
0.50%	3	3	8	0	4
0.125%	0	0	2	0	0

**Table no 5:** comparison at 15, 30, 45 days

Local Signs and symptoms	15 days	30 days	45 days
Pain	22	13	5
Induration	28	20	4
Cord feeling	37	32	20
Phlebitis	3	0	0
Skin pigmentation	0	2	5

**Table 6:** Late follow up on colour Doppler

Follow up	Frequency	Percentage
Sclerosed vein segment with moderate local signs and symptoms	11	25%
Sclerosed vein segment with minimal local signs and symptoms	25	56.81%
Partially sclerosed vein segment.	8	18.18%
<b>Total</b>	44	100%

**Table 7:** association between follow up Doppler and local sign and symptoms at 45 days

Follow up doppler/ local sign and symptoms	Sclerosed with moderate signs and symptoms	Sclerosed with minimal signs and symptoms	Partially sclerosis
Pain	3	1	1
Induration	3	1	0
Cord feeling	7	9	4
Phebitis	0	0	0
Skin pigmentation	4	1	0

**Table 8:** association between concentration and follow up doppler

Local sign and symptoms/ Follow up doppler	Sclerosed with moderate signs and symptoms	Sclerosed with minimal signs and symptoms	Partially sclerosis
0.25%	2	15	6
0.50%	9	00	1
0.125%	0	10	1

**Discussion:-**

Sclerotherapy has been frequently used worldwide (alone or in combination with surgery) to treat all types and sizes of varicose veins, primary and/or secondary in nature. <sup>(17)</sup>

**Patient Selection:-**

Pre-treatment evaluation includes careful clinical history, physical examination and appropriate diagnostic tests .We in our study did duplex imaging of all patients prior to the intervention. Patient selection is very crucial. Though FST is being used to manage all types of varicosity we excluded large varicosity requiring multiple sessions of FST, for whom we felt surgery will be better option. We had total of 50 patients, 6 were excluded as per exclusion criteria. All diabetic and patients of peripheral vascular disease were also excluded. Our patients age ranged from 12 yr to eldest being 67 yr old. Mean age was found to be 39.29 + 13.00yrs.

**Sclerosing Agent:-**

Schadeck 1995 showed that 4% polidocanol (aethoxysklerol) resulted in more venous spasm following sclerotherapy than 3% STS although the disappearance of superficial venous reflux following sclerotherapy was not statistically significant. Goldman 2002 showed no difference in photographic appearance of varicose veins following sclerotherapy with polidocanol (aethoxysklerol) compared to STS (in varying concentrations, according to vein diameter), although polidocanol caused less skin necrosis .In contrast, Labas 2003 showed that STS improved cosmetic appearance of varicose veins and achieved greater symptomatic improvement at six months. For thread veins, 10% hypertonic dextrose had similar efficacy in terms of sclerosis to 0.15% STS (Prescott 1992). Complication rates in terms of pain, matting and pigmentation was not significantly different.

We have used STS injection (SETROL), 3%; 60 mg /2ml. No Patient had any known history of allergy to the drug. Patients were counseled about the procedure in detail in language they understood. A patients having heart ailment were also excluded from the study. The medicine was procured from hospital dispensary and similar formulation used in all patients.

**Clinical Outcome:-**

As per shown in table no.1 diameter of veins among study population was maximum between 2 to 3 mm measured on USG during procedure mean diameter was 2.77+ 0.94 & we have we used 3 different concentration during study period , firstly to start with study as per author's knowledge we titrated concentration of STS & used 0.5% in !0 patients then on follow up we came to know that due to this concentration patient had local signs and symptoms, so subsequently we lowered our concentration and used 0.25% in 23 patients while 0.125% in 11 patients and on follow up mentioned patients complaints in terms of pain, 9nduration, cord feeling, skin pigmentation, phlebitis.

We followed our patients at 15, 30, 45days and after 3 months where we have done follow up Doppler and mentioned status in terms of sclerosed with moderate local signs and symptoms, sclerosed in minimal signs and symptoms, and partially sclerosed. In table no 5 and 6 respectively.

At the end of 45 days as shown in table no 5 we found that only 5 patients had pain as a local complaints snd 20 patient had cord feeling while nil patients had phlebitis,At 3 months follow up as shown in table no 6 maximum of

25 patients out of 44 had fully sclerosed vein segment with very minimal local signs and symptoms. We also compared our data in terms of association between concentration of sclerosant used & diameter of vein segment in table no 4, on applying chi square test p value was 0.005 which shows statistical significance between concentration & diameter of vein. We compared our data in terms of local signs & symptoms at 15, 30, 45 days in table no 5 which shows p value of 0.001.

Association between local signs & symptoms & concentration used at 45 days in table no 8 shows p value of 0.04 is not significant but same association at 15 days shows p value of 0.7 which means as post-operative time increases there is decline in local signs and symptoms and improvement of patients QOL.

While association between follow up Doppler & local signs & symptoms at 45 days in table no 7 shows 9 patients had moderate signs and symptoms with sclerosed vein segment after using 0.5% STS foam while only 2 patients had moderate signs & symptoms and maximum of 15 patients had minimal signs and symptoms with sclerosed vein segment after using 0.25% concentration, though 6 patients had partially sclerosed vein segment in that patient second setting can be considered because it's always better to avoid local signs & symptoms by using higher concentration of foam.

We have always used diluted foam given slowly always under USG guidance only. No patient had matting, ulceration, periphlebitis or loss of vision.<sup>(18-21)</sup> This followed our learning curve. Hamel et al 2003 reported 2 of 80 patients had popliteal DVT after Polidocanol 03 % foam sclerotherapy. Barrett et al 2004 reported 3% of their cases had minor DVT. They reported Phlebitis which was a sequel of excessive inflammatory reaction of the sclerosing foam had occurred in 2% of legs (2 different patients), while Frullini and Cavezzi 2002 and Rabee et al 2004 reported only 1% of phlebitis. We had three cases of thrombophlebitis which was managed with bed rest, analgesics. No skin necrosis, sclerosant induced ulcer, wound infection or neurasthenia reported in our study because of most likely because of constant USG guidance, and dilute solution of sclerosant.

In our preliminary data, the clinical outcome was full success (no visible varices or incompressibility of the treated vein segment and absent or improved symptoms) in 81% and partial success was 19%. This study demonstrates a high patient satisfaction with improvement of the quality of life and a high rate of closure of the visible varicosities with foam therapy. Results achieved in this study are comparable with other reports (Brett et al 2004, Hamel Desnos et al 2003, Rybak 2003, Wright 2003, Frullini and Cavezzi 2002, Frullini et al 2000 and Cabrera et al 2000). Barrett et al 2004 had reported that, 3 months follow up were enough but others (Desnos et al 2003, Rabee et al 2004 and Breu and Guggenbichler 2004) did not accept that because this period was too short to establishment of alternative venous path-way. Hence we followed up our patient for 01 year. We had no patients who were found to have recanalization.

We also compared our data of FST with conventional surgery of SF ligation, stripping of GSV and multiple phlebectomy in terms of recurrence, operation time, hospital admission, antibiotics usage, analgesics, and complications. We had total of 40 patients of open surgery on follow up.

For open surgery along with inpatient admission, usage of antibiotics (3 doses), requirement of analgesic for mean of 48 hours they were admitted for 4- 7 days. 03 of the patients had hematoma and one patient had post op site infection managed conservatively. Operation time for open surgery was mean of 90 minutes. They all required spinal anesthesia. Time for them to return back to normal job was 9- 15 days. On follow up 4 patients had recurrence of varicosity.

Our study was seen in conjunction to other studies in the literature. Lupton et al. 2002 studied patients randomized to receive 2 consecutive treatments (at 1 month interval) with laser irradiation to telangiectasia on one leg and with sclerotherapy on the other leg. The size matched vessels on thighs; knees, calves, ankles and popliteal fossa were treated by the same operator clinical improvement score 26-50% for both sclerotherapy treated legs and for laser treated legs. At 1 month after 1<sup>st</sup> sessions and after 2<sup>nd</sup> session, improvement score of 51-75% for sclerotherapy treated legs and 26-50% for laser-treated legs.

### **Conclusion:-**

Foam sclerotherapy is good minimal invasive treatment for superficial varicosities. In our study we done sclerotherapy in total 44 patients in which the truncal reflux and large tributaries were treated by EVLA. We firstly

marked superficial varicosity under USG guidance and diameter of affected vein noted. Then according to our experience titer concentration of the foam and injected in marked segment of affected vein under USG guidance. Throughout study we used 0.50%, 0.25%, 0.125% of STS foam sclerosant. We followed our patient at 15, 30, 45 days and mentioned local signs and symptoms. We correlated our data which shows there is statically significance correlation between concentrations of foam used and diameter of treated vein in view of effectiveness, closure, prevention of known side effect. We also followed our patient at 3 months and color Doppler was done, which shows 57% of patient gives better results in term of very minimal local sign and symptoms while 25% gives moderated local sign and symptoms. But all of them went to work within 1<sup>st</sup> week of treatment. We also correlated our data with follow up Doppler and concentrations used in study which shows no statically significance. So conclusively at the end of study diameter of vein and concentration used has the correlation and as the lower concentration also gives better result and avoid the local sign and symptoms and gives psychological satisfaction to the patient in form of completeness of treatment as visible veins get disappear. We can safely use this 0.25%, 0.125% concentration under 6mm of diameter vein. As compared with surgery this procedure is minimally invasive, cost effective, and early return to work.

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### RESEARCH ARTICLE

#### PERFORMANCE ANALYSIS OF MODIFIED RSA AND RSA HOMOMORPHIC ENCRYPTION SCHEME FOR CLOUD DATA SECURITY.

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Cloud Security, RSA Algorithm, Homomorphic Encryption, cipher text, decryption, Clustering, mRSA .

#### Abstract

Cloud computing plays an important role for storing large data. It is a large pool of easily and accessible virtualized resources. The major resources are hardware, development platforms and services. Since the data is open, security of data is a major issue which has to be focused. To ensure the security of data in cloud environment, we propose a method called modified RSA (M RSA) algorithm along with homomorphic encryption. Homomorphic Encryption enhances the security measures of un-trusted systems or applications. It converts the data into cipher text which is analyzed and worked with it as if it were still in its original form. It allows complex mathematical operations to be performed on encrypted data which does not compromise the process of encryption. This paper presents an effective analysis of RSA and a new modified RSA with Homomorphic operations. In the modified RSA (M RSA) encryption scheme clustering of prime numbers for the generation of keys for encryption and decryption is done which fastens the process of encryption. The weakness of RSA lies in the generation of Prime numbers. This is achieved by a new classification technique in modified RSA (M RSA). Hence, elimination of redundant messages is done on the same values of the product of two prime numbers by classifying the keys. Hence, Security is enhanced.

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#### Introduction:-

Cloud Computing is the most innovative driving force in many small, medium and large sized companies. It has three delivery models named as Saas, Iaas, Paas. It has four deployment models such as private cloud, public cloud, hybrid cloud and community cloud [17][5]. As the services of cloud computing are used by many of the cloud users, the major concern is the security of their data in the cloud. Data security is always of major concern. It plays an important role in trust worthiness of computing. Cryptography is the art of protecting secret information. There are two types of cryptography: secret-key cryptosystem and public-key cryptosystem [4][5]. The first type is the secret-key cryptosystem which uses the same key to encrypt and decrypt the ciphertext. For this reason, this type is also called as symmetric cryptosystem. Since it takes less computational time, it has several drawbacks. There are too many keys along with the key distribution problem, authentication and nonrepudiation problem are of concern. Hence, to solve the problems of symmetric cryptosystem, RSA cryptosystem is the one of the most popular approach for such problems. The RSA cryptosystem was developed in 1977 by Ronald L. Rivest, Adi Shamir, and Leonard Adleman at MIT and first published in 1978 [7]. During the year in 1978 R.L. Rivest, A. Shamir, and L. Adleman

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developed the RSA public-key cryptosystem[4]. The RSA cryptosystem simply uses the concept of modular exponentiation which says that the modulus 'n' is the product of two large prime's p and q and the Public key and private key are obtained by:

$$e = d^{-1} \pmod{\phi(n)}$$

The encryption process is performed using the public key 'n' and 'e' as follows:

$$C = M^e \pmod{n}$$

Where M is the plaintext such that  $0 < M < n$  and C is the ciphertext which can be decrypted using the private key 'n' and 'd' as follows:

$$M = C^d \pmod{n}$$

At present security should be provided to encrypt data that is stored both in Public Cloud and Private Cloud. Security also provides secure transmission from a local machine to a cloud data store. The stored data is encrypted and the channel of data transmission is well secured with the help of key exchanges. But actually performing computations on the data stored in the cloud, it requires decrypting it first, which makes critical data available to the cloud provider. The proposal here is to encrypt data before sending to the cloud providers. Thereby performing computations on clients' data at their request. To achieve this it is also necessary to hold the cryptosystems based on Homomorphic Encryption.

### Homomorphic Encryption:-

Homomorphic Encryption can either be a Fully Homomorphic Encryption (FHE) or Somewhat Homomorphic Encryption (SHE)[3][4]. It has the property of malleability. Malleability is a property of some cryptographic algorithms. It states that an encryption algorithm is malleable if it is possible for an adversary to transform a ciphertext into another ciphertext which decrypts to a related plaintext. Homomorphic encryption is the process of performing encryption on encrypted data. The encrypted data which is stored in the cloud is encrypted using homomorphic operations and decrypted with operations. The operations are Additive and Multiplicative operations[3][4][5].

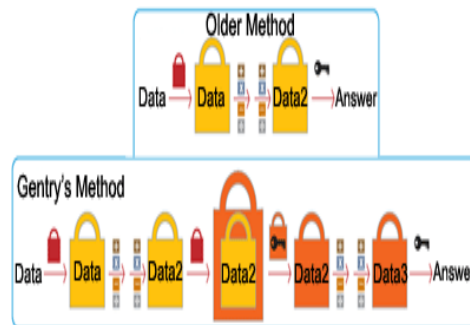


Fig 1.1:-

If the process has both additive and multiplicative operations performed on the encrypted data, then it is Fully Homomorphic Encryption (FHE). The partially Homomorphic encryption allows either additive or multiplicative operations on encrypted data. RSA encryption allows multiplicative operations on encrypted data.

Homomorphic encryption plays an important role in cloud computing. It allows companies to store encrypted data in a public cloud and take advantage of the cloud provider's analytic services.

For example, a user sends a request to add the numbers 1 and 2, which are encrypted to become the numbers 33 and 54, respectively. The server in the cloud processes the sum as 87, which is downloaded from the cloud and decrypted to the final answer, 3. A normal symmetric cipher -- DES, AES is not homomorphic[2]. The RSA algorithm is homomorphic but only with respect to multiplication.

**Related work:-**

Craig Gentry of IBM, in 2009, has proposed the first encryption system "Fully Homomorphic". The system computes and evaluates an arbitrary number of additions and multiplications and also calculates any type of function on encrypted data[1][3]. The internal working of this adds another layer of encryption and for every few steps it uses an encrypted key to unlock the inner layer of scrambling. Hence, this decryption "refreshes" the data without exposing it and allowing an infinite number of computations on the same.

The application of fully Homomorphic encryption is an important brick in Cloud Computing Security. The outsourcing of the calculations on confidential data to the Cloud server is possible, keeping the secret key that can decrypt the result of calculation [3].

**Proposed Method of MRSA:-**

The new method mRSA is the encryption process which is carried out with two prime numbers p,q. In RSA algorithm, we take two prime numbers and generate the keys for encryption. In this new approach generation of keys is done by taking prime numbers which are clustered using Euclidian Distance which solves the problem of redundant messages. The clustering simplifies the selection of prime numbers which are nearest to each other. So a situation in which the cipher text is the same as the plaintext in some values of n which is the product of two prime numbers p and q are resolved and messages which are redundant is eliminated.

The MRSA aims at classification of prime numbers for key generation. An agreement is done for communication with the parties with a secure set of alternative prime numbers (PR). This helps in alternative values of prime number for p or q or both. In addition, this set of prime numbers is divided into different classes. Each class contains a specified number of primes. We generate the prime numbers by taking odd numbers within the range N. This is a process of filtration. We eliminate all even numbers except 2, since they are not prime. This clustering is done by taking into account the number of cluster or classes. Then each of the prime numbers starting from the beginning are taken one at a time and grouped one by one, cluster by cluster i.e., 2 in c1, 3 in c2, 5 in c3, 7 in c4 and so on.

The number of clusters must be less than the half of the range of N and prime numbers within the range and can be limited. To select a certain neighbor of one of the classes in that set it is dependent on a secure distance (d1). This distance will be used to choose one prime number or both. By assigning another secure distance (d2) inside the selected class we generate the keys for encryption [16]. The purpose of the distance (d1) is to use an agreement secure parameter to choose one of the classes inside the set of all classes and this distance must be changed periodically to remove the redundant messages and to enhance more security for the RSA algorithm. Ciphers are generated for the corresponding keys due to a specific value of n and we can generate a new secure value of n to overcome these redundant values of messages.

Selection of the prime number 'p' is done from the clusters say p'. Then we compute 'n' i.e. n'. An agreement secure parameter is generated. In order to acknowledge the receiver by changing 'n', the sent ciphertext must be appended by a secure agreement parameter, denoted by f, inside the ciphertext[9][10]. This suggested parameter is used to prevent sending the value of alternative value as a public key, so we get a more secure procedure for RSA algorithm by reducing the public key into one parameter that is the public key of the user only because in the traditional method of RSA, the public key consists of two parameters; the value of n and the public of the user (e)[11].

**Algorithm:-**

The Algorithm has three phases:

**Clustering Algorithm:-**

1. Let C be the cluster where c1,c2,c3...cn be subsets of C.
2. Enter C value. Ex C=5.
3. Let N be the number of prime numbers starting from 2.
4. Input N. Say N=50.
5. Eliminate all even numbers within N value.
6. Let it be N1.
7. Then select all the prime numbers from N1.
8. Depending on C, Place the numbers one by one in each cluster as shown in fig 1.3.

9. Now choose the one prime number from one of the cluster.
10. Select the next prime number and find the nearest from the first by Euclidean distance.

**Key Generation:-**

Choose two prime numbers from PR

$$n = p * q$$

$$\phi(n) = (p-1) * (q-1)$$

Let e be the public key

Let d be the private key

$$c = m^e \pmod n$$

if  $c = m$  then

**Sender operation:-**

- 1: Choose d1 of the one of subsets Ci in S for the secure class
- 2: Choose d2 inside Ci to pick one alternative prime p'
- 3: Compute  $n' = p' * q$
- 4: Compute  $\phi(n') = (p'-1) * (q-1)$
- 5: Choose alternative public key, lets e'
- 6: Generate the corresponding private key d'
- 7: Compute the ciphertext  $C' = m^{e'} \pmod n'$
- 8: Combine the agreement factor f with the new ciphertext and send C'' as:  
 $C'' = [C', f]$

**Multiplicative Homomorphic encryption:-**

Generate two ciphers and suppose we have two ciphers C1 and C2 such that:

$$C1 = m1^e \pmod n$$

$$C2 = m2^e \pmod n$$

$$C1.C2 = m1^e m2^e \pmod n = (m1 m2)^e \pmod n$$

**RSA with Homomorphic Encryption:-**

The RSA cryptosystem is the most widely used public-key cryptosystem. It was developed in the year 1978 by Rivest, Shamir, and Adleman. It is one of the first homomorphic encryption schemes

**Key Generation:** KeyGen(p, q)

**Input:-** Two large primes – p, q

Compute  $n = p * q$

$$\phi(n) = (p - 1)(q - 1)$$

Choose e such that  $\gcd(e, \phi(n)) = 1$

Determine d such that  $e * d \equiv 1 \pmod{\phi(n)}$

**Key:-**

public key = (e, n)

secret key = (d, n)

**Encryption:-**

$$c = m^e \pmod n$$

where c is the cipher text and m is the plain text.

RSA has a multiplicative homomorphic property i.e., it is possible to find the product of the plain text by multiplying the cipher texts. The result of the operation will be the cipher text of the product. Given  $c_i = E(m_i) = m_i^e \pmod n$ , then  $(c1 . c2) \pmod n = (m1 . m2)^e \pmod n$

**Example:-**

- Choose  $p = 3$  and  $q = 11$
- Compute  $n = p * q = 3 * 11 = 33$
- Compute  $\phi(n) = (p - 1) * (q - 1) = 2 * 10 = 20$

- Choose e such that  $1 < e < \phi(n)$  and e and n are co-prime. Let  $e = 7$
- Compute a value for d such that  $e \cdot d \equiv 1 \pmod{\phi(n)}$ . One solution is  $d = 3$
- Public key is (e, n) => (7, 33)
- Private key is (d, n) => (3, 33)

**Example of homomorphic property:-**

Now, let  $m_1=2$  and  $m_2=3$   $c_1 = m_1e \pmod n = 27 \pmod{33} = 29$   $c_2 = m_2e \pmod n = 37 \pmod{33} = 9$   $c_1 \cdot c_2 = 29 * 9 = 261$  By decrypting  $(c_1 \cdot c_2)$  we get:  $2613 \pmod{33} = 6 = 2 * 3$ .

**Results:-**

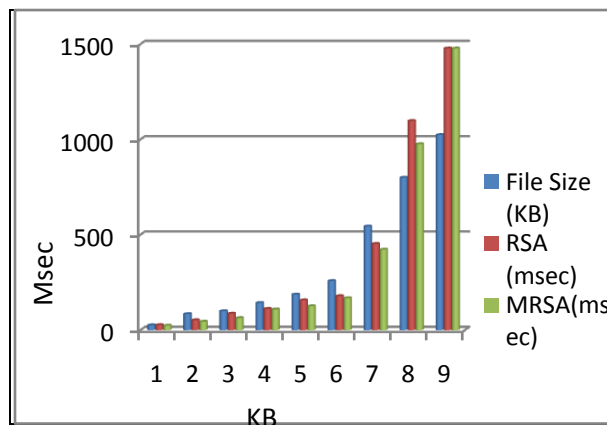
The Analysis of the two algorithms is below. With different file sizes in kilo bytes (KB) is taken and the estimation of time with respect to encryption and Decryption time (msec) is shown in the graph.

It is clear that the mRSA takes less time and secure and efficient than RSA with homomorphic operations.

**Encryption Time Analysis:-**

**Table 1:-**

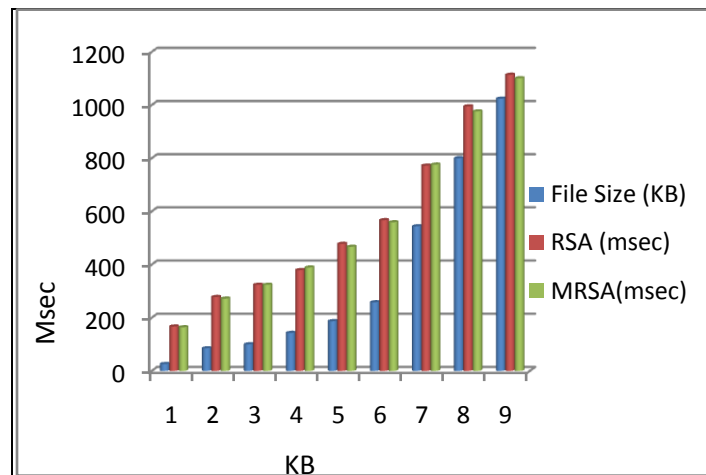
File Size (KB)	RSA (msec)	MRSA(msec)
26	27	24
85	53	45
100	87	64
143	112	109
187	157	126
258	179	168
544	453	423
800	1098	976
1024	1478	1478



**Fig 1.2:-**

**Decryption Time Analysis:****Table 2:-**

File Size (KB)	RSA (msec)	MRSA(msec)
26	167	164
85	278	272
100	324	324
143	379	389
187	478	467
258	567	559
544	772	776
800	995	976
1024	1114	1101

**Fig 1.3:-****Conclusion:-**

The cloud security is based on Homomorphic encryption, is a new concept of security which enables us to provide results of calculations on encrypted data without knowing the raw data on which the calculation was carried out, with respect of the data confidentiality. Our work is based on the application of partially Homomorphic encryption to the Cloud Computing security. It also analyzes and the improvement of the existing cryptosystems to allow servers to perform various operations requested by the client. The improvement of the complexity of the Homomorphic encryption algorithms and compare the response time of the requests to the length of the public key is to be considered. Also this method reduces the redundant messages occurred in RSA method. We see that for some values of  $n$ , there is a major problem in which the message and its corresponding ciphertext are the same. At the presence of recent active attacks, this problem can be exploited by many attackers. For this reason, this method mRSA presents an active solution by changing the value of  $n$ . Hence, MRSA is more secure and efficient than RSA with homomorphic operations.

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### RESEARCH ARTICLE

#### EVALUATION OF CANDIDA SPECIES FROM CLINICAL SPECIMENS BY USING CHROMAGAR.

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 Chromogenic methods.

#### Abstract

Candida species especially Non albicans Candida are increasingly being isolated from clinical specimens. Candida spp. are the most common cause of fungal infections and are the fourth leading cause of health care associated infections. The main aim of the study is to isolate and identify the various Candida species from clinical samples by both Conventional and chromogenic method and to check which one is better and specific method. Samples such as blood, urine and pus received in laboratory from patients of all age group and both sexes with suspected Candida infection and the positive isolates were identified by conventional as well as chromogenic method. Total 80 isolates of Candida species were recovered from the clinical specimens. *C.krusei* was most commonly isolated yeast followed by *C.albicans*. CHROMagar falsely identified *C.parapsilosis* as *C.glabrata*. Species identification using CHROMagar is rapid, technically simple, and easy as compared to conventional method.

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#### Introduction:-

Candida species are the fellow members of the normal flora of the skin, mucous membranes and gastrointestinal tract. They are an endogenous opportunist which means that they can cause secondary infection in individuals with some underlying immunocompromised conditions<sup>(1)</sup>. The genus is composed of a heterogeneous group of organisms and more than 17 different Candida species are known to be the aetiological agents of human infections<sup>(3)</sup>. The major etiological agent is *Candida albicans*, whereas different Candida species can cause a variety of infections including *C. tropicalis*, *C. dubliniensis*, *C. parapsilosis*, *C. krusei*, *C. guilliermondii*, *C. glabrata*, and *C. kefyer* which epitomize many clinical forms of candidiasis. Some of these species forgather as secondary infections to another species, for example; *C. parapsilosis* is secondary infection only when *C. albicans* as a cause of Candida endocarditis.<sup>(4)</sup> Among species of Candida, *C. albicans* is most often colligated with serious fungal infections. Other Candida species also have emerged as clinically important opportunistic pathogens<sup>(5)</sup>. The vast majority of invasive Candida infections are caused by only four species which include *C. albicans*, *C.glabrata*, *C. parapsilosis* and *C.tropicalis*. The clinical manifestations of disease are extremely varied, ranging from acute, sub acute and chronic to episodic. Involvement may be localized to the mouth, throat, skin, scalp, vagina, fingers, nails, bronchi, lungs, gastrointestinal tract or become systemic as in septicaemia, endocarditis and meningitis<sup>(1)</sup>. Identification of yeast pathogens by traditional methods like germ tube test, growth pattern on cornmeal agar are labour intensive and requires several days and specific mycological media. Chromogenic media contain chromogenic substrates which react with enzymes secreted by target microorganisms to yield colonies of varying colours.

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**Material & Methods:-**

Present prospective study was conducted in tertiary care hospital from January 2016 to June 2016. Various samples received in laboratory from patients of all age group and both sexes with suspected Candida Infection. Clinical details were noted in the case record form. Patients who were on antifungal treatment were excluded. The specimens for laboratory investigation were collected undertaking strict aseptic precautions. The various clinical specimens collected were blood, urine, pus etc. Two swabs/specimens were taken from each case. One of the specimens was subjected for direct examination and the other for the culture. All the above samples were subjected to various mycological tests.

- 1) Direct examination by KOH Mount
- 2) Gram stain



**Fig A-Candida on Gram stain**

- 3) Culture on SDA (at 25°C and 37°C)

4) Germ tube test for speciation: A small portion colony of the yeast to be tested was suspended in a test tube containing 0.5 ml human serum. The test tube was incubated at 35°C for 2-3 hours. A drop of yeast-serum suspension was placed on a microscopic slide, overlaid with a cover slip and examined microscopically for presence of germ tubes.

Observation: Filamentous extension from yeast cell with no constriction was considered as germ tube.



**Fig B- Germ tube formation**



**Growth pattern on CMA for speciation:-**

Isolated colonies of *Candida* were picked up with inoculating loop. Three parallel cuts 1 cm apart was made into the surface of Cornmeal-Tween agar, holding the inoculating loop at about a 45-degree angle. A sterile cover slip was laid on the surface of agar, covering a portion of the inoculated streaks. The inoculated plates were incubated at 25-30°C for 24-72 hours. At the end of incubation period plates were examined microscopically (under 10x and 40x) at the edge of cover slip and the pattern of growth was observed to make a presumptive identification.



**Fig C-** *C.krusei* on CMA

**Growth on CHROMagar:-**

Isolated species were inoculated on *Candida* CHROMagar to improve species identification based on coloured colony morphology. These agar plates were incubated at 37<sup>0</sup> C for 48 hours. The species were identified by characteristic colony colour.

- ❖ *C. albicans*- Light green coloured colonies
- ❖ *C. tropicalis* - Blue to metallic blue coloured colonies
- ❖ *C. glabrata* - Cream to white smooth colonies
- ❖ *C. krusei*- Pink colonies
- ❖ *C. dubliniensis* - Dark green colonies



**Fig D-** *Candida* species on *Candida* CHROMagar

**Observation and Results:-**

In present study, 80 isolates of Candida species were recovered. Species identification was done by both conventional method and Candida CHROMagar.

Samples included in the study were 80. Out of which blood (40), urine (26) and Pus (14) respectively.

Fig1-Distribution of Various samples size-

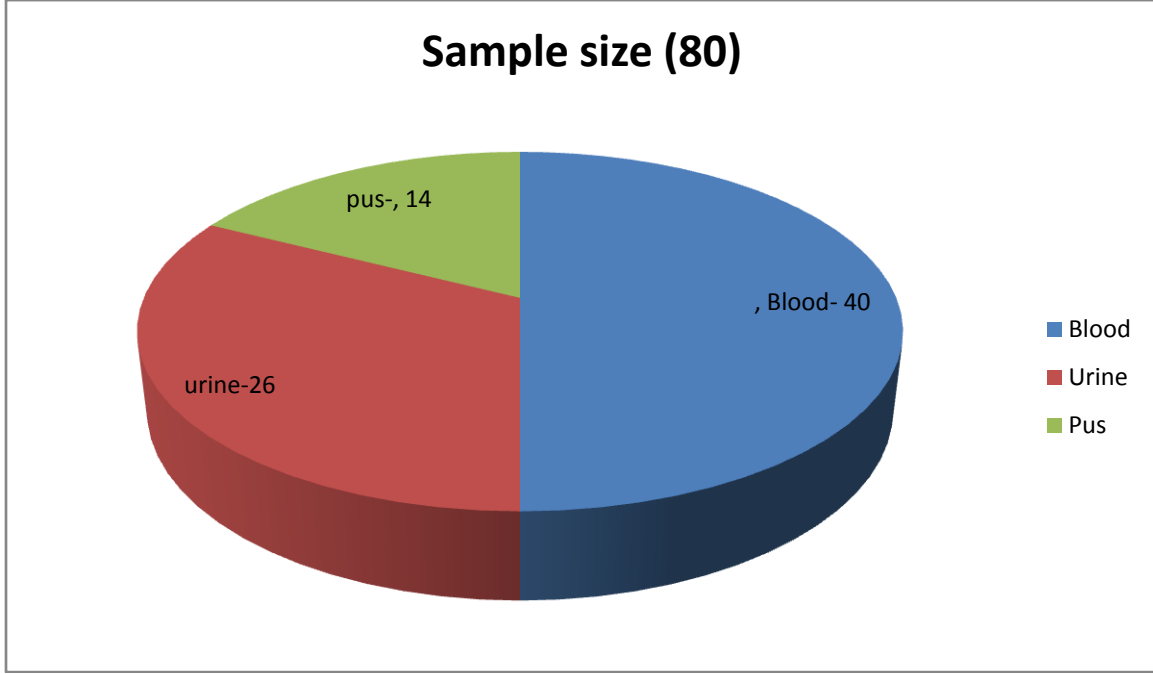


Fig1-samples size n=80 which includes blood (n=40), Urine (n=26) and Pus (n=14)

Fig 2-Showing Candida isolates in various samples such as Blood, Urine and pus.

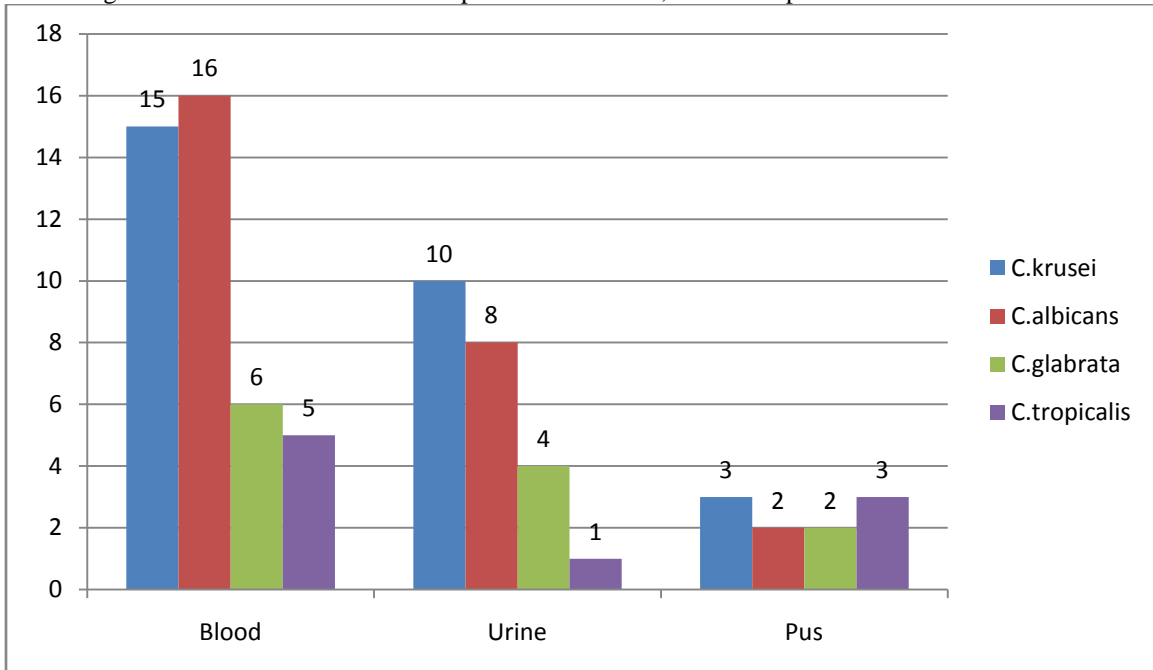


Fig 2:- Showing number of Candida isolates in various samples such as Blood, Urine and pus.

**Table 1:-**Distribution of different species of Candida-

Candida species	Number of isolates(n=80)	Percentage (%)
<i>C. krusei</i>	28	35%
<i>C. albicans</i>	26	32.5%
<i>C. glabrata</i>	12	15%
<i>C. tropicalis</i>	09	11.25%
<i>C.parapsilosis</i>	05	6.25%

Table1-Total number of Candida species isolated was 80. Out of 80 isolates, Candida krusei (35. %) was the most common species followed by C.albicans 32.5%) was most common followed by C. glabrata (15%), C.tropicalis (11.25 %.), C.parapsilosis (6.25%).

**Table 2:-**Identification of various species of Candida by conventional method and Candida CHROMagar

Candida species (n=80)	Conventional method	CHROMagar
<i>C. krusei</i>	28	28
<i>C.albicans</i>	26	26
<i>C.glabrata</i>	12	17
<i>C.tropicalis</i>	09	09
<i>C.parapsilosis</i>	05	-

Table 2-Showing Candida species isolated from Conventional method and CHROMagar.

**Table 3:-**Sensitivity and specificity of Candida CHROMagar for each species

Species	Sensitivity (%)	Specificity (%)
<i>C. krusei</i>	100%	100%
<i>C.albicans</i>	100%	100%
<i>C.glabrata</i>	100%	72.22%
<i>C.tropicalis</i>	100%	100%

Table 3- We obtained 100% sensitivity and specificity of Candida CHROMagar for *C. krusei*, *C. albicans*, *C.tropicalis* but sensitivity and specificity of Candida CHROMagar for *C. glabrata* was 100% and 72.22% respectively.

## Discussion:-

The potential clinical importance of species-level identification has been recognized as Candida species differ in the expression of virulence factors and antifungal susceptibility. Non albicans Candida are on the rise due to increasing immunocompromised states. Non albicans Candida are more resistant to fluconazole, therefore species level identification has a direct impact on choice of empirical antifungal treatment.<sup>(6)</sup> The incidence of infections caused by Candida species has increased considerably over the past three decades, mainly due to the rise of the AIDS epidemic, an increasingly aged population, higher numbers of immune-compromised patients and the more widespread use of in dwelling medical devices. *Candida albicans* is the main cause of candidiasis; however, non-albicans Candida species such as *C. glabrata*, *C. tropicalis* and *C.parapsilosis* are now frequently identified as human pathogens.<sup>(7)</sup> Total 80 Candida species were isolated from various clinical samples. Among the various clinical isolates of Candida species we obtained *C.krusei* (28) as the most common isolate followed by *C. albicans* (26), *C. glabrata* (12), *C. tropicalis* (09), *C. parapsilosis* (Table1). Factors like increased use of antifungal drugs, use of broad spectrum antibiotics, long term use of catheters and increase in the number of immunocompromised patients contributes to the emergence of non-albicans Candida species.<sup>(8)</sup> For differentiation among different species of Candida conventionally germ tube test, growth pattern on cornmeal agar and sugar assimilation tests are being used which are technically difficult, time consuming and difficult to interpret which may take 72 hours to two weeks for species identification<sup>(9)</sup>, <sup>(10)</sup>Chromogenic agar is technically simple, easy to interpret and rapid method to differentiate among different Candida species. It facilitates the detection and identification of Candida species and provides result in 24-48 hours. Among the new tests, Candida CHROMagar is rapid and cost effective as compared to other expensive systems like API systems, Vitek 2 ID system and molecular methods.<sup>(11)</sup>

In our study, for *C. glabrata* specificity of Candida CHROMagar was 72.22% as 5 species of *C.glabrata* were falsely identified by Candida CHROMagar as *C. parapsilosis*. Shettar SK et al<sup>(12)</sup> reported that on Candida CHROMagar, *C.parapsilosis* gave same cream colour as that of *C.glabrata*. This may be because of *C. glabrata*; *C. kefyr*, *C. parapsilosis* and *C.lusitaniae* appear as a variety of beige/brown/yellow colours due to the mixture of

natural Pigmentation and some alkaline phosphatase activity. <sup>(13)</sup>*C.glabrata* and *C. parapsilosis* can be easily differentiated from growth pattern on Cornmeal agar as *C. glabrata* doesn't produce pseudo-hyphae. Thus, the combination of Cornmeal agar Hi Candida agar can be used for early identification of *C. glabrata*.<sup>(12)</sup>

### Conclusion:-

Our study showed *C. krusei* as most common Non –albicans Candida species causing candidiasis, which shows the rise of Non-albicans Candida among various clinical samples. CHROMagar is a simplistic, rapid, easy and inexpensive method with good sensitivity and specificity for identification of Candida species. CHROMagar can be reliably used for identification for *C. krusei*, *C.albicans*, *C. tropicalis* but for early identification of *C. glabrata* and *C. parapsilosis* both the corn meal agar and CHROMagar should be used.

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### About the Author:-

Preeti Sharma pursuing Ph.D in Clinical Microbiology .She is having three years of research experience in Clinical Mycology.

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### RESEARCH ARTICLE

#### A COMPARATIVE IN VITRO STUDY ON RETENTION AND STABILITY OF FOUR IMPLANT-SUPPORTED OVERDENTURE BASED ON IMPLANT LOCATION

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##### *Key words:-*

Ball and socket, Dalbo, Locator, Tensometer.

#### *Abstract*

**Aim:** The aim of this study is to evaluate the effect of implant location and different implant attachment systems on the retention and stability of 4 implant-supported overdentures by measuring retentive forces during vertical, oblique and horizontal types of dislodgment forces.

**Materials and Methods:** The retention and stability of 4 implant supported overdenture at different implant locations in the arch with different attachment forms under multidirectional dislodging forces were evaluated. For that an experiment was undertaken utilizing a model simulating a maxillary edentulous ridge with 6 dental implants in positions on the model approximating the tooth positions in the natural dentition. A cobalt-chromium cast framework with 3 loops, acrylic resin inside the housing, and chains attached to a universal testing machine was used to measure peak load (N) required to disconnect an attachment. Kruskal wallis test followed by Mann Whitney U test were used for statistical analysis.

**Results:** The test results have shown significant difference ( $p < 0.05$ ) when tested within implant location and implant attachments at different directions of pull. Kruskal wallis test was performed to find whether there is any significant difference of mean present among three attachments in each group and significant difference between three groups among each attachment system. Mann Whitney U test was done to find any significant difference present between two attachments of each group and difference between two groups among each attachment system.

**Conclusion:** Within the limitations of this in vitro laboratory study, the following conclusions were made. Vertical retention increased as implant location was planned at canine and premolar location. Antero-posterior stability and horizontal stability of a simulated overdenture prosthesis increased with distal implant location up to canine and premolar location. Attachment type affects retention and stability differently by location.

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**Introduction:-**

Edentulism is defined as loss of all permanent teeth.<sup>1</sup> Tooth loss is a multifactorial process.<sup>2</sup> while the rate of edentulism has been decreasing throughout the past three decades, the subsequent increase in the world population has resulted in an increasing growth of total edentulous persons.<sup>3</sup> Residual ridge resorption continues to be primary complication of edentulism. To minimize loss of residual ridge, exemplary complete denture therapy along with routine recall systems, should be goal of the treatment.<sup>2</sup> The traditional treatment modality of edentulism has been the fabrication of removable, tissue-supported complete dentures.<sup>3</sup> Three main factors are involved in optimal denture treatment: retention, support and stability.<sup>4</sup> It is critical to evaluate and properly estimate the importance of each of these three factors involved in the treatment. In choosing between treatment approaches, patients often choose the treatment that increases stability even when cost is a major factor.<sup>5</sup> One of the greatest challenges facing the clinician is to provide a removable prosthesis with adequate retention and stability. Amount of residual ridge is correlated with the retention and stability of the denture.<sup>6-10</sup>

Overdentures have been advocated as a means to preserve the structures associated with denture support which may augment retention and stability.<sup>5</sup> In contrast to the mandible, implant placement within maxilla may be limited by the anatomy, available bone and its relationship to the sinus architecture. Less favourable mid-term and long-term survival and success rates were originally reported for maxillary implants supporting overdentures. Compared with the mandible, the maxilla contains softer bone and a different distribution of occlusal forces. Therefore, a greater number of implants are required in the maxilla compared with the mandible. However, there are no specific guidelines for the number of implants necessary to support a maxillary overdenture. A minimum of four well-spaced implants is often recommended for an implant-supported and -retained overdenture. Many studies have demonstrated that the use of only four maxillary implants can successfully restore oral function for completely

maxillary edentulous patients. Evidence has supported the treatment philosophy of focusing on providing proper standard of care within the realms of simplicity versus overly complicated. The use of stud-style attachments is considered a simplified and cost-effective treatment as compared to bar and clip type implant overdentures. While many of these studies focus their attention on the retention, release, and stability between types and forms of attachments, few have investigated overdenture properties as a function of attachment location, distribution, and number of implants. The impact of distribution and number of implants and attachment systems upon retention and stability of overdentures has been alluded to in several studies. In consideration of the currently available studies, limited information exists regarding implant position, distribution, and number and the effect upon the retention and stability of maxillary implant overdentures. The purpose of this investigation was to provide an in vitro evaluation of retention and stability of four implant supported overdentures based on implant location.

**Materials and Method:-**

An experiment was undertaken utilizing a model simulating a maxillary edentulous ridge with 6 dental implants in positions on the model approximating the tooth positions in the natural dentition. A cobalt-chromium cast framework with 3 loops, acrylic resin inside the housing, and chains attached to a universal testing machine was used to measure peak load (N) required to disconnect an attachment. Three different types of attachments were used in 3 positions on the model in sequence of 4 implants at a time.

Auto polymerizing polymethyl methacrylate (PMMA) acrylic resin was incorporated in the intaglio and facial/lingual surfaces of the framework to allow for attachment of the matrix portions. The metal framework remained constant throughout testing. Three commercially available attachment designs were evaluated: Ball and socket, Locator, Dalbo attachments. The occlusal plane of the test model was set even with the horizontal plane of a metal plate and 3 bolts were placed to affix the model to the metal plate. The incorporation of the plate allows precise reproduction of the position of the model clamping to the testing apparatus for the different attachment systems. A universal testing machine (Tensometer) was applied to test forces required to dislodge the prosthesis in various directions as described previously. Three 6.2cm metal chains were attached to a washer with three eye bolts in a triangular orientation with machine screw nuts. The washer was attached in the center with bolt and nut to a ball/socket pivoting joint assembly incorporated into the universal testing machine. The use of the eye bolts and pivoting joint allowed for precise adjustment of the chains and to ensure that all chains were pulling evenly throughout the experiment. The testing machine instrumentation was calibrated and balanced using the testing machine's computer algorithm to account for the weight of the simulated prosthesis and chains. Three chains were attached to the prosthesis and a 3-point vertical pull was used to determine retention against a vertically directed



dislodging force parallel to the path of insertion. A 2-point oblique/posterior pull was used to determine stability to determine resistance against Para-axial, oblique dislodging forces. Two chains were attached: one in incisor region and alternating chains either on the right or left side molar region. To test posterior dislodging forces, the incisor chain was removed and the remaining two chains were attached in the molar regions. The chains were adjusted to reduce slack and force was applied until separation of the prosthesis occurred. The dislodging force applied resulted in a peak load measurement (Newton's, N). For each group, 9 measurements were made of peak dislodging forces. Means were calculated and differences among the systems, directions, and groups were identified. Four patrix portions of the attachment system were placed into areas designed as group numbers that approximate natural tooth positions: Group A (#11,13,21,23), Group B (#13,14,23,24), Group C (#11,14,21,24). Matrix housing portions of the attachment system were attached to the prosthesis following manufacturer guidelines with a bis-acryl material.

### Results:-

The present study was done to evaluate and compare the retention and stability of four implant supported overdentures based on implant location. In this study retention and stability of an implant overdenture was tested between different implant locations as group A (#11,13,21,23), group B (#13,14,23,24), group C (#11,14,21,24) and different attachment systems using tensometer. The following results of statistical analysis have been obtained in this study using SPSS software package. Descriptive statistics for the three groups and different attachments were tabulated in table 1, 2, 3, 4, 5 and 6 respectively. The test results have shown significant difference ( $p < 0.05$ ) when tested within implant location and implant attachments at different directions of pull.

**Kruskal wallis test** was performed to find whether there is any significant difference of mean present among three attachments in each group and significant difference between three groups among each attachment system. **Mann Whitney U test** was done to find any significant difference present between two attachments of each group and difference between two groups among each attachment system. **Table1 and graph1-** Shows the mean and standard deviation of different attachments among group A. The maximum mean value is of dalbo attachment (43.5N) at vertical pull. The minimum mean value is of locator attachment (14.4N) at oblique pull. Ball and locator attachments showed significant difference only at vertical and oblique pull ( $p < 0.05$ ). The results were not significant between ball and locator attachments at posterior pull ( $p > 0.05$ ). **Table2 and graph2-** Shows the mean and standard deviation of different attachments among group B. The maximum mean value is of dalbo attachment (59.8N) at posterior pull. The minimum mean value is of locator attachment (13.8N) at oblique pull. Ball and locator attachments showed significant difference only at vertical and posterior pull ( $p < 0.05$ ). The results were not significant between ball and locator attachments at oblique pull ( $p > 0.05$ ). **Table3 and graph3-** Shows the mean and standard deviation of different attachments among group C. The maximum mean value is of dalbo attachment (42.5N) at vertical pull. The minimum mean value is of locator attachment (15.5N) at oblique pull. Ball and locator attachments showed significant difference only at vertical and oblique pull ( $p < 0.05$ ). The results were not significant between ball and locator attachments at posterior pull ( $p > 0.05$ ). **Table4 and graph4-** Shows the mean and standard deviation of Ball and socket attachment among different groups. The maximum mean value is at group B (34.94N) at vertical pull. The minimum mean value is at group B (19.64N) at oblique pull. **Table5 and graph5-** Shows the mean and standard deviation of Dalbo attachment among different groups. The maximum mean value is at group B (59.78N) at posterior pull. The minimum mean value is at group C (35.60N) at oblique pull. Kruskal Wallis test was performed to find whether there was significant difference between three groups among dalbo attachment, results showed there is statistically significant ( $p < 0.05$ ) difference among group A, B and C at posterior direction of pull. **Table6 and graph6-** Shows the mean and standard deviation of Locator attachment among different groups. The maximum mean value is at group C (19.08N) at posterior pull. The minimum mean value is at group B (13.84N) at oblique pull.

### Discussion:-

It is evident that many treatment concepts involving overdentures are based on empirical experiences of individuals. Clinicians often base their selection of implant location and attachment system empirically on expected retentive qualities. Evaluating these factors the results allow the clinician to formulate a comparison of implant location to retention and stability of implant-retained overdenture prosthesis.

While retention and its effect upon overdenture prosthetic factors are related, few studies have established a consensus regarding what is considered sufficient retention. Zou et al The results of prospective study clearly indicate favorable outcomes for four interconnected implants supporting a maxillary overdenture with three different

abutments. This study was an effective measure of clinical factors related to prosthetic success and acceptance by the patients at several time points throughout treatment and patients preferred the attachment that provided greater retention. Based upon these studies, it can be established that an effective retentive force may be between 8 to 10 N. Overdentures, when in place in the oral environment, move in complex ways. Movement of overdentures typically occurs in six directions: occlusal, gingival, mesial, distal, facial, and lingual. While true uni-directional dislodging forces rarely occur in clinical scenarios, directional pull-testing is an effective way of measuring retention and stability of a prosthesis during in vitro laboratory evaluation. The present in vitro study investigated the effect of implant position on the retention and stability of a simulated prosthesis. To the knowledge, no studies have evaluated the effect of varying in vitro implant location upon dislodging forces of simulated 4-implant Maxillary overdenture prosthesis. The results of this study indicate that implant location affects in vitro retention and stability of an implant overdenture. The current in vitro study reveals that vertical retention increases with implant location up to premolar. Regarding vertically directed forces, one would believe that retentive values would not change when implant location was modified. In the testing procedures, it was noted that during 3-point chain pull tests, some antero-posterior movement occurred. While this may have affected the reported force values, the method employed better simulates the movement of overdentures in clinical situations rather than utilizing a rigid design. The type of attachment affects the effect of vertically applied forces. Horizontal stability of Dalbo attachment was affected by implant positioning, incisor and canine sites had the highest values. In the present study, antero-posterior chain pulls were evaluated as an indirect method of determining the effect of implant location upon posterior dislodging forces. In all attachments systems tested, a general trend was determined that an increased resistance to dislodgment occurred as implant location was moved distally. Interestingly, all systems except the Locator group showed significant increase in resistance in moving implant location. The variation between attachment systems is of great interest when formulating conclusions regarding the effect of implant position upon retention and stability. The present study shows that attachment type affects retention and stability different by location. The results of this study illustrate that attachment systems respond in different ways depending on their location in the edentulous arch.

The results of this study indicate that 4-implants may produce effective in vitro retention and stability of overdenture prosthesis. The testing performed is limited with specific conditions and methods and does not completely replicate clinical situations as the implant overdenture clinical reality is much more complex than a laboratory setting can replicate. Furthermore, the findings of this study also do not account for attachment wear, resiliency, and tissue effects. While this in vitro based analysis shows a statistical difference between groups, long-term comparative prospective controlled studies are needed to reach agreement on an accepted treatment concept. Factors such as the type and location of implants placed, quality and quantity of bone, and type of superstructure should be part of these studies. In evaluating implant location for implant-retained overdentures, it is important to consider the biomechanics of how the prosthesis functions. Previously considered in relation to removable partial denture design, Avant described the effect of indirect retainers upon the mechanical advantage of a distal extension base. The indirect retainer acts as the fulcrum, the direct retainer assembly acts as the resistance, and the power is the force that lifts the denture base away from the ridge. Avant described methods of lowering the mechanical advantage of the lever in order to keep the denture base from lifting away from the ridge. Determination of mechanical advantage is performed by measuring the ratio of the power arm to the resistance arm. When considering antero-posterior movement such as a dislodging force would provide, an implant overdenture may function as a class I, II or III lever. Fig. Components of a Class I, II and III lever system with the implant and attachment serving as the resistance / fulcrum point. Assuming the example of an implant-retained overdenture prosthesis that is intimately fitting the soft tissue support, the fulcrum is the anterior alveolar ridge, the resistance is the attachment system, and the power is the posterior dislodging force lifting the denture base away from the ridge. Analyzing an example where implant location is anterior, such as in the incisor region, figure (A) illustrates a class I lever system. The fulcrum and resistance point would be coincident, thus making for a short resistance arm. Moving implant location distally, such as in the 1st premolar location, as shown in figure (B), the resistance arm is substantially lengthened compared to that shown in figure 16 (A). This change would also modify the lever system to a class II. Fig. Components of a Class I, II lever system with the anterior residual alveolar ridge as the fulcrum point, implant and attachment serving as the resistance and power is the posterior dislodging force. The power required to exact a similar dislodging force would be much higher in example (B) due to the reduction in mechanical advantage by lengthening the resistance arm. This mechanical illustration may help explain the results of this study. As seen in the analysis of the antero-posterior dislodging force test, significantly higher forces were required to dislodge the prosthesis when implants were located distally on the test model.



**Summary and Conclusion:-**

The aim of this study was to evaluate the effect of implant location and different implant attachments on the retention and stability of implant-supported overdentures by measuring retentive forces during vertical, oblique and horizontal types of dislodgment forces.

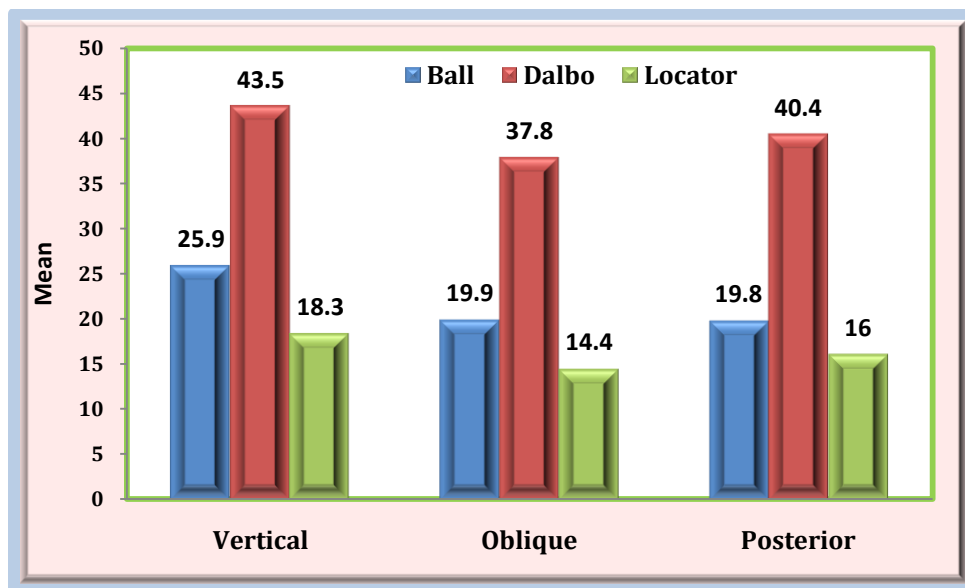
The results of statistical analysis obtained in this study using SPSS software. Within the limitations of this in vitro laboratory study, the following conclusions were made.

The interactions between attachment system, direction of force, and implant location were statistically significant ( $p < 0.005$ ).

1. Vertical retention increased as implant location was placed at canine and premolar location.
2. Antero-posterior stability and horizontal stability of a simulated overdenture prosthesis increased with distal implant location up to canine and premolar location.
3. Attachment type affects retention and stability differently by location

**Table 1:-** Comparison of Mean values and standard deviation of 3 attachment systems in vertical, oblique and anteroposterior direction among Group A in Newtons

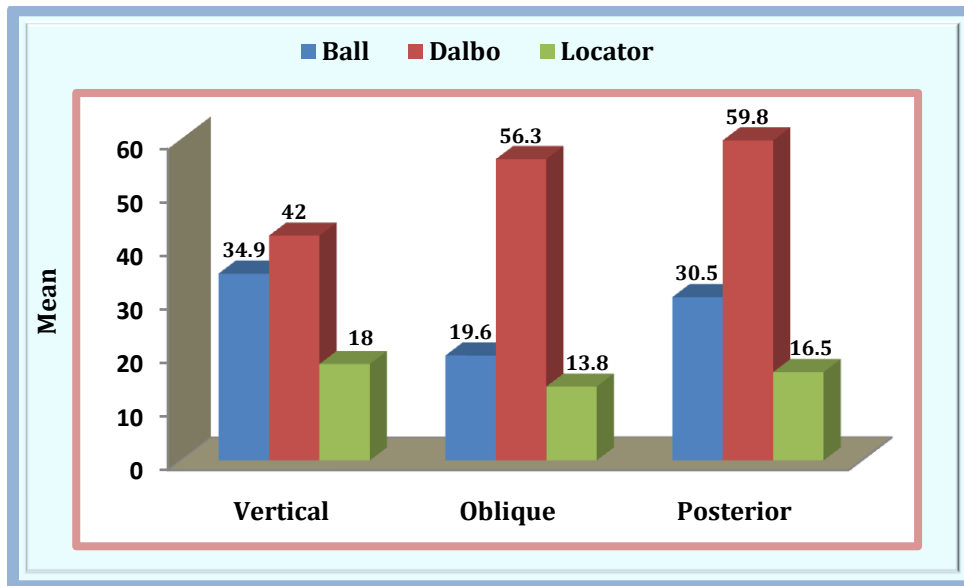
Group-A	Vertical				Oblique				Posterior			
	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD
Ball	24.3	27.3	25.9	1.5	18.7	21.7	19.9	1.6	18.5	20.8	19.8	1.2
Dalbo	42.5	44.6	43.5	1.1	36.9	38.3	37.8	0.8	38.8	42.3	40.4	1.8
Locator	15.2	21.3	18.3	3.1	12.2	17.4	14.4	2.7	13.5	19.3	16.0	3.0
B vs D vs L	0.03				0.03				0.04			
B vs D	0.05				0.05				0.05			
B vs L	0.05				0.05				0.13			
D vs L	0.05				0.05				0.05			



**Diagram 1:-** Mean Comparison of 3 attachment systems in vertical, oblique and anteroposterior direction among Group A.

**Table 2:-** Comparison of Mean values and standard deviation of 3attachment systems in vertical, oblique and anteroposterior direction among Group B in Newtons

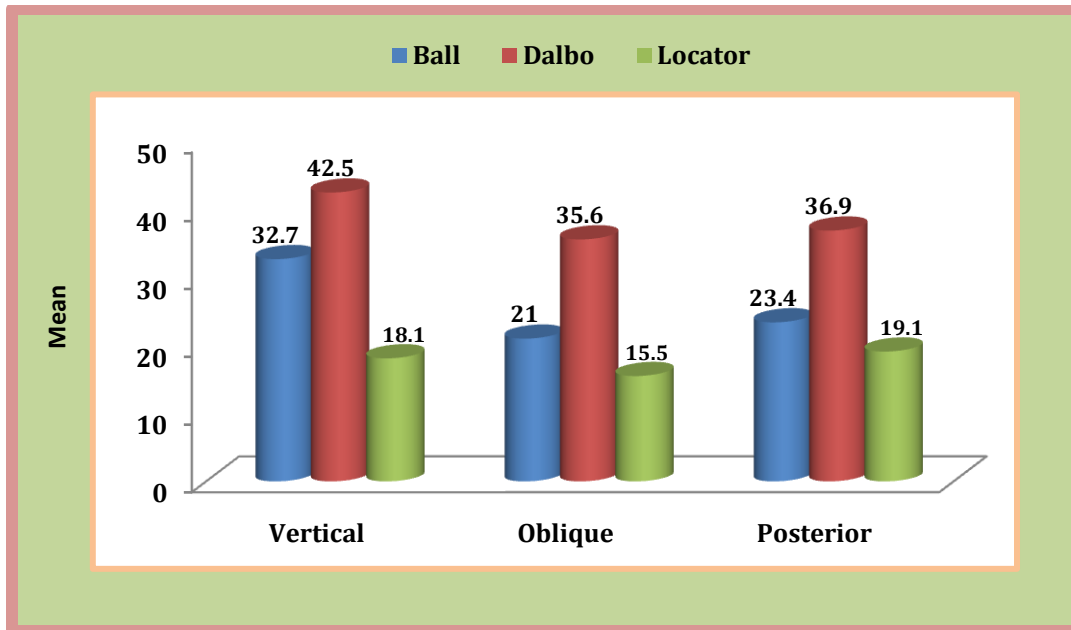
Group-B	Vertical				Oblique				Posterior			
	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD
Ball	33.1	37.3	34.9	2.2	16.8	22.3	19.6	2.7	27.6	34.2	30.5	3.4
Dalbo	40.2	44.3	42.0	2.0	53.3	59.7	56.3	3.2	57.4	62.2	59.8	2.4
Locator	14.4	22.5	18.0	4.2	11.8	17.7	13.8	3.3	14.0	20.7	16.5	3.7
B vs D vs L	0.03				0.04				0.03			
B vs D	0.05				0.05				0.05			
B vs L	0.05				0.13				0.05			
D vs L	0.05				0.05				0.05			



**Diagram 2:-** Mean Comparison of 3attachment systems in vertical, oblique and anteroposterior direction among Group B.

**Table 3:-** Comparison of Mean values and standard deviation of 3attachment systems in vertical, oblique and anteroposterior direction among Group C in Newtons

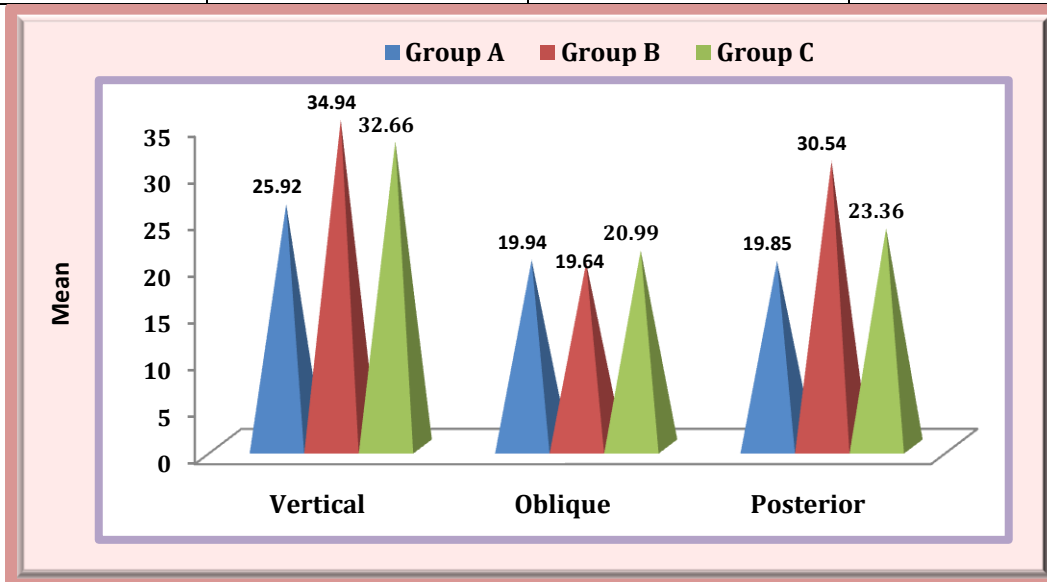
Group-c	Vertical				Oblique				Posterior			
	Min	Max	Mean	SD	Min	Max	Mean	SD	Min	Max	Mean	SD
Ball	30.2	35.7	32.7	2.8	19.7	22.3	21.0	1.3	20.3	25.4	23.4	2.7
Dalbo	40.6	43.8	42.5	1.7	32.6	39.4	35.6	3.5	35.5	37.9	36.9	1.3
Locator	15.5	20.9	18.1	2.7	12.5	18.4	15.5	3.0	14.4	22.2	19.1	4.1
B vs D vs L	0.03				0.03				0.05			
B vs D	0.05				0.05				0.05			
B vs L	0.05				0.05				0.28			
D vs L	0.05				0.05				0.05			



**Diagram 3:-** Mean Comparison of 3 attachment systems in vertical, oblique and anteroposterior direction among Group C.

**Table 4:-** Comparison of Mean values and standard deviation of Ball attachment in vertical, oblique and anteroposterior direction among different groups in Newtons

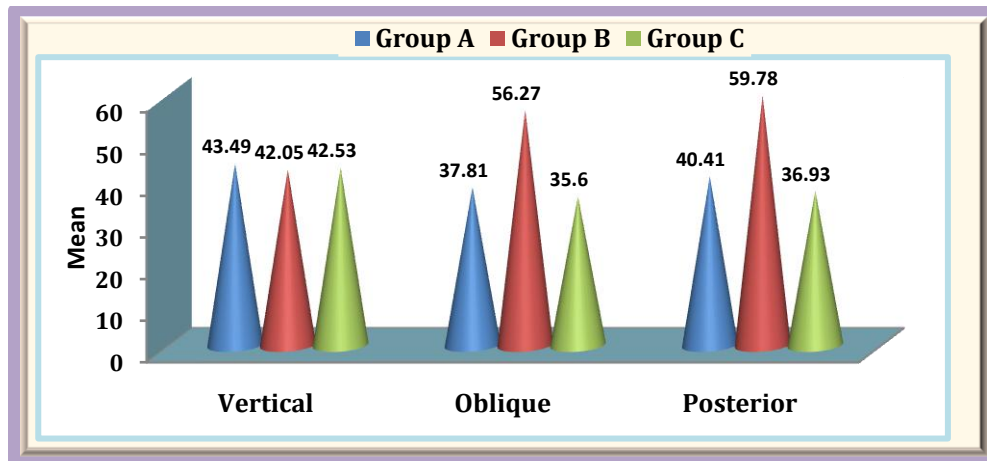
Ball	Vertical		Oblique		Posterior	
	Mean	SD	Mean	SD	Mean	SD
Group A	25.92	1.55	19.94	1.56	19.85	1.16
Group B	34.94	2.16	19.64	2.74	30.54	3.37
Group C	32.66	2.75	20.99	1.34	23.36	2.69
A vs B vs C	0.05		0.56		0.04	
A vs B	0.05		-		0.05	
A vs C	0.05		-		0.13	
B vs C	0.23		-		0.05	



**Diagram 4:-** Mean Comparison of Ball attachment in vertical, oblique and anteroposterior direction among different groups.

**Table 5:-** Comparison of Mean values and standard deviation of Dalbo attachment in vertical, oblique and anteroposterior direction among different groups in Newtons

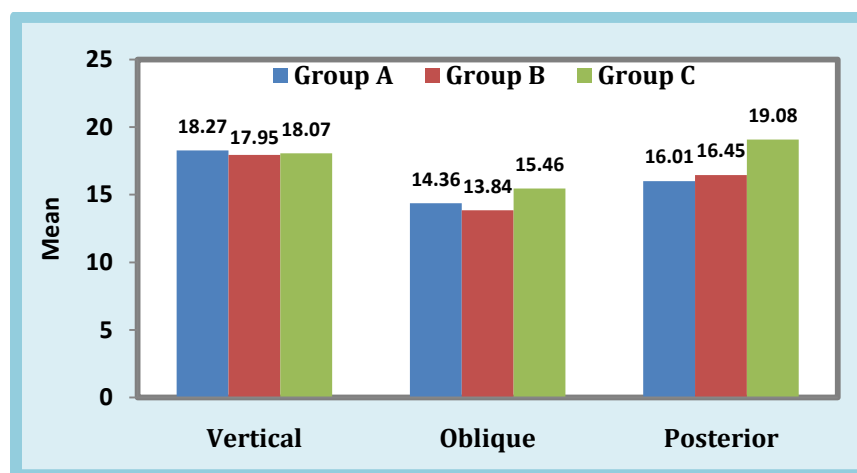
Dalbo	Vertical		Oblique		Posterior	
	Mean	SD	Mean	SD	Mean	SD
Group A	43.49	1.08	37.81	0.82	40.41	1.75
Group B	42.05	2.05	56.27	3.23	59.78	2.36
Group C	42.53	1.73	35.60	3.48	36.93	1.29
A vs B vs C	0.56		0.06		0.03	
A vs B	-		-		0.05	
A vs C	-		-		0.05	
B vs C	-		-		0.05	



**Diagram 5:-** Mean Comparison of Dalbo attachment in vertical, oblique and anteroposterior direction among different groups.

**Table 6:-** Comparison of Mean values and standard deviation of Locator attachment in vertical, oblique and anteroposterior direction among different groups in Newtons

Locator	Vertical		Oblique		Posterior	
	Mean	SD	Mean	SD	Mean	SD
Group A	18.27	3.07	14.36	2.72	16.01	2.98
Group B	17.95	4.18	13.84	3.30	16.45	3.67
Group C	18.07	2.74	15.46	2.99	19.08	4.11
A vs B vs C	0.96		0.49		0.56	



**Diagram 6:-** Mean Comparison of Locator attachment in vertical, oblique and anteroposterior direction among different groups.

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### RESEARCH ARTICLE

#### A STUDY OF DIFFERENT PHENOTYPIC PRESENTATIONS OF POLYCYSTIC OVARIAN SYNDROME: AN INSTITUTIONAL EXPERIENCE

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 phenotype,oligo/amenorrhea,  
 hyperandrogenism, cardiometabolic risk

#### Abstract

**Background:**Polycystic ovarian syndrome(PCOS) constitutes one of the most common endocrinopathy amongst the reproductive age women.Over the last few decades it has gained a lot of public attention as reflected in various internet sites and newspapers. However, it is a very complex endocrinopathy presenting as a challenge to clinician to make diagnosis and manage appropriately.

**Aims:** To study the different clinical presentations among women with PCOS and to categorise them into different phenotypes.

**Method:** An explorative hospital based study was conducted including 120 women with PCOS, during a two year period between Dec.2014 to Dec.2016. Based on history, clinical examination, hormonal evaluation and ultrasound features, all women were categorized into 4 different phenotypes.

**Results:** Out of 120 women, 29(24.16%)presented with full blown syndrome(severe PCOS), 34(28.33%) had oligo/anovulatory PCOS, 25(20.83%) of them were found to be ovulatory variety and 32(31.17%) belonged to mild PCOS category.

**Conclusion:**PCOS is represents a continuum of symptoms. No single test or clinical feature is sine qua non of the syndrome. This study demonstrates the various phenotypic expressions of PCOS and it can be viewed as a lifelong disorder with progression from mild to severe variety later on in life. Approach to each patient should be tailor made.

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#### Introduction:-

PCOS is an enigmatic disorder with heterogenous features and is one of the most common endocrinopathy in the reproductive age group. Heterogeneity of the disease was evident from the very first description by Stein and Leventhal. Among the 7 women described in the original report, a variety of clinical symptoms were observed such as obesity, amenorrhoea, acne,hirsutism and all of them were associated with bilateral enlarged polycystic ovaries. These varying degree of presentation in each case emphasise the phenotypic variability of PCOS and, explains the very fact why it is called syndrome and why not a disease<sup>1</sup>.

A cluster of symptoms define a syndrome, a common etiologic factor cannot be used to explain the varied clinical presentations. In almost every tissue the hormone acts, but at a different rate, which depends on the receptor function

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and post receptor signaling pathways, which accounts to variety of clinical presentations observed in hormonal disorders. This fact becomes further complicated in PCOS wherein more than one hormone is modified. Women with PCOS manifest with hypothalamic-pituitary-ovarian axis aberrations, hyperinsulinemia, hyperandrogenism, as well as adipose tissue dysfunctional adipokine secretion, all of which interact in different tissues (muscle, fat, liver and ovaries), thus leading to a variety of phenotypic presentations<sup>1,3</sup>.

The Rotterdam criteria used to diagnose PCOS requires the presence of atleast 2 of the features: oligo/anovulation, clinical / biochemical hyperandrogenism and ultrasound appearance of polycystic ovarian morphology. In 2006, the Androgen Excess Society (AES) pointed out that PCOS is basically anhyperandrogenic disorder and hence demonstration of acne, hirsutism and /or biochemical hyper-androgenism becomes a sine qua non of PCOS diagnosis. The second criteria required for the diagnosis of PCOS according to AES is either oligo/anovulation or polycystic ovarian morphology<sup>2,5</sup>.

The introduction of different phenotypes based on Rotterdam criteria makes PCOS represent a continuum of symptoms. PCOS may start gradually as a hyperandrogenic disorder and then lead on to anovulation or vice versa.

#### **Aim of the study:-**

To study the different clinical presentations among women with PCOS and to categorise them into different phenotypes.

#### **Objectives of the Study:-**

1. To study the most common clinical features among women with PCOS.
2. To categorise them into different phenotypes.
3. To evaluate all women with PCOS for hormonal imbalances.
4. To study the ultrasound morphology in all women suspected of PCOS.

#### **Methods:-**

**Type of study:** A hospital based explorative study.

**Place of study:** All women attending gynecology out-patient department at SS Institute of Medical Sciences and Research Centre with the complaints of menstrual irregularities, infertility and features of hyperandrogenism.

**Duration of study:** For 2 years between December 2014 to December 2016

**Sample size:** A total of 120 patients were recruited during the study period after taking informed consent.

**Inclusion criteria:** Those women who were diagnosed with PCOS according to the Rotterdam criteria were recruited irrespective of the age.

**Exclusion criteria:** Those women with non- ovarian causes of hyperandrogenism and infertility were excluded.

**Study procedure:** In OPD, a detailed history was taken. History was noted with respect cyclicity of menses, duration of menses and history of amenorrhea was noted. History suggestive of hypothyroidism (excessive weight gain, menstrual irregularities, menorrhagia) hyperprolactinemia (scanty menses, amenorrhea, premenstrual spotting, secretions from breast) were elicited.

General physical examination was done to note the height, weight and BMI. Clinical signs of hyperandrogenism like acne, hirsutism were noted. Signs of hyperinsulinemia such as acanthosis nigricans was looked for.

Ultrasound evaluation was done in relevant patients and polycystic ovarian morphology was diagnosed when 12 or more follicles were visualized measuring 2 to 9 mm or when the ovarian volume bigger than 10 ccm<sup>4</sup>.

Routine blood investigations such as complete hemogram, random blood sugar and urine routine examination were done. Hormonal evaluation comprising of serum thyroid stimulating hormone, s.prolactin, serum FSH, serum LH, serum Testosterone was done.

For women who wished to conceive, serial follicular monitoring was done to document the presence of absence of ovulation. Those women with anovulation were subjected for ovulation induction according to the institution protocols.

### Results:-

Out of 120 women who were recruited for the study, 18 were adolescents and 102 women were more than 20 years of age. Adolescents were studied separately owing to diagnostic difficulties.

Among the adolescent girls, the most common presenting symptom was menstrual irregularity. Out of 18 girls, 9(50%) of them presented with amenorrhea, 6 (33.33%) presented with oligomenorrhea, 3(16.6%) presented with regular cycles. All of them were unmarried. On estimation of BMI among adolescent girls, 8(44.4%) were overweight, 4(22.2%) were obese and 6 (33.3%) were of normal BMI. All of them were subjected to trans-abdominal sonography and 13(72%) had polycystic ovarian morphology and for documenting ovulation to categorize into different phenotypes, follicular monitoring was done and only 3(16.6%) demonstrated ovulation. Hormonal estimation revealed mildly raised serum testosterone (>80 but <200 ng/ml) in 8(44.4%) girls. Serum TSH was raised in 3(16.6%) girls and serum prolactin was raised in 1(5.5%) girl who were subsequently treated with appropriate medications. Serum LH was raised in 10(55.5%) girls.

Among the women aged more than 20 years, 75(73.5%) belonged to the age group 20-30 years and 27(26.47%) belonged to the age group 30-40 years. 89(87.2%) were married and 13(12.74%) were unmarried. Out of them, the most common complaint among them was oligomenorrhea(70.58%) and infertility(83.3%). Out of 102 women aged above 20 yrs, 72(70.58%) complained of oligomenorrhea, 16(15.23%) complained of amenorrhea, 14(13.72%) had regular cycles. 74(72.54%) of them presented with signs of hyperandrogenism (acne, hirsutism). On estimation of BMI, 65(63.72%) were found to be overweight, 15(14.7%) were obese and 22(21.56%) had normal BMI. On performing ultrasound (trans-abdominal was preferred by unmarried women and transvaginal ultrasound was done in married women) on all 102 women, 82(80.39%) demonstrated polycystic ovarian morphology and 20(19.6%) demonstrated normal ovarian morphology. Hormonal estimation revealed raised serum LH in 78(76.47%) women, serum testosterone was mildly raised in 62(60.78%) women.

Serial follicular monitoring was done in all women with PCOS to document the presence or absence of ovulation. Out of 120, ovulation was documented in 22 (21.56%) of them.

After collecting and analyzing the data, all adolescents and women were assessed for 3 features of PCOS namely, presence of oligo/anovulation, clinical /biochemical evidence of hyperandrogenism and ultrasound appearance of PCOM. The classification of phenotypes was done accordingly, as demonstrated in Table 1:

**Table 1:-** Categorization of PCOS phenotype according to the mode of presentation:

PCOS phenotype	Oligo/anovulation	Clinical/biochemical hyperandrogenism	PCOM on USG	n=120
1. Severe PCOS	+	+	+	29(24.16%)
2. Oligo/anovulatory PCOS	+	+	-	34(28.33%)
3. Ovulatory PCOS	-	+	+	25(20.83%)
4. Mild PCOS	+	-	+	32(31.37%)

### Discussion:-

Over the last few decades, various diagnostic criteria have been put up in search of ideal diagnostic approach. The following table 2 depicts the array of various definitions available in the literature:

**Table 2:-** Definitions and diagnostic criteria for PCOS:<sup>1,2,7</sup>

Definition/ year	Diagnostic criteria
NIH/ 1990	Requires the simultaneous presence of: 1. Clinical and /or biochemical hyperandrogenism 2. Ovarian dysfunction
ROTTERDHAM(ESHRE/ASRM) / 2003	Requires the presence of at least 2 criteria: 1. Clinical and /or biochemical hyperandrogenism



	<ol style="list-style-type: none"> <li>2. Ovulatory dysfunction</li> <li>3. Polycystic ovarian morphology</li> </ol>
AES/2006	Requires the presence of hyperandrogenism (clinical and / or biochemical) and either: <ol style="list-style-type: none"> <li>1. Ovulatory dysfunction</li> <li>2. Polycystic ovarian morphology</li> </ol>
Androgen Excess and PCOS Society/ 2009	Requires the simultaneous presence of: <ol style="list-style-type: none"> <li>1. Clinical and /or biochemical hyperandrogenism</li> <li>2. Ovarian dysfunction (ovulatory dysfunction and /or polycystic ovarian morphology)</li> </ol>

ESHRE=European Society of Human Reproduction and Embryology, ASRM= American Society for Reproductive Medicine, AES= Androgen Excess Society

It is important to state here that although various diagnostic criteria are available for the diagnosis of PCOS, other disorders ( Non Classical Congenital Adrenal Hyperplasia, Cushing's syndrome, acromegaly, hypothyroidism, hyperprolactinemia, virilising adrenal or ovarian neoplasm, premature ovarian failure ) which have overlapping clinical features needs to be excluded<sup>8</sup>.

The ultrasound definition of polycystic ovarian morphology is the presence of  $\geq 12$  follicles with a 2-to 9- mm diameter on the ovary. Ovarian volume of  $>10$  ml is also suggestive. One ovary consistent with polycystic ovarian morphology is sufficient for the diagnosis<sup>4</sup>. Although various studies have shown that polycystic ovarian morphology may also be found in 20-30% of normally ovulating women.

Four different phenotypes of PCOS have now been identified using the possible combinations of these criteria<sup>9,10</sup>:

- Type A: hyperandrogenism, chronic anovulation and polycystic ovaries.
- Type B: hyperandrogenism and chronic anovulation.
- Type C: hyperandrogenism and polycystic ovaries.
- Type D: chronic anovulation and polycystic ovaries

No single test is considered gold standard for the diagnosis of polycystic ovarian syndrome. A multimodality approach is required to diagnose the syndrome of polycystic ovaries.

The diagnosis of PCOS is all the more challenging in adolescent girls owing to menstrual irregularity due to anovulation which is commonly observed for few years after the onset of menarche. A high index of suspicion needs to be maintained when an adolescent persists to have menstrual irregularity for more than two years after menarche. With respect to features of hyperandrogenism in adolescents, slight acne and hirsutism is an anticipated problem because of transient functional hyperandrogenism and hence it is not of clinical significance. Hence, the combination of ultrasound and androgen evaluation will help to arrive at the diagnosis in an adolescent<sup>6</sup>.

Analysis of the study done reveals that PCOS can manifest with spectrum of symptoms, with the commonest among all age group being menstrual irregularity presenting as oligomenorrhea. Further, infertility is commonly seen among the reproductive age group women owing to anovulation. Hyperandrogenism is considered as the cardinal feature by AES criteria and it was demonstrated in women in our study. An ultrasound demonstration of polycystic ovarian morphology was seen in 99 (82.5%) women. An ultrasound appearance of PCOM is the result of chronic anovulation, one of the chief causes being PCOS. Other causes of chronic anovulation also need to be excluded at this point.

The variability of presentation of women with PCOS, with some of them having full blown syndrome (severe PCOS) to others having only 2 of the 3 features point towards the fact that PCOS is a continuum of symptoms. Women with mild or ovulatory PCOS can later on in life progress to develop severe PCOS<sup>11</sup>. A tailor made approach is required towards the diagnosis and management of different phenotypes. Adolescents who present with menstrual irregularity can be managed with oral contraceptives and those who come with acne can be managed with oral contraceptives with or without antiandrogens<sup>12</sup>. Women presenting with infertility as chief complaint benefit from weight reduction and metformin which are known to improve the insulin sensitivity and ovulation induction can be done with

clomiphene citrate or recombinant FSH. Laparoscopic ovarian drilling may be resorted to in women not responding to ovulation induction drugs.

PCOS is known to be associated with significant cardiometabolic risk like dyslipidemia, hyperglycemia, later on in life. Hence, a clinician should not only address the problem the woman seeks but also advise a woman with PCOS to embrace a healthy lifestyle, healthy eating habits and regular exercise to counter the long term effects of this metabolic syndrome<sup>13,14</sup>.

### Conclusion:-

PCOS is a heterogeneous collection of signs and symptoms, which form a spectrum of disorder, with mild variety seen in some women and full blown disorder seen in others. PCOS is viewed as a lifelong disorder with the syndrome progressing from mild to severe variety later on in life.

No single test forms the gold standard diagnostic test in the diagnosis of PCOS. PCOS is a syndrome and it is a diagnosis of exclusion. Hence, other endocrinopathies such as Non Classical Congenital Adrenal Hyperplasia, Cushing's syndrome, acromegaly, hyperprolactinemia, hypothyroidism, premature ovarian failure, virilizing adrenal or ovarian tumor needs to be excluded.

A tailor made approach needs to be under-taken in the management of women presenting with PCOS. Since PCOS is associated with significant cardiometabolic risk in later life, all these women need to be advised to embrace healthy lifestyle, healthy nutritional habits and regular exercise.

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### RESEARCH ARTICLE

#### COMPARATIVE STUDY FOR THE ASSESSMENT OF TISSUE ENGINEERED OSTEOCHONDRAL GRAFT VERSUS AUTOGENOUS GRAFT IN CRITICAL SIZE DEFECT: AN EXPERIMENTAL STUDY ON THE TEMPOROMANDIBULAR JOINT OF DOGS.

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##### Key words:-

Tissue engineering, osteochondral graft, Biphasic scaffold, autogenous graft, TMJ reconstruction.

#### Abstract

This study was performed to demonstrate the ability of mesenchymal stem cells using biphasic scaffolds, to produce osteochondral graft, assess its function, and compare it with autogenous grafting of condylar defects. Eighteen male adult mongrel dogs ranging from 12-15 kg in weight were selected for this study and were randomly divided into two equal groups: Group A: Tissue engineering procedure was performed in 2 stages, Stage 1: Aspiration of bone marrow samples from the canine subjects was performed, Stage 2: In vitro isolation, expansion, differentiation and characterization of Mesenchyme Stem Cells was performed, followed by implantation of the tissue engineered graft. Group B: autogenous bone grafting was performed. After 16 weeks from implantation of the grafts in the created condylar defects, the dogs were sacrificed, and bone samples were prepared for histological assessment and follow up. Microscopic and histochemical analysis revealed well-formed tissue-engineered osteochondral graft in the test group (Group A), versus very limited cartilage regeneration in the control group (Group B). Moreover, Radiographic evaluation was performed immediately post-operatively, 6 weeks, 12 weeks, and 16 weeks postoperatively. Based on our findings, we concluded that the replacement of TMJ bone and cartilage with tissue-engineered osteochondral graft was superior to autogenous bone graft at the same step.

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#### Introduction:-

Temporomandibular joint (TMJ) is a complex system that is regularly subjected to trauma, metabolic and inflammatory processes (Scheller, et.al. 2009). It is one of the most difficult tissues to treat due to the limited blood

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supply and hence limited capacity for self-repair. The biological basis of TMJ problems is the deterioration of articular cartilage, which covers the bone at the joint surface and performs many complex functions (Sherwooda, et.al. 2002). The articular cartilage of TMJ has a surface layer of fibro-cartilaginous and deep layer of hyaline-like hypertrophic zone with a thin intermediate proliferative zone (Atkinson and Haut 2001). Thus it has unique properties, such as viscoelastic deformation, that allow it to absorb shock, distribute loads, and facilitate stable motion (Mao, et.al. 1992). Therefore, Osteochondral defect repair is a challenging problem in the field of oral and maxillofacial surgery (Hunziker 1999, Grande, et.al. 1999).

Tissue engineering provides a new era for therapeutic medicine; it is progressing very rapidly and extends to involve all tissues in our body. Engineering the osteochondral interface with its complex structure and its cartilaginous component with its zones of different structures and organization is very challenging (Wojciech, et.al. 2014).

Tissue engineering approaches have the potential to overcome the lack of donor tissue and create TMJ replacement that is both biologically and mechanically functional (Schek, et.al. 2005, Hu, et.al. 2003, Tanaka, et.al. 2006). The standard approach of tissue engineering is to seed cells on a three-dimensional (3D) biomaterial scaffold. The scaffold is designed to create a 3D environment that promotes tissue development of cells that are placed on or within the scaffold. Gene vectors, soluble factors, and chemical signals may be incorporated into the scaffold to help promote tissue development during in vitro incubation or in vivo implantation (Elisseff, et.al. 2005).

Since bone and cartilage require different competing conditions for their regeneration, growing a biphasic osteochondral construct in vitro containing a cartilage region and a bone-appropriate region to guide the growth of these two different tissues into a single implant is therefore very difficult (Scheafer, et.al. 2000, Jill, et.al. 2002). The Biphasic scaffolds have been studied for osteochondral regeneration, and it was reported that they could support cell growth and differentiation into bone and cartilage (Kreklau, et.al. 1999, Schaefer, et.al. 2002, Gao, et.al. 2001). Furthermore, numerous studies reported the successful use of tissue engineered osteochondral implants using biphasic scaffolds in the repair of TMJ defects (Weng, et.al. 2001, Chen, et.al. 2001, Schek, et.al. 2005).

However, to date few studies have attempted to produce a tissue engineered osteochondral graft, and assess its function compared to autogenous grafting. Therefore, the objective of this study was to demonstrate the ability of mesenchymal stem cells seeded in biphasic scaffolds, to produce osteochondral graft, assess its function, and compare it with autogenous grafting of condylar defects.

## **Materials & Methods:-**

**Ethics statement.** This study was approved by CU-IACUC, (approval number CU II S 17 16). Eighteen male adult mongrel dogs ranging from 12-15 kg in weight were selected for this study. All animals to be included were examined to be sure that they were free from any disease. The animals were hosted and quarantined in separate cages for one week prior to the surgery to become acclimatized to housing and diet. Then the animals were randomly divided into two equal groups: Group A: for tissue engineering procedure and group B: for autogenous bone grafting.

### **Group A (Tissue engineering):-**

Preparation of the engineered tissue involved 2 stages. Stage 1: in which aspiration of bone marrow samples from the canine subjects was performed, Stage 2: in which in vitro isolation, expansion, differentiation and characterization of MSCs from canine bone marrow samples was performed.

#### **Stage one: Bone marrow collection:-**

Under general anesthesia and strict aseptic conditions the head of each canine's tibia was palpated carefully for the detection of the tibia tuberosity followed by introduction of special biopsy needle (aspirating needle) for about 1.5 cm depth. Bone marrow samples were aspirated in 20-ml syringe containing 2 ml heparin (preservative free, 400 units per ml).

#### **Stage two: Tissue collection and engineering:-**

According to the departmental standard operating procedures (SOP), strict aseptic conditions were followed throughout this study. The bone-marrow samples were flushed by means of an 18-gauge needle and 10-mL syringe loaded with Dulbecco's Modified Eagle's Medium-Low Glucose (DMEMLG; Sigma, St. Louis, MO, USA) supplemented with 10% fetal bovine serum (FBS) (Biocell, Rancho Dominguez, CA, USA) and 1% antibiotic-antimitotic (Gibco, Carlsbad, CA, USA). Marrow samples were mechanically disrupted by passage through 16-, 18-,

and 20-gauge needles. Marrow cells were centrifuged, suspended in serum-supplemented medium, counted, plated at  $5 \times 10^7$  cells/100-mm culture dish, and incubated for two weeks in 95% air/5% CO<sub>2</sub> at 37°C, with fresh medium change every 3-4 days. Upon reaching 80-90% confluence, primary MSCs were trypsinized, counted, and passaged at a density  $5-7 \times 10^5$  cells/100- mm culture plate.

#### **Treatment of MSCs with Chondrogenic and Osteogenic Differentiation Factors:**

The same population of first-passage MSCs was treated separately with chondrogenic or osteogenic specially formulated medium. The chondrogenic medium was supplemented with DMEM-LG, 10%FBS, BMP-7, insulin like growth factor-1, antibiotic, dexamethasone, ascorbic acid, whereas the osteogenic medium contained 100 nM dexamethasone, 10 mM  $\beta$ -glycerophosphate, and 0.05 mM ascorbic acid-2-phosphate. Cultures were incubated for 1 week in 95% air/5% CO<sub>2</sub> at 37°C, with fresh medium change every 3-4 days.

#### **Histochemical staining of subcultures**

Histochemical staining was performed for subculture in osteogenic medium at days 7, 14, 21 and 30 to detect expression of alkaline phosphatase enzyme. Moreover, Von kossa staining was performed at 7, 14, 21 and 30 days of subculture, to detect extra cellular matrix mineralization (ECM) in osteogenic medium. Furthermore, Safranin-O staining was performed at day 30 of subculture to detect proteoglycans and glycosaminoglycan found in chondrocytes (in chondrogenic medium). All stained cultures were inspected by the naked eye and under the inverted phase contrast microscope.

#### **Cells seeding onto the Biphasic-scaffold:-**

The Biphasic-scaffold (composed of porous silica calcium phosphate (SCPC) color coded discs) was sterilized, and seeded by most of the trypsinized cells after four weeks of osteogenic and chondrogenic differentiation.

#### **Group B (autogenous bone grafting):-**

After subjection of each canine to general anesthesia, an extra-oral incision and flap reflection was performed. Autogenous graft was harvested from the buccal cortical plate of the body of the mandible using trephine bur (0.5 cm diameter) at a low speed under copious irrigation with saline.

#### **Implantation of the engineered osteochondral tissue/ autogenous graft:-**

After subjection of each canine to general anesthesia, Under copious irrigation with saline and using trephine bur (0.5 cm diameter) at a low speed, a cylindrical bony defect was done at the condylar head having the same length and width of the engineered osteochondral tissue at the scaffold in group A, and the harvested autogenous graft in group B. The biphasic scaffolds seeded with differentiated cells and the autogenous bone grafts were implanted inside the surgical defects. The wound was closed in layers (Fig 1A and 1B).



**Fig 1:** (A) Clinical picture of the surgically created defect at the canine's condylar head. (B) Biphasic scaffold seeded with BM-MSCs after its placement at the created condylar defect. (group A)

The dogs were euthanized (sacrificed) after 16 weeks from implantation using hyper dosage of Thiopental Sodium 10% injected directly through the cannulated cephalic vein. The bilateral condylar bones with overlying capsules were freed in each dog by surgical dissection, examined grossly and bisected vertically by electrical saw. The bones were de-mineralized for one week in a mixture of formic acid and hydrochloric acid solution. Samples were then fixed for 24 hours in 10% neutral buffered formalin, then processed and paraffin-embedded in a standard manner.



### Assessment of the implanted osteochondral tissue/autogenous graft:-

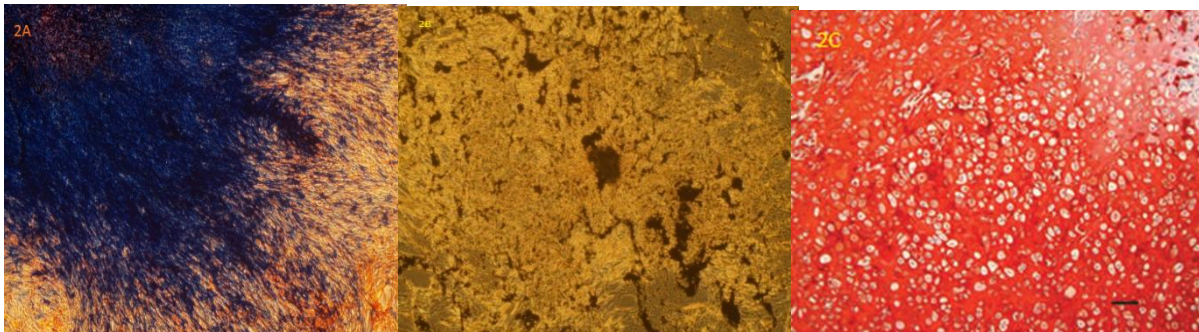
Radiographic follow up was performed using lateral oblique contact film immediate post-operatively, 6 weeks, 12 weeks, and 16 weeks postoperatively.

While Histological assessment and follow up were performed using Hematoxylin and Eosin (H&E) stain, Tartrate resistant acid-phosphatase (TRAP) special stain, Goldner's Masson Trichome special stain, and Toluidine blue staining.

### Results:-

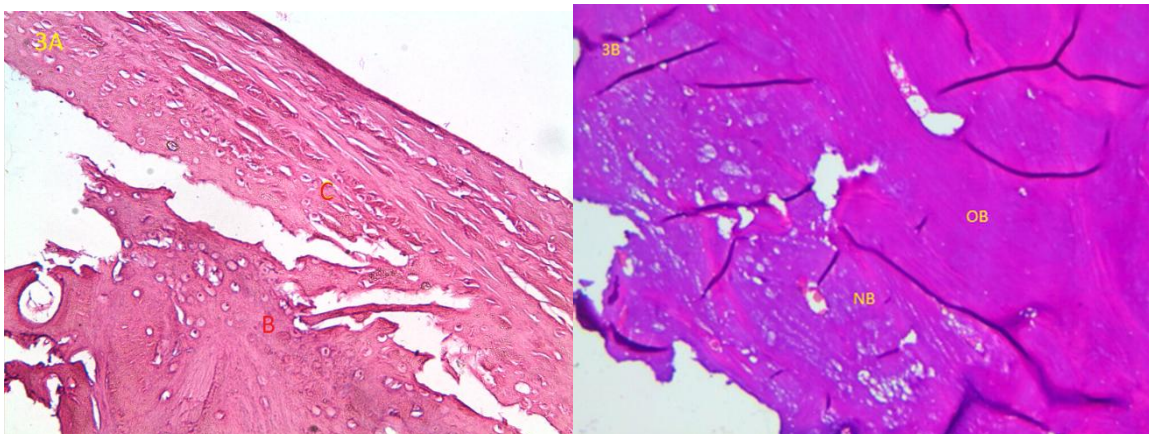
#### Histologic Evaluation:-

Bone marrow-derived MSCs in monolayer culture incubated for 4 weeks in osteogenic and chondrogenic medium reacted positively to alkaline phosphatase and Von Kossa silver stain indicating their osteogenic phenotype and mineral deposition respectively (Fig. 2A and 2B). Also they exhibited positive reaction to safranin O indicating their chondrogenic phenotype (Fig.2C).



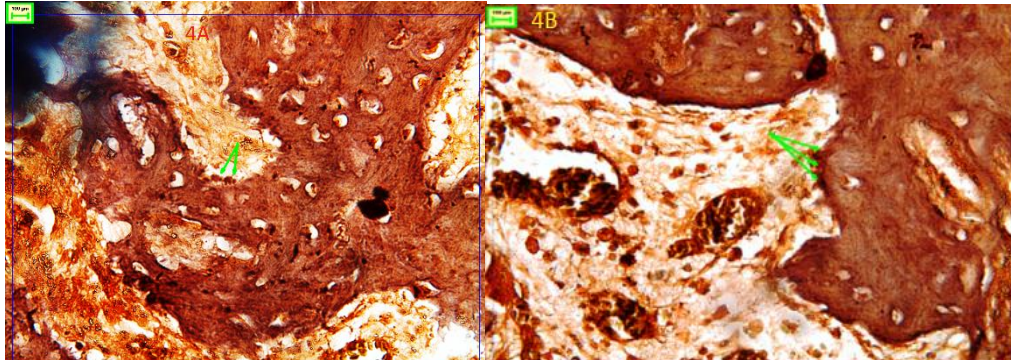
**Fig. (2):** (A) BM-MSCs subjected to osteogenic differentiation showing +ve reaction to alkaline phosphatase histochemical staining (blue spots). (B) BM-MSCs subjected to osteogenic differentiation showing +ve reaction to Von Kossahistochemical staining (black spots). (C) BM-MSCs subjected to chondrogenic differentiation, showing positive reaction of their extra cellular matrix to Safranin O histochemical stain (red-orange stain)

Regarding the histological evaluation of the osteochondral defect repair, in group (A) the H&E stained sections from de-mineralized engineered condylar bones revealed repair of the defect by formation of an upper layer of well-formed cartilage in 100% of cases overlying mature osteogenic layer in 100% of cases (Fig.3A). While in group (B) H&E stained sections from de-mineralized grafted condylar bones revealed repair of the defect by formation of an upper layer of well-formed cartilage in 10% of cases overlying mature osteogenic layer in 100% of cases (Fig.3B).



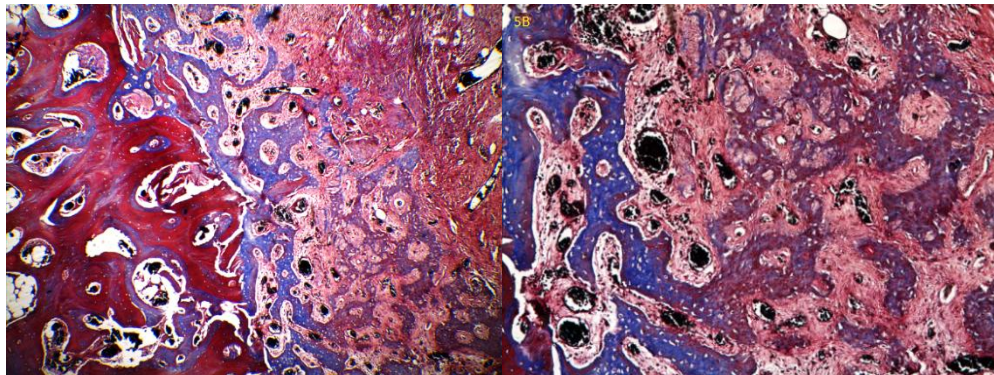
**Fig. (3):** (A) H&E stained section at the biphasic/cell composite site showing the formation of well-formed cartilage layer overlying mature osteogenic layer. (B) H&E stained section at the autogenous graft site showing borders of the bony defect old bone (OB), trabeculae of new bone (NB)

TRAP special stain was used for the detection of osteoclasts and osteoblasts in the osteogenic layer of the engineered and grafted condylar bones. In both groups (A&B) Osteoblasts and osteoclasts were strongly positive to TRAP special stain at the osteogenic layer. This was illustrated by the presence of small orange-brown spots denoting the osteoblasts and large orange-brown spots denoting the osteoclasts in their Howship's lacunae (Fig. 4A and 4B).



**Fig. (4) :**(A) strong TRAP positive expression by osteoclasts present in their Howship's lacunae(arrow)in group A.(B) strong TRAP positive expression by osteoclasts present in their Howship's lacunae(arrow) in group B.

The use of Goldner's Masson Trichrome stain in both groups (A&B) demonstrated clear differentiation between mineralized mature bone that stained blue or green and un-mineralized new immature bone that stained red. It also provided excellent highlighting of bone-forming cells or osteoblasts (red-orange) lining trabeculae of immature bone (Fig.5A and 5B).



**Fig. (5) :**(A) Goldner's Masson Trichrome staining section exhibiting the presence of newly formed woven bone taking the light red stain, underlined with old mature bone taking a blue stain in group A. (B) Goldner's Masson Trichrome staining section exhibiting the presence of newly formed woven bone taking the light red stain, underlined with old mature bone taking a blue stain in group B.

In group (A) the Presence of chondrocytes, which reacted positively with the Toluidine blue stain by taking the blue color, was detected in all of the experiments, as shown in figure (Fig.6A). While in group (B) Presence of chondrocytes, was detected only in 10% of the experiments (Fig. 6B).



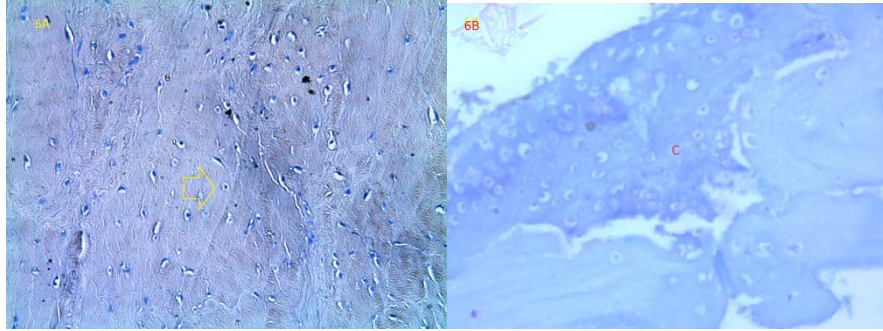
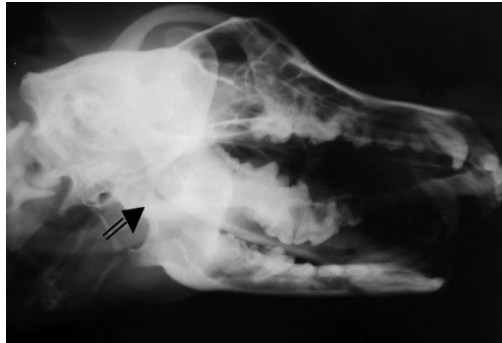


Fig. (6): (A) Toluidine blue special stain sections in the chondrogenic layer of the engineered osteochondral graft, showing the presence of chondrocytes (arrow) in the engineered cartilaginous layer.(B)Toluidine blue stained sections of the autogenous graft condyle showing areas of cartilage (C)

#### **Radiographic evaluation:-**

The radiographic follow up of (group A) showed increase in the radio-opacity at the implanted defect site packed with the seeded biphasic scaffold, accompanied with disappearance of the radiolucent rim separating between the seeded biphasic scaffold and the normal surrounding bone denoting de novo bone and cartilage formation at the defect site (Fig.7). As for (group B) radiographs showed complete integration between the autogenous graft and the normal condylar bone (Fig. 8)



**Fig. (7):** A lateral oblique radiographic picture showing total remodeling of the condyle (arrow), with difficulty to distinguish between the newly regenerated bone and the rest of the condyle.



**Fig. (8):** A lateral oblique radiographic picture showing total integration between the autogenous graft and the normal condylar bone.

#### **Discussion:-**

Temporomandibular joint (TMJ) is one of the most difficult tissues to treat due to the limited blood supply and hence limited capacity for self-repair. Since bone and cartilage require different competing conditions for their regeneration, growing a biphasic osteo-chondral construct in vitro is therefore very challenging.

The canine model was selected in this study according to the similarities between human and canine TMJ morphology and composition as proved in some studies(Aeressens, et.al. 1998, Reichert, et.al. 2009). Adult bone marrow was selected as the source of MSCs as these cells possess a multilineage differentiation capability into bone,

cartilage, adipose, tendon and muscle tissue (Ferrari, et.al. 1998, Jones, et.al. 2002). The differentiation of BM-MSCs into chondrogenic cells and osteogenic cells and active syntheses of chondral and osseous matrix in vitro is consistent with some previous work (Goldberg and Caplan 1994, Schaefer, et.al. 2000, Gao, et.al. 2001).

The data of the present study demonstrated that BM-MSCs derived chondrogenic and osteogenic cells continue their phenotypic differentiations in vivo. BM-MSC-derived chondrogenic and osteogenic cells were encapsulated into the SCPC biphasic scaffold with a dimension of 5mm diameter x 5mm height. This result is consistent with the result of (Alhadlaq and Mao 2003) who used a Poly-Ethylene Glycol hydrogel scaffold and encapsulated the BM-MSCs-derived chondrogenic and osteogenic cells into the shape of a human mandibular condyle with a dimension of 11 x 4 x 7 mm. Moreover, (Weng, et.al. 2001) have successfully used mature bovine chondrocytes and osteoblasts seeded on a polymeric scaffold molded into the shape of human mandibular condyle and yielded discrete layers of cartilage and bone. Furthermore, this result is consistent with other studies (Elisseff, et.al. 2000, Poshusta and Anseth 2001, Burdick and Anseth 2002, Halestenberg, et.al. 2002, Martens and Bryant 2003).

In the present study, the improvement in bone and cartilage repair found by the use of rh-BMP7 with the biphasic SCPC scaffold coincide with those of (Herford, et.al. 2002, Krebsbach, et.al. 2000) who used recombinant OP-1/BMP-7 delivered on bone-derived type I collagen scaffolds press-fitted into large focal defects in rabbit models. When implanted in TMJ, the silica calcium phosphate (SCPC) biphasic scaffold with its high porosity enhanced cell colonization and osteochondral formation within the graft material. Thus it may have a strong stimulatory effect on bone and cartilage cell function, and resorbs in harmony with the rate of new bone and cartilage formation. It also showed no signs of inflammation or immunologic rejection into the surrounding tissues.

Regarding the control group, the histologic characteristics of the newly formed bone in defects received autogenous bone grafts was similar to the normal bone formation, and mineralization. This finding agrees with those of (Zhu, et.al. 2006) who reported in a study on goats that the histological characteristics of the neocondyle from autogenous coronoid process were similar to the normal one with fibrous connective tissue covering the head of the neocondyle.

In the current study a mature osteogenic layer in 100% of cases was found due to its cortico-cancellous nature, which causes the new bone to be stiff, and can resist heavier forces. This finding agrees with the finding of several studies (Zhu, et.al. 2006, Liu, et.al. 2010, Zhu, et.al. 2008). Moreover, our study found the formation of an upper layer of well-formed cartilage in 10% of the control group cases overlying mature osteogenic layer which could be interpreted as a kind of tissue response to local mechanical stimulation and/or the periosteum that have exerted its chondrogenic and osteogenic potential. This finding agrees with several studies that reported the occurrence of the fibrocartilage proliferation and the sufficiently organized cartilage at the resected condylar surface after condylectomy (Murnane and Doku 1971, Sprinz 1963, Glanelly, et.al. 1965).

Comparing the 2 groups, this study showed very limited cartilage regeneration in the control group, and well-formed tissue-engineered osteochondral graft in the test group. Thus tissue-engineered osteochondral graft from BM-MSC represents another step toward therapeutic applications of TMJ reconstruction.

### **Conclusion:-**

Based on our finding, we can conclude that the tissue-engineered osteochondral graft was superior in the replacement of the bony and the cartilaginous part of the TMJ at the same step compared to the autogenous bone graft.

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### RESEARCH ARTICLE

#### PREVALENCE OF MISUSE OF TOPICAL CORTICOSTEROIDS AMONG POPULATIONS IN WESTERN REGION OF SAUDI ARABIA.

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##### Key words:-

Topical corticosteroids (TCS), Misuse,  
Non-Prescription Medicines (NPM)  
Western Region, Saudi Arabia

#### Abstract

This cross - sectional study measured the prevalence of misuse and awareness of Western region populations related to topical corticosteroids (TCS) use and its effects. It also compared the variation of level of awareness and use according to gender, age group and level of education. A sample of 458 participants were selected randomly where a well designed validated self study questionnaire was developed for data collection. Collected data was analyzed using SPSS Ver. 20 where both descriptive and analytical analysis was applied. Main findings included that the problem of TCS and its abuse, misuse, and minimum awareness related to adverse effects to topical drugs have been widespread in Saudi Arabia specially at the Western region of the Kingdom. The study recommended to develop a national policy on Non-Prescription Medicines (NPM) and it should be supported to limit self-medication practice among the Saudi population and to increase their awareness relevant to misuse and adverse side effects of topical corticosteroids. Future national studies need to explore the safety and effectiveness of using topical corticosteroids.

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#### Introduction:-

Topical corticosteroids (TCS) are of great value in treating a wide spectrum of dermatological diseases and since the time of its introduction in 1951, a new therapeutic era in dermatology has been emerged (1). The development of super potent corticosteroid in 1974 added more cutaneous diseases to the list of TCS indications. Meanwhile TCS misuse also appeared as a common problem adding a new complication which has been reported by Variety of investigators (2). Chronic misuse of TCS on the face produced a clinical condition which was described by various names, like light sensitive seborrheid, perioral dermatitis (3), rosacea-like dermatitis (4), steroid induced rosacea-like dermatitis (4), Steroid Rosacea (5), and steroid dermatitis resembling Rosacea (6).

Topical corticosteroids (TCS) are perhaps the most widely used agents amongst the therapeutic armamentarium and have been rightly acknowledged as a wonder drug in dermatological therapy (7). They provide immediate subjective and objective relief in symptoms in almost all inflammatory dermatoses thus justifying its rampant use. This usefulness of the drug has become a double edged weapon and made alarming proportion of individuals vulnerable to its abuse leading to serious local adverse effects especially on face (8). Vast sections of society have become victims of this magic drug owing to the craze of beautification leading to a virtual epidemic of acneform eruptions,

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steroid rosacea/steroid dependent facies, telangiectasia, hypertrichosis and premature aged appearance of face. Aim of our study is to make awareness about misuse of TCS.

The adverse effects of TCS tend to occur with prolonged treatment and depend on potency of TS, its vehicle and site of application. The most common include atrophy, striae, rosacea, perioral dermatitis, acne and purpura. Hypertrichosis, pigment alteration, delayed wound healing and exacerbation of skin infections are less frequent (14). Systemic adverse effects from TS have also been described and they are more likely to develop when highly potent TS are used for prolonged periods on thin skin (e.g. face) or on raw/inflamed surfaces (13, 14).

#### Research Objectives:-

- To measure the Prevalence of misuse of topical corticosteroids among populations in western region of Saudi Arabia.
- To assess the level of awareness of Western region populations related to corticosteroids use and its effects.
- To compare if there any statistical variation between the level of use of corticosteroids and gender.
- To compare if there any statistical variation between the level of use of corticosteroids and age group.
- To compare if there any statistical variation between the level of use of corticosteroids and educational level.

#### Materials and Methods:-

##### Study Design and Sample Size:-

A prospective cross sectional study was conducted in Western Region of Saudi Arabia from October to December 2016. Sample of 458 subjects were selected randomly within the age of 20 up to 65 years old.

##### Methods and Tools of Data Collection:-

A validated self-administered pretested questionnaire was devolved and filled by all participants. The questionnaire consisted demographic variables and study variables to achieve study objectives.

##### Inclusion Criteria:-

- Saudi nationality
- Male and female between (20-65) years old.
- Western region citizens

##### Data Analysis:-

Collected data was analyzed using SPSS version 20 where descriptive analysis was conducted for basic or demographic data while Chi Square test was applied to calculate correlation between different dependent and independent variables.

##### Ethical Approval:-

Approval for research was obtained from Institutional Research Ethics Committee.

#### Results:-

##### Section 1:- Demonstrates Demographic Data

Table 1:- Shows The Distribution Of Participants According To The Demographic Data

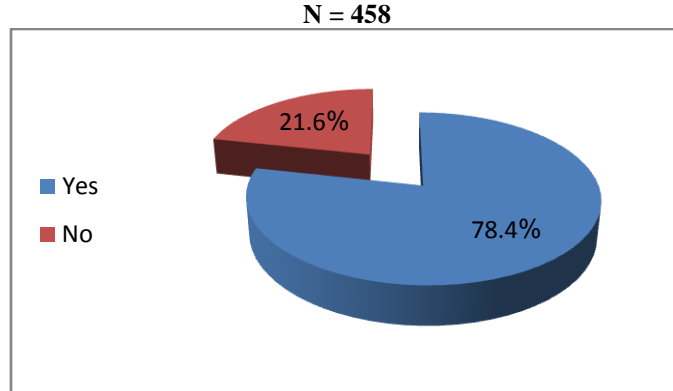
N = 458

Variable	Category	Fr.	%
Gender	Male	137	30
	Female	321	70
Age Group in Years	< 20	50	11
	21 - 40	302	66
	41 - 60	101	22
	> 61	5	1
Educational Level	Secondary or below	105	23
	Under Graduate	330	72
	Post Graduate	22	5

\* Most of participants were female (70%), within the age group of 21 - 40 years old (66%) and under graduate students (72%).

**Section 2:- Demonstrates Knowledge and practices towards topical corticosteroids**

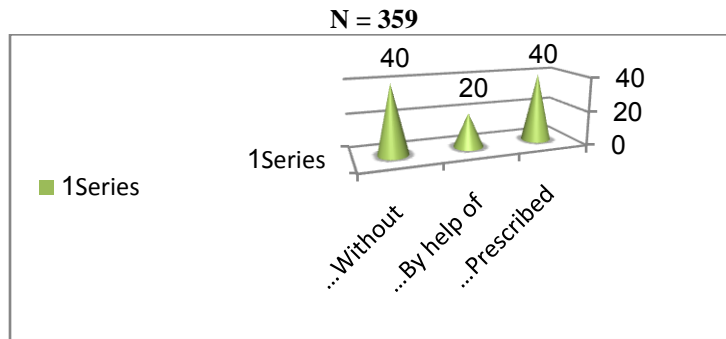
Table and Figure 2 Show The Distribution Of Participants According To The Use of topical corticosteroids



Use of corticosteroids	Fr.	%
Yes	359	78.4
No	99	21.6

The use of topical corticosteroids among participants was 78%.

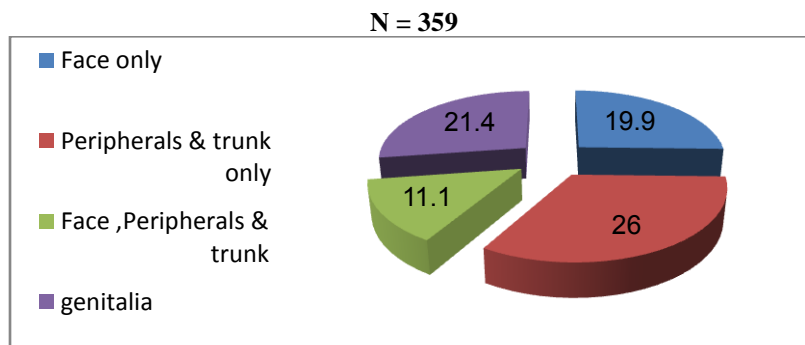
Table and Figure 3 Show The Distribution Of Participants According To The Presence Of Prescription for topical corticosteroids



Source of corticosteroids	Fr.	%
Prescribed by physician	152	40.0
By help of pharmacist	55	20.0
Without any prescription	152	40.0

Only 40 % of participants used topical corticosteroids as prescribed by physician who is only authorized person to give different medications

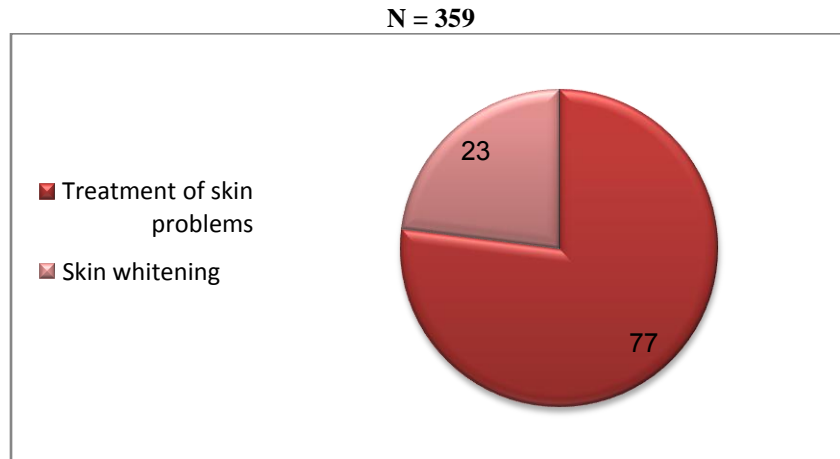
Table and Figure 4 Show The Distribution Of Participants According To The body parts where topical corticosteroids used



Body part	Yes	
	Fr.	%
Face only	91	19.9
Peripherals & trunk only	119	26.0
Face ,Peripherals & trunk	51	11.1
genitalia	98	21.4

Near to half of participants used topical corticosteroids on face 19.9%

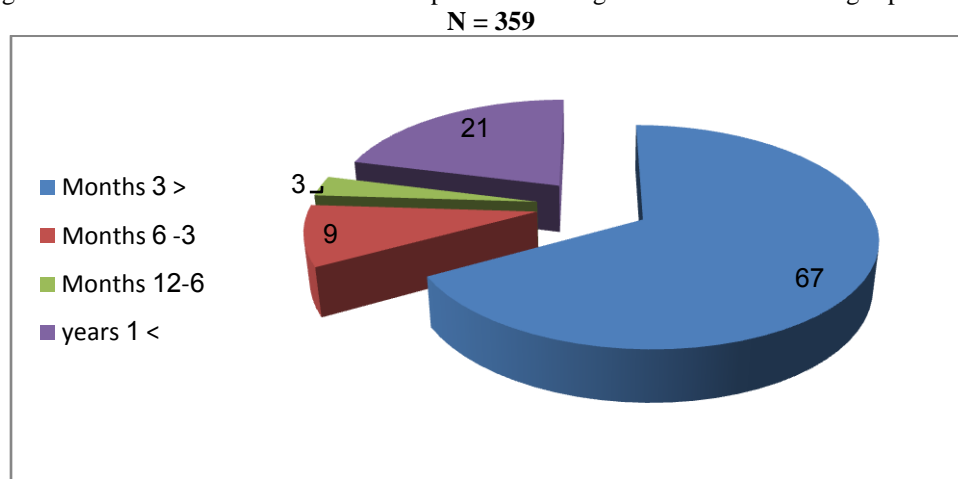
Table and Figure 5 Show The Distribution Of Participants According To The Reasons for use of topical corticosteroids



Reason for use of corticosteroids	Yes	
	Fr.	%
Treatment of skin problems	278	77
Skin whiteness	81	23

About 23 % of participants used topical corticosteroids for other purposes rather than treatment.

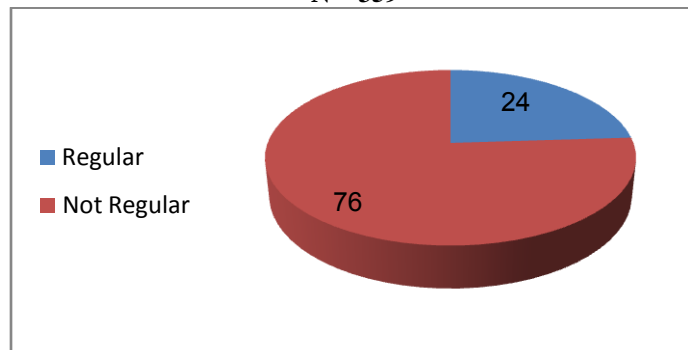
Table and Figure 6 Show The Distribution Of Participants According To The Period of using topical corticosteroids



Period of use of corticosteroids	Fr.	%
< 3 Months	242	67.0
3- 6 Months	33	9.0
6-12 Months	10	3.0
> 1 years	74	21.0



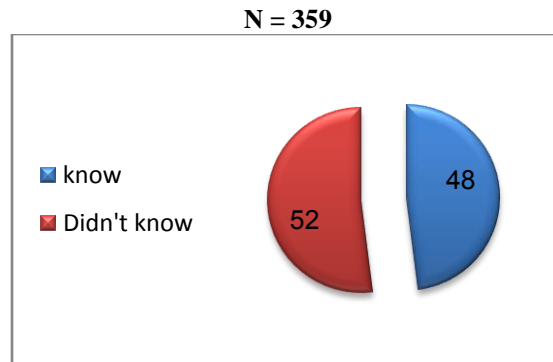
All participants used topical corticosteroids for at least **THREE** months, while about 21% used it for one year, Table and Figure 7 Show The Distribution Of Participants According To The way of using topical corticosteroids  
**N = 359**



Frequency of using corticosteroids	Fr.	%
Regular	85	24.0
Not Regular	274	76.0

About 24 % of participants used topical corticosteroids on regular basis

Table and Figure 8 Show The Distribution Of Participants According To Their Knowledge about side effects of topical corticosteroids



Side effects of corticosteroids	Fr.	%
know	174	48.0
Didn't know	185	52.0

Near to half of participants (52%) didn't know the side effects of

Table 9:- Shows The Distribution Of Participants According To Their use of topical corticosteroids and the gender

Regular use of topical corticosteroids			gender		Total	Sig
			male	female		
	yes	Count	24	55	79	0.05
		% within regular	30.4%	69.6%	100.0%	
		% within gender	23.1%	22.5%	22.7%	
		% of Total	6.9%	15.8%	22.7%	
	no	Count	80	189	269	
		% within regular	29.7%	70.3%	100.0%	
		% within gender	76.9%	77.5%	77.3%	
		% of Total	23.0%	54.3%	77.3%	
Total		Count	104	244	348	
		% within regular	29.9%	70.1%	100.0%	
		% within gender	100.0%	100.0%	100.0%	
		% of Total	29.9%	70.1%	100.0%	

There was statistical relationship between regular use of topical corticosteroids and the gender, female were use more regularly than male, P Value < 0.05.

Table 10:- Shows The Distribution Of Participants According To Their knowledge related to side effects of topical corticosteroids and the gender

knowledge related to side effects of topical corticosteroids		gender		Total	Sig.	
		male	female			
Know	Count	23	111	134	0.00	
	% within side effects	17.2%	82.8%	100.0%		
	% within gender	21.5%	44.9%	37.9%		
	% of Total	6.5%	31.4%	37.9%		
	Didn't Know	Count	84	136		220
		% within side effects	38.2%	61.8%		100.0%
		% within gender	78.5%	55.1%		62.1%
		% of Total	23.7%	38.4%		62.1%
Total	Count	107	247	354		
	% within side effects	30.2%	69.8%	100.0%		
	% within gender	100.0%	100.0%	100.0%		
	% of Total	30.2%	69.8%	100.0%		

There was statistical relationship between knowledge related to side effects of topical corticosteroids and the gender, female were more knowledgeable than male, P Value < 0.05.

Table 11:- Shows The Distribution Of Participants According To The Source of topical corticosteroids and Gender

Source of topical corticosteroids		gender		Total	Sig.	
		male	female			
Physician	Count	44	103	147	0.01	
	% within who prescript	29.9%	70.1%	100.0%		
	% within gender	41.1%	42.4%	42.0%		
	% of Total	12.6%	29.4%	42.0%		
	Pharmacist	Count	25	29		54
		% within who prescript	46.3%	53.7%		100.0%
		% within gender	23.4%	11.9%		15.4%
		% of Total	7.1%	8.3%		15.4%
	without any prescription	Count	19	71		90
		% within who prescript	21.1%	78.9%		100.0%
		% within gender	17.8%	29.2%		25.7%
		% of Total	5.4%	20.3%		25.7%
friends and relatives or others	Count	19	40	59		
	% within who prescript	32.2%	67.8%	100.0%		
	% within gender	17.8%	16.5%	16.9%		
	% of Total	5.4%	11.4%	16.9%		
Total	Count	107	243	350		
	% within who prescript	30.6%	69.4%	100.0%		
	% within gender	100.0%	100.0%	100.0%		
	% of Total	30.6%	69.4%	100.0%		

There was statistical relationship between the source of topical corticosteroids and the gender, females were more use un prescript topical corticosteroids than others, P Value < 0.05.

Table 12:- Shows The Distribution Of Participants According To Their knowledge related to side effects of topical corticosteroids and the level of education

knowledge related to side effects of topical corticosteroids and the level of education			Level of education			Total	Sig.	
			secondary or below	university	Post graduate			
yes	Count		25	102	7	134	0.04	
	% within side effects		18.7%	76.1%	5.2%	100.0%		
	% within education		31.6%	39.2%	41.2%	37.6%		
	% of Total		7.0%	28.7%	2.0%	37.6%		
no	Count		54	158	10	222		
	% within side effects		24.3%	71.2%	4.5%	100.0%		
	% within education		68.4%	60.8%	58.8%	62.4%		
	% of Total		15.2%	44.4%	2.8%	62.4%		
Total			Count	79	260	17		356
			% within side effects	22.2%	73.0%	4.8%		100.0%
			% within education	100.0%	100.0%	100.0%		100.0%
			% of Total	22.2%	73.0%	4.8%		100.0%

There was statistical relationship between knowledge related to side effects of topical corticosteroids and the level of education, university participants were more knowledgeable than others, P Value < 0.05.

Table 13:- Shows The Distribution Of Participants According To Their use of topical corticosteroids and the level of education

Use of topical corticosteroids			Level of education			Total	Sig.	
			secondary or below	university	Post graduate			
regular	yes	Count	22	57	2	81	0.029	
		% within regular	27.2%	70.4%	2.5%	100.0%		
		% within education	28.2%	22.4%	11.8%	23.1%		
	% of Total	6.3%	16.3%	.6%	23.1%			
no	Count		56	198	15	269		
	% within regular		20.8%	73.6%	5.6%	100.0%		
	% within education		71.8%	77.6%	88.2%	76.9%		
	% of Total		16.0%	56.6%	4.3%	76.9%		
Total			Count	78	255	17		350
			% within regular	22.3%	72.9%	4.9%		100.0%
			% within education	100.0%	100.0%	100.0%		100.0%
			% of Total	22.3%	72.9%	4.9%		100.0%

There was statistical relationship between regular use of topical corticosteroids and the level of education, university participants were more use than others, P Value < 0.05.

Table 14:- Shows The Distribution Of Participants According To The Source of topical corticosteroids and the level of education

Source of topical corticosteroids		Level of education			Total	Sig.	
		secondary or below	university	Post graduate			
Physician	Count	31	108	11	150	0.02	
	% within who prescript	20.7%	72.0%	7.3%	100.0%		
	% within education	40.3%	41.9%	64.7%	42.6%		
	% of Total	8.8%	30.7%	3.1%	42.6%		
	Pharmacist	Count	19	34	0		53
		% within who prescript	35.8%	64.2%	.0%		100.0%
		% within education	24.7%	13.2%	.0%		15.1%
		% of Total	5.4%	9.7%	.0%		15.1%
	without any prescription	Count	19	69	2		90
		% within who prescript	21.1%	76.7%	2.2%		100.0%
		% within education	24.7%	26.7%	11.8%		25.6%
		% of Total	5.4%	19.6%	.6%		25.6%
friends and relatives or others	Count	8	47	4	59		
	% within who prescript	13.6%	79.7%	6.8%	100.0%		
	% within education	10.4%	18.2%	23.5%	16.8%		
	% of Total	2.3%	13.4%	1.1%	16.8%		
Total	Count	77	258	17	352		
	% within who prescript	21.9%	73.3%	4.8%	100.0%		
	% within education	100.0%	100.0%	100.0%	100.0%		
	% of Total	21.9%	73.3%	4.8%	100.0%		

There was statistical relationship between the source of topical corticosteroids and the level of education, university participants were more use un prescript topical corticosteroids than others, P Value < 0.05.

Table 15:- Shows The Distribution Of Participants According To The Regular Use of topical corticosteroids and age

Regular Use of topical corticosteroids		Age in Years				Total	Sig.
		< 20	21 - 40	41 - 60	> 61		
yes	Count	4	51	11	2	68	0.03
	% within regular	5.9%	75.0%	16.2%	2.9%	100.0%	
	% within age	12.5%	27.0%	16.4%	66.7%	23.4%	
	% of Total	1.4%	17.5%	3.8%	.7%	23.4%	
no	Count	28	138	56	1	223	
	% within regular	12.6%	61.9%	25.1%	.4%	100.0%	
	% within age	87.5%	73.0%	83.6%	33.3%	76.6%	
	% of Total	9.6%	47.4%	19.2%	.3%	76.6%	
Total	Count	32	189	67	3	291	
	% within regular	11.0%	64.9%	23.0%	1.0%	100.0%	
	% within age	100.0%	100.0%	100.0%	100.0%	100.0%	
	% of Total	11.0%	64.9%	23.0%	1.0%	100.0%	

There was statistical relationship between the source of topical corticosteroids and the age group, age of 21 - 40 were more regular of topical corticosteroids than others, P Value < 0.05.

Table 16:- Shows The Distribution Of Participants According To The Source of topical corticosteroids and age

Source of topical corticosteroids		age				Total	Sig.
		< 20 years	21 - 40	41 - 60	> 61		
Physician	Count	15	85	27	1	128	0.75
	% within who prescript	11.7%	66.4%	21.1%	.8%	100.0%	
	% within age	45.5%	45.7%	38.0%	33.3%	43.7%	
	% of Total	5.1%	29.0%	9.2%	.3%	43.7%	
Pharmacist	Count	5	25	11	0	41	
	% within who prescript	12.2%	61.0%	26.8%	.0%	100.0%	
	% within age	15.2%	13.4%	15.5%	.0%	14.0%	
	% of Total	1.7%	8.5%	3.8%	.0%	14.0%	
without any prescription	Count	6	53	19	1	79	
	% within who prescript	7.6%	67.1%	24.1%	1.3%	100.0%	
	% within age	18.2%	28.5%	26.8%	33.3%	27.0%	
	% of Total	2.0%	18.1%	6.5%	.3%	27.0%	
friends and relatives or others	Count	7	23	14	1	45	
	% within who prescript	15.6%	51.1%	31.1%	2.2%	100.0%	
	% within age	21.2%	12.4%	19.7%	33.3%	15.4%	
	% of Total	2.4%	7.8%	4.8%	.3%	15.4%	
Total	Count	33	186	71	3	293	
	% within who prescript	11.3%	63.5%	24.2%	1.0%	100.0%	
	% within age	100.0%	100.0%	100.0%	100.0%	100.0%	
	% of Total	11.3%	63.5%	24.2%	1.0%	100.0%	

There was no statistical relationship between the source of topical corticosteroids and the age, P Value > 0.05.

Table 17:- Shows The Distribution Of Participants According To Their knowledge to the side effects of topical corticosteroids and age

knowledge to the side effects of topical corticosteroids		Age in Years				Total	Sig.
		< 20	21 - 40	41 - 60	> 61		
Know	Count	13	76	28	1	118	0.99
	% within side effects	11.0%	64.4%	23.7%	.8%	100.0%	
	% within age	39.4%	40.0%	40.0%	33.3%	39.9%	
	% of Total	4.4%	25.7%	9.5%	.3%	39.9%	
Didn't Know	Count	20	114	42	2	178	
	% within side effects	11.2%	64.0%	23.6%	1.1%	100.0%	
	% within age	60.6%	60.0%	60.0%	66.7%	60.1%	
	% of Total	6.8%	38.5%	14.2%	.7%	60.1%	
Total	Count	33	190	70	3	296	
	% within side effects	11.1%	64.2%	23.6%	1.0%	100.0%	
	% within age	100.0%	100.0%	100.0%	100.0%	100.0%	
	% of Total	11.1%	64.2%	23.6%	1.0%	100.0%	

There was no statistical relationship between the participants knowledge towards side effects and the age group, P Value < 0.05.

### Discussion:-

This study measured the prevalence of misuse and awareness of Western region populations related to corticosteroids use and its effects. It also compared the variation of level of awareness and use according to gender, age group and level of education.

Misuse of topical corticosteroids appears to be a common problem worldwide, as stated by study, the prevalence of topical corticosteroids misuse was 60% (By help of pharmacist or Without any prescription). The use of TCS for skin lightening was statistically significant (23%). This may also explain the female predominance in this study.

As mentioned in the table (1) 458 individuals were participated in this study where most of them were female (70%), within age group of 21 - 40 years old (66%) and under graduate (72%). The showed that use of topical corticosteroids among participants was 78%. Only 33 % of participants used topical corticosteroids as prescribed by physician who is only authorized person to give different medications while the rest of participants used topical corticosteroids without any prescription or through the advice of pharmacist who is not authorized to give medication. Near to half of participants used topical corticosteroids on face and peripheral, 20% and 25%. About 39 % of participants used topical corticosteroids for other purposes rather than treatment. All participants used topical corticosteroids for at least **THREE** months. Majority of participants (62%) didn't know the side effects of corticosteroids.

In recent years, there has been an increasing trend for self-medication with non-prescription medicines (NPM). In parallel, more products have been deregulated for purchase without a prescription (11). Population-based survey in developed countries such as Australia, Scotland, United Kingdom and other Asian countries like Taiwan and Singapore found that between a half and two-thirds of the population used NPM, including complementary and over-the-counter medicines (OTC) (12).

Misuse of topical corticosteroids is very common in patients with facial dermatoses. Many patients prefer to use topical steroids as a fairness cream (9). To minimize adverse cutaneous and systemic reactions, especially with prolonged use, the rational use of topical steroids should include careful consideration of the patient's age, total area of application, quantity to be applied, efficacy of the selected corticosteroid, and frequency of application (10). Hence, one step to achieve rational prescribing is periodic auditing of prescriptions.

As shown in tables 8,9 and 10 there was statistical relationship between regular use of topical corticosteroids, side effects, its source and the gender, female were use more regularly, more knowledgeable and more use un prescript topical corticosteroids than others, P Value < 0.05.

As shown in tables 11,12 and 13 there was statistical relationship between regular use of topical corticosteroids, side effects, its source and the educational level, under graduate participants were use more regularly, more knowledgeable and more use un prescript topical corticosteroids than others, P Value < 0.05.

As shown in tables 14 there was statistical relationship between regular use of topical corticosteroids, and the educational level, age group of 21- 40 years old were use more regularly than others, P Value < 0.05 while as shown in table 15 and 16 there was no statistical relationship between the source of topical corticosteroids and knowledge of side effects and the age group, P Value > 0.05.

### **Conclusion:-**

Thus as indicated by data in our study, the problem of TCS and its abuse, misuse, and minimum awareness related to adverse effects to topical drugs have been widespread in Saudi Arabia and specially at the Western region of the Kingdom.

Western region consumers mainly purchased Non Prescript Medications NPM to treat problems of skin, skin lightening and other purposes. The choice of NPM was associated with socio-demographic profile such as gender, age and educational level.

The development of a national policy on NPM should be supported to limit self-medication practice among the Saudi population and to increase their awareness relevant to misuse and adverse side effects of topical corticosteroids. Future national studies need to explore the safety and effectiveness of using topical corticosteroids.

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### RESEARCH ARTICLE

## THE CORPORATE IMAGE AND ITS IMPACT IN THE PURCHASE DECISION STUDY IN ORASCOM TELECOM CORPORATION DJEZZY BECHAR – ALGERIA.

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#### Key words:-

Consumer behavior; resolution purchasing, Orascom Telecom Corporation Djazzy, corporate image.

### Abstract

This study aimed to identify the relationship between company image and Purchasing decision at Orascom Telecom Djazzy in Béchar. The study identifies a community of mobile services users in Béchar "Djazzy Foundation was chosen as a sample of them reached their size (26) customer, for completion of this study, we prepared a questionnaire composed of three sections : Devoted the first part of personal information , the second of them Factors affecting the Enterprise image consists of 12 questions, and Part III ;Purchasing decision consists of (07) question, was this relationship is tested using spss 19 statistical program , there is no impact to the image of the institution on the decision of purchasing for the consumer, And there is found a set of recommendations that can help your organization to adopt this important element

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### Introduction:-

Value judgment made by an individual on a company (corporate image), brand (brand image), a product (product image) or a person (personal image). Part of the value of a brand, it is the combination of actual values of received ideas, emotional feelings, impressions, objective, subjective, conscious or unconscious, and the personality of the brand, the product of the individual or the company. The term 'goodwill' is sometimes used to denote the image of a company, the degree of confidence that bring clients and consumers of its products. However, should not confuse branding with the brand identity. Christian Michon explains in this regard that: "the concept of identity is fundamentally different from the concept of branding. The identity is part of a context more wide of the company and its history as a source of communication. Brand has as a key source of perception: the product, its attributes and advertising.

The problem of the study" :

What is the effect of company image on Purchase Decision IN Orascom Telecom institution "jazzy" Béchar – Algeria-

### Hypotheses:-

- There is a positive relationship between the corporate image and Purchase Decision.
- There are significant relationship between personal factors and the Purchase Decision.
- There are significant relationship between Social factors and the Purchase Decision.
- There are significant relationship between Organizational factors and the Purchase Decision.
- There are significant relationship between informational factors and the Purchase Decision

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**Objectives of the study:-**

- Knowledge of how to measure the company's image, and how they are configured and improvement;
- determine the effect of the company's image on Purchase Decision.

**Corporate image and Purchase Decision:-**

Some terms are so basic to a discipline that it is difficult to define them using only other terminology from within a discipline. The concept of corporate image is one such foundational term. The purpose of this paper is to review the various definitions of corporate image which have been proposed over the years and to attempt to develop a synthesis. A model is developed to differentiate among the concepts of corporate personality, corporate identity and company image. A special emphasis is placed on identifying the dimensions which underlie corporate image. Recommendations are made for measuring this important concept, depending upon the stakeholder group of interest to the researcher.

Mental picture that springs up at the mention of a firm's name. It is a composite psychological impression that continually changes with the firm's circumstances, media coverage, performance, pronouncements, etc. Similar to a firm's reputation or goodwill, it is the public perception of the firm rather than a reflection of its actual state or position. Unlike corporate identity, it is fluid and can change overnight from positive to negative to neutral. Large firms use various corporate advertising techniques to enhance their image in order to improve their desirability as a supplier, employer, customer, borrower, etc.<sup>i</sup>

**The Definition of corporate image:-**

The perception people have of your business when they hear your company name. A business's image is composed of an infinite variety of facts, events, personal histories, advertising and goals that work together to make an impression on the public

Corporate image and reputation is considered to be a critical factor in the overall evaluation of any organization (Bitner, 1990, 1991; Gronroos, 1984; Gummesson and Gronroos, 1998; Andreassen and Lanseng, 1997; Andreassen and Lindestad, 1998; Kandampully and Hu, 2007; Sarstedt et al., 2012) because of the strength that lies in the customers' perception and mind when hearing the name of the organization (Fombrun, 1996; Hatch et al., 2003; Nguyen, 2006; Bravo et al., 2009). Thus, continuous research on corporate image and reputation is a must for those organizations that want to successfully differentiate their positioning in the market.<sup>ii</sup>

Companies' increasing concern about their image, identity and culture must be seen in relation to a number of changes that influence their roles and opportunities. Today, the information we receive is no longer scarce; actually the amount of information is drowning us. This abundance has created much confusion. Demand and supply for information are disoriented and, thus, become increasingly dependent on the guidelines and criteria for sorting information in order to reduce confusion. Orientation is less and less a matter of gathering information and more and more a matter of sorting and connecting. The company's consumers, stakeholders and employees are all influenced by this development.<sup>iii</sup>

**The Definition of Purchase Decision:-**

The decision of buying an item does not instantly take place. Behind the visible act of purchasing an item, stands a buying decision process that smart companies should investigate. Motivation,

perception, learning, memory, personality, and attitude play an important role in the unfolding of the decision process that presupposes the consumer's covering of five stages: problem recognition, information search, evaluation of alternatives, purchase decision, and post purchase behaviour.

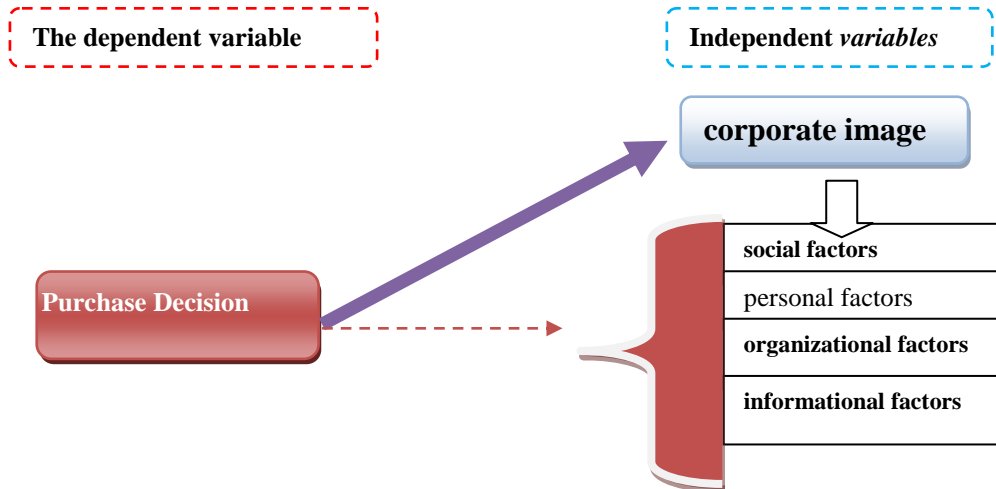
Marketers' task is to study consumer behaviour in order to achieve a thorough understanding of all five stages unfolding in this process, not only of the purchase decision as such. Buying behavior differs greatly depending on the purchased item, therefore, the types of decision behaviour need to be known and studied. They are: complex buying behaviour, dissonance-reducing buying behaviour, habitual buying behaviour, variety-seeking buying behaviour<sup>iv</sup>

**Actors Affecting in corporate image:-**

the factors affecting the mental image of the institution in the following points:

- Personal factors.
- social factors:
- organizational factors:
- informational factors

**Research questions and Model of the study:-**



**Figure 1:-** Model of the study

**Study Design:-**

This study aimed to identify the relationship between company image and Purchasing decision at Orascom Telecom Djezzy in Béchar. The study identifies a community of mobile services users in Bechar "Djezzy Foundation was chosen as a sample of them reached their size (26) customer, for completion of this study, we prepared a questionnaire composed of three sections : Devoted the first part of personal information , the second of them Factors affecting the Enterprise image consists of 12 questions, and Part III ;Purchasing decision consists of (07) question, was this relationship is tested using spss 19 statistical program , there is no impact to the image of the institution on the decision of purchasing for the consumer, And there is found a set of recommendations that can help your organization to adopt this important element

We used to divide the Likert where it meets every question from the axis of the questionnaire five options divided into grades as follows:

class V	Fourth class	third-class	second-class	First-class
Acceptable strongly	Acceptable	balanced	not agree	Strongly isagree

**Results of the study data analysis and hypothesis testing:-**

**Data analysis:-**

**Table 1:-** Demographic Data of Samples

		Choices	%
Gender	Male	17	65.4
	Female	9	34.6
	Total	26	100.0
Age	Lessthan30years	6	23.1
	31 to lessthan40years	17	65.4
	41 to lessthan55years	3	11.5
	56years and over	0	100.0
	Total	26	23.1
Qualification	Secondary	7	26.9
	Academic	17	65.4
	Graduate Studies	2	7.7

	Total	26	100.0
Work Experience	1 to less than 4 years	6	23.1
	5 to less than 10 years	17	65.4
	11 to less than 13 years	3	11.5
	Total	26	100.0
Fonction	Director of the Département	2	7.7
	Senior management	4	15.4
	Executive management	17	65.4
	Other Functions	3	11.5
	Total	26	100.0

Source: the preparation of researchers and the adoption of the spss 19.

### Test the hypotheses of the study:-

#### First hypothesis: the effect of personal factors on the buying decision:-

**H0:** There are no significant differences between the personal factors and decision-purchasing relationship.

**H1:** There are significant differences between personal factors and decision-purchasing relationship.

**Table 2:-** The results of the measurement The effect of personal factors on the buying decision.

Independent variables The personal factors	The correlation coefficient	The regression line	The variable décision-purchasing			
			R	R2	F	sig
	0.057	3.474	0.057	0.003	06.653	0.683

Source: the preparation of researchers and the adoption of the spss 19.

When the value of freedom Degree (13.28) = 2.391

Analysis: The above table shows that the bilateral link value (R) between personal factors and decision SPV was (0.057), an increase of (5.7%) is a very weak link, as was the coefficient of determination (R2 = 0.003) that is (0.3%) of change SPV in the decision due to the change in the personal factors. Note that the significance level (Sig 0.683) is greater than the level of significance (0.05) This shows that there is no statistically significant differences between the decision SPV and personal factors, I accept the hypothesis of bad and reject the alternative hypothesis which there are no statistically significant differences between the decision relationship SPV and personal factors and thus can be written regression equation between personal factors (x1) and decision SPV (y) as follows:

$$Y=3.474+0.057X_1$$

#### Second Hypothesis : the relationship between social factors and buying decision:-

**H0:** There is no statistically significant relationship between social factors and the purchasing decision.

**H1:** no statistically significant relationship between social factors and the purchasing decision.

**Table 3:-** Results of measuring the relationship between social factors and the buying decision

Independent variables The social factors	The correlation coefficient	The regression line	The variable décision-purchasing			
			R	R2	F	sig
	0.058	3.265	0.067	0.003	2.202	0.643

Source: the preparation of researchers and the adoption of the spss 19.

The above table shows that the bilateral link value (R) between social factors and decision SPV was (0.067), an increase of (6.7%) is a very weak link, as was the coefficient of determination (R2 = 0.003) that is (0.4%) of change SPV in the decision due to the change in social factors. Note that the significance level (Sig 0.643) is greater than the level of significance (0.05) This shows that there is no statistically significant differences between the decision SPV and social factors, I accept the hypothesis of bad and reject the alternative hypothesis which there are no statistically significant differences between the decision relationship SPV and social factors and therefore can be written regression equation between social factors (x2) and the decision SPV (y) as follows

$$Y=3.265+0.058X_2$$

**The third hypothesis: the relationship between organizational factors and purchasing decision.****H0:** There is no significant relationship between organizational factors and purchasing decision.**H1:** There are significant differences between organizational factors and decision-purchasing relationship**Table 4:-** The results of measuring the relationship between organizational factors and purchasing decision

Independent variables The organizational factors	The correlation coefficient	The regression line	The variable décision-purchasing			
			R	R2	F	sig
	-0.077	3.935	0.097	0.009	12.277	0.503

Source: the preparation of researchers and the adoption of the spss19.

Comment: The above table shows that the bilateral link value (R) between social factors and decision SPV was (0.097), an increase of (9.7%) is a very weak link, as was the coefficient of determination (R<sup>2</sup> = 0.009) that is (0.9%) of change SPV in the decision due to the change in regulatory factors. Note that the significance level (Sig0.503) is greater than the level of significance (0.05) This shows that there is no statistically significant differences between the purchasing decision and organizational factors differences, we accept the hypothesis of bad and reject any alternative hypothesis there is no statistically significant relationship between purchasing decision and organizational factors and thus can be written regression equation between organizational factors (x<sub>3</sub>) and the decision SPV (y) as follows:

$$Y=3.935-0.077X_3$$

**The fourth hypothesis: the relationship between the informational factors on the buying decision.****H0:** There is no statistically significant relationship between informational factors on purchasing decision.**H1:** no statistically significant relationship between informational factors on purchasing decision.**Table 5:-** Results of measuring the relationship between the informational factors on the buying decision

Independent variables The informational factors	The correlation coefficient	The regression line	The variable décision-purchasing			
			R	R2	F	sig
	0.093	3.354	0.096	0.009	4.346	0.496

Source: the preparation of researchers and the adoption of the spss19.

The table above shows that the binary value of the link (R) between the informational factors and the decision factors were SPV (0.096), an increase of 9.6% is a very weak link, as was the coefficient of determination (R<sup>2</sup> = 0.009) ie (0.09%) the change in the purchasing decision is due to the change in informational factors. Note that the significance level (Sig0.496) is greater than the level of significance (0.05) This shows that there is no statistically significant differences between the decision of purchasing and informational factors, I accept the hypothesis of bad and reject any alternative hypothesis there is no statistically significant relationship between purchasing decision factors and the informational factors (x<sub>4</sub>) and the decision SPV (y) as follows and thus can be written regression equation between informational factors :

$$Y=3.354+0.093X_4$$

**Hypothesis Basic key:-**

There is a positive correlation significant differences between the image corporate and the purchasing decision.

**H0:** There is no statistically significant relationship between the image corporate and the purchasing decision**H1:** There are significant differences between the image corporate and the purchasing decision**Table 6:-** Results of measuring the relationship between the image corporate and the purchasing decision

Independent variables corporate image	The correlation coefficient	The regression line	The variable décision-purchasing			
			R	R2	F	sig
	0.058	3.479	0.041	0.002	9.719	9.719

Source: the preparation of researchers and the adoption of the spss19.

Comment: The above table shows that the bilateral link value (R) between the corporate image and purchasing decision was (0.041), an increase of 4.1% is a very weak link, as was the coefficient of determination ( $R^2 = 0.002$ ) that is (0.2%) of change purchasing decision in the decision due to the change in the corporate image. Note that the significance level (Sig0.769) is greater than the level of significance (0.05) This shows that there is no significant differences between the purchasing decision and corporate image, we accept the hypothesis of bad and reject any alternative hypothesis there is no statistically significant relationship between purchasing decision and corporate image and thus can be written regression equation between the corporate image (x) and the purchasing decision (y) as follows

$$Y = 3.479 + 0.058X$$

### Conclusion:-

Through this analytical study and exploit the field experiences and after friction with company customer "Djezzy" can say that "Djezzy" corporate no longer has a good standing among customers for the time being through the current conditions that led to the decline in its image in the minds of consumers (béchar province) and that influenced their Purchase Decision and through our study based on the outputs of spss show us that a weak correlation coefficient, which is estimated at 0.041  $R =$ , which assured us that there is no impact to the corporate image on the decision of purchasing the final consumer and explain to us by introducing a questionnaire that promotional offers big role in improving the corporate image in the minds of consumers.

Health the hypothesis that the image on the Enterprise is the main and influential only motivation to make the consumer chooses a commodity without the other, the picture is never the sole motive but there are other motives affect consumer behavior...

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## RESEARCH ARTICLE

### LEVEL OF USABILITY OF THE MULTI FACTOR AUTHENTICATION PROCESS OF ONLINE BANKING: A USER EXPERIENCE STUDY.

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Website, Usability, Online banking,  
Internet, Authentication, MFA

#### Abstract

Most banks now offer their services online, which is known as online banking. Bank activities involve very sensitive information. Due to the high level of fraud banks have recently introduced a new authentication method which requires the users to provide more than one factor to authenticate themselves which is known as Multi Factor Authentication (MFA). But means of improving the security might compromise the level of usability of the website. Being a country with less IT literate people the researcher assumes that introduction of MFA might have an impact on the Sri Lankan online users. This paper presents an empirical study on the level of usability of MFA mechanisms used by Sri Lankan banks at present as experienced by the users. According to the results it was identified the number of online banking users are less in Sri Lanka, but they are accepting the MFA methods as usable.

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#### Introduction:-

Most of the businesses have their own websites which provides their customers the ease of performing transactions from wherever they are. But when developing the website it is essential to check that the website furnishes to the purpose. Website users prefer websites that are convenient to use and in overall which provides them an appealing online experience. "On the Web, usability is a necessary condition for survival" [1]. "If a website is difficult to use, people leave. There's no such thing as a user reading a website manual or otherwise spending much time trying to figure out an interface. There are plenty of other websites available; leaving is the first line of defense when users encounter a difficulty" [1].

"Based on the principles of Human Computer Interaction (HCI), web usability has become a recognized success factor for all e-business, including online banking" [2]. When considering online banking websites to enhance user experience further and to attract more customers it is necessary to understand the level of usability of the bank website. Past research confirms that website navigation issues, security fears and ambiguity in content are the major concerns that user face [2-6]. According to the study it demonstrates that ultimate result of a bad user experience is 50% of customers registered for online banking disregarding the use of the website [2]. Also since Bank websites deal with sensitive information like username, passwords, credit card details, account information; they are one of those that make security a priority. When the banks try to improve the authentication process through more secure mechanisms it definitely has a negative impact on the level of usability. Therefore website usability and security can be claimed as the most vibrant issues in online banking.

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Users are allowed to access their personal information through the website after an authentication process. So the security of the authentication process which serves as the entry point for the customer is extremely important. Banks have introduced Multi Factor Authentication (MFA) method in order to improve the security reassuring more online customers. MFA aims to improve the traditional password-based authentication method known as Single Factor Authentication (SFA) by demanding users to provide a supplementary authentication factor such as a separate transaction password or a verification code. When banks try to enhance security mechanisms it undeniably affect the level of usability of the website. So there is a tradeoff between the level of usability and security of a bank website.

Recently banks in Sri Lanka also started implementing this MFA method. Sri Lanka is a country with less Information Technology (IT) literate people. So this study aims to find out level of usability of the introduced MFA methods as perceived by the users and to analyze if it has greatly affected the usability than the SFA for the current online banking users.

The main objectives of the study are;

- Identify MFA methods introduced in online banking
- Find the level of usability of the available MFA methods
- Identify if the introduction of MFA has greatly affected the usability than the SFA

### **Literature Review:-**

Online banking facility provides as an essential gateway for the banking customers to interact with their bank to get the services they need. In order to make the online experience a better one the banks should consider the level of usability of their websites. Also banks try to incorporate advanced security mechanisms to their online banking websites in order to reassure the customer to use the online facility without any fear of fraud. So the security and usability of online banking are a key concern. At present there are many researches which discuss the usability issues of bank websites [7-10].

The major problem with the definition of usability is that it is quite difficult to precisely explain the term. The most common explanation of usability is simplified to ease-of-use [1], [8]. In spite of many other definitions on usability, Jakob Nielsen's [1], [11] definition on web usability is extensively used by usability experts. Jakob Nielsen was named as "the reigning guru of web usability" by Fortune and as "perhaps the best-known design and usability guru on the Internet" by Financial Times [12]. Usability is defined by five eminence components by him as;

- Learnability: "How easy is it for users to accomplish basic tasks the first time they encounter the design?" [1].
- Efficiency: "Once users have learned the design, how quickly can they perform tasks?" [1].
- Memorability: "When users return to the design after a period of not using it, how easily can they reestablish proficiency?" [1].
- Errors: "How many errors do users make, how severe are these errors, and how easily can they recover from the errors?" [1].
- Satisfaction: "How pleasant is it to use the design?" [1].

The main gateway provided for security is the authentication process. So the banks try to improve their online banking authentication mechanisms more and more. But this definitely will have an impact on the level of usability of the online banking website. At present there are different authenticating mechanisms available [13] [14].

Traditional authentication or SFA uses one factor for user authentication on a website. Often it is a knowledge-based factor, such as a password which is set during the registration process. Ma and Feng have appraised the usability of three alternative authentication methods that are available; the text passwords, mnemonic passwords and graphical passwords [15]. According to the results presented text passwords and graphical passwords proved to be equally memorable [15] and that mnemonic passwords had a higher failure rate [15]. Also they identified that the use of graphical passwords consumed more time when compared to other types [15]. The results gathered through a questionnaire and in-depth interviews with 86 contributors were used by Nilsson to compare authentication using 'security box' method (one time password) and 'fixed passwords' method (password is preset) [16]. The results exposed that security boxes are perceived as more dependable by the users [16]. L. Gorman in his study compares passwords, security tokens, and biometrics and their possible combinations for MFA [17]. Different authenticating mechanisms in use as identified by him are;

- Knowledge-Based (what you know) - characterized by secrecy [17].
- Object-Based (what you have) – characterized by physical possession [17].
- ID-Based (“who you are”) – characterized by uniqueness [17].

In the study done by Cristofaro et al. they conducted an online survey with 219 Mechanical Turk users, to measure the usability of diverse MFA methods [18]. The methods considered in the study are one-time codes generated by security tokens, one-time PINs received via SMS or email, and dedicated smartphone apps [18]. They recorded contexts and motivations, and also considered their influence on usability of different MFA methods. The study acknowledged that the existing differences among the usage of MFA methods be subject to individual characteristics of people, more than the actual technologies or contexts of use. [18]. Also the study result shows that users perceived MFA as usable [18]. According to the study done by Gunson et al. MFA methods were perceived as less usable but more secure than SFA methods [19].

All above studies discuss about different authentication methods and their usability of websites in general. This study focuses about the application of MFA methods only in the context of online banking.

The experiment conducted by Weir et al. used 50 e-banking customers to compare the security and usability of MFA methods when using token devices [20]. Through the research it was identified that participants felt card-activated tokens and the push button token to be usable and secure but the chip-and-PIN method to be less usable [20]. According to M. Mannanthe and P. C. Oorschot the guaranteed online transaction security applies only for the users who fulfill certain security requirements stated by the banks [21]. After examining some of the requirements set by major Canadian banks they evaluated on security aspects using 123 technically advanced users from a university environment. The results strongly supported their view about the gap between expectations of the bank and the actions of user related to security of online banking. [21]

When considering the importance to improve the security methods and at the same time the importance of not complicating the usability of the online experience this research tries to find the effect of applying MFA methods for Sri Lankan online banking users. The assumptions of the researcher are;

- MFA is still not popular in Sri Lankan banks
- MFA will be perceived as less usable
- SFA and MFA will have a big difference on the level of usability

### **Methodology:-**

The sample considered for the survey are IT companies/institutes in Sri Lanka under the assumption that they would comprise people open to online activities such as online banking. Questionnaire Technique is used to collect data about the level of usability of the authenticating process, as well as to gather important feedback from online banking users. The questionnaire used for the analysis is created as an online survey questionnaire using an online questionnaire tool, and is emailed to the selected sample.

The first section of the questionnaire covers general data about respondents such as their gender, age, name of the bank and type of authenticating method used by the bank (SFA, MFA). To get an idea about the level of IT literacy factors like the length of time using computers, length of time using online banking services are counted. The second section, aims to collect the level of usability of the authenticating process. As the usability measurement technique the usability definition proposed by Jakob Nielsen is used. Accordingly the five usability characteristics considered are learnability, efficiency, memorability, errors and satisfaction [1]. A set of questions targets to address one of the characteristics (independent variables). User can rate a given question on a five-point Likert scale from 1 (strongly agree) to 5 (strongly disagree). The results obtained from these are used to get a measure on the level of usability (which is the dependent variable). Since online banking usually makes the user authenticate himself during different activities such as logging in, doing a money transfer, paying a bill, etc. for the study only one of the activities is considered. So the authenticating process used when ‘performing a money transfer to a third party account’ only is considered. The third section includes open-ended questions to capture additional particulars related to user authentication process.



## Results and Discussion:-

According to the results obtained the number of online banking users in Sri Lanka is identified as only 39%. So it is identified that in Sri Lanka online banking users within the IT industry is still very small, proving the assumption of the researcher that IT job/study related people are very much exposed to online transactions through internet otherwise.

When considering the age 82% which is a significant percentage are included into the 20 – 39 years age category. It can be assumed that this bias of age factor is introduced because in Sri Lanka IT literacy is very less among older generation.

98% of the respondents who participated had used computers for more than five years and 70% had been using online banking for more than three years. This provides evidence that the users using the online facilities are the ones with a high level of IT literacy and skills.

According to the results it can be seen that majority of the users are clustered around only 5 banks for the online service. So for the study the authentication methods of those five banks are considered. The banks authentication methods when doing a money transfer to a third party account are limited to;

- Logging password only (40% banks)
- Logging password + Transaction password (which is pre set) (20% banks)
- Logging password + SMS/email based one-time verification code (20% banks)
- Logging password + token based code (20% banks)

Other authentication methods like graphical passwords and biometric identification are not used in banks in Sri Lanka. It can be due to reasons like images taking more time to load and the high cost involved in implementing biometric authentication.

According to the results during a transaction through online banking 60% of the banks use MFA and only 40% of the banks are using SFA. So it is identified that majority of banks in Sri Lanka have already applied MFA. When doing the analysis, level of usability for SFA and MFA is independently considered.

When considering the efficiency (second usability characteristic) in SFA, 78% users agreed that they can easily authenticate themselves without any trouble. But some have issues like confusion among their own passwords they have to use for different online systems, which made them successful only after the second attempt. According to the study outcomes out of the users who used MFA only 64% has agreed that they often log in without issues. This result indicates that some difficulty is there with MFA. From the open ended questions it is identified that the reason for above is mainly due to factors such as confusion between different passwords they had to use (separate logging password and transaction password), time taken to access their phone/mail to find out the verification code and forgetting to have the security code generator token.

According to the preliminary analysis of the data, majority of (81%) responded positively about the usability (dependent variable) of MFA while only 13% responded negatively. This result proves that users accept the MFA method. When considering the results of users who use banks with SFA method majority of users (89%) who use SFA responded positively, while only 8% responded negatively. When comparing the percentage of positive respondents for SFA and MFA the results shows that there is no significant difference between the two methods as perceived by the users.

## Conclusion:-

This is an empirical study about the level of usability of the MFA mechanisms applied in online banking in the context of Sri Lankan banks. The study considered 95 online banking users in Sri Lanka who have long-term experience with the use of internet. The results show that still not all banks have applied MFA even with the huge rate of online fraud that happens. Even though the researcher thought MFA might have a big impact on the level of usability of the website it is proved otherwise. Users perceive MFA as usable and have accepted the use of the new method. Since there is no big difference between the percentage of positive respondents of MFA and SFA it can be recommended that banks should use MFA since it is more secure than the SFA. Due to the limited number of online banking users for the study only 95 user responses could be explored. In future can validate the results further by

enhancing the sample size and also by conducting a detailed analysis to check that the results obtained are truly related to the usability factor and not biased on the specific bank they used.

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### REVIEW ARTICLE

#### A REVIEW ARTICLE ON AYURVEDIC/ HERBAL PLANT “ARUNA” (*ACONITUM HETEROPHYLLUM*).

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##### Key words:-

*Aconitum heterophyllum*,  
Ranunculaceae, Pharmacological  
activity, Indication.

#### Abstract

In modern days there are Allopathic medicines are most widely used for general treatments. Herbal medicine are major remedy of Traditional and Ayurvedic medicine systems. Herbal or Ayurvedic medicine are less toxic or side effects. Medicinal plants are playing an important role in the drug discovery and development of new molecules. There are a number of herbs which are used from ancient time Aruna (*Aconitum heterophyllum*) is important herbs because in this medicinal plant there are a lot off pharmacological activity like Anti-inflammatory, hepatoprotective , Digestive activity. But some species of Aconitum plant is poisons in nature. This review should be of interest to readers in the areas of Pharmacognostical and Pharmacological activity and indication of *Aconitum heterophyllum*. and *Aconitum Heterophyllum* is one of the herbs which are used for its medicinal properties. *Aconitum* species belongs to the family Ranunculaceae .it's about 300 species are found in all over the world but in India, only 24 species are found in the Himalayas sub-alpine and alpine region, suits required about 2400-3600 m altitude above sea level. Seed germination micro propagation method is used for the cultivation of *Aconitum plants*. *Aconitum heterophyllum* has a lot of pharmacological use like in the treatment of urinary infection, diarrhea, as an expectorant, Anti-inflammatory, hepatoprotective activity. It is a good source of diterpene alkaloids, flavonoids. There are some indication occurs in Aconitum heterophyllum roots part: Nausea, Bleeding piles, Periodic fever, Dyspepsia, Diarrhea, Dryness of mouth. When taken in larger doses may cause constipation

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#### Introduction:-

*Aconitum heterophyllum* is a herbal medicinal plant .Aconitum species were used as the major component in the Indian Ayurvedic formulation as well as Chinese and Bhutanese herbal medicines. This species content many phytoconstituents having a lot of pharmacological activities like Anti-inflammatory, hepatoprotective activity, Digestive Property. It is known as Asian Monkshood.<sup>1,2,3</sup> There are many local or traditional name in India it is also known Indian atees ,Atis root (English) Ativisha, Shuklakanda, Aruna (Sanskrit) Vishada (Urdu) Atees (Hindi) Atis and Atvika (Bengali) Ataish (Telugu) Ati Vasa (Gujarati) Ativakhani (Marathi) Ati vish (Kannada) Ati-Vishsa (Malayalam) Ati-Vidayam Atis (Panjabi).<sup>2,4</sup> *Aconitum heterophyllum* is belonging to family of

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Ranunculaceae plantae Kingdom 'Magnoliophyta' division, and Aconitum genus.<sup>3,4</sup> There are Around 300 species of Aconitum is found in all over the world in which only 24 species found in India. It consists of dried, tuberous roots of *Aconitum heterophyllum* Wall. ex. Royal, a perennial herb, native of western Himalayas and found in Kashmir, Uttarakhand Sikkim and Nepal at altitude between 2,500-4,000 m.<sup>5,6</sup> Its mostly species are highly toxic in nature Its several species also known as devil's helmet, Queen of all Poisons, or blue rocket.<sup>4</sup> In ancient time it were used for hunting spiko so it must need to deal with carefully.<sup>7,8</sup>

#### Development and Anthology:-

*Aconitum heterophyllum* is mostly found in sub-alpine and alpine region of the Himalayas. *Aconitum heterophyllum* cultivates in moist soil. Sandy loam and acidic soil is best for seed germination, survival, better growth and yield. In general, having sandy textured soil with rich organic matter is recommended for the cultivation. The cultivation of *Aconitum heterophyllum* suits required about 2400-3600 m altitude above sea level.<sup>3,6,7</sup> the rain fall required for the cultivation of natural and transplant populations of *Aconitum heterophyllum* is 664.2-1485.7 mm. *Aconitum heterophyllum* plants, grown from seeds and tuberous roots. Seeds Collect and germinated only in the beginning of the spring March-April.<sup>8,9</sup> generally produce one to two daughter tubers by the end of the growing season. Daughter tubers collected during autumn after the aerial shoots senesces and replanted in the spring. It produced leafy shoots in the first year of the growth , cultivated plants produced flowers in the second year of growth There are about 50-60 percent of seeds cooled for 30-45 days germinated and produced seedling. Seedlings raised from seeds after 120 days highest survival rate, nearly 45 and 29 percent under laboratory and field condition respectively The seedling remained in vegetative phase for at least 2 years It reproduce sexually in the 3rd year. Generally produce one to two daughter tubers by the end of the growing season. Daughter tubers collected during autumn after the aerial shoots senesces and replanted in the spring. It produced leafy shoots in the first year of the growth , cultivated plants produced flowers in the second year of growth There are about 50-60 percent of seeds cooled for 30-45 days germinated and produced seedling. Seedling raised from seeds after 120-days highest survival rate, nearly 45 and 29 percent under laboratory and field conditions, respectively. The seedling remained in vegetative phase for at least 2 years It reproduced by sexually in the 3rd year.<sup>7,9</sup>



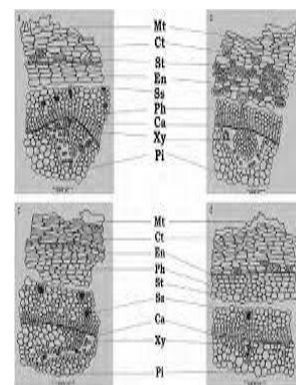
**Fig. 2:-** Nursery (left) and green house (right) grown plants of:  
A - *Aconitum balfourii*  
B - *Aconitum heterophyllum*



**Fig. 1:-** Aconitum heterophyllum Plant



**Fig.3:-** Dried Root of Aconitum heterophyllum



**Fig 4:-** Diagrammatic histological of transverse section<sup>19</sup>

### Morphology of Aconitum heterophyllum:-

Roots of *Aconitum heterophyllum* is paired whitish grey in colour 2.0-7.5 cm long, 0.4-1.6 cm or more thick at its upper extremity decreasing in thickness towards tapering end.<sup>6</sup> Stems of aconitum heterophyllum are simple and branched 15-20 cm high green in colour. It is a tree which has flowers from august to September. The leaves of *Aconitum heterophyllum* heteromorphous in nature dark greenish in color. The upper parts of the leaves are amplexicaul and lowest parts of leaves are long petioles, It's have a spiral (alternate) arrangements.<sup>6, 1</sup>

### Infinitesimal Characters:-

Transverse section of mature root shows, single layered epidermis consisting of light brown tabular cells rupturing on formation of cork It consists of 5-10 rows of tangentially elongated, thin-walled cells, cork cambium single layered consisting of tangentially elongated, thin-walled cells, cortex much wider consisting of tangentially elongated or rounded, thin-walled parenchymatous cells with intercellular spaces, cells.<sup>6</sup> The structure of the root tubers of *A. heterophyllum* irregular and different from other species of aconitum the tubers have 4-6 "vascular stands". It is identical into pith and cortex these strands occur by the splitting of one vascular stands<sup>7</sup>.

**Table 1:-** Environmental growth environment for natural and transplant Populations of Aconitum heterophyllum<sup>7</sup>

Environmental characteristic	Natural	Transplanted
Altitude (m)	2450	1520
Soil texture	Silty loam	Loam
Soil pH	5.6	7.2
Soil organic carbon (%)	2.2-3.5	2.4-3.3
Soil bulk density (g/m <sup>3</sup> )	1.43	1.75
Annual total rainfall (mm)	1485.7	664.2
Minimum temp. (C)	-19.8	-11.8
Maximum temp. (C)	28.4	36.6

**Phytochemical Analysis** The extracts of *Aconitum heterophyllum* of three different samples Leaf, Root, and Stem were tested for their phytochemical contents were found Alkaloids, Carbohydrate, Protrine & Amino acid, Saponins, Glycosides, Quinones, Flavonoids, Terpenoids by the different type of test.<sup>7</sup>

### Aconitum heterophyllum Leaves:-

The methanolic extracts of the Aconitum heterophyllum leaf showed the presence of alkaloids, carbohydrates, protein & amino acid, saponins, phenolic compounds and tannins, cardiac glycosides, quinones. Whereas, flavonoids, steroids, glycosides, and terpenoids were found absent in aconitum heterophyllum leaves.<sup>10</sup>

**Aconitum heterophyllum Roots:-**

The phytochemical analysis of the *Aconitum heterophyllum* root extracts showed the presence of alkaloids, carbohydrates, protein & amino acid, saponins, phenolic compounds and tannins, cardiac glycosides, quinones, flavonoids, steroids, terpenoids. Glycosides were not present in *Aconitum heterophyllum* roots.<sup>10</sup>

**Table 2:-** Qualitative phytochemical screening of *Aconitum heterophyllum* Extract (+Positive, - Negative)<sup>[21]</sup>

S. No.	Chemical Constituent	Phytochemical test	Leaf	Root	Stem
1	Alkaloids	<b>Mayer's test</b>	+	+	+
		<b>Wagner's test</b>	+	+	+
2	Carbohydrates	<b>Fehling, test</b>	+	+	+
3	Protein & Amino acid	<b>Ninhydrin test</b>	+	+	+
4	Saponins	<b>Salkowask'y test</b>	+	+	+
5	Glycosides	<b>Bromine water test</b>	+	+	+
		<b>Cardiac Glycosides</b>	+	+	+
6	Quinones		-	+	+
7	Flavonoids		+	+	+
8	Terpenoids		-	+	+

**Aconitum heterophyllum stem:-**

The phytochemical analysis of the *Aconitum heterophyllum* stem extracts showed the presence of alkaloids, carbohydrates, protein & amino acid, saponins, flavonoids, steroids, cardiac glycosides, terpenoids quinones in methanol extract. Absence of phenolic compounds and tannins, glycosides was observed in the *Aconitum heterophyllum* stem.<sup>10</sup>

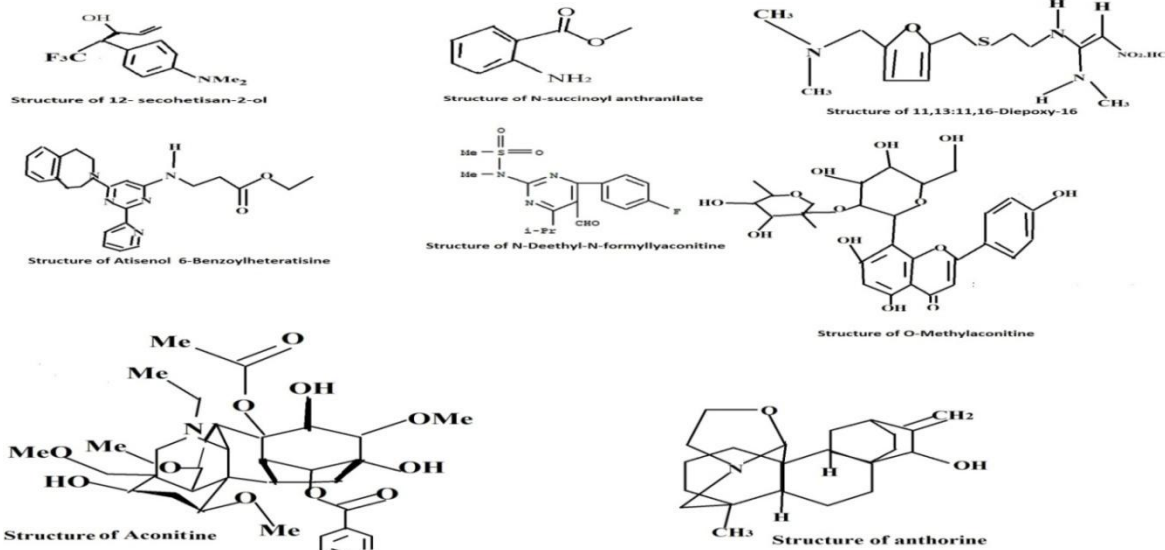
About 54 species of *Aconitum* have been chemically investigated these species are the rich sources of diterpene alkaloids and flavonoids as well as chemotaxonomic markers.<sup>11</sup>The diterpenoid alkaloids are divided in to two different type according to their substituents which affect the chemical and pharmacological properties of these alkaloids it have highly oxidative property C19-skeleton and C20-skeleton.<sup>12,13</sup> It Contain Atidine, 11, 13:11, 16-Diepoxy-16, 17-dihydro-11,12-secohetisan-2-ol, Anthorine Atisenol, 6-Benzoylheteratisine.<sup>14</sup> *Aconitum heterophyllum* also content different type of aconitine N-Diethyl-N-formylly aconitine,O-Methyl aconitine,Methyl-N-succinoyl anthranilate.<sup>14</sup>

**TLC analysis** In a qualitative assay, the alkaloid extracts of *Aconitum heterophyllum* turned milky color by the addition reaction with Mayer's reagent which confirmed the presence of alkaloid in the samples.The antibacterial activity of the alkaloid extract from the root of *A. heterophyllum* as well as eluted TLC bands was tested against different bacteria with certain human pathogens The crude alkaloid extract displayed moderate to strong level of antibacterial activity against *S. aureus*, *B. bronchiseptica*, *B. subtilis*, *P. putida* and *X. campestris* at higher concentration of 100 µg/ disc.<sup>15</sup>

**HPLC Analysis:-**

For the estimation of bioactive compound of *Aconitum heterophyllum* using a simple reversed phase HPLC-UV-DAD method. Peak heights were linear with relation to aconitine concentration with correlation coefficient >0.999. This assay is rapid, and highly reproducible and also found though a number of HPLC methods are used but the following assay system, comprising an acidic mobile phase, was found most suitable for the typical chromatogram development By optimize the extraction, separation and analytical conditions, a reliable and accurate high-performance liquid chromatography (HPLC) method coupled with photodiode array detector (DAD) was developed for simultaneous quantitative determination of six *Aconitum* alkaloids, i.e., aconitine, mesaconitine, hyaconitine, benzoylaconine, benzoylmesaconine, and benzoylhyaconine.<sup>16,17</sup>





### Chemical Structure of Some phytochemicals

#### Pharmacological Use:-

*Aconitum heterophyllum* has been used from centaury for the treatment and cure of many diseases externally and internally. Its juice of roots is used as an expectorant along with milk. Leaves and seeds are used for the treatment of tonsillitis. *Aconitum heterophyllum* seeds and roots are helpful in making a strong digestive system. Seeds have also diuretic properties which increase the intensity of urine and alleviate the burning sensation in the urine tract.<sup>18,19</sup>

**Digestive System-** In a diarrhea condition, fine powder of root with dry ginger, Beel fruits, (Bellpetra in India) Nutmeg (jaiphal in India) and (Atvika in India) mixed together in equal quantity and take two pinches with water three times a day.<sup>18</sup>

**Respiratory System-** The juice of *aconitum heterophyllum* root along with milk is given as an expectorant. Root powder is given orally in cervical lymphadenitis condition of patients.<sup>[1]</sup>

**Urinary System-** The seeds and roots of *Aconitum heterophyllum* have diuretic property, increase urine volume and reduce urinary tract burning.<sup>[1]</sup>

**Reproductive System-** The root of *Aconitum heterophyllum* is used for spermatorrhoea, and its root is also used in burning of vagina.<sup>[1]</sup>

**Hepatoprotective Activity-** *Aconitum heterophyllum* roots have hepatoprotective activity. This activity is due to the presence of antioxidants and others.<sup>17</sup> The *Aconitum* are also used as antipyretic and analgesic in the far western Nepal. Modern pharmacological study finds Caffeic acid of *A. koreanum* is anti-oxidative and anti-inflammatory. *Aconitum* is mixed with 2 spoon of ghee and taken two times in a day for fever and jaundice until recovery.<sup>24</sup> The *Aconitum* are also used as antipyretic and analgesic in the far western Nepal. Modern pharmacological study finds Caffeic acid of *A. koreanum* is anti-oxidative and anti-inflammatory. *Aconitum* is mixed with 2 spoon of ghee and taken two times in a day for fever and jaundice until recovery.<sup>20</sup> The root powder of *Ativihsa* with honey is prescribed for cough irritations and bronchitis. It is an anti-helminthic and in action it is effective against guinea-worms. It is also effective in blood pressure.<sup>21</sup> *Aconitum heterophyllum* roots have alexipharmic, anodyne, anti-atrabilious, anti-flatulent, anti-periodic, anti-phlegmatic, carminative property.<sup>22,18</sup>

#### Suggestion:-

There are some indications that occur in *Aconitum heterophyllum* roots part: Nausea, Bleeding piles, Periodic fever, Dyspepsia, Diarrhea, Dryness of mouth. When taken in larger doses may cause constipation.<sup>18</sup> Its some species are most poisons in nature.<sup>1</sup> In ancient time it is used as spike hunting so it must be handled with care.<sup>23,24</sup>

**Conclusion:-**

In the present review we have made an attempt to assemble the all information on *Aconitum heterophyllum* such as botanical, Photochemical, pharmacological, toxicological. *Aconitum heterophyllum* is a medicinal herb which is used in Indian medicine system, ayurvedic system. It is a important ingredient of Krsnadi Churna in Ayurvedic formulation this formulation are used for the baby sickness where as they are most sensitive so it must need to proof toxicity of this plant there are so many research are going on this plant till now no any toxicity related data available. It has many pharmacological property such as Alexipharmic, Anodyne, Anti-atrabilius, Anti-flatulent, Anti-periodic, Anti-phlegmatic, Carminative property, anti-oxidative and anti-inflammatory, expectorant but most species of aconitum are extremely toxic in nature.for the presence of some phytoconstituents. *Aconitum heterophyllum* is the intoxicating source of phytochemical constituents that are responsible for its pharmacological activities. This plant own medicinal value that was proved from the history of ancient-formulations.

**Conflict of interest:-**

The authors declare that there are no conflict of interest.

**Acknowledgment:-**

I take this privilege and pleasure to acknowledge the contributions of many individuals who have been inspirational and supportive throughout my review undertaken and endowed me with the most precious knowledge to see success in my endeavor. My review bears the imprint of all those people.

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### RESEARCH ARTICLE

#### RETINITIS SECONDARY TO RIFT VALLEY FEVER : CASE REPORT AND REVIEW OF LITERATURE.

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##### Key words:-

Rift valley fever, ocular manifestations,  
 review of literature

#### Abstract

A 64 year-old Saudi gentleman, originally from Gazan (southwestern region) of Saudi Arabia presented with history of decrease vision in the right eye for 25 years. Patient gave history of Rift Valley fever (RVF) 25 years ago, that nictitate his admission to the hospital for one week. He described right eye vision worsening after suffering from fever. Fundus of the right eye showed hypertrophic black chorioretinal adjacent to an atrophic scar in the macula, and the left eye showed defuse retinal pigment epithelial (RPE) mottling.

This case report aims to present the sequelae of retinitis secondary to RVF with brief review of literature of ophthalmic complications of RVF. Ocular involvements in RVF are found in up to 20 % of the cases. It may include retinal hemorrhages, anterior uveitis, vitreous reactions and macular edema and retinitis.

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#### Introduction:-

Rift valley fever (RVF) is an acute viral zoonotic febrile disease that caused by a virus related to *Bunyaviridae* Family. It affects cattle, sheep and humans<sup>1,2</sup>. The disease transmitted to human by bits of infected mosquito or direct exposure to infected animals' tissues<sup>1, 3</sup>. Disease presentation ranges from mild, self-limited to sever form with hemorrhagic, ocular, meningoencephalitis complications<sup>4</sup>. Symptoms of RVF starts after the incubation period (2days to 1 week) as flu like symptoms with headache, photophobia, joint pain, retro-orbital pain and myalgia<sup>1,5</sup>. Sever cases, 7-8% will develop hemorrhagic syndromes, meningo-encephalitis and death. Ocular complications occur in 1- 20% of them<sup>2</sup>.

Ocular manifestation may include: retinal hemorrhages, anterior uveitis, vitreous reactions, optic disc edema, and retinal vasculitis. Macular and paramacular edema also could develop<sup>6,7</sup>. The first reported epizootic RVF outbreak was in Kenya 1930, since that year epidemics was spread through Africa until 2000 when the outbreak reaches southwestern region of Saudi Arabia and Yemen as a first epidemic outside Africa<sup>2,7-8</sup>. This case report aims to present the sequelae of retinitis secondary to RVF with brief review of literature of ophthalmic complications of RVF.

#### Case presentation:-

A 64 year-old Saudi gentleman, originally from Gazan (southwestern region) of Saudi Arabia presented with history of decrease vision in the right eye for 25 years. Patient gave history of Rift Valley fever (RVF) 25 years ago, that

He presented with nictitate his admission to the hospital for one week. He described right eye vision worsening after suffering from fever. He is not known to have any medical illness.

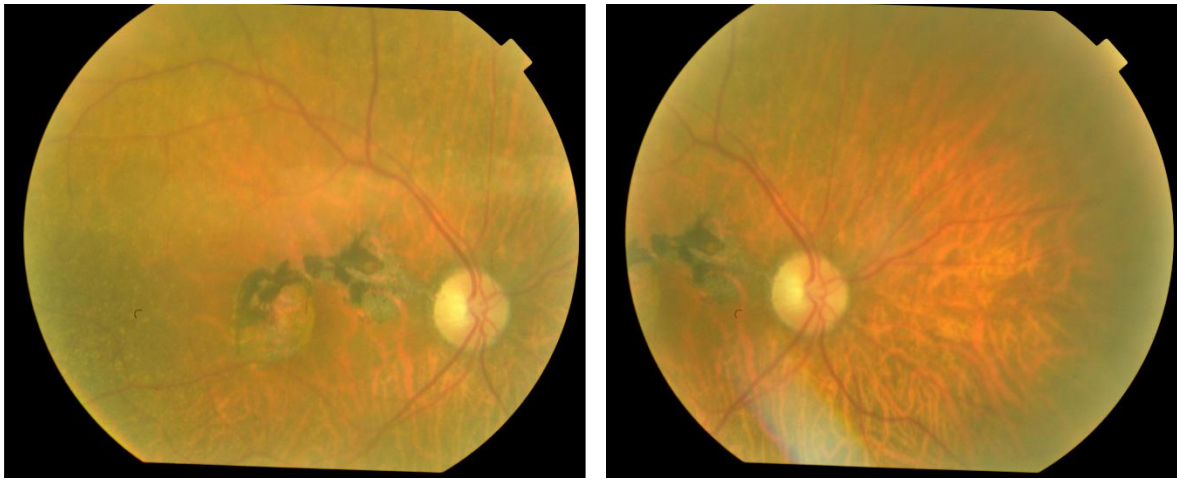
He underwent cataract surgery for the right and left eyes 3 years and 1 year back, respectively.

**On examination:-**

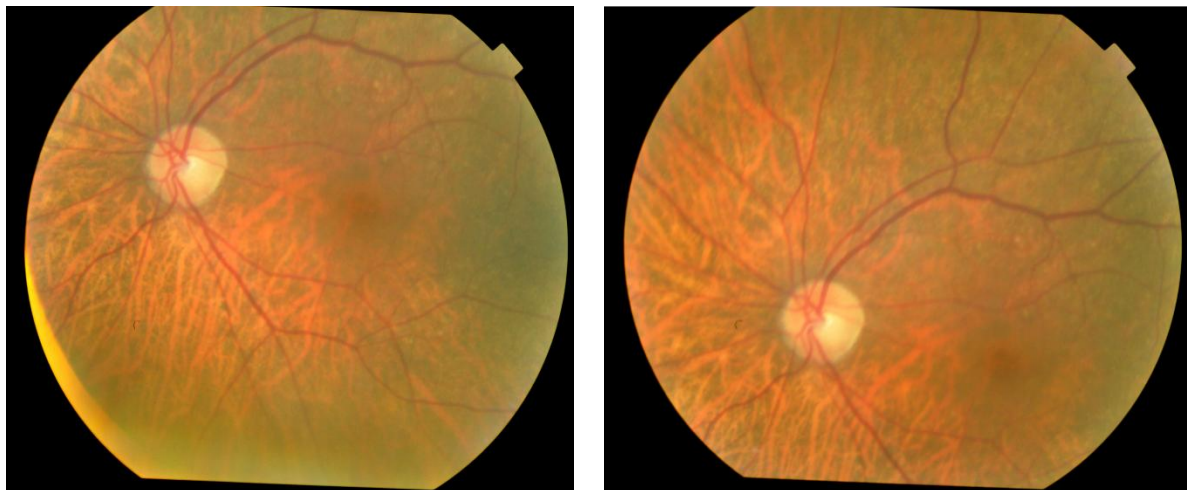
He had **visual acuity** of 0.16 in the right eye and 1.0 in the left eye.

**Slit lamp examination** showed pseudophakia in both eyes with no posterior capsular opacification (PCO).

**Fundus** of the right eye showed hypertrophic black chorioretinal adjacent to an atrophic scar in the macula, and the left eye showed diffuse retinal pigment epithelial (RPE) mottling as shown in figure 1-2.



**Figure 1:-** fundus photograph of the right eye showing atrophic macular scar.



**Figure 2:-** fundus photograph of the left eye showing retinal pigment epithelial mottling.

**Discussion:-**

Rift valley fever (RVF) is a viral zoonotic disease from the family of *Bunyaviridae* that affect both animals and humans<sup>1</sup>. Humans acquire the infection from bites of infected mosquitoes or through direct exposure to body fluid or tissues of infected animals<sup>1</sup>. The first epizootic outbreak of Rift valley fever was reported in Kenya in 1930<sup>2</sup>.

Affected individuals usually have mild, self-limited disease, lasting few days but severe disease with ocular, hemorrhagic, meningoencephalitis complications can occur<sup>7</sup>. Ocular manifestations accounts for up to 20 % of cases<sup>8</sup>. It was estimated that 1% of RVF cases have ocular complications during Gazan epidemic<sup>8</sup>. Ocular lesions usually develop within 4 weeks after the onset of illness. The pathogenesis of the lesions as suggested by fluorescein

angiography indicates that the lesions often start with primary occlusion of the retinal circulation, probably as a result of proliferation of the virus particles on the endothelial cells<sup>2</sup>. Before 1977, RVF caused mild disease in human and ocular complications were less frequent. In contrary, it was found that ocular complications were higher during Egypt outbreak<sup>3</sup>. The most common ocular presentation was macular and paramacular retinitis as found in several studies<sup>3,8</sup>. It was found during Gazan epidemic that macular retinitis accounts for 71 % while paramacular retinitis accounts for 29 %<sup>8</sup>. Retinitis can present alone or in association with other ocular abnormalities<sup>3</sup>. Anterior uveitis was reported first during Gazan epidemic. It was characterized by mild-moderate non-granulomatous type that resolved without any complication such as cataract, glaucoma or posterior synechiae<sup>3</sup>. Retinal hemorrhages occurred in 40% of cases, vasculitis was seen in 7%, vitreous reaction in 27% were seen along with retinitis. Optic nerve edema seen in 15%<sup>3</sup>.

The natural course of the disease depends upon the severity and the location of the retinal abnormality. Visual acuity may completely recover, with minimal loss of visual field, or there may be severe and permanent loss of vision, such as occurs in persistent total retinal detachment<sup>2</sup>. The most common complication was retinal scarring. Other complications include vascular occlusion leading to retinal ischemia and disc atrophy<sup>3,8</sup>.

In conclusion, retinitis is the most common ocular complication in RVF outbreak in Gazan, Saudi Arabia. Many studies recommend that Saudi Arabia and other Middle East countries have to sit a comprehensive strategy to prevent RVF recurrence.

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### RESEARCH ARTICLE

#### A CRITICAL ANALYSIS OF IMPRINTS OF NEOTECTONISAM IN SUKTA SUB -BASIN, PARTS OF NARMADA RIFT VALLEY, DISTRICT KHANDWA M.P.INDIA.

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#### Abstract

The geological geomorphological and Neotectonic studies of parts of Khandwa district Madhya Pradesh were carried out with the aid of Air photos between latitude 21°30'00 to 21°45'00 and longitude 76°15'00 to 76°30' in parts of Survey of India Sheet No. 55C\6 and an area about 720 sq.km. was covered by photo interpretation.

eologically the area comprised of Deccan trap and Quaternary sediment. The Deccan trap complex comprised of fifteen basaltic lava flows between 250 to 600 m above m.s.l. These lava flows constitute two formations viz. Khandwa formation (Nimar Group) consisting of six lava sheets between elevation of 250 to 360 m above m.s.l. and Asirgarh formation (Satpura Group) Consisting of nine lava sheets between 360 to 600 m above m.s.l. The exposed thickness of these lava flows is about 190 m.

The Quaternary deposits are represented by the sediments of two domain viz the sediments of present domain of Sukta and sediments of paleo domain of Sukta. These sediment predominantly comprised of sand, clay, silt and rock gravel. These deposits in the area are viz thin and occur as relict terraces and flood plain deposits, the average exposed thickness is about 3 m.

Geomorphologically the area comprised of nine surfaces each surface is characterized by distinct morphogenetic expression elevation, drainage, pedogenetic characters, slope elements and land use pattern. These surfaces are confined between 280 to 480 m above m.s.l. These surfaces in increasing antiquity are Quaternary terraces (280 to 300 m), Mordar surface (300 m), Sarala surface (320 m), Khadar surface (340 m), Borgaon surface (360 m), Jalandhar surface (400 m), Sarai surface (440 m), Gularpani (SE) 460 m and Gularpani (SW) (460-80 m). The morphogenetic expression of these surface has been appreciably by defaced by Neo-seismic events occurred in recent past along the network of lineaments traversing the area. The Sukta lineament trending in NE-SW, direction traverse across Mardar, Sarala, Khodar, Borgaon surfaces display selective entrustment and bear the imprints of Neotectonism in the area.

The other geomorphic features and land form elements association with the area are flood plain point bar, low level terraces, channel braids. Linear scarp, curvilinear scarp, knee shaped band, scree, re-treating

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scarp and relict terraces. Besides the area is associated with the morpho-tectonic elements viz perennial channel segments, impersistent and partly internal drainage, knee shaped channel band, linear scarps and rock cut terraces.

The study revealed the presence of five major lineament pattern in the area viz i) NE-SW, ii) NW-SE, iii) NNE-SSW to N-S, iv) NNW-WSW to E-W. The relative percentage of occurrence of these linear elements in different pattern is 29.7%, 23.4%, 23.4%, 14.1% and 9.4% respectively. The analysis of relative intensity of these lineaments reveal that major, intermediate lineament exhibit anisotropic intensity and minor elements isotropic intensity.

The Sukta is the major stream which drains across the northern part of area. Its course is controlled by NE-SW trending lineament named as Sukta lineament. It appears to be basement lineament and some movement has been taken place along this lineament in recent past. It is evident by morphogenetic manifestation of the area and imprints of Neotectonism along this lineament. A another prominent lineament which traverses between Sultanpur and Bodgaon along Moti Nala, display occurrences of hanging and impersistent drainage which often truncate against this lineament. It indicates the readjustment of base level of drainage system perhaps due to recent movement along the NE-SW trending lineament in the area. The imprints and signature of such events are documented by these first and second order streams being their sensitive and infant nature and their quick response to such events.

The Lakhauri NW-SE trending lineament and associated fabrics bears the imprints of Neotectonism and indicate some movement in the area.

The other lineament trending in NNW-SSE to N-S, NNE –SSE to N-S are associated with master joints and fracture and devoid of any significant signature of Neotectonic activity. The ENE –WSW to E-W in the area represent 9.4% of total lineament density of the area and bears some imprints of neotectonic activity east of Arud

The study of morphogenetic expression and analysis of imprints of neotectonism and overall morpho- tectonic manifestation of the area coupled with available data indicate that NE-SW trending set of lineament are active and some movement has been taken place in recent past in the area , as such the area appears to be active and prone to Neoseismic movements.

The critical analysis of data and application of keys combined with stratigraphic studies provide significant information to constrain timing and intensity and degree of movement of Sukta fault as inbuilt component of SONATA Lineament in the central western Narmada valley an important ENE–WSW-trending tectonic element responsible for the current interpolate seismicity being experienced in the central part of the Indian plate. The tectonic movements along the NSF during Late Pleistocene and Holocene have resulted three river terraces (NT\_1 to NT\_3) in Narmada valley which are in conformity of three major phases of tectonic movements in a compressive stress regimes recorded along the NSF: slow synsedimentary subsidence of the basin during Late Pleistocene due to differential movement, followed by inversion of the basin during the Holocene marked by differential uplift along the NSF. The study suggests that the inversion of the basin is in response to the significant increase in the intensity of compressive stresses in the Indian plate mainly during the Early Holocene. The occurrences of geomorphic land form elements and features, rock cut terraces , linear, scarp curvilinear scarp knee shaped channel band and segments ,

perennial channel segments, impersistent and partly internal drainage, and rock scar and plantation surfaces which are the resultant elements of tectonic movement related NSF fault to wards lat Holocene . The present incisive drainage and recent seismic activity along Sukta lineament indicate that the compressive stresses continue to accumulate along the NSF due to continued northward movement of the Indian plate.

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### **Introduction:-**

The Geological and Geomorphological studies in parts of Khandwa district M.P. in Survey of India top sheet No. 55C/6 was carried out by the author with the aid of Air photos (scale 1:50000), and an area about 720 sq.km was covered by photo interpretation. The area is located south of the Khandwa and bounded by latitude 21° 30 '00" and 21° 45 '00" and longitudes 76° 5 '00" to 76° 30 '00" E in top sheet Nos. 55C/6. The district headquarter Khandwa is well connected by State Highways and is a major railhead for broad and meter gauge sections of Central Railways. The area lies 10 km. South of Khandwa and is approachable by all weather roads. Khandwa – Singot – Borgaon – Burhanpur road diagonally passes through the areas. The interior part of the area is well connected by network of forest roads. The Khandwa – Bombay broad gauge of Central Railways passes through the Central part of the area with Dongargaon Khodar and Bagmer are important rail head in the area. The Ajmer – Khandwa – Kachigoda meter gauge line passes through the north – eastern part of the area with Mordar is main rail head. (Plate No\_1)

The area of study consists of two Physiography units viz the Nimar Plain (Narmada Valley) in the north and Satpura upland in south. The Nimar plain is characterized by a moderately upulating topography with a few low lying flat topped hills. The Satpura up land in South is characterized by the ENE-WSW to E-W trending chain of highly dissected and terraced plateau extending from Bankri on the west to Dahinala on the east. The minimum elevation of the area is 280 m. maximum elevation of is 480 m. above m.s.l.

The area is characterized by sub dendritic to sub-parallel drainage pattern. The Satpura upland form the major water divide for northerly and southerly flowing streams of the area draining into Narmada and Tapti river respectively. Bham river flowing in a westerly and northwesterly direction along with its numerous northerly flowing tributaries constitute the major drainage in the eastern part of the area. The western and north central part of the area is chiefly drained by northerly flowing Sukta Nadi and Lakhauri Nadi. The southern and south eastern part of the area is drained by Amadnagar and Pandhar Nadi which ultimately join Tapti river in the north.

### **Previous Work:-**

The area is covered by basaltic lava flows, Sharma & Yadava (1984), Yadava & Kandpal (1985) studied various aspects of lava flows their petro-chemistry, mineralogy and built up the stratigraphy of the area.

### **Present Work:-**

The present work is based of data acquired ad accrued from satellite imagery (IRS) of optical signatures of micro neosismic episodes of the area related with recent movements along the lineament fabrics of Earthquake prone area . The keys of Geomorphology and morphogenetic manifestation are applied and used in the west central segments of the SONATA LIEAMENT ZONE to trace and & analyze the imprints of neotectonism. The results of data of imprints in terms of optical signatures and landform configuration acquired and accrued both in laboratory and from ground, its synthesis & analysis and modeling by computer has been presented for the first time

### **Geological Setup:-**

The area studied is underlain by the theolitic basaltic lava flows belonging to Deccan Trap complex. These flows are confined between altitude of 245m and 485m above m.s.l. The average thickness of these lava sheets is about 190 m. A total of 15 basaltic lava flows are reported in the area by Sharma & Yadava (1984), and Yadava and Kandpal (1985). In general these are fine grained, massive hard and compact and non Porphyritic to sparsely porphyritic and some moderately to highly porphyritic in nature. These flows generally exhibit 'Aa' characters. The thickness of individual flow varies from 20 to 40 m. These lava flows are divided into two formation designated as Khandwa formation and Asirgarh formation of Nimar and Satpura Group reported by Sharma & Yadava (1984). The Geological and lithostratigraphic sequence of the area is given in Table No.1 below:-

**Table No.1:-** Geological Succession of the area OSI

Sheet No. 55C/6

Age	Group Formation	General Characters
Holocene	Quaternary sediments of Sukta Rock Gravels Sand, Silt and Clay and its Tributaries (265-270 m) above m.s.l.	
Asirgarh formation Upper (Satpura a Group) (360 m to 600m above m.s.l.) Cretaceous		Nine basaltic lava flows vesicular amygdular Mostly with fragmentary top. The The most of flows are "Aa" type, Unit at places. The individual flows
Some of flows contain mega cryst to lower Are separated by red bole weathered Eocene		Surface and intertrappean zone.
Khandwa formation (Nimar Group) (250 to 360 m above m.s.l.) Flows non-porphyratic. These flows Are separated by red bole intratra- ppen beds etc.		Six basaltic lava flows highly vesicular mygdular fragmentary and palaeo weathered top zone. Some of the

**Table No .2:-** Salient Features Of Quaternary & Prequaternary Surfaces In Sukta Sub-Basin

Locality: **KHIRGAON**

	River bad	T-0	T-1	T-2-	PQS II-IV	PQS IV- VI	PQSVI- VIII
<b>Age</b>	<b>HOLOCENE</b>						
<b>Elevation above MSL (m)</b>	<b>270</b>	<b>275</b>	<b>280</b>	<b>300</b>	<b>300-360-</b>	<b>360-420</b>	<b>420-480 Planation surfaces rock Scar</b>
<b>Geomorphic break (m)</b>	<b>0.00</b>	<b>5.00 Alluvial Face</b>	<b>5.00 Alluvial Bluff Section Steep Alluvial face</b>	<b>20.00 Steep Alluvial &amp; Composite Rock Face</b>	<b>60.00 Plantation surfaces Rock cut Terraces rock Scar Rock Face</b>	<b>80.00 Plantation surfaces / dissection Rock cut Terraces rock Scar Rock Face</b>	<b>60.00 Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face</b>
<b>Elevation above RB (m)</b>	<b>0.00 River bad Channel, Point Bar, Side Bar</b>	<b>5.00 Rock Face and Alluvial Bluff</b>	<b>10..00 Rock Face and Alluvial Bluff</b>	<b>20..00 Alluvial Bluff Rock Face</b>	<b>40.00 Rock cut Face</b>	<b>46.00 Rock Face</b>	<b>51.00 Rock cut faces rock Scar</b>
<b>Slope</b>	-----Towards North west -----			-----Towards North - -----		-----Towards North -----	
<b>Nature of surface</b>	-----Depositional, Cresent shape elongated ----- - Erosional .....				Rock cyut terraces and Rock scar -- -----Erosional ---Learnr scar line --- --		



<b>Cycle Sedimentation</b>	<b>Upward fining cycle</b> -----				<b>Rock cut scars -- Section not exposed----</b>	
	-----Polycycle -----				-----	
<b>Orientation of Axes</b>		NW-SE, N-S	NW-SE, NE-SW N-S	NW-SE, NE-SW	NW-SE	NW-SE NE-SW E-W
<b>Plunge of L-Axes</b>		-----Towards west, South North West & West -----		<b>Rock cut terraces and Scar</b>	<b>Rock cut terraces and Scar</b>	
<b>Relative disposition</b>	Divergent		Convergent	Divergent		Divergent
<b>Paired/Unpaired</b>	Unpaired		Paired	Paired	Paired	unpaired Paired
<b>Nature of scarp</b>	-----Curvilinear----		Curvilinear	-----Linear-----	-----Linear-----	
	Linear-----		-----Linear-----	-----Linear-----		-----Linear-----
			Rock cut scars	-----Erosional lines		
<b>Sedimentary feature</b>	Braided Channel, Channel bar Point bar coalescence Channel bar, Side bar , Graded bedding , Cross bedding, Lamination, cross lamination			Curvilinear ,Linear and composite scarp with rock faces		
<b>Terrace shape</b>	----- Cusate-----		----- Rectangular-----			
	-----		Rock cut scar		Sharp edge scar	
	Isolated cap					
<b>Land use pattern</b>	-----Barren -----		-----Inhabitation and cultivation-----			
	Forest covered area					
<b>Composition/Litho constituents arranged in probable order of abundance</b>	<p>River bad Braided Channel, Point Bar, Side Bar. With very coarse to very fine sand , silt &amp; Clay</p> <p>Quartzite, basalt, sandstone, limestone, Augate, Jaspar, schist, , slate, sand and silt.</p> <p>To Quartzite, gneiss, , basalt, granite sandstone, phyllite, , basic, schist shale sand and silt.</p> <p>T-1- Quartzite, granite, gneiss, meta basic sand stone, lime stone schist, basic, phyllite, slate, shale, sand silt and clay.</p> <p>T-2- Rock cut scar</p> <p>PQS II-IV : Rock cut scar Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face with soil cover</p> <p>PQS IV-VI : Rock cut scar Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face with soil cover</p> <p>PQS VI-VIII : Rock cut scar Rock cut Scar , Strand lines , rock cut dissected nicks with soil cover</p>					

**Table no. 3:-** salient features of quaternary & prequaternary surfaces in sukta sub-basin  
**Locality: BADGAON**

	River bad	T-0	T-1	T-2-	PQS II-IV	PQS IV-VI	PQSVI-VIII
<b>Age</b>	<b>HOLOCENE</b>						
<b>Elevation above MSL (m)</b>	268	272	278	300	300-360-	360-420	420-480 Planation surfaces rock Scar
<b>Geomorphic break (m)</b>	0.00	4.00 Alluvial Face	6.00 Alluvial Bluff Section Steep Alluvial face	22.00 Steep Alluvial & Composite Rock Face	60.00 Plantation surfaces Rock cut Surfaces rock Scar Rock Face	80.00 Plantation surfaces / dissection Rock cut surfaces rock Scar Composit Rock Face	60.00 Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face
<b>Elevation above RB (m)</b>	0.00 River bad Channel, Point Bar, Side Bar	4.00 Rock Face and Alluvial Bluff	10..00 Rock Face and Alluvial Bluff	32..00 Alluvial Bluff Rock Face	92.00 Rock cut Face	172.00 Rock Face	232.00 Rock cut faces rock Scar
<b>Slope</b>	-----Towards North west -----			-----Towards North - -----		-----Towards North -----	
<b>Nature of surface</b>	-----Depositional, Cresent shape elongated ----- - Erosional .....				Erosional surfaces,isolated bute & Mesa Dissection fragmentation Rock cut scarp and Rock scar ----- Erosional ---Lienar scar line escarpment -----		
<b>Cycle Sedimentation</b>	Upward fining cycle Polycycle -----					Rock cut scars -- Section not exposed----	
<b>Orientation of Axes</b>		NW-SE, N-S	NW-SE, NE-SW N-S	NW-SE, NE-SW	NW-SE, NE-SW	NW-SE	NE-SW E-W
<b>Plunge of L-Axes</b>		-----Towards west, South North West & West -----		Rock cut terraces and Scar		Rock cut terraces and Scar	
<b>Relative disposition</b>	Convergent	Divergent	Divergent	Divergent	Divergent	Divergent/	
<b>Paired/Unpaired</b>	Unpaired		Paired	Paired	unpaired	unpaired	Paired
<b>Nature of scarp</b>	-----Curvilinear----		Curvilinear	-----Linear-----	-----Linear-----		
	Linear-----		-----Linear-----	-----Linear-----		-----Linear-----	
	----- Rock cut scars		-----Erosional lines				
<b>Sedimentary / Erosional features</b>	Braided Channel, Channel bar Point bar coalescence Channel bar, Side bar , Graded bedding , Cross bedding, Lamination, cross lamination			Curvilinear ,Linear and composite scarp with rock faces Linear entrenchment ,dissection ,fragmentation , isolated rock mass			
<b>Shape of Q/PQ Surfaces</b>	----- Cresent / Cuspate-----						----- Rectangular-----

	Rock cut scar	Sharp edge scar
Land use pattern	Isolated cap -----Barren -----Inhabitation and cultivation----- Forest covered area	
Composition/Litho constituents arranged in probable order of abundance	<p>River bad: Braided Channel, Point Bar, Side Bar. With very coarse to very fine sand , silt &amp; Clay</p> <p style="padding-left: 40px;">basalt, sandstone, limestone, Augate, Jasper, , sand and silt.</p> <p>T-0 Quartzite, gneiss, , basalt, granite sandstone, phyllite, , basic, schist shale sand and silt.</p> <p>T-1- Quartzite, granite, gneiss, meta basic sand stone, lime stone schist, basic, phyllite, slate, shale, sand silt and clay.</p> <p>T-2- Rock cut scar</p> <p>PQS II-IV : Rock cut scar Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face soil cover</p> <p>PQS IV-VI : Rock cut scar Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face with soil cover</p> <p>PQS VI-VIII : Rock cut scar Rock cut Scar , Strand lines , rock cut dissected nicks with soil cover</p>	

Table no. 4:- salient features of quaternary & prequaternary surfaces in sukta sub-basin

Locality: SARLA

	River bad	T-0	T-1	T-2-	PQS II-IV	PQS IV-VI	PQS VI-VIII
Age	HOLOCENE						
Elevation above MSL (m)	265	270	275	300	300-360-	360-420	420-480 Planation surfaces rock Scar
Geomorphic break (m)	0.00	5.00 Alluvial Face	5.00 Alluvial Bluff Section Steep Alluvial face	25.00 Steep Alluvial & Composite Rock Face	60.00 Plantation surfaces Rock cut Surfaces rock Scar Rock Face	80.00 Plantation surfaces / dissection Rock cut surfaces rock Scar Composit Rock Face	60.00 Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face
Elevation above RB (m)	0.00 River bad Channel, Point Bar, Side Bar	5.00 Rock Face and Alluvial Bluff	10.00 Rock Face and Alluvial Bluff	35.00 Alluvial Bluff Rock Face	95.00 Rock cut Face	175.00 Rock Face	235.00 Rock cut faces rock Scar
Slope	-----Towards North west ----- --			-----Towards North -- -----		-----Towards North -- -----	
Nature of surface	----- Erosional & depositional I, Cresnet shape elongated ----- Erosional .....				Erosional surfaces,isolated bute & Mesa Dissection fragmentation Rock cut scarp and Rock scar -----Erosional		

	---Lianr scar line escarpment ----					
Cycle Sedimentation	Upward fining cycle -----Polycycle -----					Dissection ,Pedimentation Rock cut scars -- Section not exposed-----
Orientation of Axes		NW-SE, NE-SW	NW-SE, NE-SW N-S	NW-SE, NE-SW N-S	NW-SE, NE-SW	NW-SE NE-SW E-W
Plunge of L-Axes		-----Towards west, South North West & West -----		Rock cut terraces and Scar	Rock cut terraces and Scar	
Relative disposition	Convergent	Divergent	Divergent	Divergent	Divergent	Divergent/
Paired/Unpaired	Unpaired /Paired		Paired	Paired	unpaired	unpaired
Nature of scarp	Paired sharp Strand lines -----Curvilinear---- Curvilinear ----- -----Linear----- Linear----- -----Linear----- Linear----- Rock cut scars -----Erosional lines					
Sedimentary / Erosional features	Braided Channel, Channel bar Point bar coalescence Channel bar, Side bar , Graded bedding , Cross bedding, Lamination, cross lamination			Planation ,dissection curvilinear ,Linear and composite scarp with rock faces Linear entrenchment ,dissection ,fragmentation , isolated rock mass		
Shape of Q/PQ Surfaces	----- Cresent / Cuspate----- ----- Rectangular----- ----- Rock cut scar Sharp edge scar Isolated cap					
Land use pattern	-----Barren -----Inhabitation and cultivation----- Forest coverd area					
Composition/Litho constituents arranged in probable order of abundance	<p>River bad : Braided Channel, Point Bar, Side Bar. With very coarse to very fine sand , silt &amp; Clay Basalt , meta basic , prophylactic basalt limestone, t, green basalt sandstone, Augate, Jaspar, , sand and silt.</p> <p>T-0 Basalt, , lime stone , Augate Chert , sandstone limestone, , slate, shale, sand and silt T-1- Quartzite, , meta basic sand stone, lime stone schist, basic, , slate, shale, sand silt and clay. T-2- Rock cut scar</p> <p>PQS II-IV : Rock cut scar Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face with soil cover</p> <p>PQS IV-VI : Rock cut scar Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face with soil cover</p> <p>PQS VI-VIII : Rock cut scar Rock cut Scar , Strand lines , rock cut dissected nicks with soil cover</p>					

**Table no. 5:-** salient features of quaternary & prequaternary surfaces in sukta sub-basin  
**Locality: KHIRALA**

	River bad	T-0	T-1	T-2-	PQS II-IV	PQS IV-VI	PQS VI-VIII
<b>Age</b>		<b>HOLOCENE</b>					
Elevation above MSL (m)	262	268	273	300	300-360-	360-420	420-480 Planation surfaces rock Scar
Geomorphic break (m)	0.00	6.00 Alluvial Face	5.00 Alluvial Bluff Section Steep Alluvial face	27.00 Steep Alluvial & Composite Rock Face	60.00 Plantation surfaces Rock cut Surfaces Rock Scar Rock Face	80.00 Plantation surfaces / dissection Rock cut surfaces Rock Scar Composite Rock Face	60.00 Plantation surfaces Rock cut Terraces Rock Scar Composite Rock Face
Elevation above RB (m)	0.00 River bad Channel, Point Bar, Side Bar	6.00 Rock Face Escarpment Alluvial Bluff	16.00 Rock Face and Escarpment Alluvial Bluff	43.00 Alluvial Bluff Rock Face	103.00 Rock cut Face	183.00 Rock Face	243.00 Rock cut faces rock Scar
Slope	-----Towards North west -----			-----Towards North -----		-----Towards North -----	
Nature of surface	----- Erosional ,dissection & depositional Crescent shape elongated ----- -----				Erosional surfaces,isolated bute & Mesa Dissection fragmentation Rock cut scarp and Rock scar ----- Erosional ---Lianr scar line escarpment -----		
Cycle Sedimentation	Upward fining cycle -----Polycycle -----					Dissection ,Pedimentation Rock cut scars -- Section not exposed-----	
Orientation of Axes		NW-SE, NE-SW	NW-SE, NE-SW N-S	NW-SE, NE-SW N-S	NW-SE, NE-SW	NW-SE	NE-SW E-W
Plunge of L-Axes		-----Towards west, South North West & West -----		Rock cut terraces and Scar		Rock cut terraces and Scar	
Relative disposition	Convergent	Divergent	Divergent	Divergent	Divergent	Divergent/	
Paired/Unpaired	Unpaired /Paired		Paired	Paired	unpaired	unpaired	
Nature of scarp	-----Curvilinear-----		Curvilinear -----	-----Linear-----		-----Linear-----	
	Linear-----		-----Linear-----	-----Linear-----		-----Linear-----	
	----- Rock cut scars -----		-----Erosional lines -----				
Sedimentary / Erosional features	Braided Channel, Channel bar Point bar coalescence Channel bar, Side bar , Graded bedding , Cross bedding, Lamination,			Planation ,dissection curvilinear ,Linear and composite scarp with rock faces ,Butte Mesa Linear entrenchment ,dissection ,fragmentation , isolated rock mass			

	lamination	
Shape of Q/PQ Surfaces	----- Crescent / Cuspate----- ----- Rock cut scar	----- Rectangular----- ----- Sharp edge scar
Land use pattern	-----Barren -----	-----Inhabitation and cultivation----- Forest coverd area
Composition/Litho constituents arranged in probable order of abundance	<p>River bad Braided Channel, Point Bar, Side Bar. With very coarse to very fine sand , silt &amp; Clay. prophylactic basalt ,limestone, basalt, green basalt sandstone, Augate, Jasper,Chart , sand and silt.</p> <p>T-0 Basalt , Augate Chert , sandstone limestone, , slate, shale, sand and silt T-1- Quartzite , meta basic sand stone, lime stone meta basalt , basic, , slate, , sand silt and clay. T-2- Rock cut scar</p> <p>PQS II-IV : Rock cut scar Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face with soil cover</p> <p>PQS IV-VI : Rock cut scar Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face with soil cover</p> <p>PQSVI-VIII : Rock cut scar Rock cut Scar , Strand lines , rock cut dissected nicks with soil cover</p>	

Table no. 6:- salient features of quaternary & prequaternary surfaces in sukta sub-basin

Locality: KOTRA

	River bad	T-0	T-1	T-2-	PQS II-IV	PQS IV-VI	PQSVI-VIII
Age	HOLOCENE						
Elavation above MSL (m)	269	273	279	300	300-360-	360-420	420-480 Planation surfaces rock Scar
Geomorphic break (m)	0.00	4.00 Alluvial Face	6.00 Alluvial Bluff Section Steep Alluvial face	20.00 Steep Alluvial & Composite Rock Face	60.00 Plantation surfaces Rock cut Terraces rock Scar Rock Face	80.00 Plantation surfaces / dissection Rock cut Terraces rock Scar Rock Face	60.00 Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face
Elavation above RB (m)	0.00 River bad Channel, Point Bar, Side Bar	4.00 Rock Face and Alluvial Bluff	10..00 Rock Face and Alluvial Bluff	30..00 Alluvial Bluff Rock Face	90.00 Rock cut Face	150.00 Rock Face	210.00 Rock cut faces rock Scar
Slope	-----Towards North west ----- --			-----Towards North -- -----		-----Towards North -- -----	
Nature of surface	-----Depositional, Cresent shape elongated --- --- Errosional -----				Rock cyut terraces and Rock scar ---- ----Erosionall ---Lieanr scar line -----		
Cycle	Upward				fining		cycle Rock cut scars --

<b>Sedimentation</b>	-----Polycycle -----					Section not exposed----- ----	
<b>Orientation of Axes</b>		NW-SE, N-S	NW-SE, NE-SW N-S	NW-SE, NE-SW	NW-SE	NW-SE	NE-SW E-W
<b>Plunge of L-Axes</b>		-----Towards west, South North West & West -----		Rock cut terraces and Scar		Rock cut terraces and Scar	
<b>Relative disposition</b>	Convergent	Divergent		Divergent	Divergent		Divergent
<b>Paired/Unpaired</b>	Unpaired		Paired	Paired	Paired	unpaired	Paired
<b>Nature of scarp</b>	sharp Strand lines						
	-----Curvilinear----		Curvilinear	-----Linear-----	-----		
	Linear-----		-----Linear-----	-----			
	Linear-----		Rock cut scars	-----Erosional lines			
<b>Sedimentary feature</b>	Braided Channel, Channel bar Point bar coalescence Channel bar, Side bar , Graded bedding , Cross bedding, Lamination, cross lamination			Curvilinear ,Linear and composite scarp with rock faces			
<b>Terrace shape</b>	----- Cuspate-----		----- Rectangular-----				
	-----		Rock cut scar		Sharp edge scar		
	Isolated cap						
<b>Land use pattern</b>	-----Barren -----Inhabitation and cultivation----- Forest covered area						
<b>Composition/Litho constituents arranged in probable order of abundance</b>	<p>River bad : Rock sheets ,River Braids Braided Channel, Point Bar, Side Bar. With very coarse to very fine sand , silt &amp; Clay Basalt, meta basic , quartzite, basalt, sandstone, limestone, Augate, Jaspar, schist, , slate, sand and silt.</p> <p>To Quartzite, gneiss, , basalt, granite sandstone, phyllite, , basic, schist shale sand and silt.</p> <p>T-1- Quartzite, granite, gneiss, meta basic sand stone, lime stone schist, basic, phyllite, slate, shale, sand silt and clay.</p> <p>T-2- Rock cut scar</p> <p>PQS II-IV : Rock cut scar Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face with soil cover</p> <p>PQS IV-VI : Rock cut scar Plantation surfaces Rock cut Terraces rock Scar Composite Rock Face with soil cover</p> <p>PQS VI-VIII : Rock cut scar Rock cut Scar , Strand lines , rock cut dissected nicks with soil cover</p>						

**Khandwa Formation:-  
(Nimar Group)**

The Khandwa formation consists of six lava flows identified between elevation of 250 to 360 m above m.s.l. The average exposed thickness of this formation is about 110 m. in the area. The lava sheets of this formation are generally highly vesicular, amygdule, and sparsely porphyritic in nature. The individual flows are fine to medium grained hard compact, at places these flows are separated either by red bole, weathered zone or inter-trappean bed. This formation is exposed in the northern part of the area.

**Asirgarh Formation:-  
(Satpura Group)**

The Asirgarh formation consists of nine lava flows identified between elevation of 360 to 600 m above m.s.l. The average exposed thickness of this formation is about 240 m. The lava flows of this formation are mostly vesicular, amygdular and are 'A' type. The some of lava sheet contain mega cryst unit of feldspar. These are generally fine to medium grained hard compact and joined in nature. The vesicular unit is mostly spherical and filled with secondary silica and zeolite. These flows are either separated by red bole or inter-trappean bed. This formation is exposed in the southern part of the area.

**Quaternary Sediments:-**

The quaternary sediments and residual soil have occupied the northern part of the area of study. The quaternary deposits comprised of sediment of two domains, viz the sediment of present domain of Sukta and sediments of Paleo, domain of Sukta. The former constitutes the sediment of active flood plain facies and represented by silt, clay and rock gravel. It is restricted to the narrow valley along Sukta and its tributaries at an elevation of 265 to 280 m above m.s.l. The average thickness of sediment is about 2.5 m. The later comprised of sediment of flood plain facies of paleo-domain of Sukta predominated by clay, slit sand and rock fragments. These sediments form the quaternary terraces which are ill due to neotectonic activity in the area preserved and confined within the meandering loop of Sukta river.

These terraces are identified at an elevation of 280-340-300 m above m.s.l. and represent the former level of valley floor.

The northern plateau area is occupied by black cotton soil of residual nature developed on basaltic terrain. The thickness of soil varies from 2.5 to 6 m and average thickness is about 4.5 m. The soil thickness generally increases towards north. (Plate No.\_2)

**Geomorphological Set Up:-**

In Regional morphogenetic analysis of Sukta sub-basin were undertaken by Remote sensing techniques to decipher and trace the very process and events and resulted morphogenetic land scape architect and design. As such this tool and techniques were found very useful in understanding the landscape expression and geomorphology of the area. The satellite data image of IRS, MSS on 1:25000 and 1:50000 supplemented by Aerial Photograph with RF 1:50000 were used and field traverses in critical and crucial sections. The geomorphological mapping was carried out both in field and laboratory, based on the image interpretation; the perceptual relief and geometry of the land form have how ever helped in differentiating various land form units in some cases. A megnesopic is used for better viewing of image forms and accurate cartographic presentation. The prime objective of the study is was to analyze the geomorphic and morphotectonic elements, their spatial pattern and classification of discrete morph units to understand the morphological developments and stages of evolution of the area.

Remote sensing technique was utilized to analyze the geomorphology of the Sukta sub basin The basic data inputs is in the study from the LANDSAT – 4 MSS B/W bands 1,2,3,4 on 1:500,000 scale and standard mode FCCs of bands 1,2,3 on 1:250,000 scale.

The geological and geomorphologic maps (on 1:1 million scales) as well as the physiographic map of National Atlas were consulted. Geomorphological analysis was carried out, following the standard methodology of visual image interpretation. The perceptual relief and geometry of the landforms has helped in differentiating the various geomorphic units.

The area studied forms the part of Narmada basin. It is drained by Sukta river and its tributaries. The Sukta rises from Satpura from the south east corner of area, at an elevation of about 500 m above m.s.l. The Satpura constitute upland of E-W trading hill ranges of Deccan basalt rising to an average height about 450 m above m.s.l. It forms the water divide between Narmada and Tapti basin. The area has been posed to renewed erosional and depositional activities and has been chiseled to various platforms surfaces and landform elements. Based on morphogenetic expression, elevation, drainage, pedogenetic characters, slope elements, land use pattern and diagnostics morphogenetic expression the area is divided into eight surfaces. These surfaces are both Quaternary terraces and Pre-Quaternary surfaces, the former are two surfaces of Sukta designated as (T\_1 to T\_2) which are resultant product of Aggradations & degradation of Quaternary sediment at an elevation of (280 to 300 m above m.s.l.)



Morder surface (300 m above m.s.l.) Peneplation Sarola Surface (320 m above m.s.l.) Peneplanation Khodar Surface (340 m above m.s.l.) Dissection & Peneplanation Bargaon Surface (360 m above m.s.l.) Dissection / pedimentation / peneplanation Jalandar surface (400 m above m.s.l.) Peneplanation Sarai surface (440 m above m.s.l.) Peneplanation Gularpani Surface (SE) (460 m above m.s.l.) Peneplanation Gularpani Surface (SW) (460-80 m above m.s.l.). These surfaces are described here under. (Plate No \_2)

#### **Quaternary Surfaces:-**

The Sukta river has formed two terraces besides its present day flood plain. These terraces are identified between elevations of 280 to 300 m above m.s.l. The occurrence of these terraces is restricted to Sukta and its meandering loop in the area. These represent the former levels of valley floors and were formed by cyclic rejuvenation of channel in recent past. These surfaces on Air photos are indentified by light to moderate grey tome, low drainage density, relict expression and agriculture land use pattern. The occurrences of river terraces between 280 to 300 m and rock cut terraces in same conformity am and elevation that the area is under compressive stress unstable.

The Quaternary landscaping the area of study is represented by of prominent stepped sequence of river terraces of fluvial origin which are well-developed in the Sukta valley. These terraces are both erosional and depositional in nature and are separated by linear and curvilinear scarp and represent former valley floor.

The Quaternary events of the Sukta portys two prominent terraces which are designated T\_1 to T\_2 besides T\_0 in increasing order of antiquity. The terraces are described in detail separately. These are both erosional and depositional terraces and identified & confined at an elevation of between 280m to 300 m above m.s.l. The T\_1 is being the youngest terrace andNT\_2 it is being the oldest terrace identified in the valley. The occurrence of these terraces is restricted in Sukta its meandering loop and along the margin of valley. The occurrences of river terraces between 280 to 300 m and rock cut terraces in same conformity and elevation indicates that the area is under compressive stress and is unstable.

The other geomorphic features and landform elements delineated in the area are flood plain, point bar, low level terraces, channel braids, linear, scarp curvilinear scrap knee shaped band, scree re-retreating scrap and relict surfaces The various morph tectonic elements identified in the area are perennial channel segments, impersistent and partly internal drainage, knee shaped band, linear scarp & rock cut terraces and rock scar which are the resultant elements of tectonic activity in area.

The salient and diagnostic elements of river terraces are incorporated in (Table No 2 \_ to\_6).

#### **Pre-Quaternary Surfaces:-**

The pre-quaternary surfaces are identified above the elevation of 300 m above m.s.l.on Deccan upland of Sapura. These surfaces are basically plantation surfaces, are developed in response to the tectonic up lift of the area and consequential adjustment of regional erosional cycle in the area during pre-quaternary times.

#### **Mondar Surface:-**

It is a pre-quaternary surface identified at an elevation of 300 m above m.s.l. and named after Mordar a prominent village, situated on this surface. It is covered by thick soil and is drained by Sukta and Lakhauri rivers. These streams display deep entrenchment, selective gullyng along their courses and have chiseled rock cut terraces. The Lakhauri Nadi south of Mordar depicts perennial water channel segment which is anomalous and morphotectonic manifestation. It appears water table in the area is effluent in nature and tapped by channel along the NNE-SSW trending lineament. The slope of this surface is towards north east. On Air Photos it is characterized by distinct elevation low to moderate drainage density and agriculture land use pattern.

#### **Arola Surface:-**

It is a peniplain surface identified at an elevation of 300 m above m.s.l. and named after Sarola a prominent village situated at the nose of meandering loop of Sukta in the area. The surface has occupied large area between Rampura in North West and Nimkhera in the east. It is covered by thick soil and is drained by Sukta Lakhauri and their tributaries. It displays deep dissection and entrenchment along drainage. The slope of this surface is about 8-10 towards north east. On Air photos this surface is characterized by distinct elevation intensive dissection and selective and intensive gullyng along NE-SW trending lineaments along the stream.

#### **Khodar Surface:-**

It is erosional surface delineated at an elevation of about 340 m above m.s.l. named after the Khodar a preminet village, situated on this surface. It has occupied large area between Rustampur in the east and Kumta in the west. It

is drained by Sukta and its tributaries. It exhibit intensive dissection and entrenchment along Sukta river. The impersistent and partly internal drainage are seen on this surface around Jamthi, east of Piparahati, Jamli, Khurd and Pachama. This drainage diversely oriented and generally abuts against the lineament traversing the area. These are the positive imprints of Neotectonism in the area. The density of these relict drainage is moderately high on the northern flank of Sukta river as compared to the south. It perhaps indicate that northern block is active and under the slow process of resettlements and relative re-adjustment. The NE-SW trending lineament traversing along Moti-Nala cut across this surface from Sultanpur, south of Pachamba, Pawai Kalan, north of Takli Kalan, Khodar, Sarola and Ardalan Kalan and beyond, appears to be active and some movements have been occurred along this element in recent past. It is also evident by the over all Neotectonic manifestation of the area. The slope of this surface is about 8-10 towards north east. On Air photos this surface is characterized by distinct elevation, slope element intensive gullying selective land dissection and truncated relict drainage element.

#### **Badgaon Surface:-**

The Badgaon surface is identified at an elevation of 360 m and named after Borgaon a prominent village situated on this surface. It is erosional surface and was formed by the cumulative process of dissection pedimentation and peniplanation. It is widely developed and has occupied large area along the northern edge of Satpura between Bhilkheri and Sukhtanagar and between Sukhtanagar and Rustampur. It is drained by Sukta river and its tributaries. These streams are mostly sub-parallel to parallel and their courses are controlled by concealed fractures and lineament. The Sukta river display intensive entrenchment across this surface. It is associated with relict impersistent and partly internal drainage element. These are the signatures of Neotectonism and are identified around Borgaon, west of Khirala, north of Khirala, and east and north east of Arud. These elements show some parallelism in their disposition and ENE-WSW trending lineaments. The Sukta river in the western part of this surface form the Knee shaped channel band and form the deep gorge of about 12 m bearing rock out terraces in the river bed. The intensive entrenchment along Sukta association of knee shape channel segment, rock terraces, relict internal drainage are the signatures of neotectonic activity. The prominent NE-SW trending lineament which traverse across the Sukta and other two E-W trending lineament north and south of Arud which about against Sukta lineament east of Piparahati appears to have been re-activated in recent past.

On Air photos this surface is delineated by distinct elevation truncated and hanging drainage land use pattern and diagnostic photo elements.

#### **Alandhar surface:-**

It is situated at an elevation of about 400 m above m.s.l. and named after Jalandhar a prominent village located on this surface. It is developed along the northern edge of Satpura and its best development is seen around Jalandhar in the eastern part of the area. It is essentially a peniplain surface and forms a distinct plateau. It is drained by sub-parallel to parallel streams exhibiting intensive entrenchment along their courses which are controlled by concealed features and lineament. This surface bears segment of relict internal drainage, faulted scarp and demonstrate intensive linear gulling and accelerated headward erosion. These elements are imprints and signature of Neotectonism and suggest that the area is active. On Air photos it is characterized by distinct platform, elevation, drainage, land use practices and other diagnostic photo elements.

#### **Sarai surface:-**

It is a relict peniplain surface identified at an elevation of about 440 m. above m.s.l. It forms distinct platform and separated by prominent curvilinear scarp. It is drained by sub-parallel stream which display accelerated headward erosion. On air photos it is delineated by elevation, relict characters and thick forest covers.

#### **Gularpani surface (se):-**

It is also a relict peniplain surface identified SE of Gularpani at an elevation of 460 m above m.s.l. It forms small plateau and separated by scarp on air photos it is identified by its elevation relict mode of occurrence, low to very low drainage density and forest cover.

#### **Gularpani surface (sw):-**

It is isolated erosional surface identified south west of Gularpani at an elevation of about 460-480 m above m.s.l. It forms small relict plateau separated by re-treating scarp. (Plate No\_2 & Table No 2 to 6 )

**Tectonic setting of the area:-**

Narmada River originates at Amarkantak at an elevation of about 1057m above m.s.l. descended from the mountainous tract traversing over a distance of 1280km across the middle of the Indian sub-continent to join the Gulf of Cambay, near Baroda in Gujarat state. The river course of Narmada is conspicuously straight, controlled by E-W lineament. It descends down the mountainous tract through deep and steep gorges in straight sinuous to meandering pattern with average sinuosity index of 1.38, which at places exceeds 1.55 for some selected segments of Narmada channel. It almost flows E-W along the Lineament over a length of 1300 Kilometers across the middle of Indian sub-continent to debouch into the Gulf of Cambay in the Arabian sea. It is bound by Vindhya range in the north and Satpura range to the south; the area in between these two upland is found to be ideal loci for a study of Quaternary sedimentation, as witnessed by the presence of multicyclic sequence of Quaternary terraces in the valley. These terraces represent the former levels of valley floors formed by cumulative erosional and depositional activities of the river system.

The area studied forms part of SONATA LINEAMENT ZONE which tectonically encompasses two crustal provinces of Central India Shield, namely, the Northern Crustal Province (NCP) and the Southern Crustal Province (SCP) (Acharyya and Roy, 1998; Roy, 1988). The two provinces are separated by a crustal level shear zone, referred as Central Indian Suture (CIS Jain et al. 1995). The southern part of the NCP, containing the Satpura and Son Narmada (SONA) valley geographic domain, is known as Central Indian Tectonic Zone (CITZ; Radhakrishna and the CITZ are marked by Narmada North Fault (NNF) in the north and CIS in the south (Acharyya, 1999). The Jabalpur earthquake affected area lies in SONA lineament zone which forms the northern units of CITZ. The SONA zone is about 1600 km long and 150 km-200km wide, extending from the southern margin of Kathiawar peninsula in the west to the margin of Vindhyan basin in the east (Crewford, 1978; Ahmad, 1964). The zone has been a major locus of episodic tectonism with evidences of reactivation. The E-W to ENE-WSW trending Narmada and Tapti lineament from a prominent tectonic belt (SONATA) in midplate continental India 2). Narmada tectonic line and its presumed eastward extension, Son, have been considered as a major Precambrian deep crustal features (Auden, 1949; West 1962) and possibly a palaeo-rift (Nayak 1990) extending hundreds of kilometer in E-W direction (Mishra 1987, 1992). Pascoe (1959) recognized the Narmada lineament as a rift at its western ends however, its eastward extension and the relative timing of the Narmada rifting and Deccan Trap eruption remained unknown. The correlation of structure and geo-physical data shows that the Son-Narmada and Tapti lineament together represent an interpolate rift with a central (Satpura Block) horst bounded on either side by grabens: the Narmada graben on the north and the Tapti graben to the south (Mishra et al, 1999).

The Narmada Rift valley is conspicuous ENE-WSW to E-W trending prominent composite structural system across Indian sub-continent. It consists of various blocks which are dislocated and faulted along various faults and lineaments in space and time. The Narmada Rift System consists of various sub-basins like Hiran, Sher Shakkar, Dudhi, Tawa, in eastern and central segment, where as in the western extension Sukta which are minor basins are integrated and built part of main rift System. These sub basins possess imprints of rifting, sinking and rifting events. These imprints are recorded in terms of manifestation and signature on landscape, drainage, of land form elements, present and paleo-meandering signature, river terraces, cut of meanders, paleo channels, scars, rock cut terraces, entrenchment and linear and curvilinear scars. These sub basins have developed transverse to the main axis of Narmada rifting and had deep cut across the quaternary blanket. The evolution of Narmada graben is differential and asymmetrical with rifting and sinking valley floor. In Sukta sub basin a prominent NW-SE trending lineament is identified which controls the course of Sukta, it is named as Sukta lineament. It traverses from Katra in the east to Mordar in the north west over the distance of about 45 km. It appears to be basement element and some movement has taken place along this lineament in recent to Segwal in about 19 km. in length, the upper segment of Lakhauri Nadi between Kumtha and Gandhwa, is controlled by this lineament. It beyond Gandhwa cut across Sukta and Itwa lineament north of Badgaon and about against NE-SW lineament south of Segwal. This lineament bears the signature of neotectonism as disclosed by morphogenetic setting of the area. Another NW-SE trending lineament east of Khodar deeply incised Sarala surface and traverse across the Sukta lineament and truncates against the Moti-Nala along knee shape channel band of Sukta. The Sukta lineament is an active lineament as manifested by neoseismic signature as displayed in the area. The area is unstable prone to earthquake. (Plate 1, 2, 3, 4 & 5)

**Lineament Febrics:-**

The study revealed that the area embraces number of major, minor lineament fracture and faults. Though they have been noted in varying length and in a number of directions, only the more prominent ones which are persistent are grouped and discussed. Accordingly, four major lineament patterns have been identified and discussed. These lineament patterns viz i) NE-SW ii) NW-SE, iii) NNE-SSW to N-S, iv) NNW-SSS to N-S, v) ENE-WSW to E-W. The relative percentage of occurrence of lineament in these different patterns is 29.7%, 23.4%, 14.1%, 9.4% respectively. The analysis of these linear elements reveal that mega and intermediate lineament exhibit anisotropic intensity and minor lineament, fractures and faults isotropic intensity. (Plate (Plate \_1, 2, 3, 4 & 5, 6)

**Ne-Sw Lineaments:-**

This set of lineament is very conspicuous and stretch across the entire length of northern part of the area. It consists of about 19 lineaments which is 29.7% of total lineament present in the area. The length of these lineaments varies from 25 to 25 cm and the average length is about 7.5 km. A prominent NW-SE trending lineament which is controlled by the course of Sukta and named as Sukta lineament. It traverses from Katra in the east to Mordar in the North West over the distance of about 45 km. It appears to be basement element and some movement has taken place along this lineament in recent to Segwal in about 19 km. in length, the upper segment of Lakhauri Nadi between Kumtha and Gandhwa, is controlled by this lineament. It beyond Gandhwa cut across Sukta and Itwa lineament north of Badgaon and about against NE-SW lineament south of Segwal. This lineament bears the signature of neotectonism as disclosed by morphogenetic setting of the area. Another NW-SE trending lineament east of khodar deeply linaised Sarala surface and traverse across the Sukta lineament and trunkets against the Mati-Nala along knee shap channel band of Sukta.

In the Satpura upland south of Gullarpani three prominent NW-SE trending lineaments are delineated and named as Dahi, Mandwa, and Amadnagar lineament. These lineaments cut across about 190 m thick piles of basaltic lava sheets and seem to be active in recent past as witnessed by the geomorphic setting, drainage, intensive gullying, selective entrenchment, re-treting scarp and alignment of isolated relict surface in the area.

**Nnw-Sse To N-S Lineament:-**

It includes 15 lineaments which constitute 23.4% of the total lineament traversing the area. The length of these elements varies from 2.5 to 10 km and average length is about 4.5 km. These elements are generally associated with master joints and fractures and seem to be transverse nature and conspicuously associated along the northern edge of Satpura upland with the Badgaon surface.

**Nne-Ssw To N-S Lineament:-**

This group of lineament constitutes about 4.1% of total lineament of the area. The relative length of these lineaments is comparatively less than the other group it varies from 2 to 6.5 km and average length is about 3.25 km. These are associated with master joints and fractures of the area. These elements are coupled with the contemporary NNW-SSE lineament and are developed in response to resultant stress and strain caused by major events.

**Ene-Wsw To E-W Lineament :-**

This group includes six lineaments which constitute about 9.4% of total lineament traversing the area. The length of these linear elements varies from 1.5 to 6 km and average length is about 3 kms. These lineaments east of Arud bear the imprints of Neotectonism.

**Neotectonism:**

The area studied is part of Narmada basin and is drained by Sukta and its tributaries. The Sukta rises from the Satpura at are elevation of about 500 m above m.s.l. It decends northerly in straight to sinuous channel pattern across the deep gorges of Satpura ranges and debauches in the plain east of Katra. The river takes sharp turn towards north west of Sukta Nagar and flows towards north east accorss the central part of the area and joins Chowta Tawa river around Rudhi. The other important tribularies drain the area is Bham, Lakhauri and Abna river. In the area the course of Sukta river has been controlled by NE-SW trending lineament which bears imprints of neotectonism. These imprints are of cyclic nature and are well documented in the erosional and depositional domain of Sukta. The signature of these neo-seismic activities is also displayed in over all morphogenetic expression of the area. The Sukta river is associated with several nectectonic and morphotectonic elements, like straight channel segment, flood

plain quaternary terraces, entrenched river bank, knee shaped bands, rock cut terraces, linear scarp perennial channel segments, and truncated hanging drainage.

The present flood plain of Sukta river is confined in the narrow valley along the river course. This flood plain occurs at the elevation between 265 to 280 m above m.s.l. and has entrenched its bank about 12 m. The deeply selective and incised entrencher nature of the channel suggests rejuvenation of the river due to re-activation of NE-SW trending lineament towards the later phases of quaternary sedimentation. The relict quaternary terraces associated with the meandering loops and entrenched valley is indentified at an elevation of 340-370 m about m.s.l. These are the former level of valley floor of Sukta and were formed by cyclic rejuvenation of channel twice in the recent past. It indicates at least two distinct sequential phases of neotectonic activity along NE-SW trending lineament during Holocene time.

The Sukta river is associated with knee shaped channel band around Sarala. It is bounded by ENE-WSW trending lineament in south and NW-SE trending lineament in east and west respectively. The northern and southern lineaments converge in the east around Badgaon. The disposition of this knee shaped band with respect to the quaternary terraces, entrenched valley and frame work of lineament indicate Neosiesmic activity along these lineaments in the area.

The Sukta is associated with prominent rock cut terraces/rock benches east and northeast of Sukta Nagar, east of Khairala, around Piprahati, north of Badgaon. These elements indicate anomalous high kinetic energy condition of channel system towards later phases of sedimentation. It is perhaps due to re-activation of NE-SW trending lineament in recent past.

The linear scarp is one of prominent element associated with Sukta river. These are essentially incision scarp and their total length is about 22 km. The height rises from 5 to 15 m and average height is about 12 m. These are cyclic scarp and display divergent relative disposition all along the channel it reveal that the channel has suddenly re-adjusted its base level cutting across the bed rock perhaps due to re-activation Sukta lineament in recent past.

The Sukta all along its length of 32 km in the area display its dry river course except perennial segments of channel pool around Badgaon. This erratic behavior of stream suggest its influent nature in the area perhaps due to concealed controlled of NW-SE trending lineament, which ease out its water to sub-surface water regime.

The perennial segment of channel around Badgaon exhibit reveral behavior of stream revealing effluent nature of water table due to interesting of NW-SE and NNE-SSE trending lineament around Badgaon.

The area north of Sukta Nagar display impersistent, partly internal and truncated drainage. It is seen around Arud, north west and south of Sultanpur south west of Rustampur east of Jamli khurd around Pawaikalan, north of Takli Kalan and around Shaikhpora. These drainage are diversely distributed and often truncated against the lineament traversing the area.

It indicates re-adjustment of base level of drainage, in the response to the recent movement along the network of lineaments traversing the area. It is interesting to note that these drainage elements are mostly confined north of Sukta river. It indicates that northern block is more active and under the slow process of re-adjustment as compared to other blocks (Plate \_2, 3, 4)

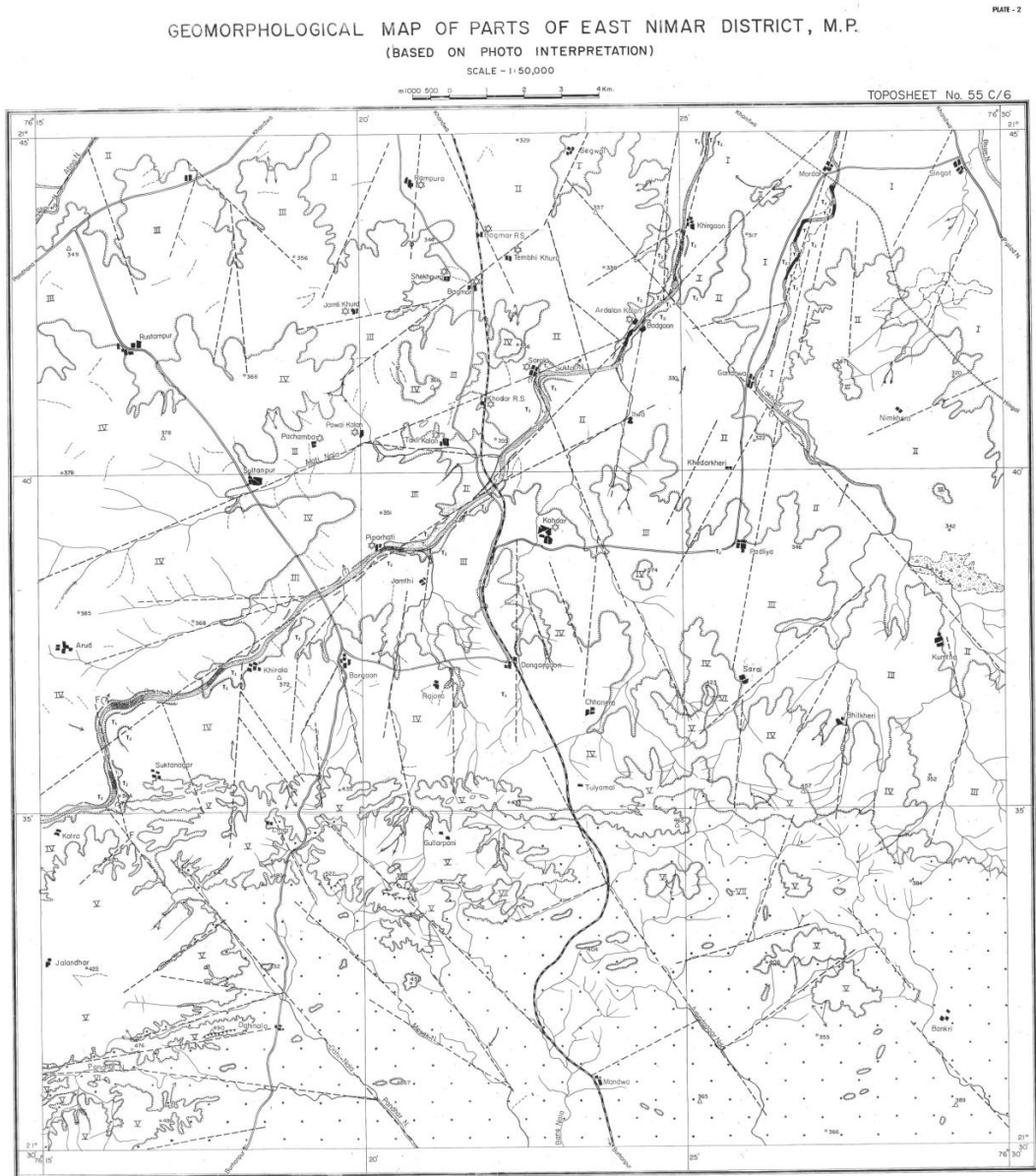
### **Summary Conclusion And Recommendation:-**

The geological, geomorphological and Neotectonic studies of parts of Sukta sub basin in parts of Khandwa district Madhya Pradesh were carried out with the aid of Satellite Imagery (IRS), air photos in Survey of India sheet 55 C /6 to acquired and accrued the data from optical signatures of micro neosiesmic episodes and recent movements along the lineament fabrics of Earthquake prone area . The Geomorphologic keys and morphotectonic manifestation in the west central segments of the SONATA LIEAMET ZONE are applied to trace and delineate imprints of neotectonism. The results of data synthesis, analysis of imprints and signature and modeling of the area by computer has been documented & presented for the first time.

The study reveals that geologically the area is occupied by Deccan trap and Quaternary sediments. The Deccan Trap complex consists of fifteen basaltic lava flows identified between 250 to 600 m above m.s.l. These lava flows are grey in color, moderately to highly vesicular in nature and each is separated by red bole intertrappean beds or mega

cryst unit. These lava flows are divided in to two formations viz i) Khandwa formation (Nimar Group) consisting of six flows between elevation of 250-360 m) and Asirgarh formation (Satpura Group) consisting of nine flows between 360-600 m above m.s.l. The exposed thickness of these flows is about 190 m.

Plate No 2:- Geomorphologic Map of Parts of East Nimar District, M.P.



INDEX	GEOMORPHIC FEATURES & LANDFORM ELEMENTS	MORPHOTECTONIC FEATURES
I Quaternary Terraces (280 to 300 m above msl) --- Aggradation & degradation of Quaternary sediments ---	Flood plain Point bar Low level terrace Channel braids Linear scarp Curvilinear scarp Knee shaped channe band Perennial channel segments Lateral bank cutting Vertical bank cutting	Perennial channel segment (Influent nature of water table controlled by cross lineament) Impersistent and partly internal drainage Knee shaped channel band Linear incisional scarp Rock cut benches / Rock cut / River bed / Nick points in channel bed.
II Murdar Surface (300m above m.s.l.) --- Penneplanation ---	Impersistent and partly internal drainage Deep gully erosion Accelerated headward erosion Scree Retreating scarp Relict Surfaces Faults Lineament	
III Sorala Surface (320 m above m.s.l.) --- Penneplanation ---		
IV Khodar Surface (340 m above m.s.l.) --- Dissection and Penneplanation ---		
V Borgon Surface (360m above m.s.l.) --- Dissection / Pedimentation / Penneplanation ---		
VI Jolaindar Surface (400 m above m.s.l.) --- Penneplanation ---		
VII Sora Surface (440 m above m.s.l.) --- Penneplanation ---		
VIII Gularpan Surface (SE) (460 m above m.s.l.) --- Penneplanation ---		
IX Gularpan Surface (SW) (460 - 480 m above m.s.l.)		

Prepared by---

Plate No :-1Location Map

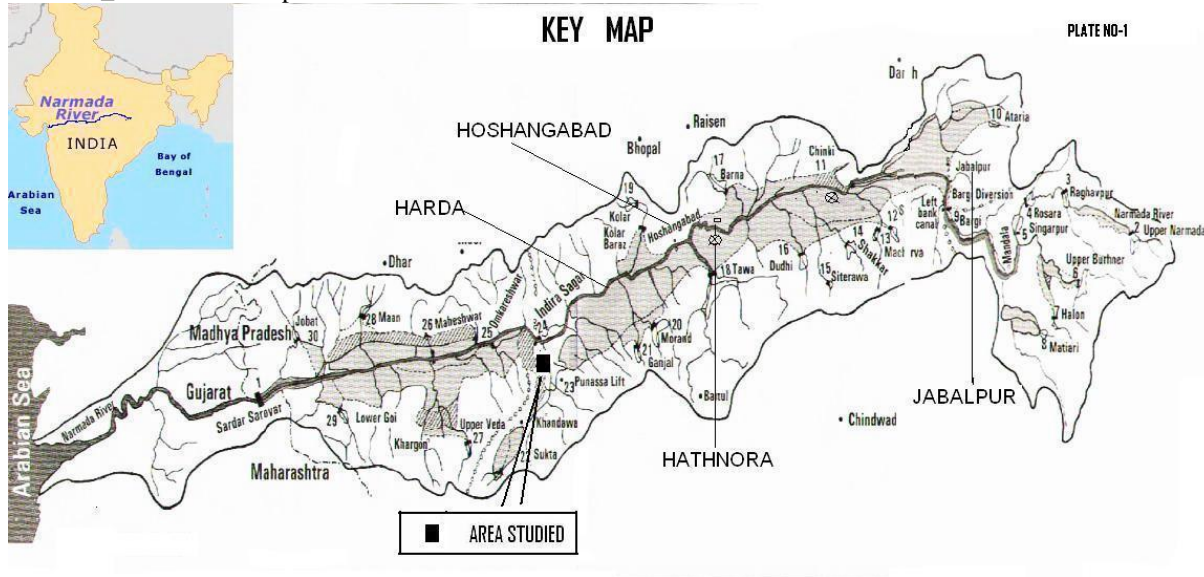


Plate No\_6:- Intensity of lineament Topo Sheet No. 55C/6 List of Plates

PLATE-6

# INTENSITY OF LINEAMENT TOPOSHEET-55C/6

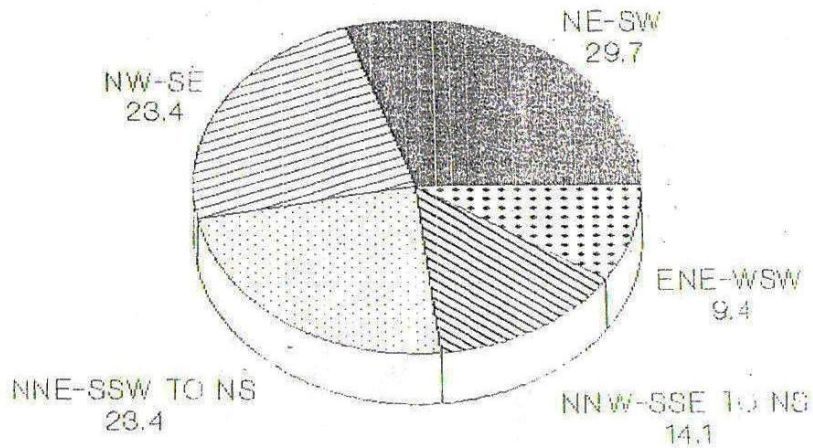




Plate No\_5:- 3\_D Diagram of 55C /6 Khandwa District M.P India.

PLATE- 5

### 3-D PROJECTION ON OF 55C/6. KHANDWA DIST. (M.P.) INDIA

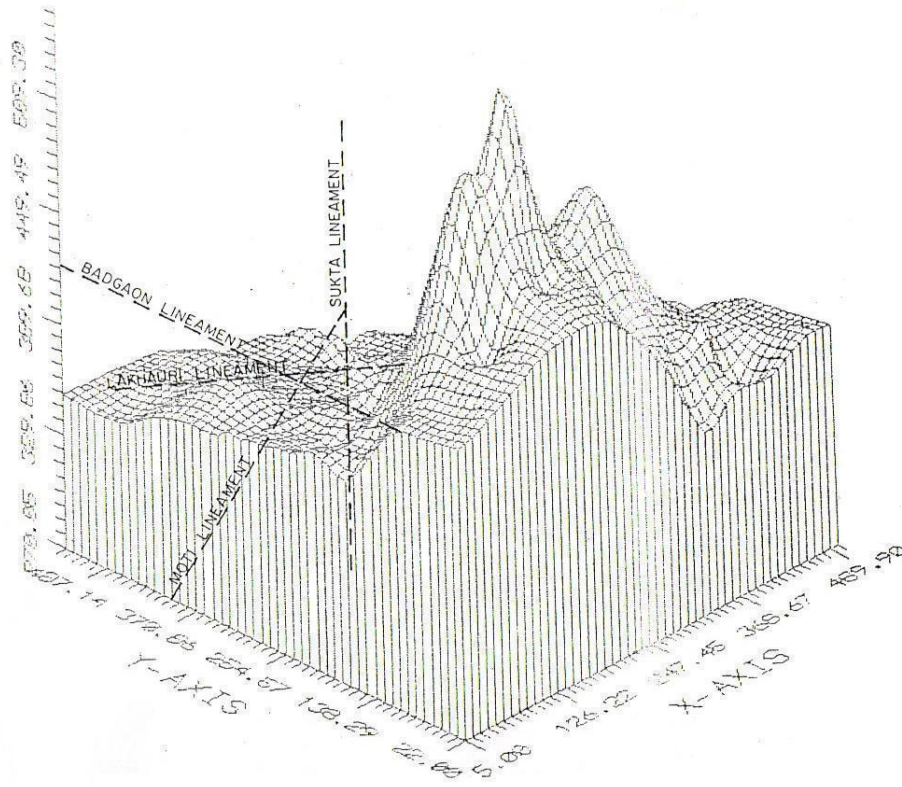




Plate No\_3:- Geodetic Map of 55 C/6 Khandwa District M.P. India

PLATE - 3

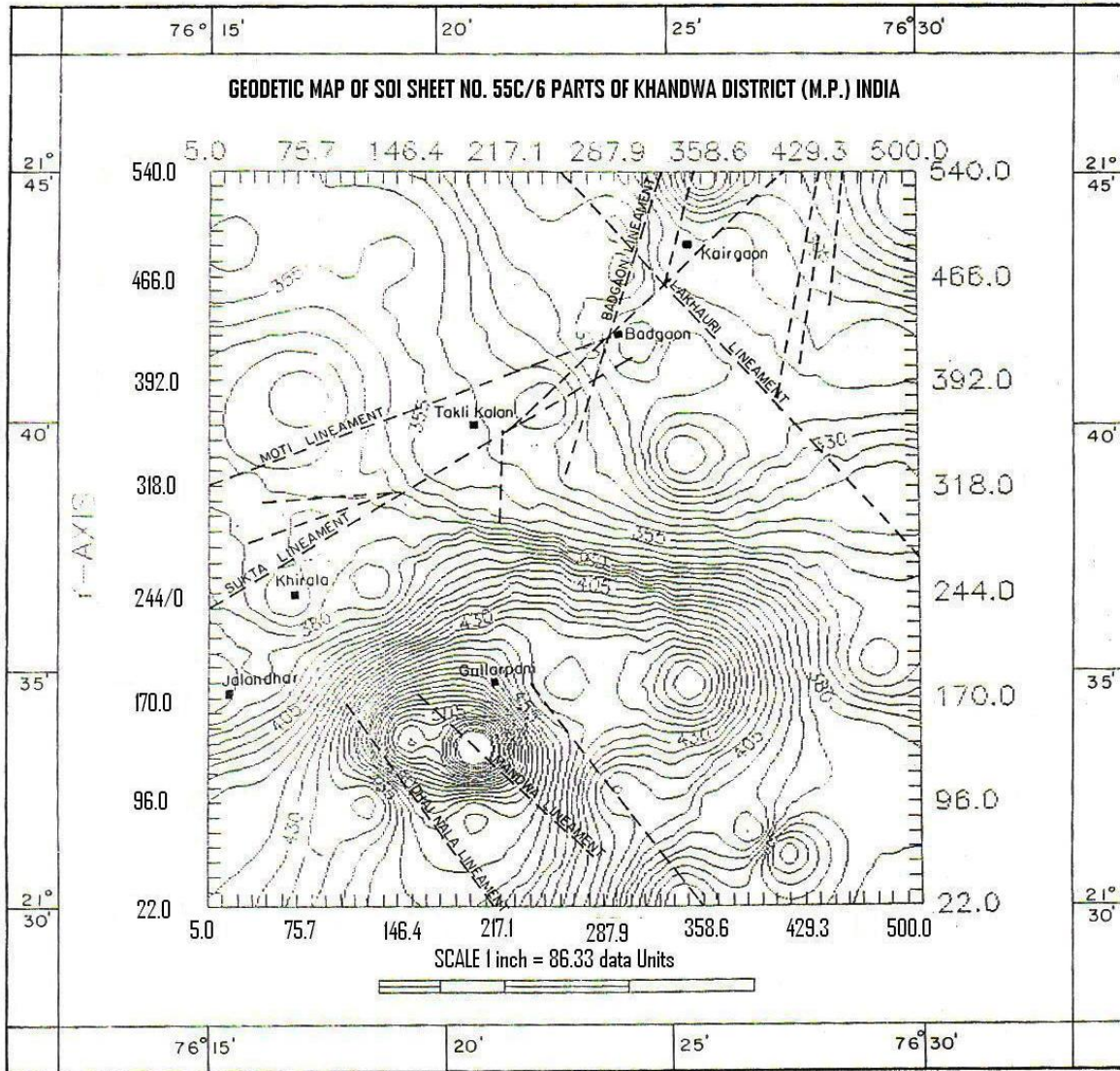
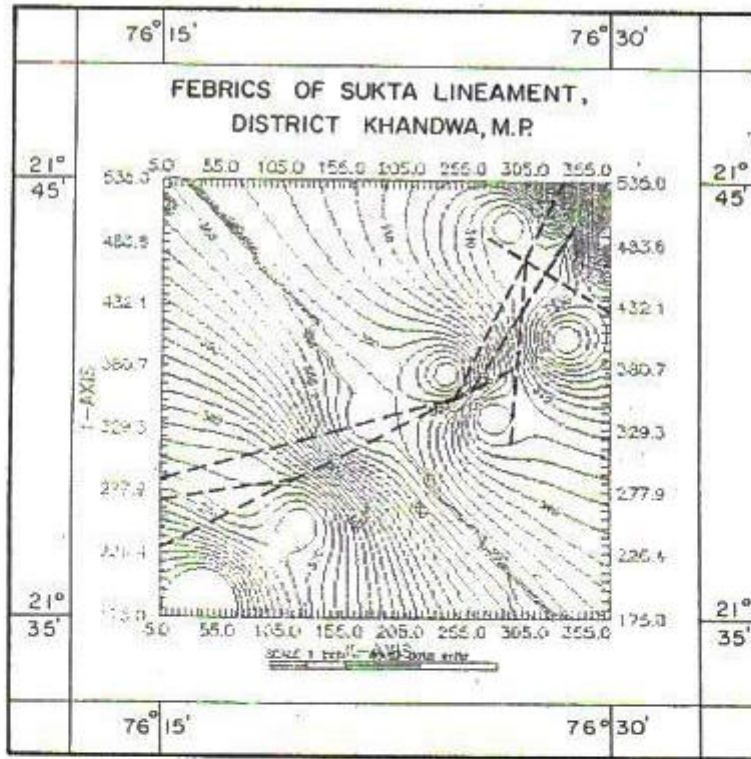
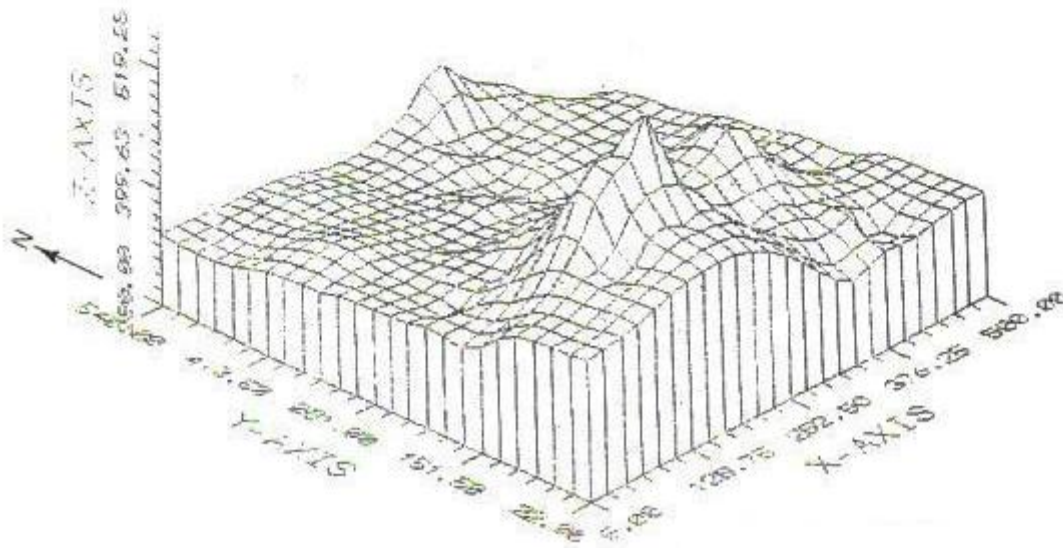


Plate No\_4:- Fabrics of Sukta Lineament District Khandwa M.P.India

PLATE-4



3-D PROJECTION ON OF 55C/6. KHANDWA DIST. (M.P.) INDIA



The Quaternary deposits are represented by the sediment of two domains viz. The sediment of present domain of Sukta and sediment of palaeo-domain of Sukta. These sediments are represented by sand, silt, clay and rock gravels. The average exposed thickness of these deposits is about 3 m.

Geomorphologically, the area comprised of nine surfaces each surface is characterized by distinct morphogenetic expression, drainage, pedogenetic character slope elements and land use practices. These surfaces are identified between 280 to 480 m above m.s.l. These surfaces delineated in increasing antiquity are Quaternary terraces (280 to 300 m), Modar surface (300m), Sarola surface (320m), Khodar surface (340m), Bargaon surface (360m), Sarai surface (940m), Gularpani (SE) (460 m) and Gularpani (SW) (460 m). These surfaces bear imprints of Neotectonism in the area. Besides geomorphic landforms elements and features delineated in the area are flood plain, point bar, low level terraces, channel braids, linear scarp and relict terraces. The Morphotectonic elements are perennial channel segments, impersistent and partly internal drainage, knee shaped channel bend linear scarp and rock cut terraces. (Plate No.\_2)

The area embraces five sets of lineament viz i) NE-SW lineament, ii) NW-SE lineament, iii) NNE-SSW to N-S lineament, iv) NNW-SSE to N-S lineament, and v) ENE-WSW to E-W lineaments. The relative percentage density of occurrence of these elements in different categories is 29.7%, 23.4%, 23.4%, 14.1% and 9.4% respectively. The analysis of relative intensity of these indicate that major intermediate lineament exhibit anisotropic intensity and minor lineament isotropic intensity. (Plate No.\_6)

The Sukta is the major stream which drains across the northern part of the area. Its course is controlled by NE-SW trending lineament named as Sukta lineament. It is a basement fracture and has imprints of its re-activation all along the course of Sukta river. It is also evident by the channel morphology, morphotectonic manifestation and relative disposition of various geomorphic elements and their inter relation with these lineament.

The Lakhauri NW-SE trending lineament also bears some imprints of Neotectonism and suggests some movement in the area.

The NNW-SSE to N-S, NNE-SSW to N-S lineaments are generally associated with master joints and fractures, their depth persistently is erratic and shallow and they are devoid of any significant signature of Neotectonism. The ENE-SSE to E-W trending lineament are parallel to Narmada lineament zone constitute about 9.4% of total lineament density. This lineament bears imprints and signature of Neotectonism east of Arud.

The study of various aspects as discussed above indicate that Neotectonically the area is active and some movements have taken place along NE-SW, NW-SE and ENE-WSW to E-W trending lineament in the area in recent past. The movement along this lineament may be responsible for recent tremors in the area; it appears that it is tectonically active and prone to Neo-seismic movements..

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### RESEARCH ARTICLE

#### A PROXIMAL LEFT MAIN BRONCHIAL INJURY ; A MANAGEMENT DILEMMA

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##### Key words:-

Tracheobronchial injury, left main bronchus injury.

#### Abstract

Tracheobronchial injuries are rare injuries that occur in less than 1% of patients following chest trauma. It should be considered in almost all patient presenting with blunt chest trauma. The diagnosis initially depends on careful history and physical examination in addition to high index of suspicion and accurate interpretation of radiological findings. The prompt recognition of the injury, skillful airway management and early treatment greatly reduce morbidity and increase the chances of restoring normal pulmonary function. In case of proximal left main bronchus injury ideally it should be exposed via a right posterolateral thoracotomy. This will provide a good exposure to the left main-stem bronchus and the carina compared to approaching it thorough a left posterolateral thoracotomy where the overlying aortic arch will obscure the field and makes it difficult to repair. We present a case of proximal left main bronchus injury that underwent left posterolateral thoracotomy repair with all difficulties because the left lung was lacerated and single lung isolation was not tolerated.

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#### Introduction:-

The first reported case of traumatic ruptured bronchus is attributed to Webb in 1848 following a postmortem on a man run over by a cart (1). Primary surgical repair was first successfully performed by Scannell in 1951 (2). Tracheobronchial disruption is an uncommon but life threatening injury associated with blunt thoracic trauma. Any injury to the trachea or major bronchi is commonly associated with high-speed motor vehicle accidents, In a large trauma autopsy series, 2% were found to have a tracheobronchial injury. Of those 81% died at the scene.

#### Case presentation:-

A 13 years old male referred from another hospital as a victim of road traffic accident. The patient was transferred from a peripheral hospital almost 24 hours after his injury. He was the driver and it was head on collision. Initial assessment revealed Glasgow coma scale was 8\15 for which he was intubated. His initial vital signs were normal and initial chest x-ray showed bilateral hemopneumothorax and evidence of lung contusion for which bilateral chest tubes were inserted. His work up demonstrated the following injuries based on pan computed tomography scan; head was unremarkable, his chest showed: intact mediastinal major vasculature with no definitive extravasation. Presence of pneumomediastinum extending through the neck region. Bilateral lung contusion and laceration more prominent at the left upper lobe. Right upper lobe consolidation collapse. Bilateral pneumothorax were demonstrated. There was a bilateral subcutaneous emphysema more extensive in the left side and associated with

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underlying rib fracture from the first to fourth ribs. Thin paper like appearance of the left bronchial away from the carina about 2 cm likely represents bronchial injury (figure1). Abdomen showed a Grade 2 splenic injury. The patient drained from left chest tube around > 800cc in 4hours. The presence of significant left hemothorax due to possible lung laceration dictated exploration (figure2). Prior to exploration, flexible bronchoscopy was done and demonstrated a proximal left main bronchus injury with complete separation of both ends around < 2cm from the carina. Approaching the right chest through right posterolateral thoracotomy would dictate isolating the right lung. The expected damage to the left lung and significant hemothorax would not be a good option for intraoperative maintenance of oxygenation. The decision was taken to explore the left chest through left posterolateral thoracotomy. Upon access, hemothorax and clots were evacuated and a left upper lobe laceration around 8 cm identified as the source of the bleeding. The examination of mediastinum showed the distal end of the left main bronchus and the proximal end was embedded under the aortic arch. Mediastinal dissection cleared both ends and primary anastomosis was done first by the posterior membranous layer by continuous running suture PDS 4\0 and followed by the anterior layer by an interrupted suture with the same type. The patient tolerated the procedure well his post op bronchoscopy showed patent left main bronchus. Unfortunately, the patient went into sepsis, multi-organ failure and passed away after 6 weeks from this procedure.

Figure 1:-

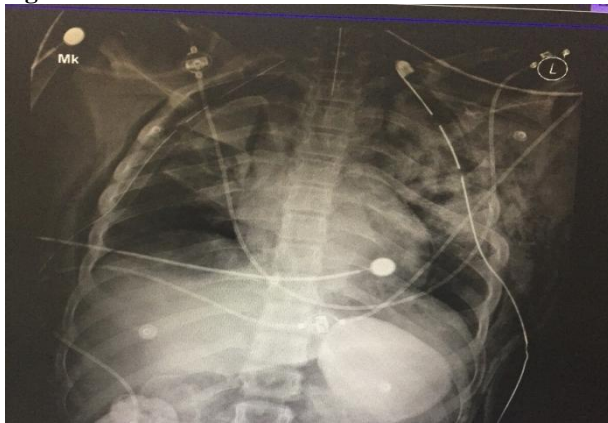


Figure 2:-

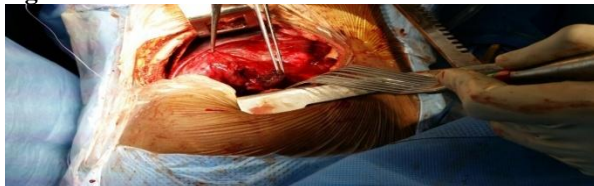
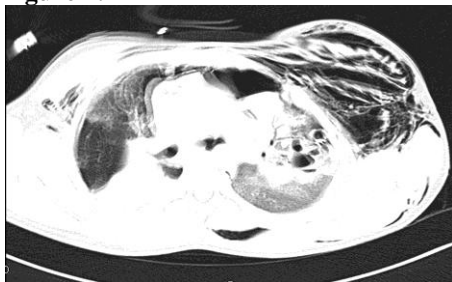


Figure 2:-



## Discussion:-

Most tracheobronchial injuries (TBI) occurred within 2 cm of the carina. Injury to the right main bronchus is more common and diagnosed earlier. This is thought to be due to the fact that the left main bronchus is protected by the aorta. The median days until diagnosis for left sided injury was 30 days. The presentation for late diagnosis is often persistent pneumothorax. Historically, the outcome for left sided injury is more favorable than the right side, with a mortality rate of 8% compared with 16% (3). TBI usually varies from simple minor tear to avulsion or rupture at different locations. Road traffic accidents accounted for the majority of patients (59%), followed by crush injuries (27%) (4). The mortality from traumatic TBI has decreased from 36% before 1950 and 30% in 1966 to 9% in 2001(5). The most common presenting signs of traumatic TBI were subcutaneous emphysema (43.5%) and followed by pneumomediastinum (17.4%) (6). It is associated with a high degree of lethality. The mechanism of injury is attributed to the following three hypotheses: First: direct chest trauma will lead to decrease the anterior posterior diameter of the thorax with increase in the transvers diameter. As the lungs remain always in contact with the chest wall because of the negative intra-pleural pressure, they stretch laterally and produce a traction force to the carina. Second: shearing of the bronchus from its points of origin near the carina, resulting in rapid deceleration. Third: the greatest wall tension generated within the trachea bronchial tree with increased air way pressures, during compression of the chest wall against a closed glottis is at the carina (3). The initial management should follow the Advance Trauma Life Support protocol. The outcome of non-operative management is generally worse than operative management in certain types of TBI. Surgical repair should be performed as soon as possible. If an injury is identified early, primary repair should be attempted. The operative approach differs depending on the location of the injury. Findings on chest x-ray can include pneumothorax, pneumomediastinum, subcutaneous emphysema and air surrounding deep cervical tissue. "Fallen lung sign" where the collapsed lung falls away from the mediastinum is not often seen but is specific to bronchial injury. Findings on CT are similar to those of chest x-ray(3). The definitive diagnosis is made by bronchoscopy which is the gold standard. Early reconstruction depends on early diagnosis. If there is complete rupture the bronchoscopy should be used as a guide during ventilation. Cervical trachea injury is repaired via collar incision. Distal trachea, carina, and right main stem bronchus are approached through right posterolateral thoracotomy. The distal third of the trachea, carina and right main stem bronchus as well as the proximal left main stem bronchus is approached by a right thoracotomy. The distal left main bronchus will be better exposed via a left posterolateral thoracotomy. Debridement and end to end anastomosis must be attempted for significant tracheal and bronchial injury. Pneumonectomy should be avoided if possible. Lobectomy is performed if the injury is associated with lobar destruction. The mortality for those who underwent primary repair was lower than those who underwent resection of the injured bronchus and distal lung parenchyma (3% vs 13%) (3). Some patients cannot be approached conservatively therefore the most appropriate treatment is the surgical treatment as early as possible. The principles of surgery dictate the following: debridement of devitalized tissue including cartilage, end to end anastomosis, flexion of the neck to avoid anastomosis line tension and supporting the suture line with the local tissues as a flap (7). Left thoracotomy provides a good exposure to the distal left main-stem bronchus, distal part of aortic arch, descending thoracic aorta and proximal left subclavian artery. Nevertheless, it is hard to reach to the proximal left main stem bronchus, carina because of the overlying aortic arch and this is what we had to face in this case. The penetrating injuries in the chest are most probably accompanied by life threatening cardiovascular injuries. While median sternotomy ensures optimal access to the heart and major vessels, it is less beneficial for trachea, carina and bronchi. Moreover, it does not provide appropriate exposure for the restoration of additional esophageal injuries (7). The severity of associated lung injury is taken into consideration regarding the approach and that what exactly what we had to experience. Massive hemothorax or massive air leakage are two indications for rapid surgical intervention in TBI (8). In delayed presentation; sequelae of stricture and stenosis (atelectasis or bronchiectasis) predominates. Fiber optic bronchoscopy is indicated and findings indicating injury includes clotted blood, edema, or erythema. However, these underestimate the real extent of the injury. In acute setting, surgical repair is the standard. Indications for surgery depend on clinical, radiological and endoscopic assessment, but clear indications are tension pneumothorax, bronchopleural fistula after drainage, increasing pneumomediastinum, or surgical emphysema (despite conservative measures), transmural tear >2 cm, and prolapsed esophageal wall into trachea or mediastinitis. In delay settings, granulation and fibrosis starts to fill the distal ruptured segment in around 3 weeks. Some authors advice to wait and control in sepsis of the stump before surgery (9). In our case the left lung was lacerated and the patient would not have tolerated single lung ventilation, isolating the right lung and depending on the left lung. In conclusion, diagnosis of airway injuries depends on high index of suspicion with adjunct diagnostic modalities. The principles of approach and surgical management is agreed upon but exceptional cases have to be managed depending on many factors including associated lung injury and tolerance to single lung isolation.

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### RESEARCH ARTICLE

#### BLEEDING PATTERN IN ABNORMAL UTERINE BLEEDING.

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##### Key words:-

Abnormal uterine bleeding, Peri-menopausal, endometrial specimen, menorrhagia

#### Abstract

**Introduction:** Abnormal uterine bleeding is the most common gynecological symptom in reproductive age group. The etiology varies from unknown pathology to cancer. AUB is mostly under-diagnosed due to lack of awareness of its severity. This study was carried out to find the bleeding pattern in patient with AUB.

**Method:** This study was conducted in the Department of Pathology, Christian Medical College, and Hospital, Ludhiana over a period of two years, which include one year of retrospective study and one year of prospective study of samples received in the department.

**Result:** Maximum number 343 (47.7%) cases were in the age group of 41-50 years. 33.7 % presented with menorrhagia.

**Conclusion:** AUB mostly seen in the peri-menopausal age group with varied bleeding pattern in different studies.

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#### Introduction:-

Abnormal uterine bleeding is a common gynecological symptom. Abnormal uterine bleeding occurring as heavy, prolonged or acyclic flow at menopausal transition or as spotting or minimal bleeding at postmenopausal period may be alarming and needs thorough evaluation, since this may be the only clinical manifestation pointing towards endometrial cancer. <sup>[1]</sup>Whilst most patients have benign disease, a thorough investigation is necessary, particularly in the peri- and post-menopausal women. <sup>[2]</sup>Abnormal and excessive endometrial bleeding without structural pathology occurs in reproductive women of all ages but is more common in adolescent and perimenopausal women. <sup>[3]</sup>Postmenopausally DUB is frequently associated with an atrophic endometrium. <sup>[4]</sup> Abnormal uterine bleeding signifies various patterns menorrhagia, metrorrhagia, menorrhagia, hypermenorrhea, hypomenorrhea, oligomenorrhea and amenorrhea, It is important to know the accurate characterization of the bleeding to assist in disease-specific management. Lack of awareness of underlying bleeding disorders has led to underdiagnosis in women with abnormal reproductive tract bleeding. This study was carried out to find the bleeding pattern in patient with AUB.

#### Method:-

This study was conducted in the Department of Pathology, Christian Medical College, and Hospital, Ludhiana over a period of two years, which include one year of retrospective study and one year of prospective study. In the retrospective study, cases from 1<sup>st</sup> January 2010 to 31<sup>st</sup> December 2010 were included, while the prospective study included cases from 1<sup>st</sup> January 2011 to 31<sup>st</sup> December 2011. A total of 719 specimens of endometrium sent as



curetting and hysterectomy received in the department with clinical diagnosis of abnormal uterine bleeding were included in the study. The clinical details were procured from the laboratory requisition form. Only non-pregnant women were included in the study.

### Results:-

The cases were distributed over a wide age range. The youngest patient was 18 years old while the oldest was 85 years old lady, mean age  $42.5 \pm 8.2$ . Maximum number 343 (47.7%) cases were in the age group of 41-50 years which was the most common age group. Majority 591 (82.2%) of the cases were seen in the fourth decade to fifth decades. (Table 1)

**Table 1:-** Age-wise distribution of cases with abnormal uterine bleeding.

AGE (years)	No. Of cases	Percentage
<20	4	0.6
21-30	51	7.1
31-40	248	34.5
41-50	343	47.7
51-60	58	8
61-70	9	1.3
71-80	5	0.7
81-90	1	0.1
<b>Total</b>	<b>719</b>	<b>100</b>

Out of 719 patients, 665 (92.5%) were premenopausal whereas 54 (7.5%) were postmenopausal.

Table 2 depicts bleeding pattern in all cases of abnormal uterine bleeding. 242 (33.7%) patients presented with complaints of menorrhagia, 198 (27.5%) with polymenorrhagia, 104 (14.5%) patients came with complaints of metrorrhagia, 103 (14.3%) patients came with complaints of menometrorrhagia, 10 (1.4%) patients came with complaints of oligomenorrhoea, 8 (1.1%) patients came with complaints of polymenorrhoea and 54 (7.5%) patients came with complaints of postmenopausal bleeding. (Fig 1)

**Figure 1:-** Bleeding pattern in patients with abnormal uterine bleeding.



### Discussion:-

The age of patients with abnormal uterine bleeding in the present study ranged from 18 to 85 years which is similar to the study done by Mirza et al 2012.<sup>[5]</sup> The peak incidence in the age of patients 41-50 years was seen in the 5<sup>th</sup> decade in the present study which is same as seen by Muzaffar et al 2005,<sup>[6]</sup> while Abdullah et al 2011<sup>[7]</sup> had it in the 6<sup>th</sup> decade. Because most cases are associated with anovulatory menstrual cycles, adolescents<sup>[8]</sup> and perimenopausal women<sup>[9]</sup> are particularly vulnerable.

The dominant menstrual problem was menorrhagia which was similar to that reported by Jetley et al and Bharat et al.<sup>[10,11]</sup> In a study of 400 perimenopausal women, the most common type of bleeding pattern was menorrhagia (67.5%).<sup>[11]</sup> Post menopausal bleeding was reported in only 7.3 % while Bhatta et al reported in 23 %. This variation may be due to age pattern.<sup>[12]</sup>

### Conclusion:-

- The majority (47.7%) of cases with abnormal uterine bleeding was seen in the age group of 41-50 years.
- Most common bleeding pattern encountered in abnormal uterine bleeding was menorrhagia, followed by polymenorrhagia.
- There is variation in bleeding pattern found in different studies among various age groups depicting a wide range of etiological factors.

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### RESEARCH ARTICLE

## THE INHIBITORY EFFECT OF NEWLY SYNTHESISED GUAR EPOXY N-METHYL PIPERAZINE ON THE GROWTH OF PATHOGENIC BACTERIA AND FUNGI.

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#### Key words:-

GE-MP, antibacterial activity, antifungal activity and inhibition zone.

### Abstract

Guar based derivative was synthesised. The inhibitory activity of the newly synthesised derivative against pathogenic bacteria such *E.coli*, *Klebseilla pnemoniae*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and some strains of fungi such as *C. kefyri*, *C. tropicalis*, *C. glabrata*, *C. auris*, *Geotricum candidum*, *Rhodoturula*, *C. parapsilosis*, *C. albicans* was evaluated. The new resin was characterized by FT-IR, <sup>1</sup>HNMR, XRD, Mass spectra and elemental analysis. Other resin characteristics like swelling, moisture content, bulk density and specific bulk volume were also studied. The antimicrobial activity was carried out by well diffusion method.

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### Introduction:-

**Guar gum** is a galactomannan biopolymeric material isolated from the endosperms of *Cyamopsis tetragonoloba*, which is native to north-western parts of India(1).Guar seed endosperm is a source of water soluble gum which is used as stabilizer, emulsifier and thickener in various food products and contributes to soluble dietary fiber portion of seed total dietary fiber (2). Its stability and solubility as well as its sorption capacity can be altered through functionalization by organic group and chelating agent. The ion exchangers based on guar gum powder is hydrophilic and biodegradable, whereas other ion exchangers prepared from petrochemical product are not hydrophilic and biodegradable. Due to rising prices of petroleum products the guar gum powder has been selected for development of guar gum resin, which are of low cost as they are locally available in large quantities from agriculture resources and these biopolymers are eco-friendly (3).Nowadays, microbial infections are a great concern because they are one of the main primary causes of death worldwide, especially in healthcare institutions, where people are generally more vulnerable (4-6).This fact is mainly due to the persistence of potentially pathogenic microbes(bacteria, viruses and fungi) in several locations, such as textiles, healthcare products, medical devices, water purification systems, sanitation facilities, among others (7,8).A variety of micro-organisms, including *E.coli*, *Pseudomonas aeruginosa* and *Staphylococcus aureus* etc. may lead to food spoilage which is one of the most important concern for food industry (9).Most microbes are harmful and can cause numerous disease infections such as diarrhoea, respiratory illness, whooping cough and fever (10).

Antimicrobial polymers, also known as polymeric biocides are a class of polymer having the ability to inhibit the growth of micro-organisms such a bacteria, fungi or protozoans (11).The use of polymers as antimicrobial agents presents several advantages, since these products usually exhibit long-term activity and limited residual toxicity, are chemically stable, non-volatile and do not permeate through skin(7,12).Guar when crosslinked, inhibits and suppresses microbial activities, due to complexation with the crosslinking agent. This interaction caused disruption

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on the microbial cells, which then changed their metabolism and led to cell death (13,14).

The aim of the present study is to synthesise guar based derivative ie. Guar epoxy n-methyl piperazine (GE-MP) and to investigate the inhibitory effect of the newly synthesized derivative against some pathogenic bacteria such as *E.coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and fungi such as *C. kefir*, *C. tropicalis*, *C. glabrata*, *C. auris*, *Geotricum candidum*, *Rhodoturula*, *C. parapsilosis* and *C. albicans*. It was characterized by FT-IR, <sup>1</sup>HNMR, XRD, Mass spectra and elemental analysis. Other resin characteristics like swelling, moisture content, bulk density and specific bulk volume were also studied.

## Material and Methods:-

### Material:-

Guar(200 mesh size) was procured from local industry. All AR grade chemicals used were procured from Sigma, Loba Chemicals and Ases Chemical Works. The antimicrobial strains were obtained from Dr. S. N Medical College, Jodhpur(Rajasthan), India.

### Synthesis of Guar epoxy n-methyl piperazine (GE-MP):-

The synthesis of GE-MP is carried out in two steps:

#### Preparation of epoxy ether of guaran:-

1 mole of guaran powder was slurried in dioxane solvent in a round bottom flask. Then 50% aqueous NaOH was added in the slurry to make the reaction mixture alkaline, and the mixture was constantly magnetically stirred at 45°C for 2 hours. Further 1mole of epichlorohydrin was added gradually with continuous stirring and the pH was adjusted to 10 then this reaction mixture was refluxed with continuous stirring for another 4 hours. The whole reaction was carried out at 45°C. Later, the compound was filtered on vacuum pump with 80% aqueous methanol containing few drops of nitric acid to remove inorganic impurities of chloride ion and excess of alkali and then the compound formed was oven dried and used for further derivatisation.(FigureI)

#### Synthesis of Guar epoxy ether of n-methyl piperazine:-

The formed epoxy ether of guar was slurried in dioxane and 50% sodium hydroxide (NaOH) under reflux, upon constant magnetic stirring at 45°C and pH was adjusted to 9-10. 0.02 moles on n- methyl piperazine was then added to the reaction mixture. The whole reaction mixture was refluxed and stirred for 5-6 hours at 45°C on the water bath. The formed compound was washed with 50% methanol. Then the air dried compound was suspended in 0.1N HCl, after filtering it was successively washed with 0.1N NaOH and 0.1NHCl and then final washing was done with 100% ethanol and dried under vacuum.(FigureII)

### Characterization of newly synthesised GE-MP:-

The GE-MP formed was characterized using swelling and water regain, moisture content, bulk density, bulk volume, elemental analysis, FTIR, XRD, NMR, and mass spectroscopy.

#### Swelling and water Regain:-

GE-MP is of polar nature and it swells in polar solvent. Water regain refers to the weight of water taken up by 1 gram of dry resin.

Water regain is given by:-  $W_r = (W_1 - W_2) / W_2$

Here,  $W_1$  = Weight of wet substance (in grams)

$W_2$  = Weight of dry substance (in grams)

#### Moisture Content:-

1gram of GE-MP was dried to a constant weight in a vacuum desiccator at 40°C overnight and then weighed. Percentage of MC =  $(W_1 - W_2) \times 100$

Here,  $W_1$  = weight of resin before keeping in desiccator

(1g)  $W_2$  = weight of resin after keeping in desiccator

#### Bulk density and Specific bulk volume:-

1g of GE-MP was dried to a constant weight and poured in a 1cm<sup>3</sup> measuring cylinder. Then the cylinder was thrashed gently on the surface until the volume of the resin remains same.

Bulk density = 1/(specific bulk volume)

**Elementary Analysis:-**

The elementary Nitrogen content was determined using standard method.

**FT-IR Analysis:-**

The FTIR spectra of GE-MP formed was analysed using AT-IR(ALPHA EX Bruker) spectrophotometer in range of  $400\text{ cm}^{-1}$ .

**XRD Analysis:-**

The crystal structure of GE-MP was characterized using X-ray diffractometer (XRD , Bruker D8 advance) with Cu K  $\alpha$  radiation. ( $\lambda=1.54\text{\AA}$ ) as x-ray source, it was operated at 40mA and 40 KV in the range of  $2\Theta=20-800$ .

**NMR Analysis:-**

<sup>1</sup>HNMR characterization was proceeded on Bruker Advance(500MHz) at 297-303K.

**Mass Spectra Analysis:-**

The mass spectra of the new guar derivative was studied using Thermo Scientific TSQ 8000 Gas Chromatograph with Ion Source Type of EI source programmable to  $350^{\circ}\text{C}$  and with mass range of 2.1100 amu.

**Antimicrobial Activity:-**

The pathogenic bacteria and fungi were isolated from Dr. S.N Medical College, Jodhpur(Raj), India. They were maintained as pure culture in specific agar medium and were preserved by sub culturing every 6 month. The present study includes the study on pathogenic bacteria and fungi. If certain bacteria and fungi are resisted by any antimicrobial agent then it stops the growth of that particular bacteria and fungi and a zone is created where the growth of bacteria or fungi is not visible, this zone is known as zone of inhibition. Zone of Inhibition testing is a quick, qualitative means to measure the ability of an antimicrobial agent to inhibit the growth of microorganisms. In the world of antimicrobial substances, the degree to which these materials are inhibitory can be of greatly importance to the health of the consumer. The pathogenic strains of bacteria used in the present study are *E.coli*, *Klebseilla pnemoniae*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and the strains of fungi used are *C. kefyri*, *C. tropicalis*, *C. glabrata*, *C. auris*, *Geotricum candidum*, *Rhodoturula*, *C. parapsilosis*, *C. albicans*.

**Preparation of Inoculum:-**

Pure isolate of each bacterium and fungi were first subcultured in nutrient broth at  $37^{\circ}\text{C}$  for 24h. With this method, approximately 100 microlitres of standard inoculums from a single strain was spread over an agar plate using a sterile swab. By using a sterile swab, a suspension of the pure culture is spread evenly over the face of a sterile agar plate.

**Antimicrobial sensitivity test using well diffusion method:-**

In well diffusion method, wells of certain diameter are dig on the sterile agar plate. Then the resin is filled in the well using micropipette, then they were incubated. If the bacterial or fungal strain is susceptible to the antimicrobial agent, then a zone of inhibition appears on the agar plate. The diameter of inhibition zone formed was measured in mm with transparent ruler and the results were recorded.

**Results and Discussion:-**

The characteristic property of newly synthesised GE-MP is shown in tabular form (Table I) which gives the information about the physiochemical property of the resin. Spectral analysis gives the exact idea about the structure and information about the functional group incorporated in the newly synthesised derivative of guar. The relevant data shows that the desired functional group has been crosslinked with guar.

The spectral data is analysed as:

**FT-IR interpretation** (Figure III): FT-IR spectrum of GE-MP resin shows a distinct peak at  $3420.23\text{ cm}^{-1}$  which is characteristic peak for N-H stretching. The band at  $2922\text{ cm}^{-1}$  denotes  $\text{sp}^3$  C-H stretching vibrations. Peaks at  $1654.08\text{ cm}^{-1}$  and  $1383.27\text{ cm}^{-1}$  corresponds to N-H bending and C-N stretching vibrations respectively. Another weak peak of  $1096.27\text{ cm}^{-1}$  attributes to phenyl C-O stretching.

**XRD interpretation**(FigureIV): The XRD data indicates that n-methyl piperazine is loaded onto the surface of epoxy ether of guar. Actual XRD spectra of guar shows that it is amorphous in nature but upon complexation it may

become crystalline or semicrystalline. The spectra reveals that the structure of GE-MP resin is triclinic and its crystalline size is 96.9Å.

**<sup>1</sup>H NMR interpretation**(Figure V):The characteristic peak at  $\delta = 2.26-2.08$  appears due to  $-N-CH_3$  and other peaks at  $\delta = 1.70$  appears due to  $-CH_2-N-$  signal at  $\delta = 3.0-5.3$  is due to  $-CH_2$  of  $-(CH_2-O-R)-$  moiety. The resin was dissolved in  $CDCl_3$  solvent for spectral analysis.

**Mass interpretation**(FigureVI):  $M^+$  (247.2)

#### Antimicrobial Activity:-

The results of the antimicrobial activity of the newly synthesised GE-MP against bacterial and fungal strains are given in table II and table III. The present study depicts that different micro-organisms respond differently towards the newly synthesised resin, as a result different measurement of diameter of inhibition zone for different micro-organisms were recorded. Pure guar do not show antimicrobial activity but upon complexation it may or may not show response towards the microbes. In the present research GE-MP resin shows positive inhibition zone for antibacterial activity and antifungal activity, in all four bacterial strains and five out of eight fungal strains. GE-MP shows small inhibition zone for *E.coli*, *Pseudomonas aeruginosa* and *Klebseilla pnemoniae* and *S.aureus* (figure VII A). Some fungi like *C. glabrata*, *Rhodoturula*, *C. parapsilosis*, *Geotricum candidum* and *C.auris* shows positive inhibition zone while *C.kefyr*, *C.tropicalis*, *C.albicans* do not shows antifungal activity (figure VII B). The results of the present study are quite encouraging as it exhibited antimicrobial activity against pathogens.

#### Conclusion:-

The newly synthesised derivative of guar, GE-MP was synthesised by using natural base with nontoxic reagents hence it is environment friendly in nature. Also they show sufficiently effective antibacterial and antifungal activity against microbes and can be of great importance to the health of the consumer.

#### Acknowledgement:-

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**Table I:-** Characteristic property of newly synthesised derivative of Guar(GE-MP)

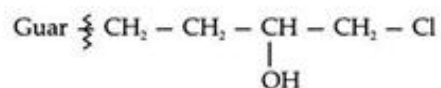
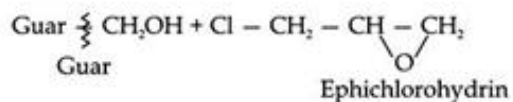
Characteristic property	GE-MP resin
1. Water regain	0.66
2. Moisture content	2.7
3. Bulk volume	2.0 cc/g
4. Nitrogen content (%)	15%

**Table II:-** Inhibition zone of GE-MP resin against pathogenic bacteria

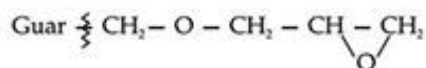
S.no	Bacteria used	Inhibition Zone
1	<i>Escherichia coli</i>	1mm
2	<i>Klebseilla pnemoniae</i>	1mm
3	<i>Psuedomonas aeruginosa</i>	1mm
4	<i>Staphylococcus aureus</i>	1mm

**Table III:-** Inhibition zone of GE-MP resin against some fungi

S.no	Fungi used	Inhibition Zone
1	<i>Candida kefyr</i>	-ve
2	<i>Candida tropicalis</i>	-ve
3	<i>Candida glabrata</i>	4mm
4	<i>Candida auris</i>	1mm
5	<i>Geotricum candidum</i>	3mm
6	<i>Rhodoturula</i>	3mm
7	<i>Candida parapsilosis</i>	2mm
8	<i>Candida albicans</i>	-ve

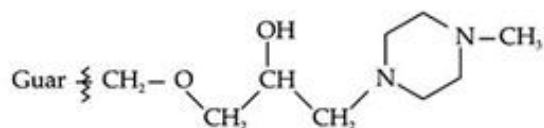
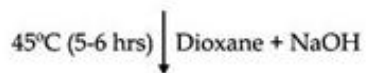
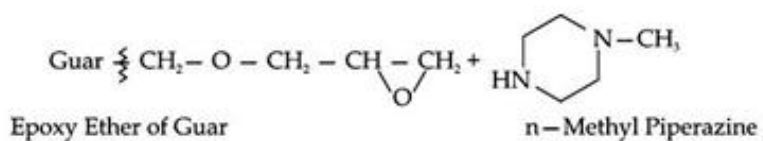


Chlorohydrin of Guar



Epoxy ether of Guar

(Figure I) Preparation of epoxy ether of Guar



(Figure II) Synthesis of GE-MP resin

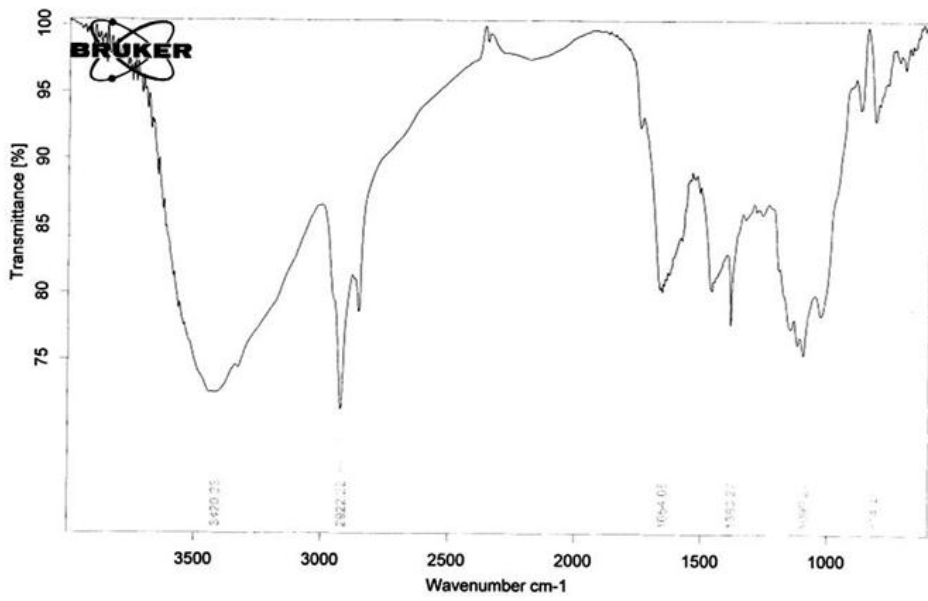


Figure III:- FT-IR spectra of GE-MP

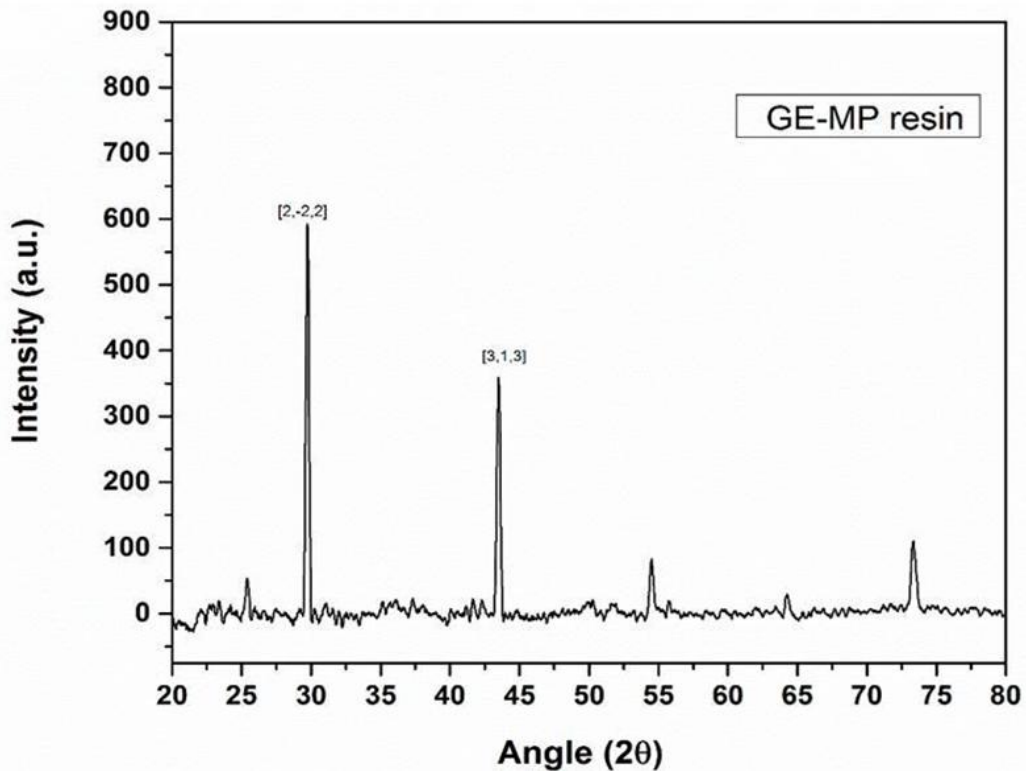


Figure IV:- XRD spectra of GE-MP



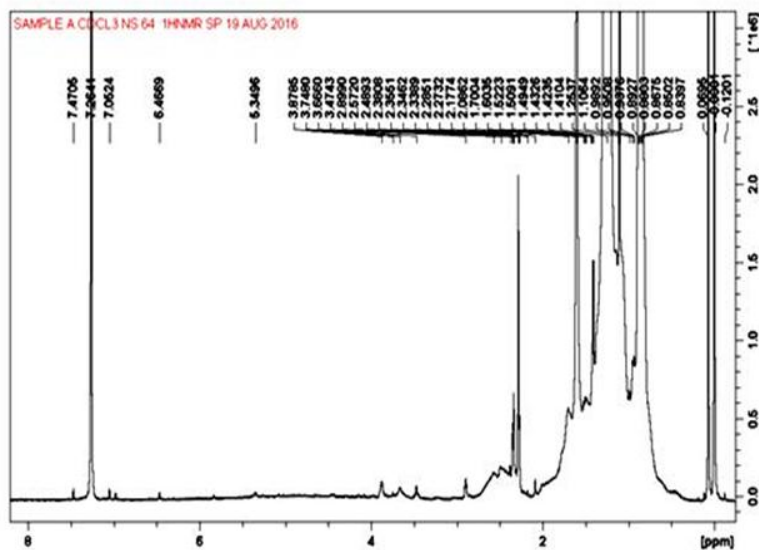


Figure V:- 1HNMR spectra of GE-MP

C #497 RT: 1.72 AV: 1 AV: 5 SB: 12 490-495 499-504 NL: 4.13E7  
T: + c EI Full ms [50.000-600.000]

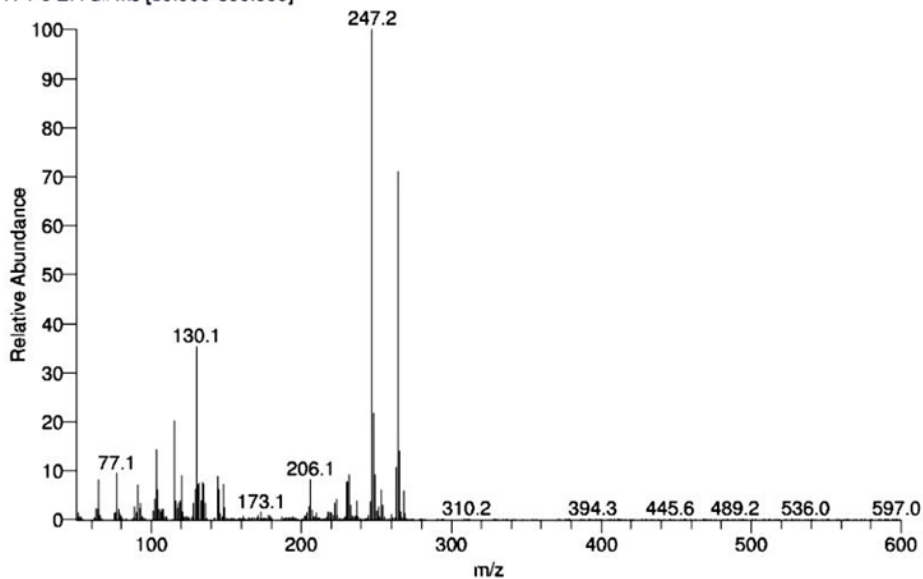
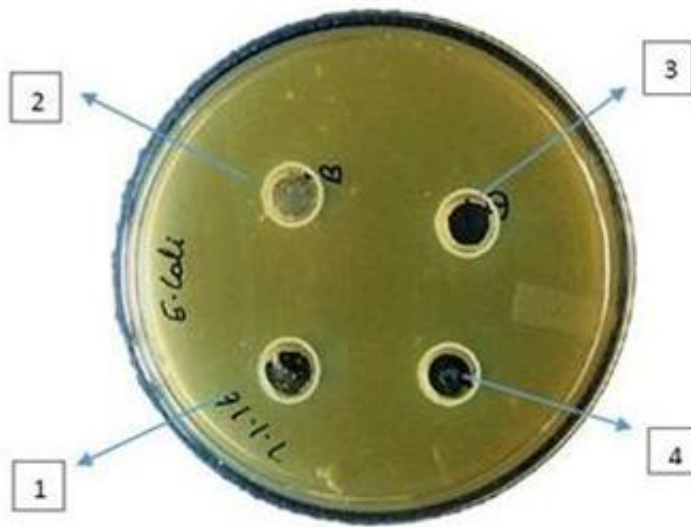
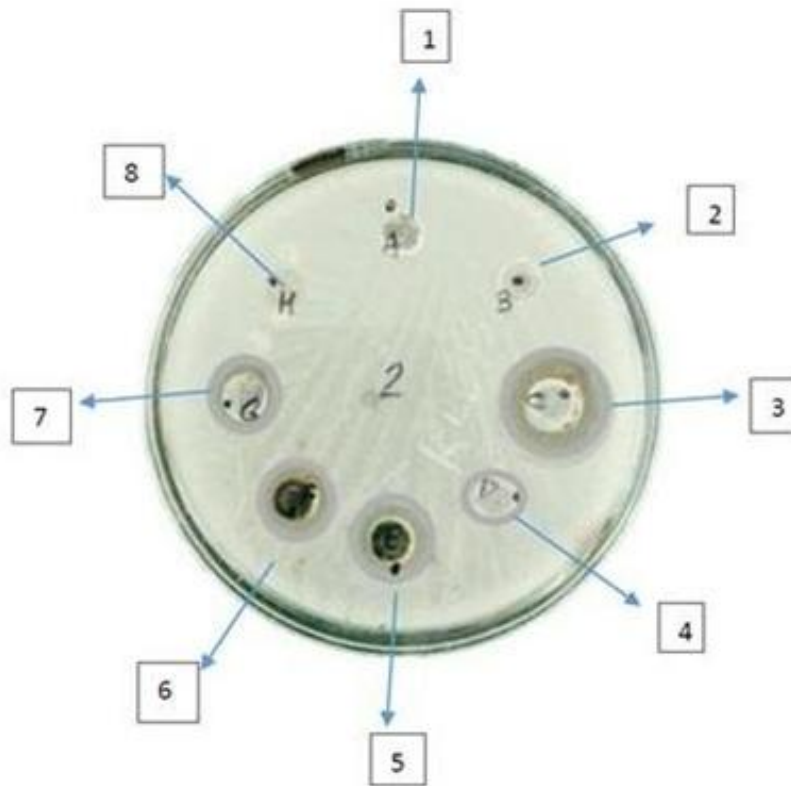


Figure VI:- Mass spectra of GE-MP



[A]



[B]

**Figure VII:-**Photographs showing Antibacterial activity [A] and Antifungal activity [B] (Numbering is done as shown in Table II and Table III).

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### RESEARCH ARTICLE

#### GC GLOBULIN GENE POLYMORPHISM: A CANDIDATE LOCUS FOR SUSCEPTIBILITY TO RHEUMATOID AND OSTEOARTHRITIS.

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Gc globulin, Rheumatoid arthritis, Osteoarthritis

#### Abstract

Multiple factors are believed to be involved in the manifestation of Rheumatoid arthritis and Osteoarthritis. Genetic factors are also considered as important predisposing factor in these debilitating conditions. In the present study we investigated the role of Group specific component also known as Gc globulin gene polymorphism in susceptibility to these frequently observed arthritic condition. Gc globulin gene polymorphism was investigated in 115 RA patients, 47 OA cases along with 100 healthy controls. The percentages for Gc 2-2, Gc 2-1 and Gc 1-1 were 8%, 35% and 57% in the controls. Significantly increased frequency of Gc 2-1 heterozygotes was observed in RA 86.09% and OA 95.74% (\*p< 0.05). It is inferred that the individuals with Gc 2-1 globulin have high risk of developing RA or OA compared to those with Gc 2-2 and Gc 1-1.

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#### Introduction:-

Arthritis is pain, swelling and stiffness of joints. As it is known that joints are parts of the body where two bones are attached and usually lined with cartilage, a rubbery material that prevents the bones from rubbing together [1]. Arthritis can result from too much wear and tear on the joint or from illness that can cause inflammation of joints [2].

Rheumatoid arthritis involves inflammation of the joint lining called synovium, which leads to joint deterioration. It is a chronic disease characterized by general ill health and chronic inflammation of the tissue around the joints and tendons [3]. It presents with symmetrical, inflammatory and destructive joint changes and tenosynovitis, but is also associated with other systemic findings that can affect virtually any body tissue or organ [4].

Rheumatoid Arthritis is a frequently observed disorder of connective tissue and is an important cause of disability, morbidity and mortality [5]. Rheumatoid Arthritis occurs worldwide with variable incidence and severity. The etiology of Rheumatoid Arthritis remains unclear but there is evidence of genetic predisposition to the disease [6].

OA is another form of arthritis, especially among older obese people [7, 8]. It is the joint disease caused by the breakdown of cartilage that firm rubbery tissue that cushions bones at joints. Men and women are affected but symptoms occur earlier and appear to be more severe in women [9]. The exact etiology of OA is unknown but it is believed that multiple factors (e.g. heredity, trauma and obesity) interact to cause this disorder. The pathophysiology involves a combination of mechanical, cellular and biochemical processes [10]. The interaction of

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these processes leads to changes in the composition and mechanical properties of the particular cartilage. Cartilage is composed of water, collagen and it absorbs energy from the shock of physical movement. In OA cartilage breaks down and wears away. As a result, the bones rub together, causing pain, swelling and stiffness. OA may also limit the range of motion in affected individuals [11]. Most often, OA develops in the hands, knee, hips and spine [12].

Genetic factors play a important role in the etiology of RA and OA in addition to biochemical and immunological factors. Candidate gene approach was employed using Gc globulin to investigate disease association in RA and OA patients.

The vitamin D binding protein (DBP) also known as Gc globulin is a multifunctional plasma protein that can bind several diverse ligands. It is a member of the albumin and alpha-fetoprotein gene family and shares considerable amino acid homology with this protein.

Gc is a 52 to 58 kDa multifunctional plasma protein, synthesized mainly by hepatocytes. Polymorphism in the Gc gene (Codominant alleles) gives rise to three major electrophoretic variants of Gc (Gc2, Gc1s and Gc1f) which differ by amino acid substitution as well as glycosylation [13]. They differ with regards to relative vitamin binding capacity. Reduced vitamin D binding capacity and reduced vitamin D levels are believed to be associated with susceptibility to autoimmunity as well as reduced bone density in RA and OA patients. The physiological significance related to the various phenotypes is yet to be discovered.

Gc is the major carrier protein of vitamin D and its metabolites in the circulation and is important for preservation of the Vitamin [14]. Gc globulin also transports components such as fatty acids and endotoxin and it is an important player in the actin scavenging system [15]. Gc binds actin released from cells upon injury and Gc actin complexes are rapidly cleared from the circulation, thereby preventing the harmful effects of actin filaments in blood vessels. The resulting decrease in Gc concentration makes Gc usable as a prognostic indicator of survival of patients with significant tissue injury after trauma and among patients with hepatic failure [16]. The vitamin D binding protein (DBP) is the major carrier protein for vitamin D metabolites in plasma. Polymorphisms in DBP have been described to be associated with an increased bone fracture risk and diabetes.

High frequency of the GC\*2 allele and a low frequency of the GC\*1S allele were observed in rheumatoid arthritis and osteoarthritis compared to controls [17]. There are few studies from India on role of Gc globulin polymorphism in susceptibility to RA and OA. Hence the present study was carried to investigate the role of polymorphic variants of Gc globulin in RA and OA.

### Material and Methods:-

The blood samples of RA and OA patients were collected from local Rheumatology centre in the Hyderabad under the guidance of a Rheumatologist. The control samples were randomly collected from general population.

Protein polymorphism of Gc globulin was determined in the blood samples of RA and OA patients by polyacrylamide gel electrophoresis and gels were stained by amidoblack. The method followed for electrophoresis and phenotyping was according to procedure described in **Giblet** 1961 [18].

**Table 1:-** Distribution of Gc Phenotypes in RA and OA cases

Category	Total	Gc 2-2	Gc 2-1	Gc 1-1
RA	115	2(1.74%)	99(86.09%)*	1(12.17%)*
OA	47	1(2.12%)	45(95.74%)*	1(2.12%)*
Control	100	8(8.00%)	35(35.00%)	57(57.00%)

\*p< 0.05

**Table 2:-** Distribution of Gc Phenotypes in RA and OA patients with respect to sex \*p< 0.05

Category	Total	Gc 2-2	Gc 2-1	Gc 1-1
RA				
Male	21	0(0.00%)	19(90.47%)	2(9.53%)
Female	94	1(2.12%)*	80(85.11%)	12(12.76%)
OA				
Male	8	0(0.00%)	7(87.50%)	1(12.50%)
Female	39	1(2.56%)	3(97.44%)	12(0.00%)

## Result and Discussion:-

A perusal of Table 1 reveals significantly high frequency of Gc 2-1 in both RA and OA patients compared with controls (86.09% in RA and 95.74% in OA (\* $p < 0.05$ ) and only 35% in controls). Relative risk analysis by odds ratio revealed that patients with Gc 2-1 have increased risk of developing RA and OA. In RA relative risk was found to be 11.49 while in OA it was 41.78. These results indicate that gene coding Gc globulin can be considered as potential candidate gene for RA and OA. The susceptibility is found to be higher even in OA than in RA patients. Distribution of Gc phenotype in male and female revealed that both male and female cases with Gc 2-1 phenotype are significantly higher than in the control samples.

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### RESEARCH ARTICLE

#### A SURVEY ON TASK SCHEDULING MODEL IN CLOUD COMPUTING USING OPTIMIZATION TECHNIQUE.

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Ant Colony Optimization, makespan, performance.

#### Abstract

Task scheduling is the most important part of cloud computing. To optimize the system, the tasks have to be scheduled in an efficient manner. A scheduling algorithm must be efficient in a way that it improves the performance of the system. The primary goal of task scheduling algorithm is to reduce the makespan and to increase resource utilization. In this paper a task scheduling model using various algorithms has been analyzed. These algorithms take into consideration of various parameters and improve the system.

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#### Introduction:-

##### Cloud Computing:-

Cloud computing is a shared pool of the various configurable computing resources (e.g. server, storage, network, services, and applications) that can be accessed remotely without owning the entire cloud. Cloud scheduling is the scheduling of incoming tasks to the available  $n$  resources. There are various scheduling algorithms and the traditional scheduling algorithms only aims at reducing the total execution time of the system. The meta-heuristic algorithms like Ant Colony Optimization (ACO) and Particle Swarm Optimization (PSO) tend to be efficient than traditional scheduling algorithms.

##### Need for Cloud Scheduling:-

Many users access the cloud at the same time and it is not possible to allocate each task manually. Due to increase in demand for cloud resources, the resources need to be allocated to each task in an efficient manner. So there is a need for cloud scheduling to schedule the tasks to resources efficiently.

Max-Min algorithm select tasks with maximum execution time on a faster available machine that is capable of giving minimum completion time. The disadvantage of this algorithm is that the tasks with minimum execution time are delayed. Hence this algorithm is not efficient for scheduling. Genetic algorithm is used to find the optimal sequence of tasks. By executing tasks in that sequence the makespan of the tasks gets reduced. PSO algorithm follows the behavior of bird searching for foods. It searches the perfect place to schedule the data by using the random number which is used to search the location. Ant colony algorithm follows the behavior of ants. It uses the pheromone laid on the path to travel. It will be disappeared after some time so that new paths are formed automatically. Bee colony algorithm follows the behavior of bees called foraging. It is used to find the feasible path for scheduling problem. The bees are divided into different groups and do the job like that in the bee colony.

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**Related Works:-**

**Liji Jacob [1]** proposed the BAT algorithm for scheduling in the tasks in the cloud. This algorithm is inspired by the behavior of bats. Bats use echoes to sense food/prey and barriers in the darkness. They fly randomly with fixed frequency and loudness. Initially, bat population and its echolocation parameters are initialized. Candidate micro bats are then generated and it is evaluated. After evaluation, the echolocation parameters are updated. It is repeated until there is a feasible design. This algorithm is compared with other optimization algorithms and it has high accuracy, high efficiency, and high convergence rate.

**UmaraniSrikanth et al. [2]** proposed that in cloud computing it is very important to schedule the task correctly. If the task scheduling algorithm is used to schedule means it will take more time for allocation. In order to avoid that here, they are trying to predict a schedule for the new task set without running the task scheduling algorithm. For that, they are using the ACO, a swarm intelligence model to reduce the scheduling time. Here they use the utilization matrix.

**SumandeepAujla et al. [3]** proposed the hybrid Cuckoo algorithm. This algorithm is a combination of Genetic Algorithm (GA) and Cuckoo algorithm. First, the tasks are scheduled by genetic algorithm and the output from GA is given as input to the Cuckoo algorithm. The results are proven to be better than GA and Cuckoo algorithm in terms of energy, execution time and resource utilization.

**Awad et al. [4]** proposed the Load Balancing Mutation Particle Swarm Optimization (LBMPSTO) algorithm which is an enhanced form of PSO algorithm. This model is proposed for allocation of tasks to virtual machines with maintaining the reliability. The tasks that are failed to schedule are rescheduled using LBMPSTO, thus achieving reliability. This algorithm is compared with standard PSO and few other algorithms. It is found that this algorithm reduces the execution time, cost, transmission time and helps in achieving the load balancing between tasks and virtual machines. It provides a reliable and good distribution of resources when compared with other algorithms.

**NimaJafariNavimipour [5]** proposed the artificial bee colony algorithm. This algorithm works based on the foraging behavior of honey bees. This algorithm consists of employed, onlooker and scout bees. Each employed bee searches for the new food source in the neighborhood of its current food source. The onlooker bee evaluates the nectar information from all employed bee and chooses the best. The scout bees determine the abandoned sources and replace it with randomly produces new food sources. Food source represents the possible solution and the nectar amount represents the quality of the solution. This algorithm is proved to be better in terms of-of task execution time and waiting time.

**Ramya et al.[6]** proposed a cost efficient algorithm for task scheduling. It uses two scheduling heuristic. The first heuristic uses the concept of Pareto dominance to generate a cost efficient task schedule based on the execution time of the tasks and the monetary charges of VM's. The second heuristic complements to the first heuristic and attempts to minimize the monetary costs of non-critical tasks.

**Durga Lakshmi et al. [7]** proposed the genetic algorithm which is a heuristic search technique that produces an optimal solution of tasks. This algorithm mainly aims to find the best sequence of tasks to execute to optimize the overall waiting time of the system. The request from the Client User (CU) is stored in the Request Queue (RQ). Then GA Module Queue Sequencer (GAQS) interchanges the position of the tasks so that the waiting time of the tasks is less. The sequence of tasks is stored in buffer queue and then it is executed by the Job Scheduler (JS). This algorithm is compared with tradition scheduling algorithm and it increases the throughput of the system and can be implemented to increase the performance of the system.

**KokKonjaang et al. [8]** proposed the Max-Min algorithm to efficiently optimize the task scheduling by allocating the tasks with maximum execution time on a faster available machine. This algorithm aims at the first allocation of tasks with maximum execution time before assigning the tasks with minimum execution time for the purpose of minimizing make span. This enhanced algorithm is compared with Max-Min and Data Aware algorithms. It is found that it provides efficient resource allocation and reduces the make span. The drawback of this algorithm is that there will be a delay in execution of tasks with minimum execution time.

**Leila Ismail et al. [9]** proposed the Energy-Aware Task Scheduling (EATS) model which aims to increase the efficiency of the application and to reduce the energy consumption. In this model, the big data is divided and



scheduled in the cloud for distributed processing by taking into consideration of both the performance and energy consumption. They have taken the application to be a divisible load application so that it is divided into independent tasks and assigned to distributed resources. The distributed processing consumes less energy compared to sequential execution. It is shown that the ratio of consumption of energy in a fully utilized server to its consumption of energy when it is idle is 1.3 which says that the server should be fully utilized to reduce energy consumption and increase performance.

**Hussin M. Alkhashai et al. [10]** proposed an algorithm which is a combination of Particle Swarm Optimization (PSO), the Best-Fit (BF), and Tabu-Search (TS) algorithms called BFPSOTS. The BF algorithm is used to generate an initial population of standard PSO, the Tabu-Search (TS) algorithm has been used with PSO to avoid the trap of local optimality which occurred when using the standard PSO. The cloudsim tool is used for the implementation of this hybrid algorithm. This algorithm reduces the makespan, cost and increases the resource utilization. But still, this improvement is achieved at the expense of fulfillment of the time complexity.

**ShengjunXue et al. [11]** proposed the experiment and analysis of task scheduling of workflow under the cloud computing by using the particle swarm optimization. It is used to achieve the minimum cost of users. Workflow represents the logic and rules that how to organize the front and rear works together in the work process. Here they use the service cost optimization algorithm based on PSO (PSO-SC). This algorithm makes use of the matrix to solve the problem with the help of graph with in-degree and out-degree. In this, it not only decreases the total time it also adjusts the execution task with the help of virtual machines in the data centers.

**Parminder Singh et al. [12]** proposed an improved and adaptive firefly algorithm for efficient task scheduling in the cloud. This algorithm has two aspects. First is the development of the cloud framework for job scheduling while the second is the development of firefly algorithm which can be applied to the cloud to improve the task scheduling. This algorithm is compared with other meta-heuristic algorithms and it provides better results than others.

### Conclusion:-

By using ACO algorithm, a swarm intelligence model the scheduling time is reduced, pheromone value used will be disappeared automatically and the new path is formed for scheduling the task. Hence, it will increase the performance and efficiency of the model. This model will automatically schedule the tasks without using the task scheduling algorithm so that scheduling time is reduced.

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### RESEARCH ARTICLE

## EOSINOPHILIA STILL REMAINS THE GOLD STANDARD FOR THE DIAGNOSIS OF ALLERGIC NON NEOPLASTIC NASAL POLYPOIDAL LESIONS.

Arshdeep Kaur, Gurpreet Singh Sran, Manharjot Singh Malhi and Vijay Suri.

#### Manuscript Info

#### Abstract

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#### Introduction:-

Nasal polyps is the most common group of mass lesions encountered in the nose.<sup>1</sup> Nasal polyps are a multifactorial disease, with infectious, non-infectious, inflammatory, anatomic and genetic abnormalities. Most theories consider polyps to be the ultimate manifestation of chronic inflammation.<sup>2</sup> Nasal polyp is a relatively common condition found in 1-4% of general population and in high percentage of some selected group of patients. Nasal polyps diagnosed clinically are not always inflammatory in origin. A variety of non-neoplastic and neoplastic conditions can present as nasal polyps. Though, inflammatory polyps are the commonest.<sup>3,4</sup> Nasal polyps are pedunculated smooth, gelatinous, semi-translucent, round or pear shaped masses of inflamed mucosa of the nose and para-nasal sinuses prolapsing into the nose. Nasal polyposis is often associated with asthma, and other respiratory diseases like cystic fibrosis, primary ciliary dyskinesia, and aspirin sensitivity.

The site of polyp origin is a particular narrow area in the upper part of the nose, lateral to the middle turbinate, and around the openings of the ethmoid and maxillary sinuses. This is a part where the mucous membranes come into close contact.<sup>5</sup>

The etiology of nasal polyps is still unclear and currently no single theory adequately explains the formation of all nasal polyps. The two most frequently mentioned theories are based on allergic and infectious causes. Although nasal polyp tissue is known to contain a high level of histamine (Drake-Lee et al 1984), there are hardly any details in the literature regarding the distribution and abundance of mast cells in nasal polyp tissue.<sup>6</sup> The present study is conducted to quantitate and study the localization of mast cells in nasal non- neoplastic polypoidal lesions of varied aetiology.

Nasal polyps are an available model for chronic airway inflammation research, since the biopsy is easy to obtain. Histologically, nasal polyps are characterized by a large number of inflammatory cells infiltration and structural modifications of the epithelium and lamina propria.

#### Aims and objectives:-

To calculate local and systemic eosinophilia.

#### Material and method:-

The present observational study was done in the department of pathology AIMS over a period of one and a half

year from 1<sup>st</sup> April 2014 to 30<sup>th</sup> September 2015. All patients with nasal polyps taken up for surgery were considered. The patients were evaluated clinically and history was taken. Ethical approval from institutional ethical committee of ADESH UNIVERSITY was taken before the start of the study. Proper informed consent was taken from all the patients.

#### Inclusion Criteria:

1. Only non-neoplastic lesions (eg. allergic, non-allergic like inflammatory, tuberculosis, rhinosporidiosis, fungal polyps etc.) of nose presenting as nasal polyp were taken up for study.
2. All patients of both sexes irrespective of socio economic status were taken up for the study.

#### Exclusion Criteria:

1. Patients with diagnosed neoplastic lesion (eg. Benign like inverted papilloma, transitional papilloma, angiofibroma and malignant like squamous cell carcinoma, adenocarcinoma, adenoid cystic carcinoma etc.) were excluded from the study.

The samples received were processed using standard technique and haematoxylin and eosin staining was done on all the samples. Only the polyps that were diagnosed as non-neoplastic polyps on H&E were taken up for study.

#### Observation:-

**Table-1:-** Age And Sex Incidence Of Nasal Polyps

Age	Male Number(%)	Female Number(%)	Total Number(%)	Ratio Male:Female
0-10	2(3.45)	3(5.77)	5(4.55)	0.67
10-20	16(27.59)	14(26.92)	30(27.27)	1.14
20-30	15(25.86)	10(19.23)	25(22.73)	1.50
30-40	12(20.69)	10(19.23)	22(20.00)	1.20
40-50	6(10.34)	7(13.46)	13(11.82)	0.86
50-60	5(8.62)	6(11.54)	11(10)	0.83
60-70	2(3.45)	2(3.85)	4(3.64)	1.00
Total	58(100.00)	52(100.00)	110(100.00)	1.12
Mean	29.87	30.73	30.30	
SD	14.99	16.40	15.60	

P value=0.543

Female patients outnumbered males in all decades except in 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 7<sup>th</sup> decade where males dominated females. Mean age in males was 29.87yrs and mean age in females was 30.73yrs. Overall mean age was 30.30yrs.

**Table: 2:-** Distribution Of Subjects According To Clinical Diagnosis

Histopathology	Number	Percentage
Allergic	29	26.36
Non-allergic	81	73.64

P value=0.000

Non-allergic polyps (73.64%) were significantly more than allergic polyps (26.36%).

**Table: 3:-** distribution of different non-neoplastic polyps in different age groups according to the histopathological diagnosis.

Age	Allergic polyp	Non- allergic polyps		
		Non-specific inflammatory polyp	Specific inflammatory polyp	
			Tubercular	Fungal
0-10	-	5		
10-20	6	20	1	4
20-30	5	11	1	7
30-40	9	6		7
40-50	4	7		2
50-60	5	5		1
60-70	-	4		
TOTAL	29	56	2	22
Percentage	26.36	69.14	2.47	27.16

Out of the total 110 cases, most of them were diagnosed as non-allergic polyps, with non-specific inflammatory being the most common (69.14), followed by fungal (27.16%) and tubercular (2.47%). Allergic polyps account for about 26.36% of the total polyp specimens received.

**Table: 4:-** gross examination of nasal polyps.

Gross feature		Number	Percentage
Gross colour	Grey white	78	70.91
	Grey brown	29	26.36
	Grey tan	3	2.73
Gross consistency	Soft	108	98.18
	Firm	2	1.82

Out of the total 110 cases, 70.91% cases were grey-white in colour, followed by grey brown(26.36%) and minimum grey tan(2.73%).

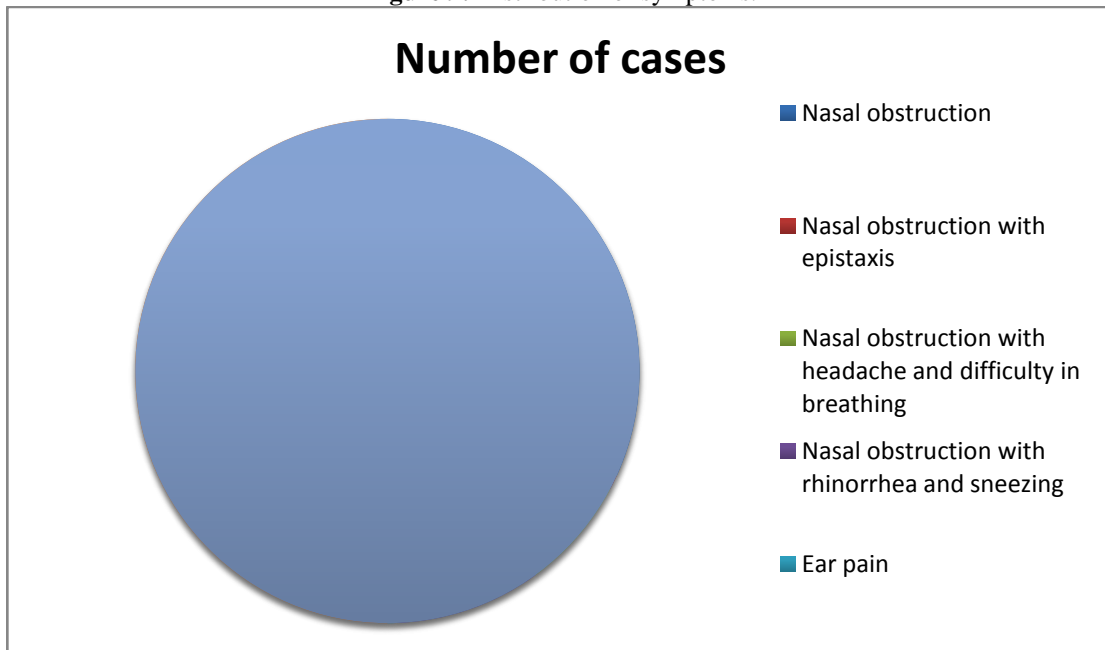
Out of the total 110 nasal polyps, 98.98% (108 cases) were soft in consistency.

**Table: 5:-** Distribution Of Symptoms

Symptoms	Number of cases	Percentage
Nasal obstruction	70	63.64
Nasal obstruction with epistaxis	2	1.82
Nasal obstruction with headache and difficulty in breathing	16	14.55
Nasal obstruction with rhinorrhea and sneezing	21	19.09
Ear pain	1	0.91
Total	110	110

Nasal obstruction (70%) was the commonest symptom followed by nasal obstruction with rhinorrhea and sneezing (19.09%), nasal obstruction with headache and difficulty in breathing (14.55%), nasal obstruction with epistaxis (1.82%) and ear pain (0.91%).

**Figure 9:** Distribution of symptoms.



**Microscopic findings in polyps:-**

The type and density of inflammatory cell population was observed. Majority of the polyps had lymphocytes, plasma cells, eosinophils, neutrophils and macrophages. The polyps were distributed according to the predominance

of stromal infiltrate which was mono-nuclear (comprising predominantly of lymphocytes and plasma cells) or eosinophil rich.

**Table: 6:-** Distribution According To Stromal Infiltrate

Infiltrate	Number of cases	Percentage
Predominance of mononuclear cells	64	58.18
Predominance of eosinophils	46	41.82
Total	110	100

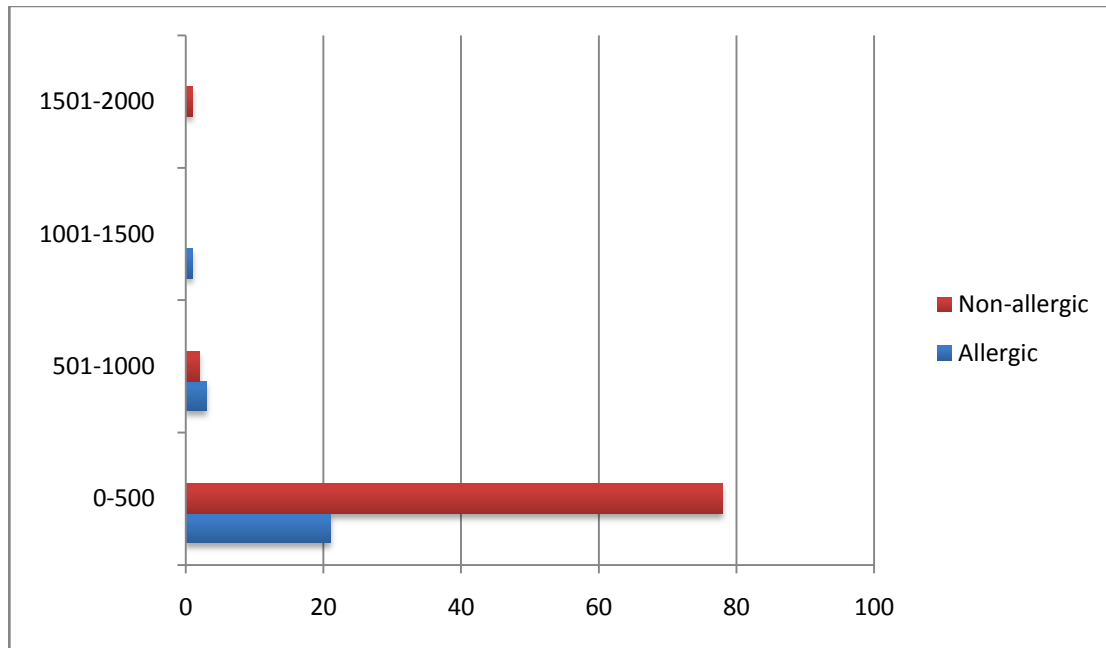
58.18% (64 cases) of the nasal polyps showed predominance of mononuclear cell infiltrate and 41.82% (46 cases) showed eosinophil predominance.

**Table: 7:-** Distribution According To Absolute Eosinophil Count In Patients Of Nasal Polyps

AEC	Allergic		Non-allergic	
	Number	Percentage	Number	Percentage
0-500	4	13.79	78	96.30
501-1000	21	72.41	2	2.47
1001-1500	3	10.34	0	0.00
1501-2000	1	3.45	1	1.23
Mean	789.83		220.26	
SD	328.17		223.43	

P value=0.000

Significant peripheral eosinophilia was seen in 72.4% (21 cases) of allergic polyps with most common range of 501-1000 eosinophils per  $\text{mm}^3$ . Maximum absolute eosinophil count was 1824 eosinophils/ $\text{mm}^3$  and minimum was 248 eosinophils per  $\text{mm}^3$ . In case of non-allergic polyps, eosinophils were in range of 0-500 eosinophils per  $\text{mm}^3$  in 96.3% (78 cases), with a maximum of 1632 eosinophils/ $\text{mm}^3$ , seen in only one fungal polyp.



**Figure 14:** Distribution of nasal polyps according to the absolute eosinophil count.

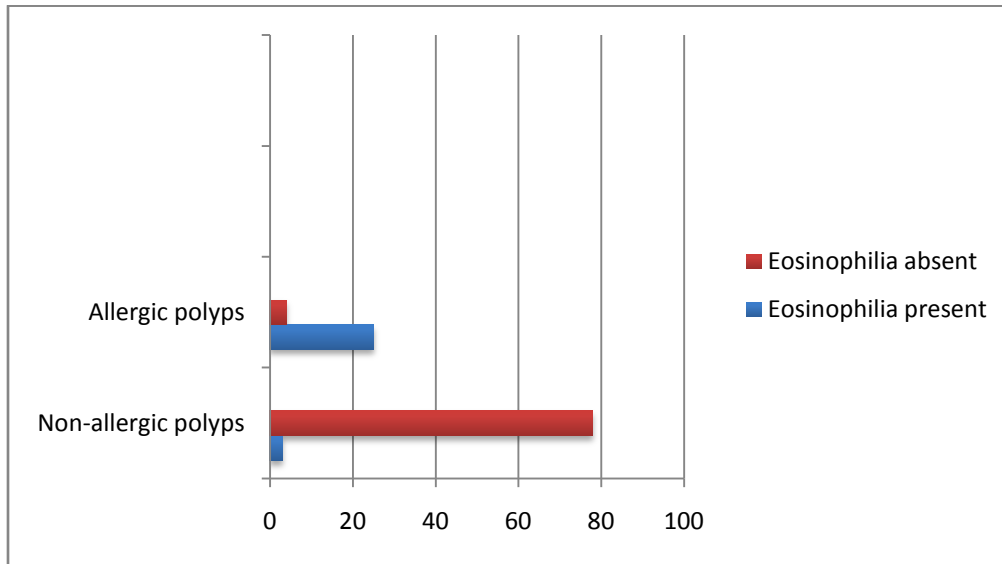
**Peripheral eosinophilia levels:** Absolute eosinophil count was determined in blood sample of both study and control groups. More than or equal to 500 eosinophils per micro litre is considered as systemic eosinophilia.

**Table 8:-** Peripheral Eosinophil Count In Patients Of Nasal Polyps

Peripheral eosinophilia		Cases	Percentage
Non-allergic polyps (29)	Present	3	3.70
	Absent	78	96.30
Allergic polyps (81)	Present	25	86.21
	Absent	4	13.73

P=0.000

So, in our study, 86.21% (25 cases) of allergic polyps and 3.7% (3 cases) of non-allergic polyps showed significant peripheral eosinophilia.



**Table 9:-** Local Eosinophilia In Allergic And Non-Allergic Nasal Polyps

Group	Number	Present		Absent	
		Number	Percentage	Number	Percentage
Allergic	29	29	100.00	0	0.00
Non-allergic	81	16	19.75	65	80.25

p value=0.003

In our study, eosinophilia was seen in 100% of cases of allergic polyps and 19.75% of cases of non-allergic polyps.

**Eosinophil count in stroma:-**

The histological examination of the slide for calculating local eosinophil count were performed. In total of 10 representative fields of inflammatory infiltrate density on each slide were counted with relation to eosinophils. These counts were converted to the average cells per high power field. The average cells per high power field more than or equal to 20 were taken as significant local eosinophilia for statistical analysis.

**Table-10:-** Eosinophil Count In Stroma Of Nasalpolyps.

	Eosinophilia	Cases	Percentage
	Non-allergic polyps	Present	16
Absent		65	59.09
Allergic polyps	Present	29	26.36
	Absent	-	0.00
Total		110	100.00

Significant local eosinophilia was seen in 29% of allergic and 16% of non- allergic polyps.

**Table: 11:-** Percentage Of Eosinophils In Stroma Of Nasal Polyps

Percentage of eosinophils	Allergic polyp	Non-allergic polyp	Total (percentage)
<5%	-	8	8(7.27%)
5-19%	-	57	57(51.82%)
20-50%	14	16	30(27.27%)
>50%	15	-	15(13.64%)

In our study, most of the nasal polyps (51.82%) showed 5-19% eosinophils per high power field. In allergic polyps, all the nasal polyps showed >20% eosinophils out of which about 50% had more than 50% eosinophils per hpf. Correlation between peripheral and systemic eosinophilia:

**Table: 12:-** Correlation Between Peripheral And Systemic Eosinophilia In Nasal Polyps

Eosinophilia	Local eosinophilia absent	Local eosinophilia present	Total
Systemic eosinophilia absent	65	17	82
Systemic eosinophilia present	2	26	28
Total	67	43	110

(p-value <0.00001)

Our study showed that there is a significant correlation between local and systemic eosinophilia.

**TABLE: 13:-** Relation Between Eosinophils And Clinical Symptoms In Nasal Polyps

Symptoms	Eosinophils	
	Mean	Standard deviation
Nasal obstruction	10.43	9.40
Nasal obstruction with epistaxis	17.50	10.61
Nasal obstruction with headache and difficulty in breathing	28.74	21.02
Nasal obstruction with rhinorrhea and sneezing	54.76	13.74
Ear pain	20.00	-
P-value	0.000	

Significant relation was also seen between the percentage of eosinophils and clinical presentation of nasal obstruction, rhinorrhea and sneezing.

## Discussion:-

**Table: 14:-** Comparative Study Of Age Distribution Of Nasal Polyps

Patient age (years)	Busuttil <sup>7</sup> (1992)	Dandapath <sup>8</sup> (1993)	Present study (2015)
0-10	-	4 (3.54%)	5(4.55%)
11-20	2 (2.7%)	36 (31.86%)	30(27.52%)
21-30	16 (21.62%)	44 (38.94%)	25(22.73%)
31-40	19 (25.67%)	13 (11.5%)	22(20%)
41-50	19 (25.67%)	9 (7.96%)	13(11.82%)
51-60	6 (8.1%)	7(6.2%)	11(10%)
61-70	6 (8.1%)	-	4(3.64%)
71-80	6 (8.1%)	-	-
Total	74	113	110(100%)

In the present study, the youngest patient was 5 years old and oldest 69 years. Majority of patients were in the second decade [27.52%] and fourth decades [22.73%] of life, followed by 3rd decade [20.00%], 5th decade [11.82%], 6th decade [10.00%], 1st decade [4.55%], and least was in 7th decade [3.64%].

According to Busuttil et al(1978), nasal polyps were more common in the 4<sup>th</sup> and 5<sup>th</sup> decade so, their results did not correlate with our study.<sup>7</sup>



Dandapath et al(1993) observed 2nd and 3rd decade as the most common age group affected. The present study correlated with the study of Dandapath et al in which nasal polyps were common in second decade of life.<sup>8</sup> According to KirtsreesakulV(2005) , in the general population, the overall prevalence rate of nasal polyps in adults is about 4%. The prevalence is much lower in children, except nasal polyps usually occurs in the age group of 30 – 60 years when associated with cystic fibrosis. In the present study children are the less commonly affected group [4.55%, 5 cases].<sup>9</sup>

Klossek et al(1997) reported mean age for nasal polyps patients was  $49.4 \pm 17.6$  years.<sup>10</sup>

Ediger et al(2005) reported age range for nasal polyps is 19–63 years with mean age of  $38.29 \pm 13.27$  years.<sup>11</sup>

According to a study conducted by Pradhananga et al(2008), the patients of all age group present with nasal polyps with the peak age of 50 and above. In their study, nasal polyps were found in age range from 14 to 85 years with mean age of  $40.33 \pm 17.4$  years and the maximum number of the patients (37.2%) was in the age group of 20-40years,<sup>12</sup> whereas in our study, mean age was  $30.3 \pm 15.60$  years.

So as in our study the mean age was lower than all these studies, it may be because this region is more prone to infections, air pollution and allergies as compared to the other regions.

**Table: 15:-** Comparison Of Distribution Of Symptoms

Study	No of cases
Sethi et al <sup>13</sup> (1998)	6
Triglia and Nicollas <sup>14</sup> (1997)	46
Drake et al <sup>15</sup> (1997)	200
Present study	109

In other studies as well, nasal obstruction was the predominant symptom, which is in concordance with the present study.

Same results were obtained by Shulbha and Dayananda, that is both in non- allergic and allergic polyps, the commonest symptom was nasal obstruction, which was found to be statistically significant ( $P < 0.001$ )<sup>16</sup>

#### Comparison of local and systemic eosinophilia:-

According to Wardlaw et al<sup>17</sup> (2000), the hypothesis that eosinophils are important effector cells in allergic disease rests on the evidence that the eosinophils are found in tissues in allergic diseases, their mediators are relevant to the disease process and removal of eosinophils is associated with an improvement in the disease. GCs undoubtedly have a profound effect on eosinophils and their beneficial effects in allergic disease appear to go hand-in- hand with their inhibition of tissue eosinophilia, but they are of course broad- spectrum anti-inflammatory drugs.<sup>17</sup>

There is no doubt that eosinophils are intimately associated with asthma and the other atopic diseases. As there is virtually no evidence that eosinophils can ameliorate disease, we presume they must either be bystander cells or actively involved in pathogenesis. The current evidence is consistent with a role for eosinophils simply as markers of the inflammatory process. Perhaps eosinophils are part of a complex inflammatory process in which they favoursome aspect of the pathophysiology.

So, more work needs be done to determine the extent to which the eosinophilia might guide management of nasal polyps.<sup>17</sup>

Zhang et al<sup>18</sup> (2008) also assessed the infiltration and activation of eosinophils in nasal polyps immunohistochemically. They concluded eosinophilia is a prominent histological feature of nasal polyps, which indicates that the activated eosinophils may play vital role in the pathogenesis of nasal polyps.

According to Pradhananga et al<sup>19</sup> (2008), there is significant correlation between local and systemic eosinophilia. Thus this study correlated with our findings.

**Table: 16:-** Comparison Of Number Of Eosinophils Per Hpf

Study	No. of eosinophils per hpf	
	Allergic nasal polyps	
Aleksander et al <sup>18</sup>	$55.92 \pm 5.82$	$11.12 \pm 2.03$
Present study	$59.89 \pm 16.48$	$15.68 \pm 7.69$

The study done by Bryson et al<sup>20</sup> (2003) on biopsy of diseased sinonasal tissue from 116 patients undergoing endoscopic sinus surgery and 24 control group with normal nasal mucosa undergoing septal surgery showed that the area of inflammatory infiltrate density and the numbers of eosinophils were high in patients with nasal polyps ( $p < 0.0001$ ) and also it has significant correlation with degree of the polyps ( $p = 0.0017$ ).

The results were similar to the results of our study in terms of local and systemic eosinophilia.

**Table: 17:-** Comparison Of Percentage Of Eosinophils Per Hpf

Percentage of eosinophils	Luis et al <sup>21</sup> (2008)	Present study
<5%	3(7.5%)	8(7.27%)
5-19%	5(12.5%)	57(51.82%)
20-50%	17(42.5%)	30(27.27%)
>50%	15(37.5%)	15(13.64%)

The study by Garin et al<sup>21</sup> (2008) showed that most of the nasal polyps showed 20-50% eosinophils per high power field but this study did not correlate with our study, as in our study most polyps had 5-19% eosinophils.

### Conclusion:-

A male predominance was seen in the study with a male to female ratio of 1.12:1.

Most of the patients presented with the clinical features of nasal obstruction and a few presented with epistaxis, headache, rhinorrhea and sneezing and only one case presented with ear pain.

Out of the total 110 cases, 26.36% were allergic nasal polyps and 73.64% were non- allergic nasal polyps.

Eosinophilia- local and peripheral:

All the allergic polyps and about 20% of non-allergic polyp showed local eosinophilia in tissue sections. The percentage of eosinophils was more in allergic polyps than in non- allergic polyps in histology sections.

About 86% of the allergic polys and only 3.7% of non-allergic polyps showed peripheral eosinophilia. Hence, significant peripheral eosinophilia was seen in allergic nasal polyps compared to non-allergic nasal polyps. Thereby a direct significant correlation was seen between peripheral and local eosinophilia in our study.

An increase in the percentage of eosinophils was associated with symptoms of nasal obstruction, rhinorrhea and sneezing.

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### RESEARCH ARTICLE

#### BOMBAX CEIBA: KALPATARU, A TREE OF LIFE.

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##### Key words:-

Bombaxceiba, Silk cotton tree, Anti-oxidant, Oxytotic activity, Anti-bacterial property.

#### Abstract

Natural plant products have been used throughout human history for various purposes. This plant was used for multiple daily requirements, for instance, as food, fodder, fuel, fibre, medicines etc. It possess Anti-oxidant, Oxytotic activity, anti-inflammatory, anti-diabetic, hepatoprotective property etc.

This plant still remains under-utilized because of slow propagation and unawareness of its medicinal uses. The objective of this article is to focus on various pharmacological uses of Bombaxceiba as home remedies.

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#### Introduction:-

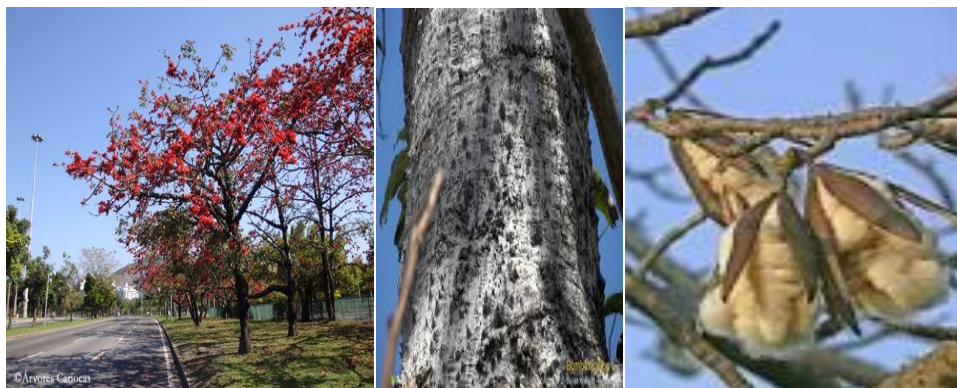
Bombaxceiba plant is like a Kalpataru as its each and every part can be used for its medicinal and commercial importance. It is 'The best creation of god' for human beings and valuable gift of nature because its multipurpose eco-friendly uses.<sup>[1]</sup> Many custom, traditions, rituals, folk tales and rites are related to this tree. Bombaxceiba L. commonly known as silk cotton tree, Semal and it is popular in many tribal communities. This tree possess medicinal and commercial properties but it is exploited by using in Holika-dahan.<sup>[2]</sup> In India Bombaxceiba has different names in different language as Semal, Shalmali, Indian Kapok tree, Shimul, Mullilavu,<sup>[3]</sup> Moca, Picchila, Raktapushp, Katakdhya, Tulini, Semul, Shemalo.<sup>[6]</sup>

It's a widely distributed throughout Australia and Asia including India and Pakistan. It also found in Java, Sumatra, Malaysia, Bangladesh and Myanmar.<sup>[15]</sup> In India it is found in Southern Rajasthan because its drought tolerance ability.<sup>[1]</sup> It belongs to family Bombacaceae, genus ceiba is a tall, straight, rigid, deciduous tree. Its trunk is straight and tall and bears spikes for its protection from animals. Its leaves are palmate, large, spreading, glabrous, digitate having common petiole and 15 to 30 cm long.<sup>[3]</sup> In spring Pentamerous large red flowers come into sight (January to March) which are ornithophilous with cup shaped, thick and fleshy sepals. The flowers have a well-protected ovary with hard perianth containing stiff filaments. On ripening flowers produce a capsule enclosing white fibers embedded with smooth, black or gray seeds. The large, showy flowers usually appear when the trees are leafless.<sup>[4]</sup> In India various tribal people used this plant for fuel, food, fodder, fibre and medicine hence, it holds the socio-economic and ethno-medicinal values. Gum is light brown in colour and gradually becomes dark brown.<sup>[5]</sup>

The plant also known as 'King of Forest' because of its giant appearance and big flowers and has spiritual importance too. It is one of member of the five sacred trees of 'Panchvati'. Its each and every part like root, bark, gum, leaves, heartwood, flower, stem, fruit have specific medicinal importance.<sup>[1]</sup> Its medicinal benefits are found in Ayurveda, Unani and Siddha medicines.<sup>[15]</sup>

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**Taxonomical Classification:-**

Rank	Scientific Name	common Name
Kingdom-	Plantae	Plants
Subkingdom-	Tracheobionta	Vascular plants
Superdivision-	Spermatophyta	Seed plants
Division-	Magnoliophyta	Flowering plants
Class-	Magnoliopsida	Dicotyledons
Subclass-	Dilleniidae	
Order-	Malvales	
Family-	Bombacaceae	Kapok-tree family
Genus -	BombaxL.	cottontree
Species-	BombaxceibaL.	Red silk cotton tree <sup>[7]</sup>
Binomial name: BombaxceibaL.; BombaxmalabaricumD.C.; Salmaliamalabarica <sup>[6]</sup>		

**Floral characters of *Bombaxceiba* :** <sup>[20]</sup>**Floral character Observation:**

Flowering period	January– March
Flower type	Somewhat ornithophilous
Flower color	Crimson
Odor	Absent
Nectar	Present
Flower opening time	Post-midnight to morning
Anther dehiscence time	After anthesis
Anther dehiscence mode	Longitudinal
Number of anthers	Many (100 approx.)
Average number of pollens per anther	88,630
Average number of pollens per flower	88,63,000
Pollen type	3-colporate
Pollen shape	Euoblate
Pollen size	± 38.8 ' 71.75 µm
Atmospheric pollen frequency	5.17% in 10.00 h
Stigma type	Above anther level, digitate with stout style and wet type.

**Medicinal Importance:-**

1. Roots of Bombaxceiba show antioxidant property.<sup>[8],[9],[22]</sup> and used in excess bleeding in menstruation<sup>[7]</sup>.
2. B. ceibashows cardiac stimulant properties<sup>[21]</sup>, hypotensive and hypoglycaemic activity, analgesic activity, traditional anti-inflammatory agent.
3. Dried tender fruits of B. ceiba are given in calculus affections and chronic inflammation and ulceration of the bladder and kidneys including strangury and other forms of dysuria<sup>[10]</sup>
4. Bark of Bombaxceiba shows anti-diabetic activity.<sup>[11]</sup> Fresh rubbed bark of B. ceiba was applied topically on pimples, acne, boils<sup>[18]</sup> wounds and to improve breast milk.<sup>[7]</sup> An infusion of the bark of B. ceiba is used as a tonic<sup>[19]</sup>
5. Tannins present in aqueous extract of Bombaxceiba bark is used against pathogenic bacterial strains<sup>[5]</sup> due to its anti-bacterial activity<sup>[12]</sup>
6. Flowers of Bombaxceiba shows hepatoprotective activity due to the presence of flavonoids and sesquiterpenoids.<sup>[13]</sup> and it also shows cardioprotective activity<sup>[14]</sup> and seminal flower green base part used in weakness<sup>[7]</sup>
7. Seeds<sup>[16]</sup>, leaves, stem, flower<sup>[1]</sup> possess oxytocic activity.
8. Seeds and roots of B. ceiba were used in the treatment of serious skin diseases like Leprosy.<sup>[17]</sup>
9. Flower and fruit of Bombaxceiba are used in snakebite and leucorrhoea.<sup>[2]</sup>
10. Phytochemicals present in plant help in providing protection against cataract, ageing, dementia, cancer.<sup>[16]</sup>
11. Leaves of Bombaxceiba used for blood purification<sup>[7]</sup>.

**Commercial Importance:-<sup>[2]</sup>**

1. It is commercially used for various purposes like toys and coffins making, artifact production, in match industry.
2. In Rajasthan (India) Kathodi tribes use its wood to make musical instruments like Dholak and Tambura while Bhil tribe uses to prepare spoons.
3. Seed oil of Bombaxceiba used as an illuminant and also for soap making.
4. Cotton extracted from its fruit is used as insulator for refrigerator, soundproof covers and in formation of padded surgical dressings.
5. Floss is generally used for making pillows and cushions because it is vermin-proof.

**Conclusion:-**

Bombaxceiba is overlooked because of some myths but it is a very valuable tree; each and every part of it is useful and valuable for various purposes. This article may develop awareness in people regarding importance and valuable uses of this tree and people can think to plant this tree in their garden in small cities and in kitchen garden in metropolitans. Various parts of this plant can be used as home remedies

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### RESEARCH ARTICLE

## EQUILIBRIUM ISOTHERM, KINETIC AND THERMODYNAMIC STUDIES OF THE ADSORPTION OF CONGO RED DYE ONTO ACTIVATED CARBON FROM SNAIL SHELL.

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#### Key words:-

Snail shell, adsorption isotherm, kinetic, thermodynamic, Congo red.

### Abstract

Snail shell samples were washed and carbonized at 400°C, ground, sieved and activated with 0.1M HCl at 800°C in a furnace. The activated carbon prepared, were used as adsorbent to remove Congo red from aqueous solution. Factors such as contact time, temperature and initial concentration were studied through single-factor experiment, while other factors are kept constant (at 30min, 30°C and 50mg/L) in each. Adsorption isotherm, kinetic and thermodynamic studies were carried out for the corresponding experiment. The isotherm results show that, Freundlich isotherm has the best fit for the adsorption. Again, the adsorption kinetic followed pseudo-second order reaction with rate constant ( $K_2$ ) = 0.2667 g/mg.min, correlation coefficient, ( $R^2$ ) = 0.9999 and adsorption capacity, ( $q_e$ ) = 2.2573 mg/g. Also, the thermodynamic parameters, enthalpy ( $\Delta H$ ) = 23.93KJ/mol, entropy ( $\Delta S$ ) = 84.64J/mol.K and negative values of free energy ( $\Delta G$ ) were obtained. These results show that activated carbon from snail shell is a good low-cost adsorbent for the removal of Congo red from aqueous solution.

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### Introduction:-

Dye removal from wastewater is the main problem encountered in the industries where they are used. Color is a visible pollutant and the presence of even very minute amount of coloring substance makes it undesirable due to its appearance. Therefore, it is required that the color-bearing effluents be treated to remove the color/dye in an economical fashion to the prescribed concentration level before they are discharged into bodies of water. All methods used for the removal suffer from one or other limitations, and none of them were successful in completely removing the color from wastewater. Adsorption process is efficient for removal of colors, odor, organic and inorganic pollutants from the industrial wastewater. Currently, the most commonly used adsorption agent in industry is activated carbon, which was successfully tested also for the removal of dye from wastewater. Although commercial activated carbon is a preferred adsorbent for color removal, its widespread use is restricted due to high cost, and its regeneration and reuse makes it more costly. Therefore, a number of nonconventional adsorbents have been tried for the treatment of wastewaters. Natural materials, biosorbents, and waste materials from industry and agriculture represent potentially more economical alternative adsorbents (Emrah et al, 2008).

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In this study, the ability of snail shell carbon to remove Congo red by adsorption is been studied. The Langmuir, Freundlich, Redlich-Peterson, Dubinin-Radushkevich and Temkin isotherms will be used to fit the equilibrium data. The order of the adsorption and the thermodynamic parameters will also be determined (Hakan, İlknur, & Belgin, 2008).

## Materials and Methods:-

### Preparation of adsorbents:-

Samples of snail shell were picked from the environment in Elele, Rivers State, Nigeria. The snail shells were washed with tap water until the washing water was colorless. They were respectively dried in the open air. The dried snail shells were carbonized in a furnace (SX-5-12) at 400°C for 3 hours and the charred snail shells were allowed to cool to room temperature, ground and sieved (200 – 600µm). It was chemically activated by weighing 100gram of the ground carbonized snail shells in 300 ml of 0.1M HCl solution, mixed and heated until it formed slurry. The slurry was heated in a furnace (SX-5-12) at 800°C for 3 hours, cooled, washed with de-ionized water and dried in an oven at 110°C for 2 hours (Gumus and Okpeku, 2015).

### Preparation of adsorbate:-

The Congo red used, is of laboratory grade (KEM LIGHT, India). The solution was prepared with de-ionized water from Ion-exchange (Indian) Ltd, Eleme, Port Harcourt, Nigeria. 150mg of the dye was weighed and dissolved in 1 liter of de-ionized water to prepare the standard solution.

### Adsorption experiment:-

1000mg of the activated carbon from snail shell was mixed with 50ml of Congo red solution (25, 50, 75, 100, 125 and 150mg/L) at 30°C in a temperature controlled water bath with constant shaking. The samples were withdrawn after 30 minutes and dye solutions were separated from the adsorbent using Whatmann filter paper. The concentration of the filtrate was measured with a UV spectrophotometer (2OD) at 496nm. The experiment was repeated using 1000mg of the activated carbon with 50ml of 50mg/L concentration of Congo red solution at 30°C. The samples were withdrawn after 30, 60, 90, 120, 150 and 180minutes respectively. Again 1000mg of the activated carbon mixed with 50ml of 50mg/L concentration of Congo red solution at 30, 35, 40, 45, 50 and 55°C in a temperature controlled water bath (DK – 420) with constant shaking was also carried out. The samples were withdrawn after 30minutes respectively.

The adsorption capacity of Congo red dye adsorbed onto the snail shell adsorbent at equilibrium was calculated with the following equation:

$$q_e = \frac{(C_0 - C_e)V}{X} \quad 1$$

Where  $C_0$  (mg/L) and  $C_e$  (mg/L) are the initial and equilibrium concentration of the dyes,  $V$  (L) is the volume of solution,  $X$  (g) is the weight of adsorbent in one container.

## Theory:-

### Langmuir adsorption isotherm (model) :-

The Langmuir equation is probably the best known and most widely applied adsorption isotherm. It is represented as follows in equation 3

$$q_e = \frac{a b C_e}{1 + a C_e} \quad 2$$

Rearranging equation 2, makes the equation linearized from which values of  $a$  and  $b$  can be determined from the slope and intercept respectively of the plot of  $C_e/q_e$  versus  $C_e$ .

$$\frac{C_e}{q_e} = \frac{1}{b Q_0} + \frac{C_e}{Q_0} \quad 3$$

Where  $Q_0$  and  $b$  are Langmuir constants,  $q_e$  is amount of solute removed or adsorbed at equilibrium.  $C_e$  is equilibrium concentration of mixtures. Thus  $Q_0$ ,  $b$  and the squared of the regression coefficient ( $R^2$ ), are adsorption parameters estimated by Langmuir model, which are used to suggest whether the adsorption can be modeled by Langmuir is isotherm.

### Freundlich adsorption isotherm (model):-

The Freundlich isotherm is an empirical relationship which often gives a more satisfactory model of experimental data. The Freundlich model can be applied onto heterogeneous surface involving multilayer adsorption. It can be expressed as follows:

$$K_f C_e^{1/n} \quad 4$$

However, the linearized Freundlich adsorption isotherm can be expressed in the form;

$$\text{Log } q_e = \text{Log } (K_f) + \frac{1}{n} \text{Log } C_e \quad 5$$

Where  $C_e$  and  $q_e$  are equilibrium concentration and amount of congo red adsorbed at equilibrium stage, while  $K_f$  and  $n$  are Freundlich constants which incorporates all factors affecting the adsorption process (adsorption capacity and intensity).

#### Redlich-Peterson isotherm (model) :-

The Redlich-Peterson (R-P) isotherm model can be represented as

$$q_e = \frac{K_R C_e}{1 + a_R C_R^\beta} \quad 6$$

Where  $K_R$  is the R-P isotherm constant (1/mg),  $a_R$  is also a constant  $(\frac{1}{\text{mg}})^\beta$  and  $\beta$  is the exponent which lies between 0 and 1. The R-P isotherm has a linear dependence on concentration in the numerator and an exponential function in the denominator. It approaches the Freundlich model at high concentrations and is in accord with the low concentration limit of the Langmuir equation.

#### Adsorption kinetics:-

The pseudo first order and second order kinetic models were tested at different concentrations in this study to determine which model is in good agreement with experiment  $q_e$  (adsorption capacity) value, thus suggesting which model the adsorption system follows.

#### Pseudo- first order equation:-

The Lagergren model, proposed in 1898, assumes a first order adsorption kinetics and can be represented by the equation.

$$\frac{dq_t}{dt} = K_1(q_e - q_t) \quad 7$$

Where  $q_e$  and  $q_t$  are adsorption capacity at equilibrium and at time  $t$ , respectively (mg/g),  $K_1$  is the rate constant of pseudo first order adsorption ( $\text{min}^{-1}$ ). After integration and applying boundary conditions  $t = 0$  to  $t = t$  and  $q_t = 0$  to  $q_t = q_e$ , the integrated form becomes:

$$\text{Log } (q_e - q_t) = \text{Log}(q_e) - \frac{K_1}{2.303} t \quad 8$$

The values of  $\text{Log } (q_e - q_t)$  were linearly correlated with  $t$ . The plot of  $\text{Log } (q_e - q_t)$  versus  $t$  should give a linear relationship from which  $K_1$  and  $q_e$  can be determined from the slope and intercept of the plot, respectively.

#### The pseudo second-order equation:-

The pseudo-second-order adsorption kinetic rates equation is expressed as

$$\frac{dq_t}{dt} = K_2(q_e - q_t)^2 \quad 9$$

Applying boundary conditions, the integrated form of the equation becomes.

$$\frac{t}{q_t} = \frac{1}{K_2 q_e^2} + \frac{1}{q_e} t \quad 10$$

The plot of  $(t/q_t)$  and  $t$  of equation 10 should give a linear relationship from which  $q_e$  and  $K_2$  can be determined from the slope and intercept of the plot, respectively.

#### Thermodynamic studies:-

The determination of the basic thermodynamic parameters: enthalpy of adsorption ( $\Delta H^\circ$ ), Gibb's free energy of adsorption ( $\Delta G^\circ$ ) and entropy of adsorption ( $\Delta S^\circ$ ), is important as it allows to estimate if the process is favorable or not from thermodynamic point of view, to assess the spontaneity of the system and to ascertain whether it is exothermic or endothermic. An adsorption process is generally considered as physical if  $\Delta H^\circ < 84 \text{ kJ mol}^{-1}$  and as chemical when  $\Delta H^\circ$  lies between 84 and 420  $\text{kJ mol}^{-1}$  (Zhang et al, 2011).

$$\Delta G = -RT \ln K_d \quad 11$$

$$K_d = \frac{q_e}{C_e} \quad 12$$

$$\ln K_d = \frac{\Delta S}{R} - \frac{\Delta H}{RT} \quad 13$$

where  $K_d$  is the distribution coefficient for the adsorption,  $q_e$  is the amount of dye (mg) adsorbed on the adsorbent per L of solution at equilibrium,  $C_e$  is the equilibrium concentration (mg/L) of the dye in solution,  $T$  is the absolute

temperature, R is gas constant,  $\Delta G^o$ ,  $\Delta H^o$ , and  $\Delta S^o$  are Gibbs free energy change, enthalpy change and entropy change, respectively.

**Result :-**

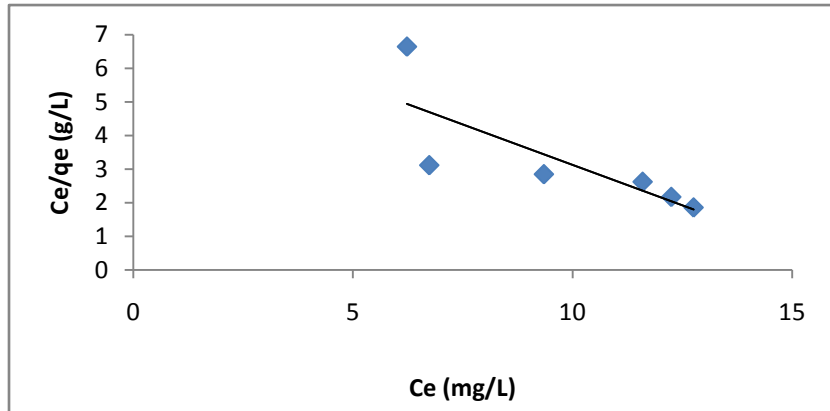


Fig. 1: Langmuir model

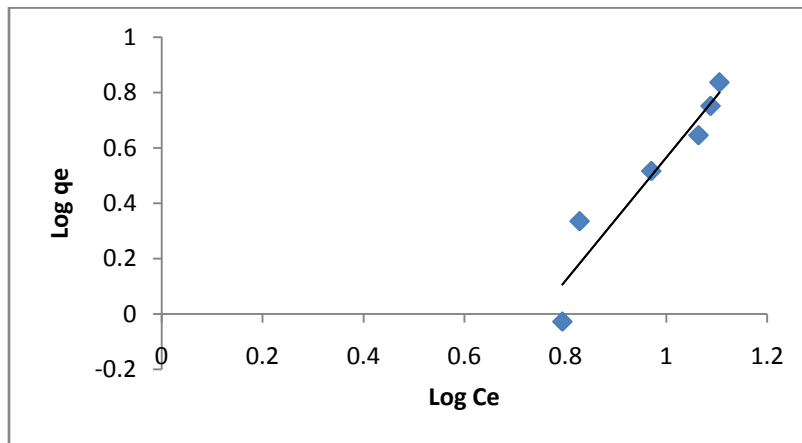


Fig. 2: Freundlich model

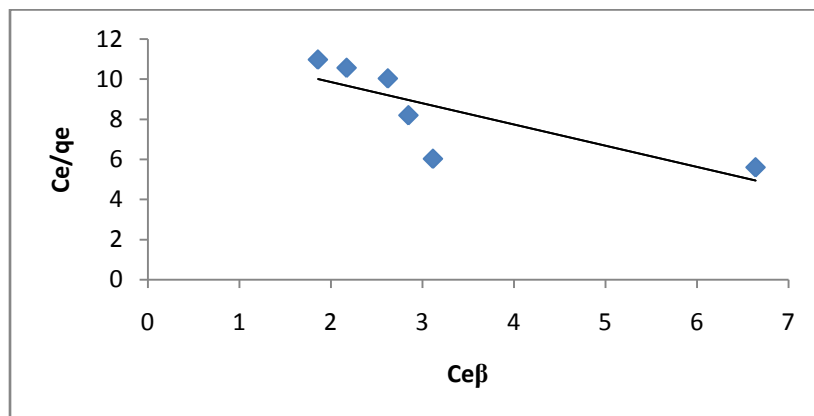


Fig. 3: Redlich-Peterson model

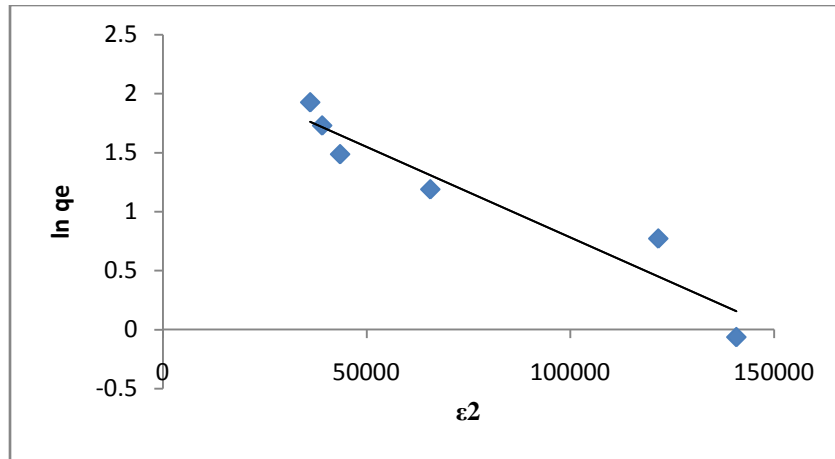


Fig. 4: Dubinin-Radushkevich model

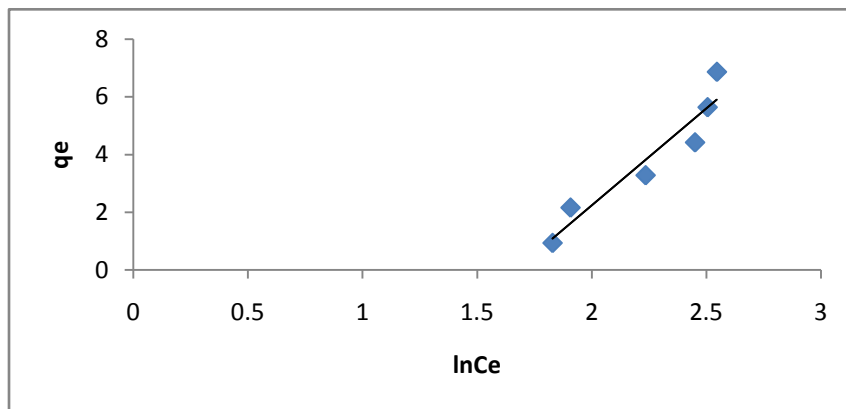


Fig. 5: Temkin model

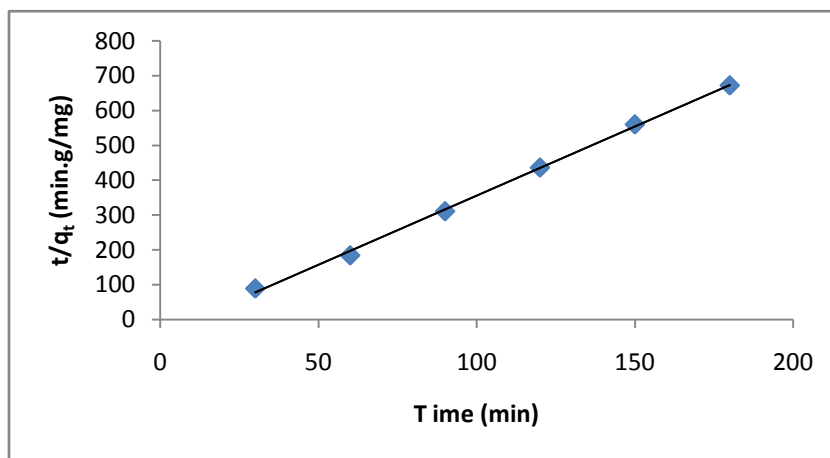


Fig. 6: Pseudo second order model

**Table 1:-** Adsorption isotherm constants and kinetic for snail shell activated carbon

Langmuir			
$Q_o$ (mg/g)	$b$ (L/mg)	$R^2$	
-2.079	0.0606	0.615	
Freundlich			
$K_f$ (mg/l)	$n$ (l/g)	$R^2$	
0.0217	0.4488	0.906	
Redlich-Peterson			
$K_R$ (L/mg)	$a_R$ (L/mg)	$R^2$	$\beta$
0.0837	-0.0884	0.617	0.914
Temkin			
$b$ (J.mol,l)	$A$ (L/g)	$R^2$	
374.71	0.9705	0.907	
Dubinin-Radushkevich			
$q_m$ (mg/g)	$E$	$R^2$	$\beta$
10.1452	158.1	0.917	2E-5
2 <sup>nd</sup> order reaction kinetic			
$K_2$ (g/mg.min)	$q_e$ (mg/g)	$R^2$	
0.2667	2.2573	0.9999	

**Table 2:-** energy parameters for Congo red adsorption by activated carbon

Temperature (K)	$\Delta G$ (KJ/mol)	$\Delta H$ (KJ/mol)	$\Delta S$ (J/mol.K)
303	-4.68	23.93	84.64
308	-4.96		
313	-5.91		
318	-6.08		
323	-6.31		
328	-6.78		

**Discussion:-**

The values of the adsorption model are presented in table 1, showing that the correlation coefficient of Freundlich isotherm is closer to 1 than that of Langmuir, indicating that it a heterogeneous adsorption process. This is also confirmed by the value of Temkin isotherm. While Dubinin-Radushkevich isotherm value showing that the adsorption is dominated by particle diffusion.

The kinetic of adsorption of Congo red onto snail shell was studied by using pseudo first- and second-order equations, for the examined system. The pseudo second-order kinetic model provided the best correlation of the experimental data.

The positive value of  $\Delta H$  indicates that the adsorption of Congo red on snail shell is an endothermic and a physical process. The positive value of  $\Delta S$  shows the existence of structural changes at the solid-liquid interface and  $\Delta S$  favors ion exchange and stability of adsorption.

**Conclusion:-**

The adsorption of Congo red onto snail shell based-activated carbon was investigated in this research work and the results of the study indicates that snail shell will be an excellent low-cost adsorbent for the removal of Congo red dye from industrial effluents.

**Reference:-**

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### RESEARCH ARTICLE

#### REVIEWING ON STREET ATTRIBUTES IN INFLUENCING SENSE OF PLACE AND PLACE ATTACHMENT.

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##### Key words:-

Street Attributes; Street Character; Sense of Place; Place Attachment.

#### Abstract

Nowadays, the concept of sense of place and place attachment are threatened by new developments, urban interventions, poor design and erosion in streets of towns and cities. These threatens lead to the loss of the character of city centers. There is no doubt that the sense of place and place attachment can be created by street attributes. Thus, this paper attempts to review the attributes of city center streets that contribute in influencing sense of place and place attachment. The study postulates this question: what are the street attributes that have influences on the sense of place and place attachment? The study aims at establishing the theoretical framework of street attributes in terms of creating sense of place and place attachment. The study reveals that streets have two types of characteristics, physical and functional. These characteristics can create and enhance street attributes that include vitality, diversity, transaction, accessibility, legibility, distinctiveness, comfort, and safety and security in terms of making place attachment, besides commerce, cultural value, social value, movement, accessibility, legibility, recognition, sense of comfort, and sense of safety in terms of making sense of place.

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#### Introduction:-

It is worth noting, some environmental psychologists who argued the experience of place is one of the most important factors in sense of place such as, Shamai (1991), Kevin Lynch (1960), Relph (1976) and others. Those defined and explained many important definitions and concepts which related with place. In addition, they are regarded as pioneers in using experiential perspectives to reflect on place and 'sense of place'.

Relph (1976) described place as an interaction of three components i.e. 'physical setting', 'activity' and 'meaning'. While Sense of place is defined as a combination of three elements i.e. location, landscape, and personal involvement (Shamai, 1991). Spirit of place relates to the exclusive aspects of a place (Smaldone, 2006). Barker (1979) quoted from Bassett (2011), defined the sense of place as one of the most intangible concepts. Alford (2011) refers that unique identity of place is one of sense of place meanings. Moreover, she defined sense of place as relationship between people and their atmosphere.

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Three components that contribute in making a sense of place were referred to by Najafi and Shariff (2011); and Beidler, (2007). They mentioned that activities, meanings and physical attributes are components related to places that contribute to creating a sense of place. It is worth considering that each place was built for serving a specific action, meaning activity could refer to actions served by the place (Najafi and Shariff, 2011). As for physical elements, it indicates to the characteristics and attributes of a setting that define the kind of place it is. Additionally, it can also be said, as mentioned by Najafi and Shariff (2011) that sense of place is defined as an overall impression surrounding the general ways in which people feel towards places, sense them, and assign concepts and values to them.

In parallel, place relationships were related with sense of place, since place is fully made of concrete things that comprise of shape, texture, substance, materials, and colour, which together determine the essence of a place (Shinbira, 2012). It is the area where one is acquainted of the unique character of given localities and perception is enhanced. The faculty of recognising various places and distinguishing different identities of a place is attributed to the concept of sense of place. People are effected by places and reciprocally place is affected by people due to the attribution of meanings to physical forms. Subsequently an interaction occurs with a place rather than a response to a place, hence enriching the place with meanings. For this reason historical and heritage places carry more sense of place compared to contemporary modern places. Based on the aforementioned, this study looks into the role of characteristics of streets in terms of their physical and functional aspects, while excluding the meanings of street.

About place attachment, commencing by 1970th, phenomenological studies are the earliest sorts of literature introducing place attachment. Place attachment is associated with the development of affective connection between people or individuals and specific places which is expressed through “interplay of affects and emotions, knowledge and beliefs, and behaviours and actions” as Ujang and Shamssudin (2012) quoted from Altman and Low (1992). Attachments can be formed between people and buildings, environments, homes, objects, landscapes, neighborhoods, towns and cities. Alford (2011) mentioned that place attachment is as an affective bond that people establish with specific areas where they prefer to remain and where they feel comfortable and safe. Scannell and Gifford (2010) defined place attachment as an emotional bond. (Jorgensen and Stedman, 2005; Lewicka, 2008; Raymond, 2010) Place attachment refers to bonds that people develop with places.

This study will centre upon street as urban space. Hence, Lynch (1960) mentioned that street is very considerable elements in cities, which reflects the image and character of cities. Moughtin (2003) defined the street as one of the important elements that act as a public open space. According to Sulaiman et al. (2008) the street is one of the earliest components of the urban and plays the most important role as a channel for communication, also generates outdoor activities that are vital for the visual introduction of the urban dwellers.

Nowadays, the concept of sense of place and relationship between place and people are threatened by new developments, urban interventions, poor design and erosion in streets of towns and cities. These threatens lead to weakness the role of character and sense of place in streets (Sulaiman et al., 2008). Thus, streets in cities loss their historical and cultural values (Najafi and Shariff, 2011). Because of strong attendance of commercial activities, many people who live around streets move to another places. This led to imbalance state in cities and made them noisy and unsuitable for living (Ja'afar et al., 2012). Hence, changes of street activities reduce its importance as one of the main components which performs cities and urban fabric. All these reasons aid to loss sense, attachment and character of places (Ja'afar and Usman, 2009; Ujang, 2008).

According to the aforementioned introduction, the street is one important component of the city that can strongly reflect its character, sense of place and place attachment. This means that the street has attributors that give its sense of place and place attachment. Strength of sense of place and place attachment are evident of the multiplicity of street attributors. So, it is important to review these attributes.

### **1. Attributes by which sense of place can be identified in streets:-**

Ja'afar et al. (2012), Lin (2011), Ja'afar (2006) and others who mentioned elements and features of streets to find the degree of sense of place. Physical and functional characteristics, and their division able to identify sense of place in open spaces or any place by brought about the relationship between it and its people (Lin, 2011).



### **1.1 Physical Characteristics:-**

Ja'afar et al. (2012) examines sense of place in traditional streets in Malaysia through three main qualities which are physical, activity, and meaning qualities to attract visitors. Physical quality encompasses physical elements (building and non-building). Activity quality encompasses activity element (formal and informal activity) and meaning quality encompasses meaning element (familiarity, historical and heritage).

Physical element is identified as the first important element contributing to sense of place in cities. It can be divided into two categories; buildings and non-buildings physical (Ja'afar and Usmar, 2009; Ja'afar et al., 2012 and 2008). The physical features plays an important role in influencing the sense of place (Ujang, 2008).

Buildings attract respondents to the street is associated with its use (activity inside the building). In the case, street character is reflected by the building use for business activities in all streets. For non-physical building, it is associated with presence of people. Meanwhile, non-physical building is associated with landscape element, soft and hard landscape. The mature trees are considered by respondents as a street symbol and contribute to the comfort environment which encourages a walkable atmosphere Ja'afar et al. (2012).

#### **(a) Accessibility:-**

Accessibility means the ability to easily get to and move through a place, thus provides ease of movement (Ujang, 2008). So, it is related to location of place. Location in context is one of the physical characteristics of the street (Shamsuddin, 1997). She finds that the location of the street becomes a recognisable feature, especially when its surrounding environment is easily identified. Streets and buildings are recognised by their location in relation to the buildings located adjacent to them or within their vicinity. Accessibility has two types: (a) Visual accessibility which allows people to see it and be informed about what is happening there, and (b) Physical accessibility which allows people to enter that space and use its functions. An urban public space should invite people to come inside and use its facilities (Jalaladdini and Oktay, 2012).

Each street forms both a destination and a connection to other places (South Gloucestershire Council, 2013). According to Ujang (2008), the location of the place play an important role in making the street accessible, particularly, when these streets are strategically located and are highly accessible from various locations, are well connected streets, are well connected pedestrian paths, and are accessible by various transport modes. These features of street location determine how the accessibility of a place is.

Ujang (2008) observed that street elements are vital in providing a foundation for an accessible built environment, while others (Ujang, 2008; Shamsuddin, 1997) noted they are important in recognising the street, especially buildings which act as landmarks. Places become more enjoyable to be in and more accessible to all when understanding and navigating through the built environment involves all of the senses through colour, light, shade, texture, sounds, and fragrances (Moreton Bay Regional Council, 2013). In this way, places can be designed to be easily comprehended and assist the individual to easily understand them, connect with them, use them and navigate through them (Moreton Bay Regional Council, 2013).

#### **(b) Recognition:-**

Recognition is another attribute of street that help to give a good sense to a place. People can recognize the street through its physical appearance. Physical form and appearance are the characteristics of the physical environment, especially buildings, which are distinctive and easily recalled (Shinbira and Sulaiman, 2010). Building and non-building appearances are consist of style, form, facade, material, color, height, size, age, condition, roof form, and signage (Abbaszadeh, 2011; Grabler et al., 2008; Shamsuddin,1997). Also, people can realize the place by its building that can act as landmarks and nodes, and can be used in determining the path of place or street (BMS, 2011; Mohammed, 2010; Long et al., 2007; Lynch, 1981).

#### **(c) Sense of Safety and Comfort:-**

They are another street attributes related to landscape features. According to Ja'afar, et al. (2012), landscape features are one of the physical elements of the place. The landscape elements include trees (soft features) and street furniture (hard landscape elements) such as pavements, lighting, public art, and fences (London Borough of Croydon, 2009; Ja'afar and Usman, 2009). The success of any given place is highly influenced by the safety, comfort and convenience which people experience while pass through and/or go to places, spaces, and buildings (CABE, 2008). According to Ja'afar, et al. (2012), the presence of signs, lighting at night, sitting areas, trees,

beautiful views, parking areas, facilities, and pavements with suitable width to walk on, contribute to making a comfortable environment. On the other hand, South Dublin County Council (2011) refers to six features that contribute in making the environment in street uncomfortable. These features are benches, dustbins, bicycle racks, bus stops, the quality of view, and pavements.

### **1.2 Functional characteristics:-**

Historically, streets have played a very important role for a variety of reasons, such as providing an environment to meet friends and neighbours, being a platform for political protests, a location for markets and fairs, and even being a play area for children in the residential setting. The heart of economic and social activities in a city is traditionally situated in the city centre, as it is regarded the main source of commerce and labour (Rastegar, N. et al., 2014). Sammas (2008) quoted from Moughtin (2003) states that streets have functional elements in the city. They serve many functions; not only the movement of traffic, but also economic, political functions and social amenity. Thus, the street contributes in commerce and trading prosperity, and moving people from place to others, as well as reflects social and cultural values and importance. These attributes will be more discussed as the following.

#### **(a) Movement:-**

According to Al-Obeidy (2017) quoted from Telford (2007), movement is the most important feature in determining the character of a street, and it is the main functional role of the street (Leeuwen and Timmermans, 2006; Mahdzar, 2003). As a channel of movement, streets connect one place to another (Sholihah, 2005; Sammas, 2008). People use streets to move from one place to another by foot or by car. The street provides a link between buildings, both within the street and in the city at large. As a link, it facilitates the movement of people, as pedestrians or within vehicles, and the movement of goods.

#### **(b) Commerce and Trading:-**

They are second functional attributors of the street. Sholihah (2005) mentioned that people use streets as a place to offer goods and a place to display as much as they were "allowed". Pedestrians see, compare, discuss with their companions, bargain and decide whether to buy an item or not.

#### **(c) Social Values:-**

Streets can reflect the social values of communities because they present as arena for social expression (Moughtin, 2006). Street can provides eleven social uses of streets, including using the street for strolling and window-shopping, resting, people-watching, vendors, telephones, newspapers, art works and banners, schmoozing, eating, waiting, orientation or information seeking, street performers, drinking fountains, and finally fountains (Eichner and Tobey, 1987). Moreover, Ortiz (2012) points out to the successful public spaces where celebrations are held, where social interactions take place, where one finds and gathers with one's friends, where ideas are exchanged, where one expresses oneself, where one rests and observes, and where one finds the public institutions of cities.

The street is also an environment that offers multiple lessons for children just by watching people and their activities. Experiences in public spaces are not only a source for the education of children in learning how to cope with new situations in real life (Jacobs, 1961), but also for the education of adults in learning, by observing the way people do things differently (Lofland). Additionally, seeing other people engage in activities can be an inspiration to engage in new activities. Hence, even in contemporary times, the street, as a social space, can play multiple roles and offer social contact and interaction, social awareness and learning, and social cohesion. Therefore, Donnelley (2010, pp.38) emphasises that the design of all streets should recognise the importance of creating places for people to enjoy rather than simply providing corridors for the movement of traffic. Streets should generally be designed with a focus on social interaction.

#### **(d) Cultural Values:-**

According to Lai, et al. (2013), culture is one of the attributes to devote the significance of a place. Streets can provide cultural values which refer to parades, street events, art performances, street musicians, traditional foods, culture-based goods such as crafts, and so forth, that form the life of a street (Sammas, 2008). According to McClinchey (2011), festivals, along with other leisure experiences, are perceived as important components of vibrant, diverse and creative urban spaces. Cultural festivals, in particular, are rapidly becoming an acceptable form of urban tourism in that they allow for the consumption of ethnic culture and are part of the overall experience economy. Cultural festivals have the potential to provide social benefits by contributing to a sense of shared identity, civic pride, cultural pride, community cohesiveness, place and belonging, and are also perceived as place image

boosters. In his study, McClinchey (2011) concludes that festivals may contribute to a sense of place, but not substantially. The role of the festival was as a space for the showcasing and communication of culture, as a connection that ethno-cultural group leaders needed to maintain throughout the year in order to connect to broader meanings of place and identity. The festival allowed cultural entrepreneurs to value their own ethnic identity, maintain their cultural traditions and increase the awareness of their culture.

## **2. Attributes by which place attachment can be identified in street:-**

Place attachment has employed by many researchers as (Ujang and Dola, 2007; Morgan, 2010; Ujang and Shamsuddin, 2008; Hidalgo and Hernandez (2001); Beidler, 2007). These authors and others divided place attachment to three categories namely, activity encompasses vitality, diversity and transaction, Physical elements encompass accessibility and legibility, and image encompasses distinctiveness, comfort, and safety and security.

### **2.1 Activity:-**

Three of the key attributes of the activity contributing to place attachment are vitality, diversity and transaction. Available these activities able to make vibrant street.

#### **(a) Vitality:-**

Vitality means the capacity of the place to make multiple choices of activities used by users of street. A successful or responsive street able to fulfill human needs, and accommodate people activities (Jacobs, 1993). Firstly, continuous attributes of place have ability to create and enhance attachments between people and place. Secondly, pedestrian movement is an important factor to feed public space specially, streets. Thus, the number of people who visit street and presence of facilities on street have ability to make vibrant street (Montgomery, 1998).

#### **(b) Diversity:-**

Diversity is another attributes which has a pioneer role in fostering place attachment in urban experience (Bentley et al., 1985). Many considerable researchers describe diversity as variety of building and facade forms, building types and activities. The best street has diversity in physical, social and economic aspects which make it more vital, active and safer (Jacobs, 1993).

#### **(c) Transaction:-**

It refers to good interaction between people and place. This positive interaction flows from positive surrounding atmosphere. Thus, the importance of this aspect is evident in street life. Opening hour of shops able to develop economic activity in street (Montgomery, 1998). Moreover, presence of events, celebrations, occasions and meetings encourage on strengthen of place attachment and sense of welcoming in streets. Moreover, all these issues work together to create sense of place (Sulaiman et al., 2008) and contribute with the character of streets in towns and cities.

## **2.2 Physical elements:-**

Two of the key attributes of the physical element contributing to place character are accessibility and legibility.

#### **(a) Accessibility:-**

Ujang (2008) mentioned that accessibility determines uses and activities of places, these uses encompass location, visual cues, and legibility. It means the ability to reach activities, services and people to place. Meantime, it means the ability to reach people from place to other places (Lynch, 1960). Here, should mention that connectivity plays important role in providing street's life. Connectivity is associated with the ability to easily get to and move through a place. Thus, it leads to safety and security concepts for users of these places (Commission of Architecture and the Built Environment, 2000).

#### **(b) Legibility:-**

Legibility is an attribute vital for good and successful places. A legible place is defined by vivid and integrated physical environment (Ujang and Shamsuddin, 2010). It eases the way of peoples' understanding, organizing and identifying their physical environment (Bentley et al., 1985). It explains how people can realize what opportunities a street can show.

### 2.3 Image:-

Lynch (1960) explains the meaning of image and mentioned that streets are good places which reflect identity and image of place. Many scholars state how we can measure image of city and determine three aspects namely, distinctiveness, comfort, and safety and security.

#### (a) Distinctiveness:-

It related with character and identity of street because it means uniqueness that can distinguish one place from others (Relph, 1976). Distinctiveness determines the quality of street and examine opinions of people in certain place. For example, ask people about do you have memories which relates you with this place? Why this place is important for you? This importance of imageability or legibility of place and its relation with sense of place that previously explained, Cadw's (2013, p.39) endeavours in making places legible is to make them easy to understand and navigate, so that people have a clear mental image of the place. He also emphasises that recognisable features or elements in a certain place contributes to give a sense of place. Since the place should be noticeable or recognisable through its physical characteristics, it is evident that the role of these characteristics is to make the street recognisable or noticeable or legible that make it distinctive.

#### (b) Comfort:-

Comfort is another attributes which give strong attachment between people and their place (Shamsuddin et al., 2008; Ujang, 2008). It performs successful streets in towns and cities. Comfort features generate sense of relaxing and sense of happiness by many elements such as landscape, water features and traffic free area. Thus, these issues will create beautiful and positive image for certain place or street, which received by its users or dwellers (Ujang and Shamsuddin, 2010; Lynch, 1960).

#### (c) Safety and security:-

Safety and security are the third contributes which have very important role to generate good image of city thus, strong attachments. Many aspects can encourage and strength safety such as presence of people, security officials and traffic free area in streets (PPS, 2013). Meanwhile, these aspects can reduce or deny the fear factor in peoples' feeling (Mehta 2007; Shamsulddin et al., 2008), crimes and bad events like, theft. Moreover, lighting of street is very important factor to available safety environment in streets.

### Measuring Street Attributes in terms of Sense of Place and Place Attachment:-

Identifying street characteristics and attributes is related to perceptions and feelings of users. Sense of place is studied to understand or examine current people feelings and perceptions, while place attachment is related to the long term period and studied to examine the memory of people. On such basis, the streets attributes in terms of sense of place can be measured by asking people or users about their feelings, opinions, or perceptions like "how do you feel, understand, or use the street?", and "Why". For instance, "do you feel comfortable when you walk in the street?" and "why?" The answer of "Do" question will be yes or no. And the answer of "Why" question will determine the reason. On the other hand, place attachment means an effective or emotional bond that people establish with a specific place as mentioned in the introduction. This bond can be strengthened during the time. Thus, to know how to measure place attachment, the degree of relationship between people and place must be known. This can be obtained by asking people about the degree of their feelings and perceptions. This type of questions is called likert scale questions. For example, I feel comfortable when I walk in the street. The answer should be strongly disagree, disagree, agree or strongly disagree.

Previous research on perception, evaluation, imageability of place, sense of place, and place attachment are approached through the use of mixed methods, quantitative and qualitative techniques, which are employed by many considerable researchers as Shamsuddin (1997), Affendi (2004), Sulaiman and Shamsuddin (1998), Hilmilia (2005), Alford (2011), Fullerton (2011), Abbaszadeh (2011), Ujang (2008), Ja'afar (2006), Lin (2012), Shamsuddin and Ujang (2008), Ja'afar and Usman (2009), Ja'afar, et. al. (2012), Ujang and Dola (2007), Ja'afar, et al. (2008) Ujang and Shamsuddin (2008), Haji Bilyamin (2014), Lynch (1960), and Creswell (2003) (see Table 1.0). All of them find the combined methods as the most appropriate in their field of studies.

**Table 1.0:-** Table of design methodology by researchers

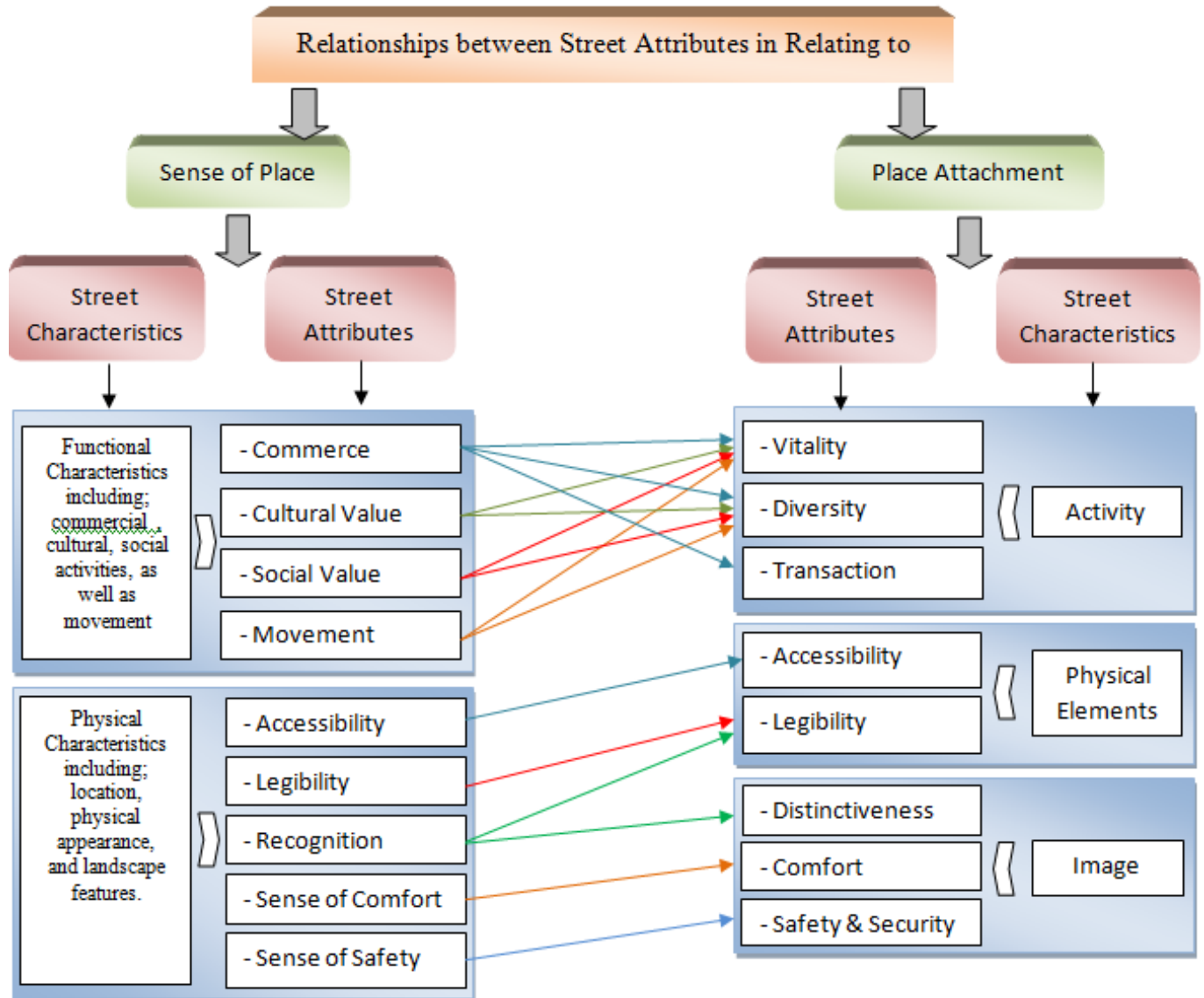
The methodology used Types of Resources with their Researcher (s)	"Research Family"		Relating Concept	
	Qualitative	Quantitative	Sense of Place	Place Attachment
Haji Bilyamin, S. F. (2014)	■	■	■	
Alford S. R. (2011)	■	■	■	
Fullerton K. R. (2011)	■		■	
Zadeh F. A. (2011)	■	■	■	
Ujang N. (2008)	■	■		■
Baghi M. H. (2011)	■		■	
Ja'afar N. H. (2006)	■	■	■	
Sammas Y. A. A. (2008)	■		■	
Lin C. C. (2012)	■	■	■	
Affendi Ahamad (2004)	■	■	■	
Hilmilia Selamat (2005)	■	■	■	
Shuhana Shamsuddin (1997)	■	■		■
Ja'afar N. H. & Usman I. M.S. (2009)	■	■	■	
Ja'afar N. H. & Sulaiman A. B. and Shamsuddin S. (2012)	■	■	■	
Ujang N. and Dola K. (2007)	■	■	■	■
Ja'afar N. H., Usman I.M.S., Tahir M.M., Mohd Nor M.F. I. (2008)	■	■	■	
Ujang, N. and Shamsuddin, S. (2012)	■	■		■
Ujang N. & Shamsuddin S. (2008)	■	■	■	
Ja'afar N. H., Sulaiman A. B. & Shamsuddin S. (2012)	■	■	■	
Shinbira and Sulaiman (2010)	■	■	■	

For example, the study of Shinbira and Sulaiman (2010), also adopted the mixed method to support evidence and examine the physical and functional characteristics associated with street identity. Moreover, Abbaszadeh (2011) studied the characterisation of the physical elements of street design by using the mixed method to collect data.

Hence, the research suggests that the use of the mixed method can provide the study with a more complete understanding of the phenomena and support the findings. This study tries to explain how to achieve integrated methods of studying influential attributes of street in terms of sense of place and place attachment.

### Conclusion:-

Streets are an important icon of city. They have had pioneer role in strengthening of relationships among people, producing of services like shopping, by brought about vitality, diversity and transaction which reflect good place attachment, and functional and physical characteristics which reflect charm sense of place of streets in towns and cities. Figure 1.0 shows the theoretical framework of the study. It explains street characteristics and their attributes in relating firstly to sense of place and secondly place attachment. Commerce, cultural value, social value, and movement are functional contributors of street in terms of sense of place, while accessibility, legibility, recognition, sense of comfort, and sense of safety are its physical contributors. In terms of place attachment, the attributors of activity in the street are vitality, diversity, and transaction, the attributes of physical elements are accessibility, and legibility, the attributors of image are distinctiveness, comfort, and safety and security.



**Figure 1.0:-** Theoretical Framework that Explains the street Characteristics and Attributes, and their Relationships for Two Concepts, Sense of Place and Place Attachment.

To secure streets characteristics and keep unique character of city centers, the achieving sense of place should be sought firstly then place attachment. It means that the feelings or senses that affect people positively should be created first to make strong place attachment. No attachment (relationships between person and place) without sense of place (good feelings and emotions) first. Thus, both of sense of place and place attachment are important and contribute to secure the character of streets' city centers. Place makers, developers, and designers should take into consideration enhancing sense of any place through design and improve its functional and physical characteristics that contribute in making good senses or feelings to its users. Besides, activity, physical elements, and image are key attributes of streets to strengthen sense of attachment or belonging.

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### RESEARCH ARTICLE

#### EFFECT OF ODD EVEN SCHEME TO COMBAT AIR POLLUTION IN NCT OF DELHI.

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#### Abstract

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 and PM<sub>10</sub>, Vehicular pollution

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#### Introduction:-

Air pollution is a major environmental issue affecting people across the world. According to the World Health Organization (WHO), more than 2 million people worldwide die every year from air pollution. Of all the air pollutants, fine particulate matter (PM) is one of the most hazardous pollution for the human health. The particulate matter causes about 9% of lung cancer deaths worldwide, 5% of cardiopulmonary deaths and about 1% of respiratory infection deaths. There have been several studies done on assessment of ambient air quality and concentration of different pollutants of air (i.e. heavy metals, polycyclic aromatic hydrocarbons etc) in various regions of India. (Kaushik & Haritash, 2006; Haritash & Kaushik, 2007, Haritash & Kaushik, 2011). But the policy related interventions to improve air quality are still lacking in Indian context.

Air quality or ambient (outdoor) air pollution is represented by the annual mean concentration of particulate matter PM<sub>10</sub> (particles smaller than 10 microns) and PM<sub>2.5</sub> (particles smaller than 2.5 microns, about 25 to 100 times thinner than a human hair). The environmental and health concerns related to PM<sub>1</sub> is more since the penetration of fine particles into the respiratory system is deeper and associated health effects are also severe (Haritash & Kaushik, 2012). Considering health effects of PM<sub>1</sub>, SAFAR initiated monitoring of this pollutant in the air during second phase of Odd Even Scheme.

The Government of NCT of Delhi had implemented odd-even scheme aiming to reduce the pollution level in the city. The idea of this scheme came from the system that was implemented in Beijing in 2008 just before the summer Olympics. While the rule was initially said to be temporary, it turned out to be so effective the government made it

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permanent. Similar road-rationing rules are imposed in many places around the world like Paris, Mexico and Bogota to curb road jams and pollution.

The scheme has been performed in two phases. One from 1st to 15th January, 2016 and the second phase of the scheme was implemented between 15<sup>th</sup> to 30<sup>th</sup> April 2016 with the objective of reducing air pollution in Delhi. The odd-even scheme applied to four wheeler Passenger/Private Cars. The AAP cabinet announced private vehicles to run across the city based on their registration numbers. If a vehicle's registration number ends with an odd digit, it will be allowed on the road on January 1 that is on odd numbered days, while that ending with an even number can be driven on the second, and so on. This step has been taken as a measure to bring down and control air pollution.

Air-pollution levels in Delhi rose 15% during the 15-day period (January 1 to 15, 2016) of the state government's odd-even measure over the previous 15 days (December 17 to 31, 2015), according to an analysis of PM<sub>2.5</sub> (particulate matter) data, generated by various studies.

### **Odd Even Scheme:-**

The odd even scheme is one of the road rationing system also called as alternate-day travel is a travel demand management strategy aimed at reducing the negative obverse generated by urban air pollution or peak urban travel demand through artificially restricting demand (vehicle travel), especially during the peak periods or during peak pollution events. This objective is achieved by restricting traffic access into an urban area, city or district based upon the last digits of the license number on pre-established days and during certain periods, usually, the peak hours.

Delhi Government had imposed this scheme in two phases. Initially the scheme was implemented from 1<sup>st</sup> January 2016 to 15<sup>th</sup> January 2016 and the second phase had been in operation from 15<sup>th</sup> April to 30<sup>th</sup> April 2016. According to the notification issued by the government, from 8 am to 8 pm private vehicles with odd registration numbers will be allowed on the road on Mondays, Wednesdays and Fridays. Vehicles with even numbers will run on Tuesday, Thursday and Saturday. But on Sundays there was no as such restrictions.

This rule will not be applicable on emergency vehicles like PCR vans, fire tenders and ambulances, and on public transports like CNG-driven buses, taxis and auto-rickshaws.

The government also decided to exempt two-wheelers from this rule. This system, therefore, was applicable only on private-owned four wheelers running across Delhi, and on those coming in from other states. And that includes vehicles used by ministers and bureaucrats of all ranks.

To make the scheme work effectively the government has added the public transport will be strengthened from the first of January. This will include increasing the frequency of metro trains across the city.

### **Analysis of data:-**

The air quality in Delhi is monitored through a set of Continuous Ambient Air Quality Monitoring System (CAAQMS) and manual stations (NAMP). The present analysis is based on the data collected by CPCB from 08 operational CAQMSs including 04 of its own (Shadipur, Dwarka, Dilshad Garden & Parivesh Bhawan) and 04 belonging to DPCC (Mandir Masg, R. K. Puram, Punjabi Bagh & Anand Vihar). Apart from this, data has also been collected from 07 manual stations of CPCB (Pitampura, Sirifort, Janakpuri, Nizamuddin, Shahzada Bagh, Shahdara & BSZ Marg) which operate on alternate days. The overall contribution of vehicular pollution in ambient air in Delhi during winter season is estimated to be around 20-25% in respect of PM<sub>10</sub> and PM<sub>2.5</sub>. However, in terms of emission load, it contributes about 9% and 20% respectively for PM<sub>10</sub> and PM<sub>2.5</sub>, as per IIT Kanpur study, of which the 4-wheeler passenger cars contribute about 10%. The odd-even scheme could have theoretically contributed to PM reductions in respect of exhaust emissions from off-road odd or even cars, marginal reduction in road dust and secondary pollutants.

The pollutants for which data have been considered for the above said assessment include PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, Benzene, O<sub>3</sub>, NO<sub>2</sub> and CO. It may be seen that during January 1-15, 2016, the pollutants viz., PM<sub>10</sub> ranged between (161-629 µg/m<sup>3</sup>); PM<sub>2.5</sub> (79 – 507 µg/m<sup>3</sup>); SO<sub>2</sub> (4-42 µg/m<sup>3</sup>); Benzene (1-11 µg/m<sup>3</sup>); O<sub>3</sub> (2-66 µg/m<sup>3</sup>); NO<sub>2</sub> (9-159 µg/m<sup>3</sup>) and CO (280 – 1990 µg/m<sup>3</sup>).

The data analyses for days preceding (period from 25th to 31st December, 2015) and post (period from 16th to 21st January, 2016) to the odd-even scheme, shows that during pre-odd-even scheme December 25-31, 2015; the

pollutants viz., PM<sub>10</sub> ranged between (142-454 µg/m<sup>3</sup>); PM<sub>2.5</sub> (52-298 µg/m<sup>3</sup>);SO<sub>2</sub> (4-31 µg/m<sup>3</sup>); Benzene (1-7 µg/m<sup>3</sup>); O<sub>3</sub> (18-48 µg/m<sup>3</sup>); NO<sub>2</sub> (5-116 µg/m<sup>3</sup>)and CO (114 – 1244 µg/m<sup>3</sup>); while during post odd-even scheme, January 16-21, 2016; the pollutants viz., PM<sub>2.5</sub> ranged between (76-342 µg/m<sup>3</sup>); SO<sub>2</sub> (4-13µg/m<sup>3</sup>); Benzene (1-7 µg/m<sup>3</sup>) O<sub>3</sub>(13-34 µg/m<sup>3</sup>); NO<sub>2</sub> (17-47 µg/m<sup>3</sup>) and CO(278 – 1316 µg/m<sup>3</sup>).With no clear trend and wide fluctuations observed in the concentrations, it is evident that the meteorology and emissions from other polluting sources have been major factors impacting air quality of Delhi during the period. Higher wind speeds and mixing height in general result in better dispersion and lower pollution levels. Overall, it can be stated that while some reduction in air pollution is likely to happen due to odd-even scheme, a single factor or action cannot substantially reduce air pollution levels in Delhi. Therefore, a comprehensive set of actions following an integrated approach is required to make substantial improvement in air quality.

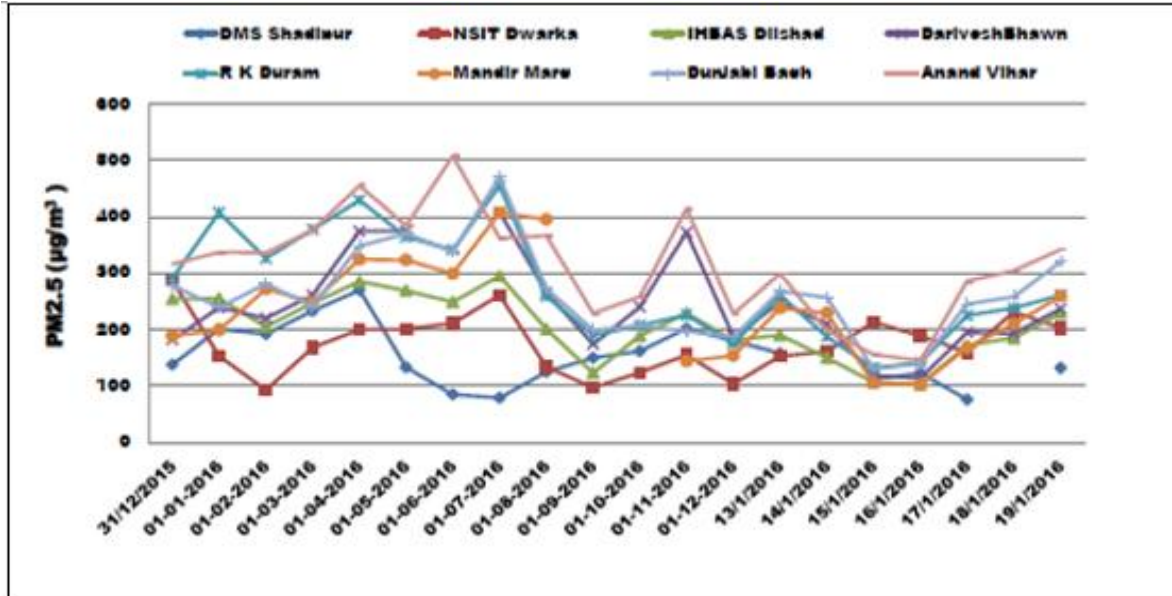


Fig 1:- Daily average PM<sub>2.5</sub> values comparison at different stations Across Delhi

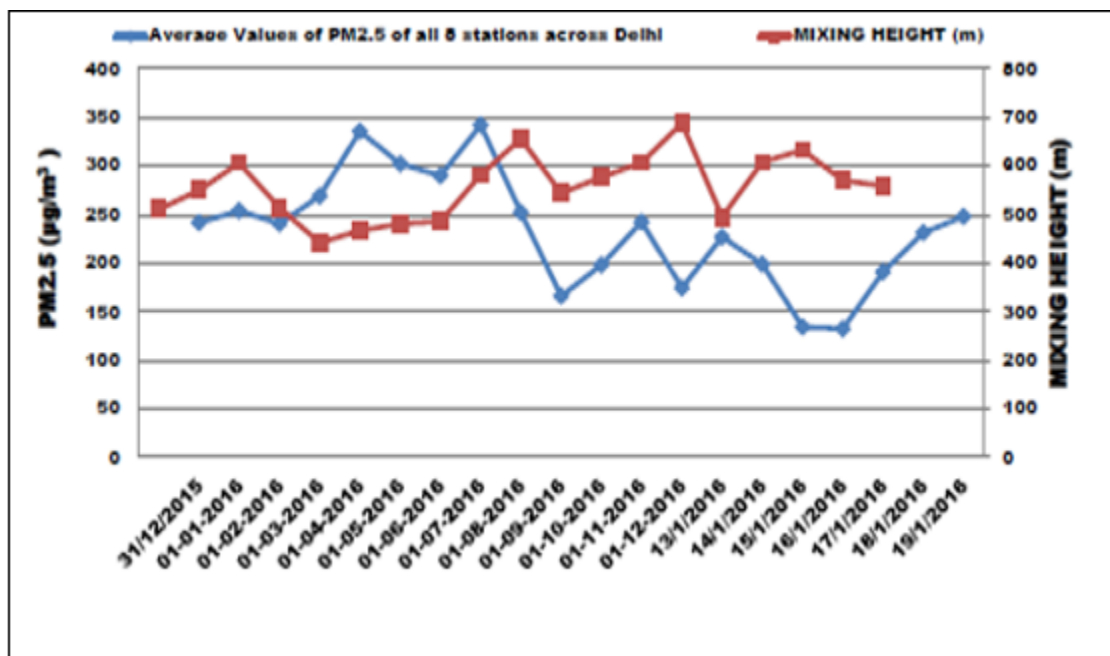


Fig 2:- Correlation of daily average PM<sub>2.5</sub> values with mixing height

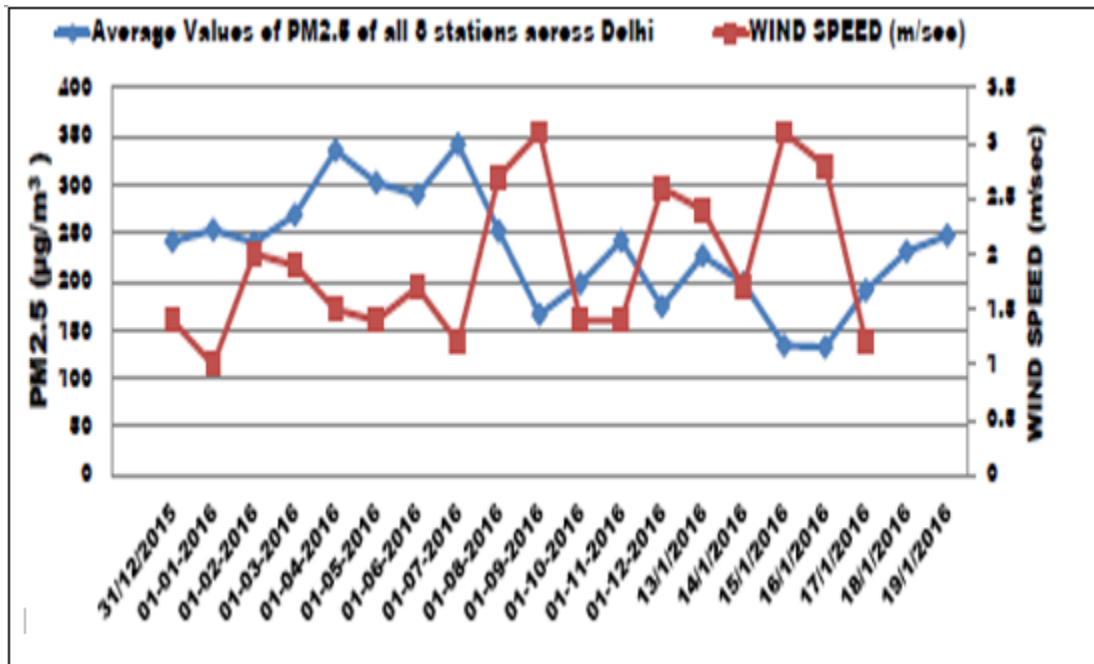


Fig 3:- Correlation of PM<sub>2.5</sub> with wind speed

Table 1:- Daily average concentration (µg/m<sup>3</sup>) of air pollutants in Delhi during the study

(CAAQM Stations)

Stations (CPCB Stns.)	Parameters	Pre Odd Even Scheme (25-31 December 2015)						During Odd Even Scheme (01-15 January 2016)						Post Odd Even Scheme (01-15 January 2016)					
		PM 2.5	CO	NO <sub>2</sub>	O <sub>3</sub>	Benzene	SO <sub>2</sub>	PM 2.5	CO	NO <sub>2</sub>	NO <sub>x</sub>	Benzene	SO <sub>2</sub>	PM 2.5	CO	NO <sub>2</sub>	O <sub>3</sub>	Benzene	SO <sub>2</sub>
Shadipur	Max	141	1244	72	48	3	31	220	1990	126	45	8	26	165	604	47	34	4	13
	Min	65	114	35	34	1	22	73	280	14	2	1	7	76	270	20	13	1	7
Dwarka	Max	298	693	12	40	7	28	261	1061	33	66	11	8	235	675	28	32	7	7
	Min	52	484	3	18	3	8	93	438	9	4	2	3	160	502	17	13	3	4
Dilshad Garden	Max	221	1006	71	NA	NA	19	295	1610	140	NA	NA	12	229	1316	44	NA	NA	8
	Min	85	321	51	-	-	7	107	321	29	-	-	6	102	363	27	-	-	7
Parivesh Bahwan	Max	NA	NA	NA	NA	NA	NA	400	NA	NA	NA	NA	NA	237	NA	NA	NA	NA	NA
	Min	-	-	-	-	-	NA	119	-	-	-	-	-	114	-	-	-	-	-

**Table 2:-** Daily average concentration ( $\mu\text{g}/\text{m}^3$ ) of air pollutants in Delhi during the study  
(Manual Monitoring Stations in Delhi)

Manual Stations (CPCB Stns.)	Parameters & Data Range	Pre Odd Even Scheme (25-31 December 2015)				During Odd Even Scheme (01-15 January 2016)			
		PM 10	PM 2.5	NO <sub>2</sub>	SO <sub>2</sub>	PM 10	PM 2.5	NO <sub>2</sub>	SO <sub>2</sub>
Pitampura	Max	420	NA	44	9	541	429	98	17
	Min	142	NA	43	5	207	116	15	4
Sirifort	Max	Data Inadequate				548	286	98	39
	Min	Data Inadequate				301	168	33	4
Janakpuri	Max	Data Inadequate				614	259	97	34
	Min	Data Inadequate				367	102	24	4
Nizamuddin	Max	270	NA	71	30	294	185	81	11
	Min	253	NA	51	13	161	84	31	4
Shazada Bagh	Max	309	233	93	17	607	166	93	15
	Min	301	193	52	5	172	81	50	4
Shahdara	Max	Data Inadequate				629	231	106	42
	Min	Data Inadequate				217	82	26	4
BSZ-Marg	Max	454	-	116	4	516	-	159	17
	Min	254	-	77	4	169	-	64	4

Another analysis done by **System of Air Quality and Whether Forecasting and Research** (SAFAR) also showed a similar trend in air quality status of Delhi.

The pollutants for which data have been considered for the above said assessment include PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, Benzene, O<sub>3</sub>, NO<sub>2</sub> and CO of which ozone, PM<sub>10</sub> and PM<sub>2.5</sub> is the major one. It also monitored the finer PM<sub>1</sub> particles, or particles of size less than 1 micron, which are known to penetrate deep into the lung tissues and the cardiovascular tract.

#### Ozone:

The levels of ozone, which scientists describe as the most critical summer pollutant in Delhi, between April 15 and 30, peaked at 88 parts per billion or 176 micrograms per cubic metre ( $\mu\text{g}/\text{m}^3$ ) on April 30, the last day of the odd-even scheme, according to SAFAR data. In comparison, during April 1-15, the levels peaked at around 60 parts per billion or 120  $\mu\text{g}/\text{m}^3$  on April 6.

On April 24, ozone levels hit 75 parts per billion or 150  $\mu\text{g}/\text{m}^3$ , the first sharp rise seen during the scheme, from around 62 parts per billion or 124  $\mu\text{g}/\text{m}^3$  the preceding day. Between April 19-22 ozone levels remained around 51-52 parts per billion or 102-104  $\mu\text{g}/\text{m}^3$ . According to scientists, the level of the pollutant spiked consistently between April 17 and 19, ranging between 75 and 80  $\mu\text{g}/\text{m}^3$ . An initial dip was reported between April 15-17.

Comparing this with data from April last year, the trends are quite similar, according to scientists. On April 24 last year, ozone levels had peaked at 90 parts per billion or 180  $\mu\text{g}/\text{m}^3$ , the highest between April 15-30. Between April 1-15 last year, a peak of around 70 parts per billion or 140  $\mu\text{g}/\text{m}^3$  was observed in ozone levels on April 5, the highest during the first fortnight of the month. This year, the peak was observed on April 6.

#### PM<sub>1</sub>

Between April 15-30, the data shows, PM<sub>1</sub> levels peaked on April 30 at around 78  $\mu\text{g}/\text{m}^3$ . After recording less than 60  $\mu\text{g}/\text{m}^3$ , till April 23 which is the safe limit for the larger PM<sub>2.5</sub> particles, the PM<sub>1</sub> levels escalated between April 25-28 at around 75  $\mu\text{g}/\text{m}^3$ . After dropping to 60  $\mu\text{g}/\text{m}^3$  again on April 29, the levels shot up on the last day of the scheme. "The safe limits for PM<sub>1</sub> are not defined as yet in India. But considering that these are finer than PM<sub>2.5</sub> and they can penetrate deeper into the respiratory and cardiac organs, the safe limits should be far lower," a studied. In comparison, between April 1-15, PM<sub>1</sub> levels peaked at around 70  $\mu\text{g}/\text{m}^3$  on April 3. Three peaks of around 60  $\mu\text{g}/\text{m}^3$  each were observed on April 4, 7 and 9, before the levels dropped to between 30 and 40  $\mu\text{g}/\text{m}^3$  till April 14. On April 15, levels again hit 60  $\mu\text{g}/\text{m}^3$ . PM<sub>1</sub> levels were not being monitored last year.

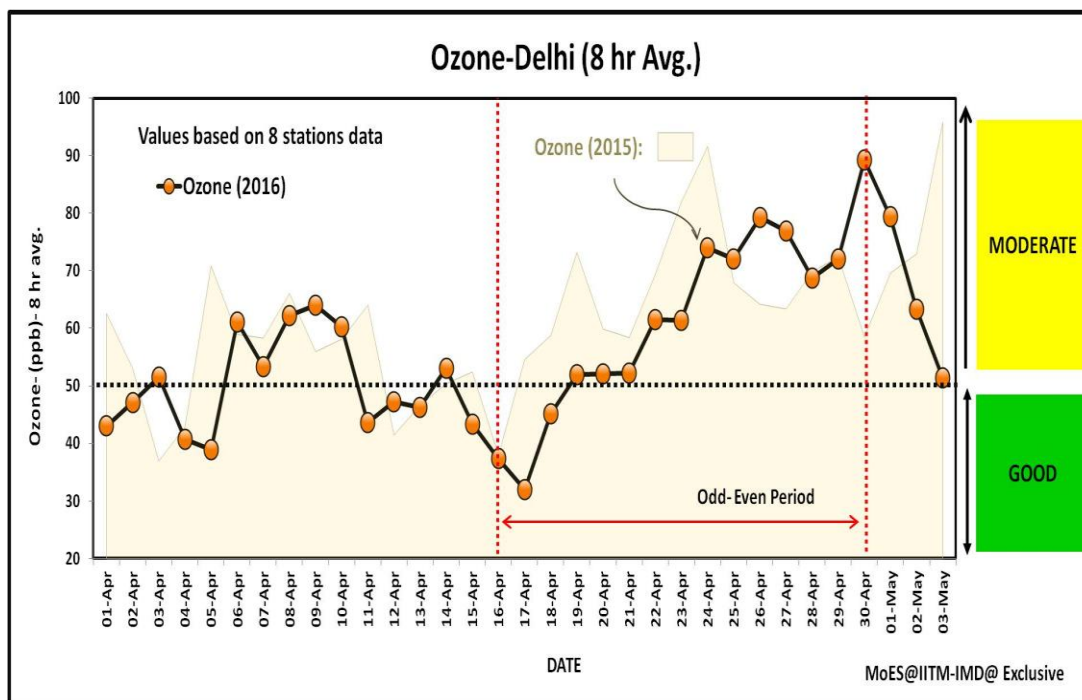


Fig 4:- Average Ozone levels in Delhi (8hr)

### Conclusions:-

The Government of NCT of Delhi has implemented Odd Even Scheme with aim to reduce air pollution level in the city. Data from either the DPCC or the CPCB has not shown any improvement in air quality. Similar trends can be observed from data from the Indian Institute of Tropical Meteorology's SAFAR, which showed that the quality of air continuously deteriorated from December 25, with pollution levels being "severe" on four out of the first eight days of January, worse than the previous week. It is concluded that the scheme did not worsen air quality; meteorological conditions did, but the scheme was not able to mitigate this impact. For one, wind, which disperses pollutants, has fallen consistently in speed since December. On the other hand, higher temperatures in this year as compared to the same time last year, usually improve air quality by dispersing pollutants in the atmosphere, but the concentration level of particulate matter in January 2016 is twice as much as it was during January 2015. It is quite clear from data about sources of air pollution in Delhi that cars are not the major polluters. The draft report of the Indian Institute of Technology, Kanpur, which was commissioned by the Delhi Government in 2013, on the sources of particulate matter found that vehicles contribute to 20 percent of PM<sub>2.5</sub> concentration. Among them, trucks and two-wheelers together contribute to 80% of pollution and cars contribute 10% only. This means that the contribution of four-wheelers to air pollution in Delhi is just 2%. On a given day, when half the cars are taken off the road during the odd-even trail, with additional exemptions, only a 0.5-1% reduction in pollution can be expected. This could be marginally higher depending on the impact of the wind.

In Delhi, the transport, industrial and the domestic sectors were also considered as the major contributors towards the rising ambient air pollution levels, in addition to the presence of natural dust due to meteorological conditions. Besides anthropogenic sources, some other factors that contribute in the buildup of pollution levels are climate and natural sources. Delhi has a semi-arid climate, with an extremely hot summer, average rainfall and very cold winters. Mean monthly temperatures range from 14.3 °C in January (minimum 3 °C) to 34.5 °C in June (maximum 47 °C). Dust storms occur frequently during summer months leading to build-up of particulate matter in the atmosphere. It is concluded that two-wheelers along with many other environmental factors are responsible for more PM<sub>10</sub> and PM<sub>2.5</sub> than cars when it comes to polluting the air.

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### RESEARCH ARTICLE

#### THE MOST COMMON GENETIC DISEASE IN HAIL AND DISEASES RELATED TO CONSANGUINITY.

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#### Abstract

**Background and objective:** There are common genetic diseases in Hail, but the information about it are still limited. The objective of this cross-sectional study was to detect the most common genetic disease and the risk factor of consanguinity on genetic diseases in Hail.

**Subjects and methods:** The study samples were determined by multistage probability random sampling procedure. Genetic diseases were obtained from 500 papers and electronic questionnaires. The data were analyzed by using SPSS and calculator.

**Results:** The proportions of genetic diseases were ordered from highest to lowest as follow: Type 1 Diabetes Mellitus (20%), Congenital Heart Disease (9%), breast cancer (8.2%), Down syndrome (6.4%), Sickle cell disease (3.8%), Muscular Dystrophy (1.8%) and Thalassemia (1%). However, 49.6% of sample answered the question were consanguineous. The proportions showed Thalassemia was the highest disease affected by consanguinity relationship with (100%,  $p=0.023$ ), followed Sickle cell disease (73.68%,  $p=0.032$ ) and breast cancer (34.14%,  $p=0.039$ ).

**Conclusion:** The data suggested that the most common genetic disease in Hail is Type 1 Diabetes Mellitus and consanguinity is one of the risk factor on some of these genetic diseases as Thalassemia, Sickle cell disease and breast cancer.

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#### Introduction:-

Quick search for published genetic diagnoses from Saudi Arabia readily reveals the clear bias toward autosomal recessive disorders [1] such as, Sickle cell Disease (SCD) and Thalassemia. The spread of these genetic blood disorders differs among the various regions of the Kingdom. According to the statistics released by the Ministry of Health (Health Marriage Against Genetic Blood Disorders Program: SCD and Thalassemia), from 1425H till the end of 1430H, the recorded incidence of SCD was 0.27%, whereas the incidence of thalassemia was 0.05%.

However, the Saudi Premarital Screening Program estimated the prevalence of the sickle cell gene in the adult population at 4.2% for sickle-cell trait and 0.26% for SCD, with the highest prevalence noted in the Eastern province (approximately 17% for sickle-cell trait and 1.2% for SCD) during February 2004 to January 2005 [2], but in the children and adolescents SCD was detected in 108 of 45,682 with a prevalence of 24 per 10,000. The regional distribution of SCD showed eastern region dominance with a prevalence of 145 per 10,000, followed by the southern

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region with a prevalence of 24 per 10,000, western region 12 per 10,000, and central region with 6 per 10,000. No cases were found in the northern regions. The male to female ratio was approximately 1:1 during 2004 to 2005 [3]. Prevalence of beta thalassemia trait are 3.22% and thalassemia disease had 0.07% mainly in the eastern, western, and southwestern parts of the country, and it was taken from 488,315 individuals screened in February 2004 to January 2005 [2].

Other genetic diseases as Down syndrome which is one of the most common chromosomal disorders in Saudi Arabia, its prevalence was 1.8 per 1000 since, July 1982 to June 1991[4]. Congenital Heart Disease (CHD) in Saudi Arabia has been reported in 4 regions of Saudi Arabia in (August 1988-February 2000) and 2604 individuals with CHD were evaluated. Ventricular septal defect was the commonest lesion (33.9%) followed by atrial septal defect (18.1%) and the sex distribution was similar; for 3 conditions, more males than females were affected and 2269 (59%) presenting in the first year of life, 566 (24.9%) had neonatal CHD [5].

Type 1 diabetes mellitus prevalence in Saudi Arabian in children and adolescents is 109.5 per 100,000 in 2001-2007. The male to female ratio was almost equal (26 males and 24 females) and its distribution by region shows that the highest was 162 in the central region, and the lowest was 48 in the eastern region. Children and adolescents were also grouped by age into 5-6 (prevalence 100), 7-12 (prevalence 109), 13-16 (prevalence 243), and 17-18 (prevalence 150) [6].

Muscular dystrophy which is X-linked genetic neuromuscular disease of childhood, it is relatively frequent, with an incidence is 1 in 3500 male live birth [7].

The yearly percentage distribution of incidence of malignant breast cancer showed a steady rise over the years, as compared to benign breast lesions. In 2000, 76.5% of the tissues submitted for histopathology were benign and only 23.5% were malignant. From 2000 to 2007, there was a steady rise by a mean of 4.8% in the annual incidence of malignant breast lesions, with the exception of 2003, when there was a slight decrease. The annual rate of a malignant breast lesions confirmed by histopathological examination ranged from 23.5% in 2000 to 47.2% in 2007. In contrast, after 2007, there was a shift of the trend toward more benign cases. There was increase in the percentage of people diagnosed with breast cancer from 23.5% in 2000 to 34.5% in 2010 [8]. The Saudi Cancer Registry reported a rising proportion of Breast Cancer among women of all ages, from 10.2% in 2000 to 24.3% in 2005[9].

The high rate of consanguinity has greatly impacted the landscape of genetic disorders in Saudi Arabia, so the most common genetic disorders are SCD, Thalassemia, Down syndrome, CHD, type 1 diabetes mellitus, muscular dystrophy and breast cancer [4].

In this recent study, we present the incidence of the most common genetic diseases in Hail region together with recommendations for developing strategies for prevention and health care system.

### **Methodology:-**

In this study participants were selected by multistage random probability sampling of Hail households from each region. This cross sectional sample was used to know the most common genetic diseases in Hail. A questionnaire was designed for this purpose and administered to the families through paper questionnaires or electronic questionnaires, male (34) and female (466) with total number of (500). One member of each family was asked about personal data as age, sex and the consanguineous marriage for member and member parents. Also this questionnaire asked about cases of genetic diseases in these families, including inherited blood diseases as thalassemia and sickle cell anemia, chromosomal disorders as Down syndrome, multifactorial disorders as type 1 diabetes mellitus and breast cancer, and also muscular dystrophy and congenital anomalies as CHD.

Data were analyzed by using the SPSS software package, and the chi-square test was used to compare proportions of cases in consanguineous. A statistically significant difference was assumed when the  $p < 0.05$ .

### **Results:-**

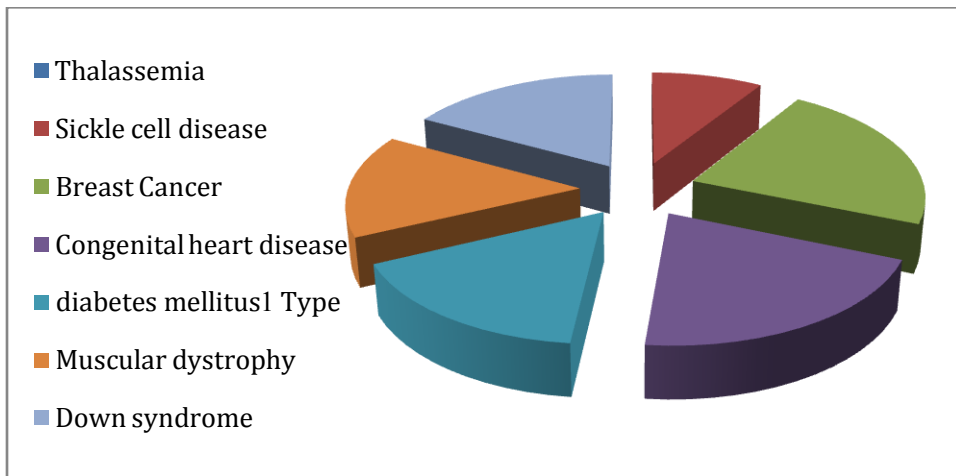
The highest proportion was 20% in Type 1 Diabetes Mellitus, accounting for (100) cases of genetic disorders from all collected samples. CHD was the second high proportion, occurring in 9% of cases, whereas Breast Cancer occurs in 8.2%. Down syndrome included in 6.4% of samples, followed by SCD occurs in 3.8%. Muscular Dystrophy was

1.8%. Finally, the lowest proportion in this questionnaire was in Thalassemia with percentage of 1% as shown in Table 1.

In our study, 500 of sample answered the question on consanguinity (49.6%) were consanguineous. Table 2 shows pattern of genetic disorders and parental consanguinity, indicating that Thalassemia was the commonest type accounting for 100% of cases, because they were 5 and all those were consanguineous. Then, SCD has 73.68%. Whereas Muscular Dystrophy included 55.55% of consanguinity relationship and diabetes mellitus Type 1 was 52%. Down Syndrome has 50% and CHD occupied 40% of cases. Finally, Breast Cancer was the least percent of consanguinity (34.14%).

**Table 1:-** Genetic disease in Hail city

Condition	Number of Condition	Percent %
Type 1 diabetes mellitus	100	20%
Congenital heart disease	45	9%
Breast Cancer	41	8.2%
Down syndrome	32	6.4%
Sickle cell disease	19	3.8%
Muscular dystrophy	9	1.8%
Thalassemia	5	1%



**Fig 1:-** the % distribution of most common genetic disease in Hail city

**Table 2:-** The relation of genetic disease and parental consanguinity in Hail city

Condition	Consanguinity	Non- Consanguinity	P value
Thalassemia	5 (100%)	0 (0%)	0.023
Sickle cell disease	14 (73.68%)	5 (26.31%)	0.032
Breast Cancer	14 (34.14%)	27 (65.85%)	0.039
Congenital heart disease	18 (40%)	27 (60%)	0.178
Type 1 diabetes mellitus	52 (52%)	48 (48%)	0.592
Muscular dystrophy	5 (55.55%)	4 (44.44%)	0.719
Down syndrome	16 (50%)	16 (50%)	0.963

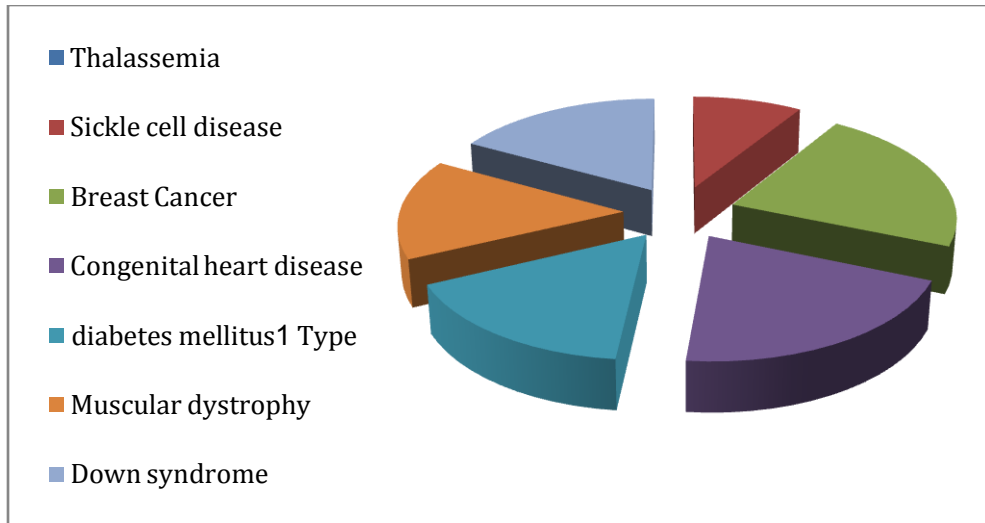


Fig 2:- the relation between genetic diseases and consanguinity

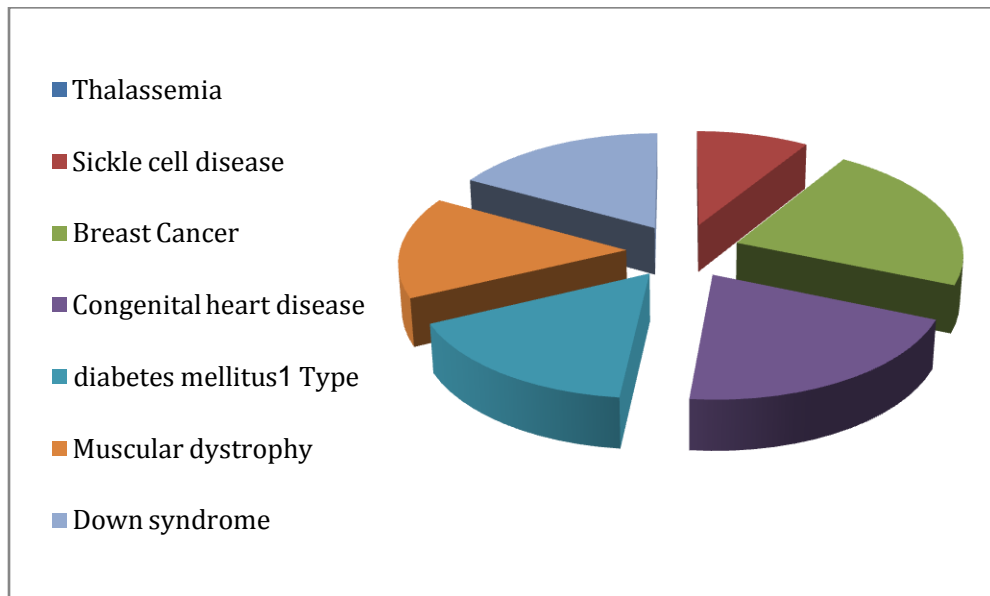


Fig 3:- the relation between genetic diseases and non-consanguinity

**Discussion:-**

When comparing the result of genetic disorders in this study to previously published studies, the demonstrated rates seems to be much higher in some diseases and lower in other diseases than studies done before. For examples, prevalence of SCD washighest in the Eastern region with 13.41% per 1000, followed by Southern and Western regions with 5.56% and 2.85%, respectively and lowest in Central and Northern regions with 1.37% and 1.35%, respectively[10].In more, the regional distribution of SCD showed Eastern region dominance with a prevalence of 1.45%, followed by the Southern region with a prevalence of 0.24%, Western region 0.12%, and central region with 0.06%. No cases were found in the Northern regions [3]. However, the proportion of SCD in Hail was lower than Eastern and Southern regions,but higher thanWestern Central and Northern regions.Thalassemia was highest in the Eastern region (5.9%), moderate in the Southern, Western and Central regions (1.42%, 1.02%, and 1.01% per 1000, respectively) and lowest in the Northern region with 0.39% [2]. In this study, Thalassemia was lower than Eastern, Southern, Western and Central regions,but higher than northern region.The registry of King Faisal Specialist Hospital and Research Centre reported that the number of Breast Cancer cases has increased considerably,there were 1152 female Breast Cancer cases in 2008 in comparison with 1308 in 2009, and 1473 in 2010. Breast cancer ranked first among females accounting for 27.4% of all newly diagnosed female cancers (5378) in the year

2010[8]. Compared to the rate reported in the literature of Breast Cancer, we found Breast Cancer decreased than previous cases reported [9]. Our findings of Down's syndrome seem to be much higher than previous study[4]. Down's syndrome was ascertained in 0.18% of 23,261 consecutive babies born alive to Saudi women, giving an incidence of 1 in 554 live births (1.8 per 1,000)[4], so that lower than our findings of (6.4%). Muscular dystrophy, it is relatively high than study done before[7]. In Alqassim region, the pediatric cardiology unit of King Fahad Specialist, Buraidah had 320 of 379 patients with CHD, so the CHD in Alqassim lower than in Hail which Hail has 45 CHD of 500 samples [11]. Type 1 diabetes mellitus was not related with consanguinity [12] and this agrees about type 1 diabetes mellitus with our study.

Theoretically, consanguineous marriages have a relatively higher risk of producing offspring with genetic damage than that of general population. Accordingly, the concurrence of genetic disease should be higher in consanguineous marriages[4]. In countries, such as Saudi Arabia with a high consanguinity rate, it is tempting to blame consanguinity as one of the causes of condition with genetic diseases, so in this study SCD, Thalassemia, Down syndrome and type 1 diabetes mellitus were high in consanguineous marriages.

### Recommendation:-

Premarital screening to detect the Hb S (SCD) or Thalassemia to both partners. If they are carriers, they must have Genetic counseling trying the birth prevention of an affected child. Screening for presymptomatic individuals who are at risk for diabetes and breast cancer. Doing the triple test for the detection of Down Syndrome in the pregnant woman.

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### RESEARCH ARTICLE

## EVALUATION OF POST-OPERATIVE BITE FORCE IN MANDIBLE FRACTURES TREATED WITH OPEN AND CLOSED REDUCTION

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##### Key words:-

Maximum bite force, Open reduction and internal fixation, Closed reduction, Gnathodynamometre, Mandible fracture.

#### Abstract

**Background:** Mandible fractures lead to loss of masticatory function and therapeutic goal of any fracture management is to restore original anatomic form and function. For this, maximal bite force could be considered as a major factor for evaluating the success of treatment. The objective was to measure the bite force post-operatively in patients with mandible fractures treated with open reduction and internal fixation and close reduction and compared with normal healthy group.

**Methodology:** Normal bite force of control group was calculated bilaterally and compared with patients with mandible fractures treated with open and closed reduction in the region of incisors and molars at 5<sup>th</sup>, 7<sup>th</sup> and 12<sup>th</sup> week post-operatively using a customised Gnathodyanamometre .

**Results:** Post-operative bite force in incisor region is significantly reduced (1.86kg) for the first 5-6 weeks and gradually increases (5.42kg) later while in molars, it gradually increases(5.67kg) from 5 weeks and significantly increases after 7 weeks and reaches its maximum range(25.14kg) in a span of 12 weeks.

**Conclusion:** Both modes of treatment are equally popular among the surgeons, having different indications. As seen in the study after three months open reduction and internal fixation shows significantly better results than the closed reduction

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#### Introduction:-

Bite force is the result of the coordination between different components of the masticatory system (muscles, bones and teeth). Its determination has been considered important in the diagnosis of disturbances of the stomatognathic system. Maximum bite force is understood as the capacity of the mandibular elevator muscles to perform a maximum strain of mandibular teeth against the maxillary teeth, under favorable conditions.[1] Gnathodynamometers and force transducers are some of methods for the evaluation of bite force.[2]

Every species has a definite value of bite force which falls in a range due to various factors like age, sex, dental status, temporomandibular joint status , strength of the muscle, condition of the jaw bone etc. Anyone of these factors can affect the power of the jaws and ability of an organism to chew the food which can gradually deteriorate the normal health status of an organism and can also hamper the quality of life. Similarly when a human being is in a healthy state he or she bears a bite force which helps to chew the food. But any physiologic or pathologic change which occurs in the maxillofacial region can affect the bite force. The treatment aims to restore the same force in the bite what the patient had earlier what he or she was in normal and healthy state. With the help of this study we are

trying to evaluate the variations in the bite force of the patients both pre-operatively and post-operatively of mandibular fractures and comparing it with his or her normal and healthy group.

Maximum bite force is a useful indicator of the functional state of the masticatory system and the loading of the teeth[3]. Bite force results from the action of the jaw elevator muscles which is determined by the central nervous system and feedback from muscle spindles, mechanoreceptors and nociceptors modified by the craniomandibular biomechanics[4]. Bite force is influenced by muscle efficiency and development of masticatory function. Maximum bite force increases with the number of teeth present. The number of occlusal tooth contacts is an important determinant for the maximally attainable bite force[5,6].

The etiology of facial bone fractures included mainly assaults and road traffic automobile accidents. Other common causes include accidental falls, sports injuries. Considering its incidence, mandibular fracture is the second most commonly occurring fracture next to nasal bone fractures when considering facial fractures. It is the tenth most commonly occurring fractures when considering frequency of bone fracture of the whole body. Majority of mandibular fractures were found in males and it contributes to around 61% of all facial bone fractures. Mandibular fractures outnumbered zygomatic and maxillary bone fractures by a ratio of 6:2:1 respectively.[7] The therapeutic goal of any fracture management is to restore the original anatomic form and function as soon as possible without any morbidity. For this the maximum voluntary bite force could be considered as a major factor for the evaluation of the success rate of the treatment provided. Although there are methods which are near to accuracy and convenient to determine voluntary maximum bite force which requires sophisticated instrumentation, intervention, investigation of many physiological parameters. However, it is difficult to establish exact mathematical model to estimate individual bite force[8].

### Materials & Method:-

Data collection – patients with mandibular fractures reporting to the casualty and interdepartmental referral patients of our institute were calculated. A customized Gnathodynamometre is used giving digital values in kilograms.



For the study sixty patients of mandibular fractures are included and divided into two groups. GROUP-A contains 30 patients of mandible fractures, treated with open reduction and internal fixation. GROUP-B contains 30 patients treated with closed reduction. For the comparison a control group, GROUP-C with 80 healthy individuals with Class-I molar relationship bilaterally were included between the age group 12-75 yrs containing 40 males and 40 females and bite force was evaluated. All the patients of mandibular fractures were evaluated clinically with detail case history. Bite force was calculated with respect to incisors and molars. Post-operatively the bite force was calculated and was compared with the control group. Follow up was done at 5 week, 7 week, 12 week interval and was compared with normal healthy group.

All patients with mandibular fractures were evaluated. Both males and females of all age group were studied. The medically compromised patients, patients with missing or loss of posterior teeth, pan-facial trauma, temporomandibular disorder. Patients unable to follow instructions or unable to comprehend information about the study were also excluded, from the study.



**Results:-**

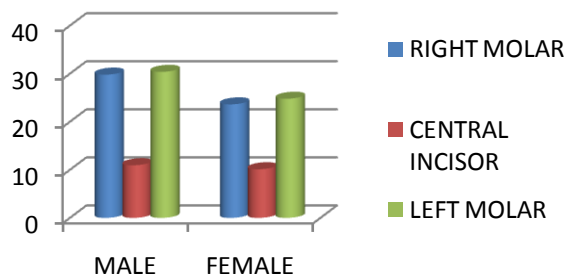
**Measurements of control group (cg):-**

To evaluate and compare the bite force measurements, a study was done on a group of healthy individuals (n=80) which was considered as Control Group (CG), with 40 males and 40 females in the age group of 12 – 75 yrs. Bite force of the individuals in the CG on the right molar region ranged from 14 kg to 42 kg with a mean of 27.2 kg (std. dev +/-6.48). On the left molar region the bite force ranged from 15 kg to 44 kg with a mean of 27.6 kg (std. dev +/- 6.84). On the incisor region the bite force ranged from 5 kg to 17 kg with a mean of 10.5 kg (std. dev +/-2.49).

The measurements of the MALE individuals showed a bite force in the right molar region ranging from 19 kg to 42 kg with a mean of 29.8 kg (std. dev +/-6.661), on the left molar region ranging from 17 kg to 44 kg with a mean of 30.4 kg (std. dev +/-7.181) and at the central incisor region from 5 kg to 17 kg with a mean of 11 kg (std. dev +/- 2.689).

The measurements of the FEMALE individuals showed a bite force in the right molar region ranging from 14 kg to 34 kg with a mean of 24.6 kg (std. dev +/- 5.217), on the left molar region ranging from 15 kg to 37 kg with a mean of 24.7 kg (std. dev +/- 5.221) and at the central incisor region from 6 kg to 17 kg with a mean of 10.12 kg (std. dev +/- 2.232).

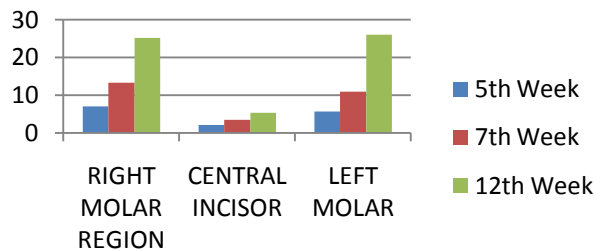
In the CG the males showed greater mean bite force when compared with females in all age groups.



**Fig:-** Maximum bite force of males and females individuals of CG at right molar, central incisor and left molar

**Measurements of group- 1 (surgically treated):-**

The mean of bite force measurement on right molar region at 5<sup>th</sup>, 7<sup>th</sup> and 12<sup>th</sup> week were found to be 7.09 kg, 13.24 kg and 25.14 kg respectively. On the central incisor region the mean of bite force measurement at 5<sup>th</sup>, 7<sup>th</sup> and 12<sup>th</sup> week were found to be 2.17 kg, 3.52 kg and 5.42 kg. whereas over the left molar region the bite force measurement at 5<sup>th</sup>, 7<sup>th</sup> and 12<sup>th</sup> week were found to be 5.67 kg, 10.90 kg and 18.48 kg.



**Fig:-** Maximum bite force of GROUP-1 at right molar, central incisor and left molar.

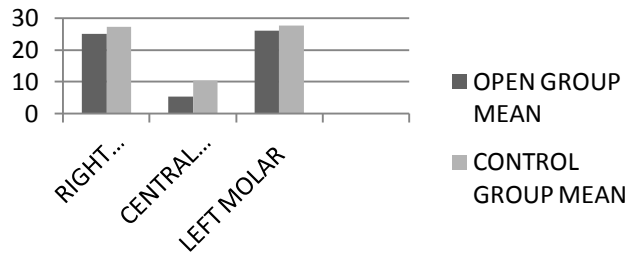
At 12<sup>th</sup> week the bite force of the MALES of GROUP- 1 at the right molar region ranged from 16.2 kg to 32.2 kg with a mean of 25.4 (std.dev +/-4.01)kg whereas on the left molar region from 21.5 kg to 37.6 kg with a mean of 26.5 kg (std.dev +/-4.29) and on the central incisor region it is 2.2 kg to 9.3 kg with a mean of 5.4kg (std.dev +/- 2.31).



At 12<sup>th</sup> week the bite force of the FEMALES of GROUP- 1 at the right molar region ranged from 17.2 kg to 29.1 kg with a mean of 23.4 kg (std.dev +/-5.02) whereas on the left molar region from 18 kg to 26 kg with a mean of 22.6 kg (std.dev +/-3.26) and on the central incisor region it is 3.2 kg to 9.8 kg with a mean of 5.7 kg (std.dev +/-2.86). In the Group- 1 the males had a significantly higher bite force as compared to females at the end of 12<sup>th</sup> week.

**Comparison of group- 1with control group:-**

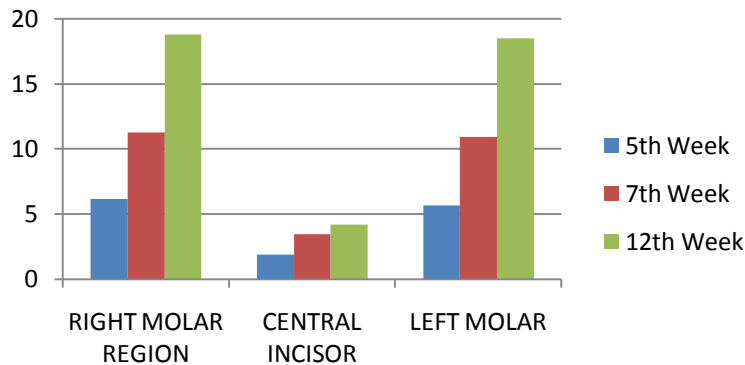
The bite force of the patients in Group- 1 at the end of 12<sup>th</sup> week is lesser than the bite force of the healthy individuals of the control group. At the end of 12<sup>th</sup> week –At right molar Mean bite force of Group- 1 is 25.1 kg, mean bite force of the control group is 27.2 kg. At central incisor Mean bite force of Group- 1 is 5.4 kg, mean bite force of the control group is 10.5 kg. At left molar Mean bite force of Group- 1 is 26 kg, mean bite force of the control group is 27.6 kg. This data indicates that after surgical treatment bite force is almost restored to the values obtained in a normal healthy individual.



**Fig:-** Maximum bite force of GROUP-1 and CONTROL GROUP at right molar, central incisor and left molar

**Measurements of group- 2 (conservatively treated):-**

The mean of bite force measurement on right molar region at 5<sup>th</sup>, 7<sup>th</sup> and 12<sup>th</sup> week were found to be 6.16 kg, 11.24 kg and 18.78 kg respectively. On the central incisor region the mean of bite force measurement at 5<sup>th</sup>, 7<sup>th</sup> and 12<sup>th</sup> week were found to be 1.86 kg, 3.42 kg and 4.19 kg. whereas over the left molar region the bite force measurement at 5<sup>th</sup>, 7<sup>th</sup> and 12<sup>th</sup> week were found to be 5.67 kg, 10.90 kg and 18.48 kg. (fig. -)



**Fig:-** Maximum bite force of GROUP-2 at right molar, central incisor and left molar

At 12<sup>th</sup> week the bite force of the MALES of the GROUP- 2 at the right molar region ranged from 9.6 kg to 24.2 kg with a mean of 19.14 kg (std.dev +/-3.18) whereas on the left molar region from 7 kg to 27.5 kg (std.dev +/-3.74) with a mean of 18.64 kg and on the central incisor region it is 3.2 kg to 11 kg with a mean of 4.39 kg (std.dev +/-1.58).

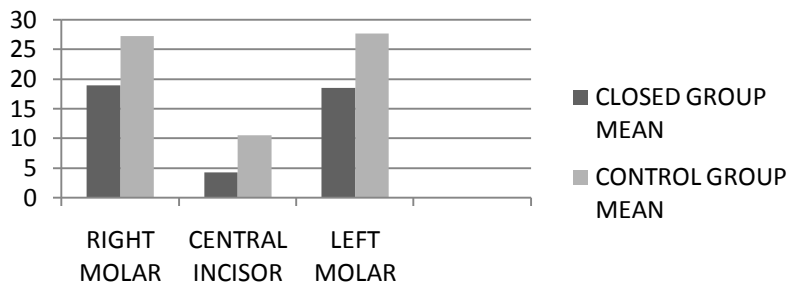
At 12<sup>th</sup> week the bite force of the FEMALES of the GROUP- 2 at the right molar region ranged from 14.4 kg to 20.1 kg with a mean of 17 kg (std.dev +/-2.27) whereas on the left molar region from 12.24 kg to 21.5 kg with a mean of 17.7 kg (std.dev +/-3.43) and on the central incisor region it is 2.2 kg to 3.9 kg with a mean of 3.2 kg (std.dev +/-0.62).

In Group- 2 the males had a significantly higher bite force as compared to females at the end of 12<sup>th</sup> week.

#### Comparison of group- 2 with control group:-

The bite force of the patients in closed group at the end of 12<sup>th</sup> week is lesser than the bite force of the healthy individuals of the control group. At the end of 12<sup>th</sup> week – At right molar Mean bite force of closed group is 18.9 kg, mean bite force of the control group is 27.2 kg. At central incisor Mean bite force of closed group is 4.2 kg, mean bite force of the control group is 10.5 kg. At left molar Mean bite force of closed group is 18.5 kg, mean bite force of the control group is 27.6 kg.

This data indicates that after conservative treatment bite force restored was significantly less than normal healthy individual.



**Fig:-** Maximum bite force of GROUP-2 and CONTROL GROUP at right molar, central incisor and left molar

#### Discussion:-

Adequate mastication is known to give stimulus and proper function to the normal development of the maxilla and mandible. Any traumatic injury to the mandible may lead to disruption in the balance between the masticatory muscles which results in decrease in the bite force which is one of the most important functional aspect of the mandible and its musculature. Since ages various surgeons have suggested numerous modes of treatment for the fractured mandible. The objective of all these treatment modalities is to restore complete functional ability of the mandible. So with our study we have tried to quantify the restoration of the functional ability of mandible as a part of the masticatory unit in the post-operative phase after trauma.

A study was done on healthy individuals of the Indian population by Rajesh Kshirsagar et al on a group of 60 volunteers (male and female) and the mean bite force on the right molar was found to be 36.2 kg, on the left molar region it was 35.96 kg and 14.83 kg on the incisor region. The disadvantage of this study is that the age group of the volunteers involved in the study was not mentioned. A study conducted by Veena Jain et al on a group of 358 subjects (mean age group being 26.66 yrs). In their study the males showed a higher mean bite force of around 45.76 kg and of females around 30.23 kg. [9]

In our study we realized the importance of age related changes of the jaw and the associated musculature. Therefore our volunteer group were divided into four, based on age. Further the data was analyzed separately for males and females. With reference to the literature in the third decade in our study the males showed a mean bite force measurement as 32.28 kg and 23.53 kg for females which is lower than the measurements as per the study by Veena Jain et al[10]. This difference in measurements can be attributed to the different kind of customized bite force device that was used. We found that the maximum voluntary bite force of the CG at three different sites in the oral cavity ie at the right molar was of 27.2 kg, on the left molar region was 27.6 kg and on the incisor region was 10.5 kg. In all the above studies though different modalities of bite force measurements have been employed, females have always shown less bite forces when compared with males. This indicates that the bite force is influenced by gender.

In our study we also found a pattern of increased bite forces with increasing age in males and female till the age of 50 years, but in the age group of 51 – 75 years the bite force was lesser as compared to the younger individuals. The right and left molar regions did not show any significant differences in bite forces. Very few researches have been conducted on measurement of the restoration of the bite force after treatment of maxillomandibular trauma. The

study conducted by Rajesh Kshirsagar involved only six patients of parasymphyseal fracture who all were treated according to surgical protocols. They reported that the bite forces in molar region took six to twelve weeks to regain maximum voluntary bite force and compared to the volunteer group in their study[11]. Gerlach K.L et al reported their results after evaluating maximum voluntary bite force in twenty two patients with mandibular angle fractures. All the patients in the study group were surgically treated with miniplate osteosynthesis. They evaluated the patients from first week to sixth week and at the end of sixth week only 58% of the maximum vertical loading found in the controls were registered. In this study they stated that the normal values did not return until three months postoperatively[12].

In our study we have treated thirty patients in GROUP-1 with surgical protocols and have evaluated the bite force at the end of 5<sup>th</sup>, 7<sup>th</sup> and 12<sup>th</sup> postoperative week. At the end of 5<sup>th</sup> and 7<sup>th</sup> post-operative week the maximum voluntary bite force was significantly less than the range of normal bite force, but at the end of 12<sup>th</sup> post operative week the maximum voluntary bite force was restored towards the normal range. At the end of 12<sup>th</sup> week the males showed an improvement upto 85.23% on the right molar region, 87.17% on the left molar region and an improvement of 49.09% in the central incisor region was found as compared to the data from the CG. Similarly in the female patients of GROUP-1 has an improvement of 95.12% in the right molar region, 91.49% in the left molar region and 56.32% in the central incisor region with respect to the CG. Among the GROUP- 1 (surgically treated), the number of females were much lesser than the males which shows that the males are more exposed to maxillofacial injuries as compared to females. At the end of 12<sup>th</sup> post-operative week the maximum voluntary bite force generated by males was more than the females. This difference can be attributed to greater muscular potential of men due to anatomical variations of the type of muscle fibers, which are larger than those of females. As women are known to have a lower pain threshold, it might be a significant factor for lower bite force measurements.

Not many studies have been carried out in the literature regarding the bite force measurement after the treatment of mandibular trauma by conservative protocols. Here we have evaluated equal number of patients in GROUP-2 which underwent conservative treatment following mandibular trauma. Like GROUP-1, all the data for the conservatively managed patients were collected at the same time intervals. Here also, the values of the mean bite force were less in the 5<sup>th</sup> and 7<sup>th</sup> postoperative week which gradually increased up to the 12<sup>th</sup> postoperative week. The improvement at the end of 12<sup>th</sup> postoperative week in the males of GROUP-2 in relation to the CG at the right molar region was 64.22%, at the central incisors it is 39.9% and at the left molar region it is found to be 61.31%. For the females the percentage improvement at the right molar region is 69.1%, at the central incisors it was 31.62% and at the left molar region it was found to be 71.65% with respect to the CG. At the end of the 12<sup>th</sup> week though there was considerable improvement since the 5<sup>th</sup> week it was on the lower side as compared to CG. It is to be noted that even in this group at the end of 12<sup>th</sup> post-operative week the maximum voluntary bite force generated by males was more than the females.

The data of sixty patients who were treated surgically and conservatively were compared with the measurements obtained from our volunteer group. It is to be noted that the bite force measurement of the patients treated surgically(group-I) was much higher at 85.23% than that of (group II)conservatively treated at 64.22% on the right side. Similarly at the left molar and incisor region the measurements were higher in the group treated surgically than conservatively. This can be attributed to early precise anatomical reduction and rigid fixation which promotes contact healing of the fractured fragments. During conservative treatment though the fragments are immobilized and stabilized in occlusion the gap healing process between the fractured segments might contribute to lesser bite forces and longer time might be required to achieve the complete maximum bite force. . The further scope of this study lies in measuring bite forces after 6 months period allowing complete remodeling of fracture site to take place.

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### RESEARCH ARTICLE

#### PRELIMINARY DESIGN OF IRAQI SPECTRUM MANAGEMENT SOFTWARE (ISMS).

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#### Abstract

Spectrum is a basic natural resource as water, air energy, and so on, which has to be shared as the other natural resources due to new emerging technologies leveraging and new approaches developing to enable more effective and efficient use of the limited electromagnetic (EM) spectrum. Fortunately, evolving software radio managements will lead to the emergence of adaptive systems that offer the potential for quantum improvements in spectrum efficiency. Central to the current systems in the range (2-6GHz) will be the main contribution of this project controlled by rules of radio spectrum management tools, directly guided to the manner in which the system uses the EM spectrum. Study of the possibilities of preventing a harmful interference to other users or services will be our main target. The obvious question is: How does this new spectrum management tool would affect the spectrum plan in Iraq. Procedures to support, guide, and manage the behaviour of signals according to different services will be taken. This work will address this central question as it relates to Spectrum Management Software for Iraq.

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#### Introduction:-

Spectrum is like a river. We use it and it is our responsibility to keep it clean. Achieving the full promise of this vision will largely depend on how well we structure our spectrum management tool. We will have to make hard choices to achieve the tradeoffs that will bring the best balance, most capability, and greatest interoperability for the least cost. Our readiness and the force structure needed to execute our operational tasks between now and the year 2019.

It serves as the basis for focusing the strengths of each individual Service or component to exploit the full array of available capabilities and allow us to achieve full spectrum dominance in the mentioned range. It will also guide the evolution of joint education, and training to assure we will be able to achieve more seamless joint operations in the future. Lead to a success software technology aspects and basic facts must clarify, as follow:

#### Technology:-

Demand for radio spectrum is growing steadily due to technological, market and regulatory developments and spectrum availability will become soon a key element for future systems. This is not balanced by additional radio spectrum becoming available through the introduction of new and more, efficient technologies such as digital radio systems in the areas of broadcasting and mobile/personal communications. Technology could play a pivotal role in minimizing the interference and allowing for uniform access to the spectrum. Maximum power levels could be

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increased in rural areas so that service can be provided over larger areas at lower cost. In congested urban areas, where high transmitter power levels on one frequency can often adversely impact the use of other frequencies, the enabling of the use of lower power transmissions will be considered.

**Basic Facts:-**

Spectrum has some specific characteristics:

- It can be reused nearly indefinitely as we increase the number of the base stations and so the infrastructure cost (Major role of economic factor).
- The service given by spectrum usage is dependant on infrastructure design (MS to BS distance) and on highly variable propagation conditions.
- Different parts of the spectrum have different characteristics in particular in propagation.

In general sense, the coexistence and sharing between systems is a recently critical issue due to emerging new technologies and spectrum scarcity. At WRC-07, ITU-R allocated many bands for IMT systems (IMT-2000 and IMT-Advanced) on a co-primary basis along with FWA, FSS and WiMAX systems. Therefore, coexistence and sharing requirements like separation distance and frequency separation must be determined. Spectrum management tool is software established to assess these requirements. Furthermore, the effect of interference in terms of Interference to Noise (I/N) ratio of co-channel and adjacent channel, Carrier to Interference (C/I) ratio as well as Carrier to Noise (C/N) ratio can be predicted by this spectrum management tool. Also, additional isolation needed for co-sited and non co-sited base stations for adjacent channel would be estimated.

Propagation models are used extensively in network planning, particularly for conducting feasibility studies and during initial deployment. They are also very important for performing interference studies as the deployment proceeds. These models can be broadly categorized into three types; empirical, deterministic and stochastic. Empirical models are those based on observations and measurements alone. The deterministic models make use of the laws governing electromagnetic wave propagation to determine the received signal power at a particular location. Deterministic models often require a complete 3-D map of the propagation environment. An example of a deterministic model is a ray tracing model. Stochastic models, on the other hand, model the environment as a series of random variables. These models are the least accurate but require the least information about the environment and use much less processing power to generate predictions.

The current surge of new techniques and systems being applied to telecommunications requires radio propagation information, especially for short range propagation within buildings, long range propagation into buildings and vehicles, better knowledge and modeling of atmospheric ducts, and the influence of climate and ionospheric parameters on propagation modeling in general. The challenges to seek frequency allocations is our aim and to satisfy the ever-increasing global radio communication requirement. Most new systems and techniques require radio propagation information to assess their frequency sharing capabilities

**Background:-**

The radio spectrum is a limited and valuable resource, and as a result of the drastic growth demand for wireless communication applications, radio spectrum regulation and management have become increasingly significant (J. Mitola (1999)).

Due to scarcity of the frequency spectrum, many bands are allocated for more than one radio service and thus the sharing is necessary. Therefore, the increased sharing of spectrum translates into a higher likelihood of users interfering with one another (SDRF Technical Report 2.0, (1999)). Interference between two wireless communication systems (intersystem interference) occurs when these systems operate at overlapping frequencies, sharing the same physical environment, at the same time with overlapping antenna patterns which leads to capacity loss and coverage limitation.

The economic implications of spectrum misallocation (wrong pricing, scarcity, congestion) were recognised early (Herzel 1951; Coase 1959; 1960; Levin 1966; De Vany et al. 1969) but its manifestation only became obvious with recent shifts from wireline to wireless systems in telecommunications markets. This radical transformation of the spectrum user market considerably increased demand for specific bands, altering, in various countries, the methods commonly used to assign user rights.

International Telecommunication Union for Radiocommunication (ITU-R) has become involved with the spectrum allocation for next generation mobile communication services in WRC-07. During work performed within ITU-R working party (WP) 8F, several of the frequency bands had been identified for the future development of International Mobile Telecommunications–Advanced (IMT-Advanced) systems (Joint Tactical Radio System (JTRS) Operational Requirements Document (ORD), (1998)). These bands are already being used for current services like Fixed Wireless Access (FWA), fixed satellite services and WiMAX systems in many countries around the world including Iraq, which means that the probability of happening of the interference is probable. Therefore, the spectrum management and propagation prediction issues should be preceded by sharing and coexistence verification between current services and future systems(Federal Communications Commission, (2000)).

The radio frequency spectrum is a key strategic asset for the economies of industrialized nations. It is used for a broad range of business and consumer communication, R&D and IT purposes, such as private and public telecommunication operations (e.g., Fixed satellite receiver, wireless internet communication, aviation, shipping, defense, public safety), broadcasting, radar, astronomy and various other applications including countless short-range, low-power wireless devices. Sound and socially efficient management of electromagnetic spectrum usage is a key input into the performance of these markets. Flexible regulatory regimes and technologies that make spectrum use more accessible to start-ups and other small innovative operators offer significant potential to reduce lead times from innovation to market for communication products (Berggren et al. 2004; Chapin & Lehr 2007).

By contrast, current control and command arrangements in most countries rest on administrative licensing regimes that allocate blocks of spectrum to specific uses and entities (often large operators) as the need arises. Originally, control and command through licensing presented desirable properties in terms of interference control, international harmonization of frequency allocation and new products standardizations. However, as demand for spectrum rights grew spectacularly over time, the problem of spectrum scarcity became the main issue(E. M. Noam,(1995)).

#### **Frequency Management Systems Use of GIS:-**

Canada could be a good example since it has an international reputation for its ability to efficiently manage its frequency spectrum. Many of these spectrum management techniques and business practices have been incorporated into Automated Frequency Management System (AFMS) over the last decade.

In the frequency engineering realm analytical systems have been used for more than a decade. These tools are part of the solution telecom companies employ when designing telecom infrastructure and applying for frequency allocations. Spectrum regulators have only recently employed GIS as a means of speeding their application process in response to the growing demand for frequency allotments by telecom companies. More and more national regulators are focusing on the Technical Analysis and GIS components of Frequency Management systems (W. Kennard, FCC Chairman,(2000)).

#### **Current Challenges:-**

As mentioned previously, frequency management systems have only recently incorporated GIS. The following is a list of the current challenges both regulators and telecom applicants' face.

1. Regulators are not set-up to allow secure external access to information, therefore limiting applicant's ability to assess their application against the national database.
2. Regulators use worst case propagation modeling there by limiting their ability to use natural and man made barriers to propagation and limiting the number of potential frequency allocations for a given area.
3. Regulators and telecoms may not use the same map information for their assessments resulting in different analysis of frequency coverage.
4. Length of time required for interaction between regulators and telecoms penalizes growth.

The GIS Framework is an architecture that solves a specific requirement. In this case the requirement is to utilize spatial information and GIS processing for a more effective management of frequency allocations and take advantage of automated processes and imbed the functionality within the overall application workflow (Alex LIGHTMAN, (2002)).

#### **Objectives:-**

A spectrum management tool contains objectives and activities for radio frequency management and spectrum monitoring and control, including:

- To verify the feasibility of coexistence between the two systems depending on the input specification.

- To determine the separation distance and frequency separation to coexist the two systems.
- To estimate the additional isolation to decrease interference and achieve coexistence and thus spectrum efficiency.
- Analysis of channel occupancy measurements.
- Technical measurements: frequency, bandwidth, signal strength, signals & systems analysis, etc.
- statistical data for frequency management purposes
- frequency planning
- Estimate the coverage based on the ITU models.

#### Scope of work:-

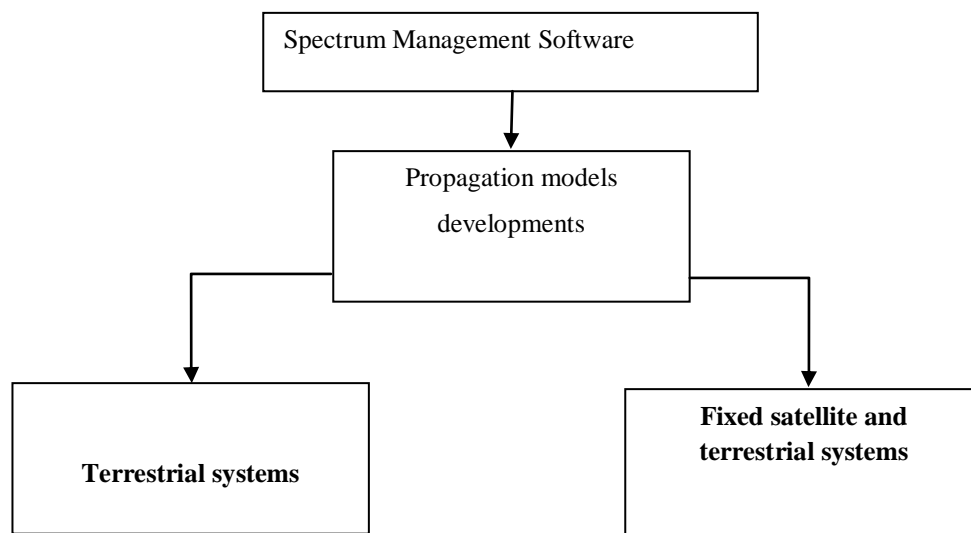
To carry the previous objectives of spectrum management tools and to achieve sharing and coexistence between systems all necessary formulas should be included in a data base as a library. All required standard coexistence and interference criterion values should be adjusted. Specifications, lowest and highest parameters values have to be assessed and Suitable radio propagation models and its parameters and standard values should be estimated. All the data required will be covered by study and analysis and the parameters will be taken according to the ITU recommendations, in term to prepare high accurate software according to the Iraqi environment. Later on, the results should be applied in the software by using computer language in order to obtain the objectives within a good looking (as mentioned by the methodology) (Radiocom Agency, (2002).

the principal components of a spectrum management program would involve the following activities like co-ordinate bilaterally the allocation of frequencies, depend on standards for radio equipment and systems (like ITU), establish operating procedures, and ensure radio apparatus are approved for use.

The propagation prediction part will be carried out by applying all the formals for the chosen ITU models, the antenna parameters such as radiation pattern, antenna gain will be assessed according to the standard values, propagation model will be suggested to the user based on different scenarios.

#### Design flowchart:-

Spectrum management software looks into both the technology and law side of the problem and recommended ways in which we can make more efficient utilization of the spectrum to achieve our objectives, the research divided into three parts in order to cover propagation prediction and interference investigations:



**Figure 1:** Spectrum management software main divisions.

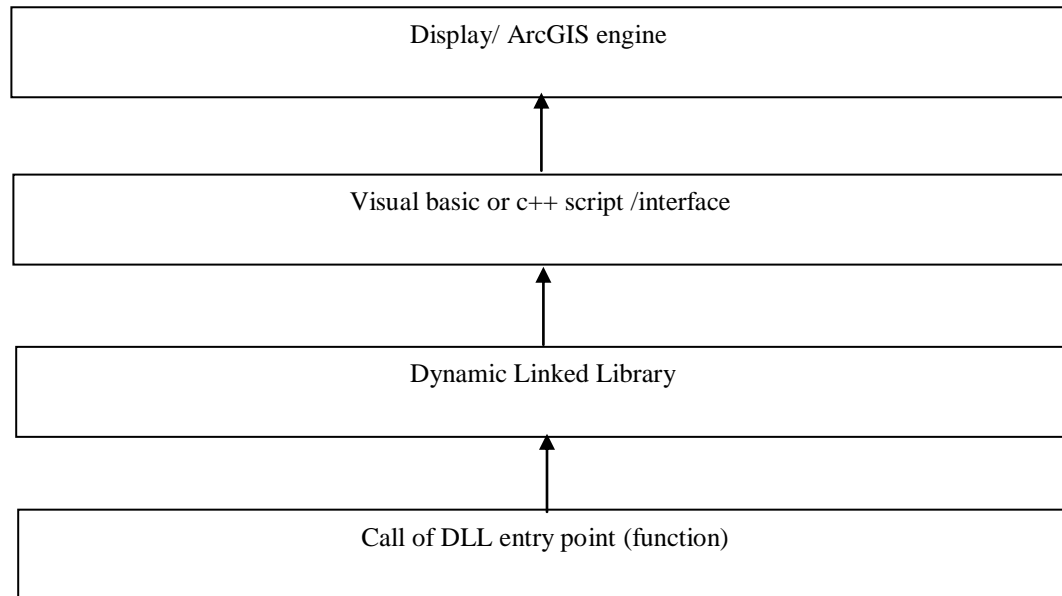


### Spectrum management propagation models developments :-

#### Phase 1: Propagation model library development

In this stage the all the formal from the chosen ITU models will be developed in Dynamic linked library files (DLL) using C++ programming language all related information for the propagation models will be taken into consideration.

A DLL is a library of functions that is not included in executables and that can be loaded and used dynamically .Dynamic Link Libraries are useful way to run simulations or computations on various Microsoft application with only one single file that contains all functions .It allows an easy and flexible management of the upgrade of DLL Functions (Special Issue of IEEE Personal Communications, August 1999).



**Figure 2:** Spectrum management library development

Phase 2 (Inputs): Antenna parameters database will be build in ASCII format to be accessible by the propagation models. The standard types of the available antenna database will developed. The general parameters of the antenna will be accessible for adjusting purposes (TIA,(2002)).

Phase 3 (Outputs): Coverage prediction, Interference calculation will be base on the input scenario and the results will be displayed which allow the user identify the possible coverage based on chosen model and the specific scenario used (Cengiz EVCI et (2001).

### Spectrum management between terrestrial systems:-

In the methodology of the spectrum management tool, there are number of stages should be follow to achieve the aforementioned objectives,

Phase 1 Database configuration: In which all the following should be formed and arranged: necessary formulas, required parameters and specifications for transmitters and receivers, type of deployment area, sharing and coexistence criterion. Propagation wave model also is a part of project requirements.

Phase 2 Interference Analysis: Perform an analysis on a frequency that has interference to determine the potential interference from existing transmitters or to existing receivers by determine the type of analysis model and interference scenario (co-channel, adjacent channel, guard band or overlapping).

Phase 3 results and Outcome: Desired and interference signal strength, Separation distance and frequency separation, additional isolation needed for each co-channel and adjacent channel either by spectrum emission mask model or adjacent channel interference model.

Phase 4 **Interference Report**: Create new interference reports and output them to the printer or to a file compatible with the system.

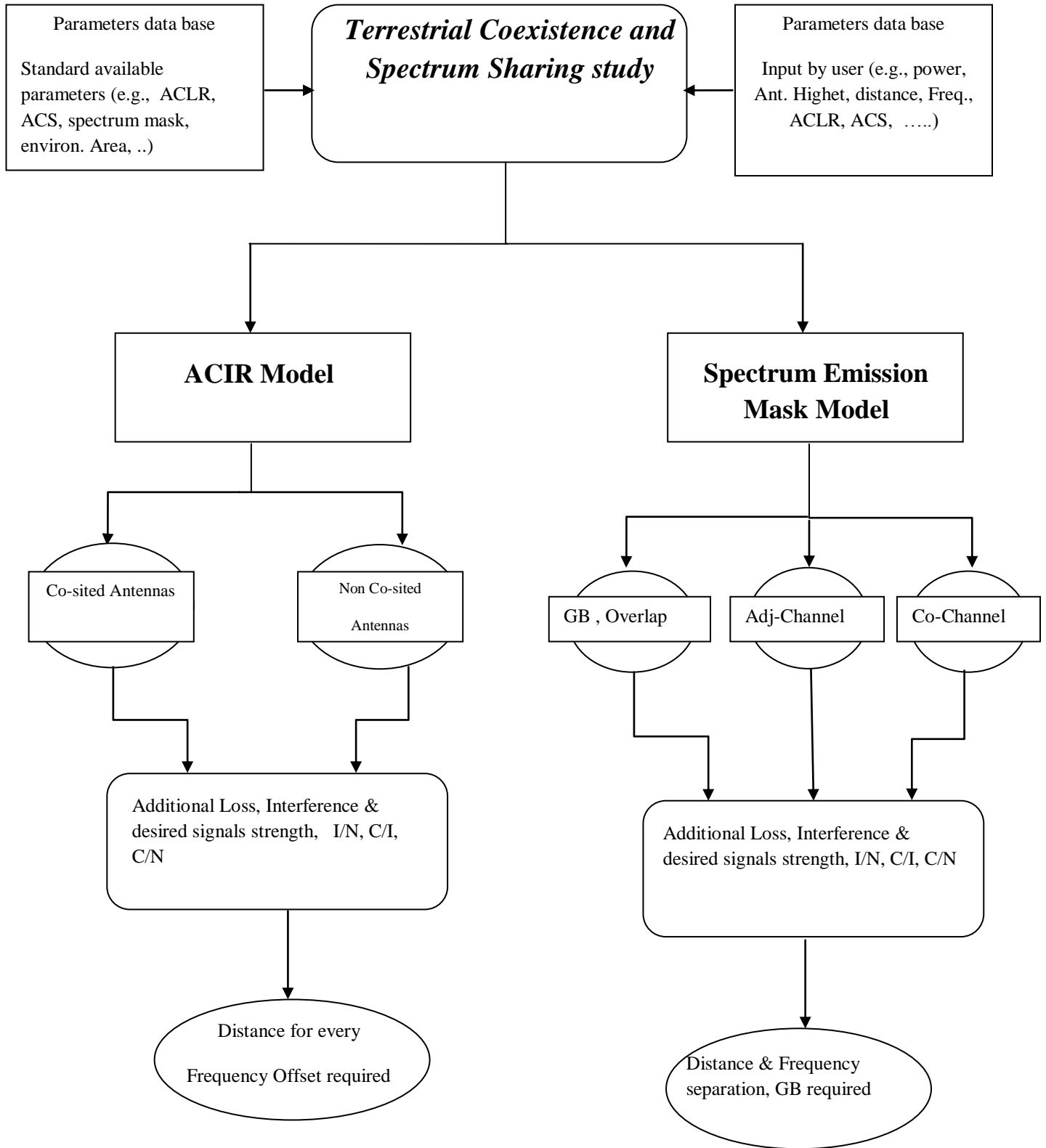


Figure 3: Flow Chart for Spectrum Management Tool Methodology Proposal.

**Spectrum management between Fixed satellite and terrestrial systems:-**

Phase 1 (Frequency Range): We chose the frequency range to suite the FSS and FWA band requirements. However, the FSS frequency range have already sat to be from 3400-4200MHz, at the same time we have the point to point FWA which suppose to operate on frequency range 3400-3600MHz. For FWA as point to multipoint we will cover this service because it's assigned globally by ITU to be work in frequency range 3400-3700MHz, so the software should be able to cover this service as well. Furthermore, we will cover the range 3300-3400MHz as an expected band for FWA because in a case that we will shift this services to be work on the band mentioned above we need a software to calculate the possibilities of deployments (Proceedings of 2nd.European Colloquium, (2002)).

Phase 2 (Inputs): Several types of information should be clarified, in term that we want a high capability and performance. For FSS inputs like propagation models (which will be base on ITU-R), select receiver type & specifications (ITU base) and multiple access technique ( E. Goodman. (2004, Mar)). For FWA we should consider the propagation models, receiver/transmitter Type and coverage (base on ITU), multiple access technique.

Phase 3 (Outputs): Interference calculation will be base on the input scenario and the results will be generated in a report which should include the interred case and the possible mitigations base on graphs. Recommendations will be provided (FCC. (2002, Nov)). Study will cover both co-channel and adjacent channel, for the adjacent channel all the possibilities of guard band will be included inside the library. However in the end we will be able to find the possibilities of deploy different services base on spectral power distribution.

Phase 4: Programming issues like data input, representing the date output, graphical design, generating reports and recommendations, ability to cover the mistakes, future developments base on the feedback and Compressions with the existing software.

**System Outputs:-**

The system output and results for this work are:

- Implementation of ITU-R propagation models for various radio services between 2 to 6 GHz.
- Verifying of the feasibility of coexistence between the two systems depending on the input specification by means standard criterion (e.g., I/N).
- Determination of the separation distance and frequency separation to coexist the two systems in case of Co-channel interference and adjacent channel interference.
- Estimation of the additional isolation to decrease the interference and achieve coexistence.
- Geographical Iraqi map based utilization and generation of the electronic report.
- Expecting recording frequency applications, frequency plans, frequency assignments, technical details and interferences.
- Identifying the priority of data items required for registration of stations in electronic data base.
- User-friendly data entry masks with on-line data validation mechanisms, if applicable.
- Signal strength calculation using propagation models within a selected area (coverage area), along a profile, along a polygon, at given points.
- Calculation of network coverage.
- Interference calculation around the concerned terrestrial transmitters and victim receivers.
- Interference calculation between Geostationary satellite Earth stations and BWA stations.
- Interference analysis for assigning frequencies to stations in given locations using relevant ITU-R recommendations, protection ratios and PSD (Power Spectral Density) masks of emissions.

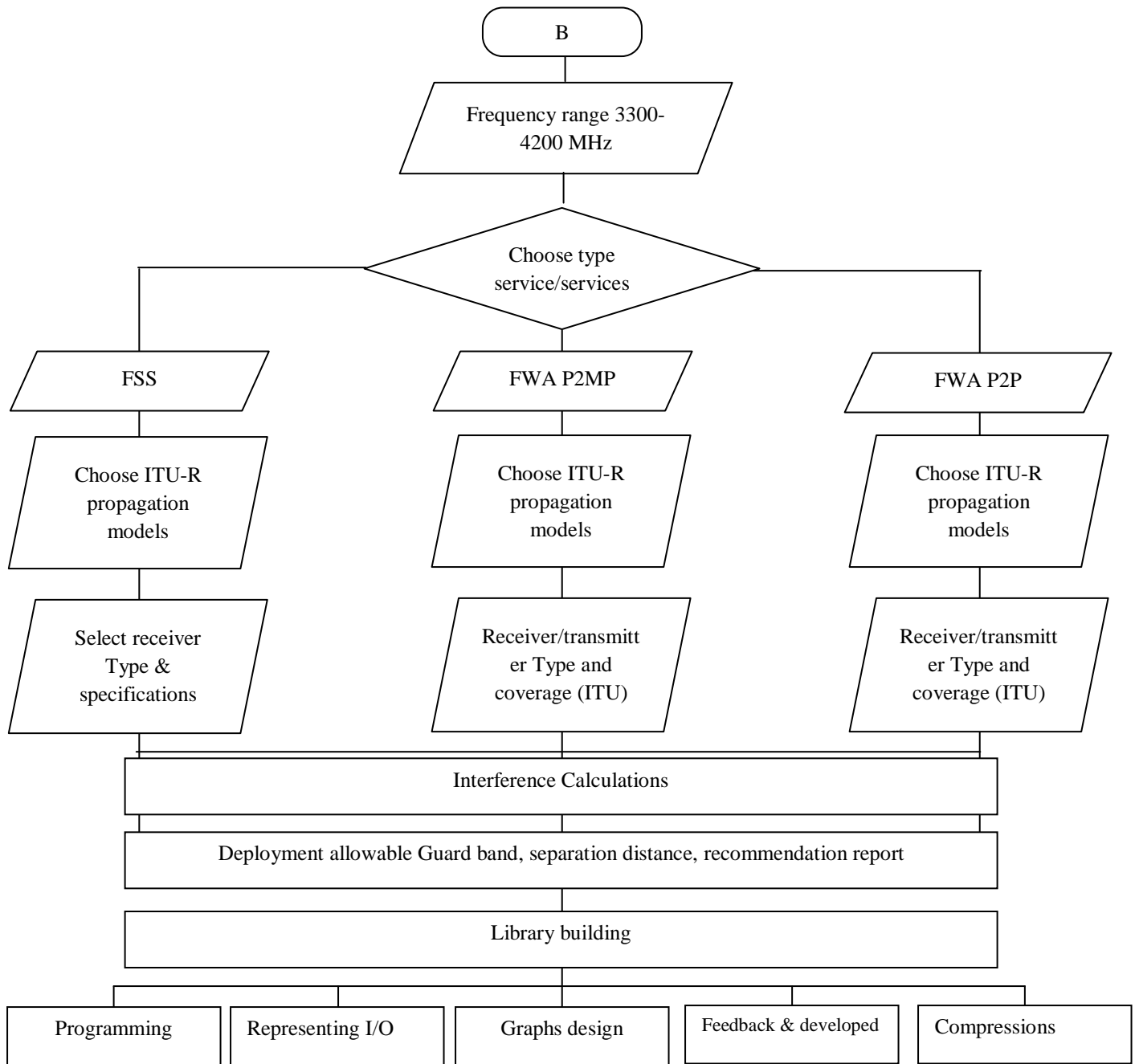


Figure 4: Flow Chart for Spectrum Management Tool Methodology Proposal

**Conclusion:-**

The information which will be gathered from this investigation will be extremely useful for Iraq to share with other countries through APT, WRC and other ITU forums. In addition to that new specialists to deal with new technologies on horizon will have a chance to explore more into this area. There will be good economic benefits for this project like: cost saving, revenue from consultancies, future estimation demand, and royalties from tools licensing.

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### RESEARCH ARTICLE

#### USING ANTCONC: A CORPUS-BASED TOOL, TO INVESTIGATE AND ANALYSE THE KEYWORDS IN DICKENS' NOVEL 'A TALE OF TWO CITIES'.

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#### Abstract

Keywords analysis is one of the important methods in corpus linguistics. It has the privilege to analyse texts/corpora in terms of statistical significance, by comparing two or more texts/corpora. This study regarded the keywords that are notable statistically in Dickens' 'A tale of two cities' using Laurence Anthony's AntConc tools. It aimed to find out a number of keywords of the mentioned Victorian novel (the node) compared with 35 Victorian novels (as a reference corpus). This study briefly shows and discusses a number of keywords of this novel as well as showing the limitations of this method of analysis. Quantitative and qualitative approaches are used; the quantitative analysis is by Laurence Anthony's AntConc concordancer whereas the qualitative analysis would be individual. Log-likelihood method, significant keywords as well as a number of negative

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#### Introduction: -

The term "Keyword" is one of the research methods used in corpus linguistics which means: "words that are claimed to have a special status, either because they express important evaluative social meanings or because they play a special role in text or text - type" (Stubbs, 2010: 21). From this definition, keywords are the units that carry or participate in discovering the meaning of a text, this is from the perspective of Linguistics; from the social perspective, they are the units that have partial reference the culture and society, and also would represent the text type. There is an issue regarding the relationship between these two perspectives. Although in keywords analysis analysts correlate semantics with social aspects, the meaning of a text's keywords (semantics) tends not to be strongly related to the social and cultural world (Ibid, 2010). Words are the smallest units of meanings, but their meaning could be affected by a number of reasons: the combination with other words, the intention and purpose of saying/writing these words, as well as the participants who say/write them; and in social world, all these reasons are taken into consideration, therefore the social analysis is not strongly related to the individual semantic meaning of these keywords.

Stubbs (2010) argued that corpus linguistics studies are predominantly weak in social theory in the contrary of speech act theory – which means: regarding an utterance as a type of action which performs a function in language (*The Oxford English Dictionary*) - which provides 'powerful' social theory. However, it might be more sufficient to use empirical research of real data in studying the social theory. According to Stubbs (2010), there are three concepts

of keywords: the first concept is originated from ‘cultural studies’, the second is originated from ‘lexico-grammar work’, and finally, the concept that derived from the ‘comparative quantitative corpus analysis’. This essay focuses on the third concept of keywords which means searching for words that are notable statistically in a text or a number of texts by using Laurence Anthony’s AntConc tools. More specifically, this essay focuses on the keywords of Charles Dickens’ novel ‘A tale of two cities’ (taken as a node corpus), compared with 35 Victorian novels (as a reference corpus). It is interesting to find out the keywords of this novel to know what is different in its language, and what could they reveal in terms of understanding it. This essay briefly shows and discusses a number of keywords of this novel as well as showing the limitations of this method of analysis.

### **Keyness: -**

Keyness is “a quality possessed by words, words clusters, phrases etc., a quality which is not language -dependent but text -dependent” (Scott, 2010: 43). Therefore, words or keywords are not stand individually as a quality, but they are considered to be a quality in regard to the whole text or maybe in a number of texts, with also regard to social and cultural aspects. Because keywords are statistically significant in a text/texts (in comparison with usually a larger corpus), they tend to indicate the text’s ‘aboutness’ - simply, what the text is about- as well as the text’s style (Scott, 2010; Groom, 2010). On the one hand, keywords appear to provide an understanding about the whole or maybe just part of a text/ texts. On the other hand, these keywords would to a great extent participate in revealing aspects of styles of specific text/ texts which are different in comparison with the styles of others. As Scott (2010) pointed out, the use of the word ‘key’ is metaphorical. From this sense, key is what allow an individual to access a position which has not accessed before, or as he put it “enabling device” (2010: 44) i.e. as mentioned previously, they (keys/keywords) tend to provide an understanding of a text/texts.

Finding out the keyness of words in a text/ texts individually is not an easy process; the use of an automatic analysis (keywords tools) solves this issue. However, it has been claimed that the results of individual versus automatic analysis are not the same, for instance: Scott (2010) claimed that because keywords tools process analysis differently, their results are different (from that is of individual) quantitatively and qualitatively. It is not usually the case, sometimes the results could be the same even if the process is different and it is worth mentioning that because these two processes are different, in a sense, they are not comparable; as both of them has its advantages and disadvantages. The main differences in these both are: individuals seem not to agree consistently on the keywords of specific text/ texts picked by automatic tools, and automatic tools would provide keywords that are difficult for individual to notice (Ibid, 2010). The typical way of analysis is taking both processes together, using automatic tools to provide quantitative analysis and individual analysis using qualitative approach. However, there are a number of limitations regarding both approaches for example: the statistical process in comparing two or more texts is not always accurate, it tends to have a number of problematic issues considering the choice of keywords; taking, for example, a word from a text which is considered as a key in comparison to a reference corpus, but this word might tell nothing about the aboutness or the style of a text i.e. it might not be a key in this specific text.

This inaccuracy problem could be avoided by choosing the right reference corpus (Scott, and Tribble, 2006). In terms of qualitative analysis, the problem is not accuracy but it could, to an extent, be regarded as subjectivity. Individuals do have differences in perceptions, so, their analysis seems to be bias towards their perspectives. Avoiding this issue could happen only by perceiving the surroundings in objective ways.

### **Choosing the right reference corpus: -**

Choosing a reference corpus is an important issue. It affects all the statistical processes and results. The most important issues taken into consideration when choosing a reference are: the size of the corpus and its content. The larger the reference corpus is taken the more and accurate keywords detection (Scott, and Tribble, 2006). Moderate reference corpus may be sufficient as Scott (2010) argues, Sardinha (2004 cited in Scott, and Tribble, 2006) argued that the reference corpus should be five times larger than the node one and if it is more than that, it would be more accurate. Logically speaking, if the reference corpus is slightly larger than the node one, then there would be no significance in keywords and it is not a rule regarding the size but the more significant results wanted, the larger corpus should be used. In terms of content, there must be a relation between the node and the reference corpora. It would not be appropriate, for example, using a medical corpus as a reference to analyse the keywords of a literary work. It can be done, but the results would be inaccurate. Therefore, using ‘genre specific’ is a key aspect in finding the accurate results. In addition, using period specific which means the node and the reference corpora are originated in the same period of time, because social aspects change through time and it tends to have an influence on language; of course unless if the study is about the change of language through time or the effects of social aspects on

language, both of these are exceptions from the period specific principle. In this study the node text is a novel in the Victorian era 'A tale of two cities' and the reference corpus is 35 Victorian novels, so, the two issues (size and content) and time are taken into consideration.

#### **Open-class versus closed-class keywords: -**

Open-class words are the content words which allow an addition of new words, whereas closed-class ones are the functional words which do not allow any additions and it contains the grammatical and functional words. In keyword analysis, it is generally considered by discourse analysts that open-class keywords represent the aboutness of a specific text/texts or corpus, while closed-class words represent the style of a specific text/texts or corpus (Groom,2010; Scott, and Tribble, 2006). However, analysing the meaning of a corpus depends on the sequences of words not on the form of these words (Groom, 2010). In addition, Sinclair (1991 cited in Groom, 2010: 62) mentioned that "[m]ost everyday words do not have an independent meaning, or meanings, but are components of a rich repertoire of multi-word patterns that make up text". Therefore, analysing text/texts, using keywords, does not depend on the meaning of the words themselves, but on their meaning within the context. There is a slight distinction between closed-class and open-class keywords (Scott, and Tribble, 2006). Therefore, Groom (2010) argued that this distinction is regarded as a reason in skipping the analysis of closed-class keywords. It is possible to say that this issue is not a rule of thumb; it significantly depends on the text/texts or corpus. In a type of text, for instance, one can find the use of functional words (closed-class) is a representative of the style as well as the aboutness of this text but in other texts s/he may find these words represent just the style and not the aboutness. However, closed-class keywords would not be treated as the same as open-class keywords in analysing the aboutness, open-class keywords are always the prime indicators of aboutness (Groom, 2010; Baker, 2006).

There are two different methods of analysis: the quantitative and the qualitative, along with the distinction between aboutness and style. For closed-class keywords, quantitatively, they tend to have a statistical significance as they are grammatical and functional words; but, qualitatively, "these words can tell us almost nothing about the meanings and values expressed in a specialized corpus" (Groom, 2010: 63). Although these words are considered meaningless in terms of analysis, they appear to have the ability to reveal an indication of the meaning of a specific text/texts or corpus as well as the indication of the style; not when they are analysed individually, but when they are analysed contextually (Ibid, 2010). For open-class keywords, quantitatively, they, statistically, seem to be slightly lesser than the closed-class ones except for the proper nouns which always come first. Qualitatively, those keywords are the representative or the principal of meanings. Proper nouns tend to be also meaningless while analysing, except for a number of studies which require the analysis of them. Groom (2010: 70) points out that, considering closed-class keywords "irrelevant" or less important would be "wrong". It is possible to say that only a number of closed-class keywords could be 'tractable' to semantic (meaning) analysis, for example: the words 'the' and 'a', generally, provide almost nothing to indicate the aboutness. However, the word 'of' in Groom's (2010) study provided plenty of indication to the aboutness. In this study, both classes of keywords would be concentrated on to see whether the closed-class keywords in this novel provide indications of aboutness or not.

#### **Bottom-up versus Top-down approaches of analysis of discourse: -**

Bottom-up and Top-down approaches are contrasted. Simply, top-down approach is used when there is already an existed hypothesis or 'framework' of analysis and the reason of analysis is to support or prove the effectiveness of this framework. Whereas bottom-up approach is used when an analyst starts his/her analysis with the data (corpus/text(s) in order to reach or create a suitable framework of analysis (Biber, et al. 2007). Typically, the case of keywords analysis tends to be a bottom-up approach. However, it could be possible and effective to work with these two approaches in keywords analysis. In literary work analysis, which is the concern of this paper, 'corpus stylistics' appears to be the comprehensible approach of analysis. Corpus stylistics is the cooperation of methods of corpus linguistics and literary stylistics – where corpus linguistics is the bottom-up and literary stylistics is the top-down (Mahlberg, 2010; 2012). It is possible to claim that the relation between these approaches is similar to the relation between quantitative results and qualitative analysis, in a way that both of these relations could address difficulties and limitations of keywords analysis.



From a logical perspective, on the one hand, the bottom-up approach of analysis seems to be more difficult and subjective while working with alone and there is a possibility of wrong or odd findings. Therefore, taking the framework (top-down approach) – in this case, the literary stylistic methods – would be a guidance mostly towards significant findings. On the other hand, taking the top-down approach alone would be a time consuming; as Short (1996 cited in Mahlberg, 2010: 295) put it “analysing a long novel ... could take a lifetime”. Moreover, there are plenty of other limitations which would be mentioned later. To avoid such limitations, this essay would take these both approaches into consideration. In terms of top-down approach, this novel is on the time of French revolution, and the story is taking place in two cities, London and Paris. It has a sub story and the concentration is mainly on the characters of this story. It has a psychological effect on the readers because of the use of different techniques such as: ‘metaphors’, ‘comic relief’ (humour), ‘repetition’ ...etc. (Newlin, 1998). The language of this novel is highly stylistic and philosophical; moreover, it has a subjective element, by which it differs according to the characters’ perspectives (the view points of the characters are different because of the class distinction) (Ibid, 1998). The understanding of this brief summary would provide guidance and an idea about the analysis of keywords

### Methodology: -

The aim of this study is to find out a number of keywords of the Victorian novel ‘A tale of two cities’ and what these keywords could tell about this novel. Quantitative and qualitative approaches are used; the quantitative analysis is by Laurence Anthony’s AntConc concordancer whereas the qualitative analysis would be individual. Top-down and bottom-up approaches of analysis are used in this analysis to provide clearer insights and provide possible hypotheses, but the focus would be more on bottom-up approach. The node text (A tale of two cities) was downloaded from the Project Gutenberg website whereas the reference corpus was taken from one of the corpus linguistics lectures, which is also downloaded from the Project Gutenberg website. The reference corpus consists of 35 Victorian novels. By using AntConc, Log-likelihood method, significant keywords as well as a number of negative keywords are selected and analysed.

### Keywords Analysis: -

**Table 1:-** the significant keywords in this study

Rank	Freq	Keyness	Keyword
1	223	649.786	doctor
2	138	592.878	prisoner
3	63	362.907	citizen
4	60	297.528	spy
5	2011	268.943	his
6	76	212.373	streets
7	622	163.047	mr
8	134	137.103	business
9	20	131.850	patriots
10	22	115.954	tribunal
11	13	99.646	citizeness
12	54	87.528	faces
13	233	86.668	miss
14	98	84.531	until
15	20	75.729	wot
16	221	63.054	its
17	10	62.737	wos
18	4999	59.761	and

**Table 2:-** the negative keywords in this study

Rank	Freq	Keyness	N. Keyword
1	18	240.434	mrs
2	1987	158.423	i
3	1045	137.901	her
4	27	65.414	oh

The word ‘doctor’, other than its normal role, emphasizes the role of social class, the well educated people and also there is a logical tendency with the term doctor as whenever there is an emphasis on doctors there must be patients, it might be a representative of the ill situation at that time i.e. sick people as a sign of not only physical sickness but the poverty and depression of maybe most of the lower or working class at that time. The word ‘prisoner’ in this novel is not surprisingly being a keyword as the story deals with prison and court. However, it also has a metaphoric use as in ‘must positively find the prisoner Guilty’ and in ‘innocent prisoner’ these two examples are not only metaphoric, but also a representation of injustice. Moreover, the word ‘spy’ used in this novel as also a representative of the world of injustice.

As citizen means “someone who has the right to live permanently in a particular country and has the right to the legal and social benefits of that country ...” (Macmillan dictionary). The use of this word in this context has two senses: the first one is the sense of formality, this word has been mentioned once in the first book of the novel and the rest 62 times were mentioned at the third book because the word occurred in the context of court which tends to be more formal than any other situation. It also carries positive aspects (most collocates are positive semantically). The second sense, this word is used metaphorically as good quality content must be existed in people (it is the ‘container’ conceptually; whoever supports the French revolution is called citizen/ess).

The use of the possessive pronoun ‘his’ is an indication of the major theme of this novel; it seems to be a male dominance. Although it does not deal with only one hero and it is not only a one story novel, it seems that the focus is on one hero of the sub story. For more support, it is obvious that the use of female possessive pronoun ‘her’ (which is negative keyword in this novel) is only half times than ‘his’ which also indicates the male dominance theme.

The word ‘streets’ is significant in this novel, but it tells a little about the aboutness, simply as the actions are taken place in the streets. However, “but, when the streets grew hot” and “once-peaceful streets” in these examples ‘streets’ has another meaning: metonymic way of representing weather and personifying the impersonal.

The word “Mr.” is mentioned 622 times and it tells nothing but when comparing with the negative keyword “Mrs” which is mentioned only 16 times, one can assume that this novel is male dominance, though the word “miss” is significant (mentioned 233 times).

The word “business” used in different situations providing different meanings for instance: ‘business eye’ metaphoric use, ‘man of business’ used in two senses: men who have jobs and men who are in charge, ‘business mind’ means reasonable, ‘it’s not my business’ means not my responsibility. In addition, this word provides positive sense, however there are some instances of the negative use of this word as in ‘dreadful/murderous business’.

Although the word ‘patriots’ is mentioned only twenty times, it is significant in this novel. The instances are seen from the second half of book two and book three, when the revolution started, because of the fact that it appears to

be semantically and logically linked with the revolution.

The word 'until' is used as a preposition as well as conjunction. The conjunction 'until' is used more than the preposition one, and it might be more interesting in the sense that a certain action is depending on another action, so, this would tell a little about the language of this novel.

The word 'wot' is the non-standard form of the word 'what' and it is significant in this novel. Although it is not frequent enough, it shows the colloquial language used by people at that time. And also shows the subjective element mentioned above, which is not all characters use this word instead of 'what'; 'what' was used 384 times while 'wot' was used 20 times.

It is not unusual for the word 'and' to be a keyword; it is the additive element, so, it might be possible to say that this novel has a significant number of extensions. As for the possessive 'its', it is mostly preceded by the prepositions 'in, of' and only in small number of instances it is preceded by 'on, at, for'.

The word 'wos' is used ten times and it is significant in this novel for the same reason of the word 'wot'. It is the colloquial term of the word 'was', but in seven instances it was used as: 'if it wos so' and two times without 'so', 'if it wos' and only one time it was used alone.

The word 'faces' is significant in this novel; it represents the normal use of the word and: the metonymic concept of 'part represents the whole', so, face represents the whole body as in:

'and faces hardened in the furnaces of suffering'. It represents the status of a person as in: 'the faces changed, from faces of pride to faces of anger and pain'.

The only aspect of the significance of the word 'tribunal' in this novel may lie in the element of formality i.e. the court tends to be more formal than the tribunal and the fact that at the times of French revolution, the revolutionary court was oppressive and informal. Therefore, this could be the reason of using this word instead of the word court.

The negative keywords 'I' and 'oh' can tell that the use of the first speaker pronoun is not significant and it could be because the focus is on the indirect speech. As for 'oh' a representative of sigh and grief, it is unusual to be negative in this novel (as it is sorrowful and melancholic).

Finally, the keywords used in this analysis provided a number of elements regarding the aboutness and the style of this novel and provided an understanding on the surface level. In order to widening this research to gain an understanding on a deeper level, there are a number of limitations will be mentioned later. If a researcher takes them all into consideration, the results would be deeper and more generalizable. In Addition, the closed-class keywords in this novel appear to have nothing about the aboutness.

\* The examples are taken from AntConc directly and the whole text is referenced in the reference list.

#### **Limitations and further study: -**

There are a number of limitations in the study of keywords analysis other than the ones mentioned above. It is difficult to make 'generalizations' in a wide range of texts because it depends on the linguistic features of different registers and on the writer's style (in this case Charles Dickens whose style can be generalized in almost all his texts and that could provide clues to the analysis of a specific one(text) i.e. the style of a text tends to be subjective and the effect on readers/listeners may also be subjective – in a sense that text could affect readers/listeners differently (Mahlberg, 2012). A word could be a key that frequently occurs in one part of a text/corpus as in the case of the word 'citizens' in this novel. The keywords do not focus on grammatical, semantic or functional differences or even lexical similarities; they concentrate only on lexical differences (Baker, 2004a cited in Rayson, 2012). It is also possible that the selection of keywords could be subjective and that would to an extent frame the analysis in certain perspective. Mahlberg (2005: 17) pointed out that, generally, "corpuslinguistics is still a long way away from the creation of a unifying theory that accommodates individual findings within a broad framework".

For further study, it would be beneficial to include collocation analysis in researching keywords because perhaps it would provide a deeper analysis of keywords. Also using Scott's technique to find 'key keywords' would be

beneficial (Rayson, 2012) – key keywords are words that are keys in not only one text/corpus but in a large number of texts/corpora (Scott, and Tribble, 1996). This technique would support Groom's claim in focusing on the closed-class words (because key keywords frequently are from the closed-class group) as well as the phrasal/cluster analysis.

### Conclusion: -

In conclusion, keywords analysis is one of the important methods in corpus linguistics. It has the privilege to analyse texts/corpora in terms of statistical significance, by comparing two or more texts/corpora i.e. analysing the texts/corpora using the most frequent words. Theoretically, this method would be the most significant method of analysis in corpus linguistics, because it is an inclusive approach as it focuses at the text/corpora as a whole and selects the most frequent words for the analysis. However, texts/corpora are not just language, there is always aspects other than language (Social, cultural and cognitive aspects) which influence the language. Inevitably, these aspects affect the context of texts/corpora. With the fact that the meanings of words in texts are different from their meanings in isolation, keywords might to an extent be influenced by those aspects. Therefore, using multi-approaches (Top-down/Bottom-up) would result more accuracy in terms of analysis. Both of these approaches support the analysis of this novel as well as the choice of the reference corpus. Although the findings are not generalizable because the number of keywords analysed is not enough, there are a number of indications about the aboutness and style of the language used and this brief analysis reveals a number of aspects that support the understanding of this text.

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### **RESEARCH ARTICLE**

#### **SINGLE VISIT APEXIFICATION AND OBTURATION OF IMMATURE NECROTIC PERMANENT TEETH USING BIODENTINE – FOUR CASE REPORTS.**

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Single visit apexification, artificial apical plug, Biodentine

#### **Abstract**

The management of a tooth with open apex consists of either the induction of a natural barrier or the creation of an artificial apical barrier. Since the conventional apexification using calcium hydroxide has certain drawbacks recent approach is to form an artificial apical plug using newer biomaterials. In addition to MTA, alternative materials are being developed and researched studied for the purpose. This article describes the successful management of traumatized and necrotic permanent maxillary incisor teeth with open apex using artificial apical barrier technique with Biodentine.

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#### **Introduction:-**

Traumatic injury to an immature permanent tooth leads to loss of pulp vitality and arrested root development. Thus, endodontic management of these teeth in young patients is a great challenge. The walls are divergent and wide open apex makes debridement and obturation difficult [1]. An Apical root closure may result from apexification or bridge formation. Apexification is defined as a method to induce a calcified barrier in a root with an open apex or continued apical development of an incomplete root in a tooth with necrotic pulp [2].

Various techniques were used to induce the apexification process. The most common traditionally used medicament is Calcium Hydroxide. It was first introduced by Kaiser and Frank in 1960's. The approximate time for induction of calcified apical barrier varies between 6 months and 24 months. Although technique is efficient with predictable outcomes, it has several disadvantages like prolonged treatment time, chances of re-infection and risk of cervical fracture [3].

An alternative to apexification with calcium hydroxide is formation of an artificial apical barrier technique using MTA. Literature suggests that MTA is biocompatible with cementogenic properties and has superior sealing ability. But it has certain disadvantages like questionable antimicrobial activity, difficult to handle, potential for discolouring the tooth [4].

To overcome the disadvantages of MTA, a new calcium silicate based material; Biodentine™ (Septodont) has been introduced in 2009 claiming to be a revolutionary material capable of offering a bioactive and biocompatible

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replacement for dentine. The endodontic indications of the novel material are similar to MTA but are reported to offer several advantages including better consistency, improved handling, and quicker setting time (12 minutes) [5]. The following four case reports describe successful management of traumatized permanent anterior teeth with open apex with Biodentine apexification followed by root canal treatment followed by crown placement.

### Case Reports:-

Four cases of open apices reported at different time in the Department of Conservative Dentistry and Endodontics, Guru Nanak Institute of Dental Science and Research, Kolkata- 700114 with the **chief complaint** of discolouration in upper front teeth region of mouth. The age of the patients were in a range between 21 to 25 years. The medical and dental histories were non-contributory. All of the four cases were presented with similar features as follows :-

**History-** Trauma 12-13 years back.

#### Clinical presentation:-

- i) Discolouration
- ii) Offending tooth shows negative response in electric pulp test (EPT)
- iii) Non mobile and non tender

#### Radiographic presentation:-

Circumferential periapical radiolucency with wide open apex along with thin root dentin. The bony support of the tooth was completely intact.

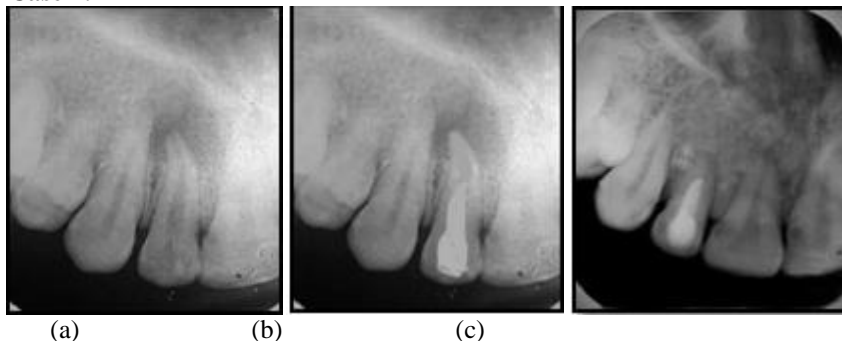
#### Treatment procedure:-

The treatment protocol was performed as follows :-access cavity was prepared using no.2 round bur (Dentmark) and refined with endo Z bur (Dentsply) with rubber dam (Coltene) isolation. Working length was established by radiograph. Biomechanical preparation and circumferential filling was done with 80 K file. Irrigation was performed with 3% sodium hypochlorite and normal saline alternatively. Calcium hydroxide as an intracanal medicament was placed in the canal for 1 week and the access cavity was sealed with zinc oxide eugenol.

On recall visit, the tooth was found to be asymptomatic clinically and radiographically. Intracanal medicament was removed by irrigating with alternating solutions of 3% Sodium hypochlorite and saline. The canal was completely dried with size 80 absorbent paper point and the absorbable gelatin base foam (AbGel) placed apically as a barrier.

Biodentine (Septodont) capsule was tapped on a hard surface to diffuse the powder. After this, five drops of manufacturer's supplied liquid was dispensed into the capsule. The capsule was then placed in triturator for 30 s. After mixing, biodentine was placed at the apical region and gently adapted to the apical portion of the canals using endodontic pluggers until an apical plug of 4-5 mm was reached. Correct placement of Biodentine apical plug was assessed radiographically. Following the placement of biodentine over the barrier, butt-end of a paper point was used to clean out any excess material from the walls. After 10-12 minutes, the hardness of the biodentine was examined using the plunger to confirm its set. Rest of the canal space was obturated with gutta flow and post obturation access cavity restoration was done with light cure composite resin (Filtek Z 250 XT, 3M ESPE) on the same day. The patients were recalled at every 1 month interval for a period of 6 months for clinical and radiographic assessment during this period.

#### Case 1:-



(a)- Pre operative radiograph (22)

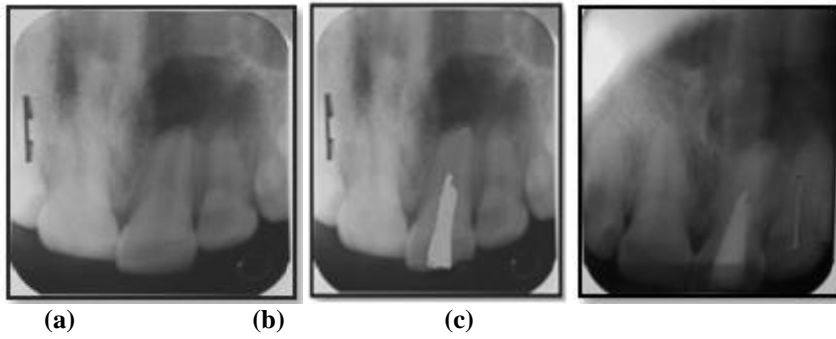
(b)- Post operative radiograph

(c)- 6 months follow up radiograph

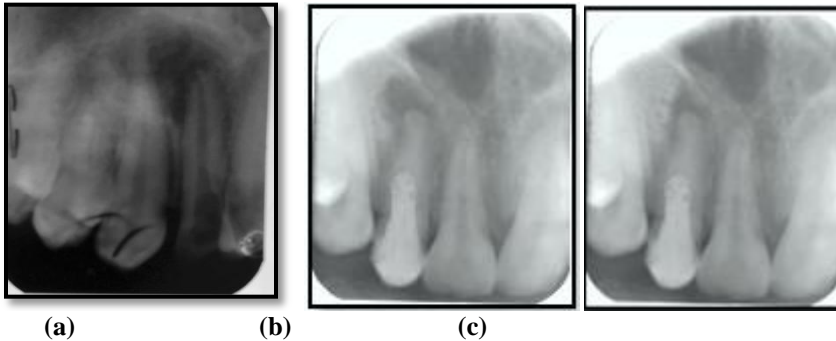
(a)

(b)

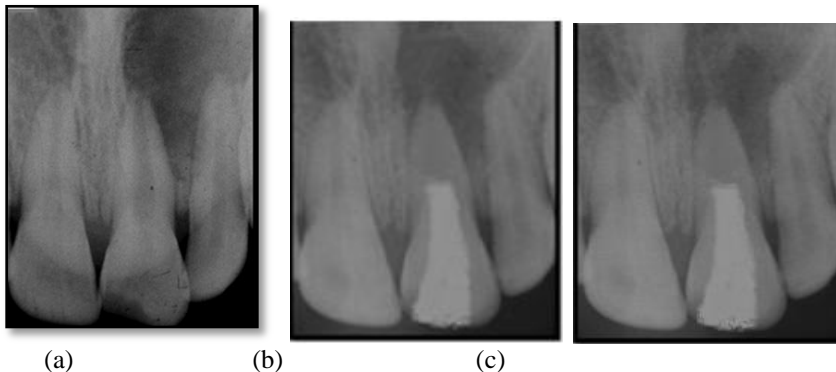
(c)

**Case 2:-**

- (a)- Pre operative radiograph (11)  
 (b)- Post operative radiograph  
 (c)- 6 months follow up radiograph

**Case 3:-**

- (a)- Pre operative radiograph (22)  
 (b)- Post operative radiograph  
 (c)- 6 months follow up radiograph

**Case 4-**

- (a)- Pre operative radiograph (11)  
 (b)- Post operative radiograph  
 (c)- 6 months follow up radiograph

**Discussion:-**

Calcium hydroxide has been used in the conventional apexification technique to create an environment conducive to the formation of an apical barrier formed by osteo-cementum tissue at the end of the root canal in teeth with open apices. However, it has certain drawbacks like the long duration of therapy (3 to 21 months), susceptibility of the tooth to fracture during treatment, and susceptibility of the root canal to re-infection due to a temporary seal in the tooth [4]. With the introduction of MTA, a more convenient and less time taking technique by placing a plug of MTA in apical 4 mm of the root canal was conceptualized. MTA has a range of advantages such as biocompatibility, hard tissue formation, sealing ability, antibacterial property and MTA is not affected by the presence of blood [5]. But compressive strength of MTA is lower (40 MPa immediately after setting and increases to 70 MPa after 21 days) than Biodentine (300 MPa after one month).

Biodentine is a novel innovative bioactive and biocompatible material which provides a good biological seal and excellent marginal adaptation, a high degree of biocompatibility material that was introduced by Septodont. The powder is chiefly composed of tricalcium silicate with added CaCO<sub>3</sub> and zirconium oxide. The liquid portion contains calcium chloride (CaCl<sub>2</sub>), as setting accelerator, in the water reducing agent. Addition of CaCl<sub>2</sub> not only



decreases setting time but also improves its handling properties. Setting time of MTA is 2 hours and 45 minutes and needs at least two appointments to complete the obturation. But the setting time of Biodentine is 9–12 minutes, does not require two- step obturation and the treatment can be rendered in a single appointment. These factors reduce the chances of bacterial contamination [6]. Biodentine like MTA has an ability to initiate and continue the mineralization process. It has an elastic modulus of 22GPa which is very close to that of dentin 18.5GPa [7].

Many studies have been performed to demonstrate the bioactivity of Biodentine in clinical situations because it was able to stimulate initiation and development of mineralization [3]. Studies on management of large periapical lesion using Biodentine as retrograde restoration showed positive response in treatment outcome [8]. The only limitation of Biodentine is that it cannot be used in the presence of moisture unlike MTA. Hence, proper isolation is mandatory while using Biodentine. In the present case, the use of Abgel as apical matrix not only served in limiting the Biodentine to root canal but also provided an isolated environment for setting of Biodentine [9].

### **Conclusion:-**

Biodentine, a bioactive – biomimetic material, shows promising use for apexification, and reinforcement in management of immature teeth with open apex while serving as a monoblock. However, in such cases, long term follow up is necessary to ensure and evaluate success. Periapical healing was seen on radiographic observance. This may be due to the fact that Biodentine has superior marginal adaptation. Periapical radiolucency was almost completely healed after 6 months follow- up. In these cases, the circumferential diameter of radiolucency was decreased

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### RESEARCH ARTICLE

## RELATIONSHIP BETWEEN TACIT KNOWLEDGE SHARING, PROFESSIONALISM AND LIFELONG LEARNING IN ACCRUING PERSONAL COMPETENCIES

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Tacit Knowledge Sharing, Personal Competencies, Professionalism, Lifelong Learning

### Abstract

The knowledge-based view of competitive advantage acknowledges the importance of knowledge and human resource (HR) competencies as an organization's valuable assets (Hislop, 2003; Oltra, 2005). Intellectual ability of workers in particular tacit knowledge sharing and personal competencies are the essential pillars to build the organisation's capital. However, research has shown that people are reluctant to share because employees' beliefs that their shared knowledge is useful to others than the personal benefits they gain, especially in a professional network. This study explores the relationship among tacit knowledge sharing, professionalism and lifelong learning. The conceptual framework consists of three capable factors i.e. tacit knowledge sharing, professionalism and lifelong learning and three groups of domain of both factors; professionalism (Professional challenge, professional facilitation and work engagement) and lifelong learning (self-efficacy, change readiness, and openness & experience). This research contributes to a better understanding of tacit knowledge sharing and how that knowledge accrues personal competencies through professionalism and lifelong learning. Therefore, the proposed model might be used as an alternative theoretical model for evaluating the relationship among these factors in future studies.

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### Introduction:-

In the era of knowledge-based economy, resources and competencies are expected to be the crucial factors for organizations to survive in dynamic and competitive environment (Subramaniam & Youndt, 2005; Teece, Pisano, & Shuen, 1997). The new economy is based on the rules which emphasize the role of knowledge and competencies in shaping the competitive advantage of the organization. As a result, the value of the organisation is based on the resources inherent in the knowledge and competencies of its employees. To better use of competencies, employees always have to borrow from tacit knowledge of their colleagues. Thus it is also important to be aware of those competencies that encourage knowledge sharing (Csepregi, 2011).

The main issue of KS is associated with managing tacit knowledge rather than explicit knowledge (Bollinger and Smith, 2001) as people are reluctant to share it because employees' beliefs that their shared knowledge is useful to others than the personal benefits they gain, especially in a professional network (Chiu et al., 2006; Siemsen et al., 2007; Wasko & Faraj, 2000; Wang & Noe, 2010). Professionalism focuses on the question of what qualifications

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and acquired capacities, what competence is required for the successful exercise of an occupation (Englund, 2002:76). To maintain the status as a professional, the individual should continue to acquire new knowledge and practice his or her profession according to the code of the profession (Mottian, 2014). Successful societies and economies will depend on how well they enable these valuable assets to be shared, how well they learn from the knowledge they hold (Noor and Salim, 2011) and how they use it in their professions. The concept of professionalism is multifaceted in nature and, in spite of much research done in this field, it is still poorly conceptualised (Grinspun, 2007:22).

More recently, some studies empirically discussed the effects of knowledge sharing on various aspects of competencies. However, there is dearth of research of an integrative framework of tacit knowledge sharing, professionalism and lifelong learning together. Existing literature also shows that there is dearth of research which directly established a relationship between tacit knowledge sharing and personal competencies. Further there is lack of literature support that substantiates the interrelatedness between professionalism and lifelong learning. This study contributes to fill these gaps existing in the literature. Thus, the objective of this study is:

**Objective:-**

1. To study the relationship between tacit knowledge sharing and personal competencies.
2. To study the relationship between tacit knowledge sharing and professionalism.
3. To study the relationship between tacit knowledge sharing and lifelong learning.
4. To study the relationship between professionalism and lifelong learning.

**Literature Review:-**

**Tacit knowledge sharing (TKS)**

Tacit knowledge is unspoken and hidden and deeply rooted in action, procedures, routines, commitment, ideals, values, and emotions (Nonaka, Toyama, & Konno, 2000). This type of knowledge can be found in everyday discussions, face-to-face informal meetings, and reports (Panahi et al., 2012). This knowledge is a consequence of years of learning, gaining experience, and unspecified skill building within the mind, associations inexpressible by language, along with rules of inference and decision making (Ciechanowska, 2014). This knowledge resides in the mind of human being.

Tacit knowledge plays an important role in improving individual and organizational productivity and competitive advantage (Panahi et al., 2012). It is perceived as an important asset in improving quality of work, decision making, organization learning, productivity, competitiveness and major time saving for individuals and organizations (Herrgard,2000; Wahab et.al., 2010; Selamat and Choudrie, 2004). As a result, TKS is critical for individuals and organizations. Unlike explicit knowledge, tacit knowledge is more dependent to its human carrier (Grutter et. al., 1999). Even though the importance of tacit knowledge has been proved, unfortunately, in the work life, tacit knowledge is underrated.

**Personal competencies (PC):-**

According to Srivastava (2007), competencies means different things to different people. However, it is generally accepted as encompassing aptitudes (natural talent, susceptible to improvement), abilities (the practical application of a talent) and knowledge (necessary information for task achievement) (Lustri et. al., 2007). PC not only promotes learning, flexibility and adaptability but also contributes to the success of the entire organization. In order to enhance the productivity of knowledge workers, their competency enhancement and learning has to take place directly at their workplaces (Ley et al., 2008). The included items under PC are interpersonal skills, integrity, professionalism, initiative and lifelong learning. Without these attributes or competencies, the individual is not considered qualified. In this paper we have studied only two sub factors i.e. professionalism and lifelong learning.

**Professionalism:-**

Professionalism is a multidimensional concept that encompasses a number of different attributes including specialized knowledge, competency, honesty and integrity, respect, accountability, self-regulation and image etc. and, together, these attributes identify and define a professional. Professionals need to balance their own and their clients' interests through 'a voluntaristic commitment to a set of principles governing good practice and the realisation of these through day-to-day professional activities' (Hoyle and John 1995: 104).

Professionalism is a trait that's highly valued in the workforce. The three concepts of knowledge, autonomy and responsibility, central to a traditional notion of professionalism, are often seen as closely interrelated (Furlong et al., 2000: 5). Professionalism is related to proficiency – the knowledge, skill, competence or character of a highly trained individual, as opposed to one of amateur status or capability (Wingrave and McMahon, 2016). While nearly all organisations have some form of professionalism curriculum, how best to promote and evaluate professionalism is unclear (Swick et. al., 1999; Kao, 2003).

#### **Lifelong learning (LLL):-**

LLL has been characterised as the "capacity to respond flexibly to changing circumstances, to learn throughout a career, and to integrate theory and practice...to deal capably with previously unmet situations" (Bligh, 1982), but also more broadly, embracing learning in a variety of formal, informal, planned and opportunistic settings (Candy, Crebert, and O'Leary, 1994).

LLL is never-ending process that involves and engages the learners of all ages in acquiring and using knowledge and skills. It is flexible, diverse and beginning with learning from families, communities, schools, religious institutions, workplaces, etc. which takes place at all times and in all places. It is attitudinal—that one can and should be open to new ideas, decisions, skills, or behaviors. This determines what an individual need to learn and how to make and carry out the learning plan (Collins, 2009).

Learning flows from a variety of activities, for example, observing how other people do something, discussing with others, asking someone, looking up information, trying something for oneself and learning from trial and error, and reflecting on all the previous activities (Bolhuis, 2003). LLL has emerged as one of the major challenges for the worldwide knowledge society of the future (Collins, 2009).

#### **Conceptual Model and Hypotheses:-**

##### **Tacit knowledge sharing and personal competencies:-**

Knowledge sharing practices in the whole organization are very important for preserving valuable heritage, learning new techniques, solving problems, creating core competences and initiating new situations (Hu et al., 2009; Huang et al., 2010; Law & Ngai, 2008). Knowledge cannot be shared efficiently without having the adequate competences. To better use of competencies, employees always have to borrow from tacit knowledge (skills or experience) of their colleagues.

Sita Vanka, K. Sriram and A. Agarwal, in 5th International Conference on e-governance, ICEG (2007) also highlighted that there is lack of knowledge sharing, lack of personnel with appropriate background and aptitude and inadequate skill sets of personnel deployed in Indian e-governance system. Thus it is also important to be aware of those competences that are necessary for knowledge sharing (Csepregi, 2011). Knowledge sharing and competencies are the essential pillars in this knowledge era still the dearth of research of these two constructs together, exist in the organisations. Thus, the proposed hypothesis is as follows:

**H1:** There is an influence of tacit knowledge sharing on personal competencies.

A three-item scale of tacit knowledge sharing is developed by reference to a range of studies (Bock, Zmud, Kim, & Lee, 2005; Holste & Fields, 2010; C.P. Lin, 2007; H.F. Lin, 2007; Wang & Wang, 2012). These scales contain (1) Employee experience; (2) Know- whom and know-where; (4) Lessons from past failures.

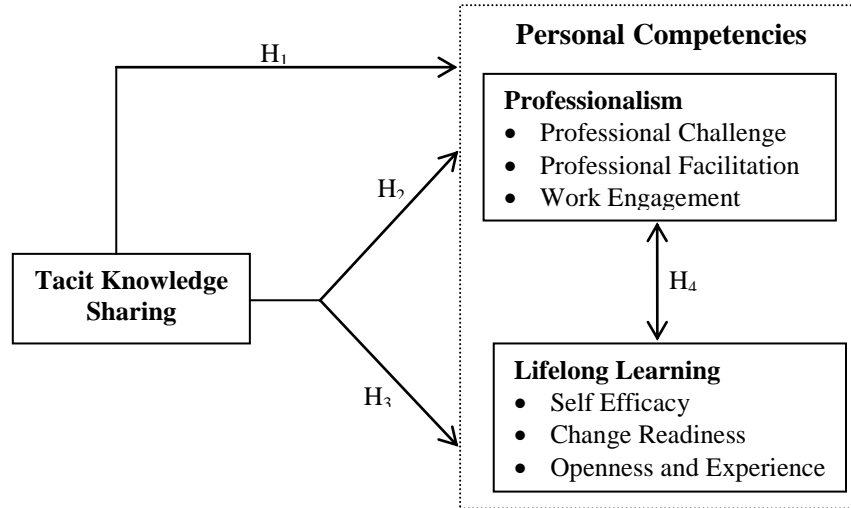
##### **Tacit knowledge sharing and professionalism:-**

Leach (2003) mentions professionalism as "a commitment to a high quality qualification training, an expectation of continuing learning, improving expertise among qualified practitioners and an enthusiasm for maintaining and developing the knowledge base on which the work of the service rests through study, research and recording and writing up developments". Researchers find that employees with high confidence in their ability to provide valuable knowledge are more likely to both donate and collect knowledge with colleagues (Lin, 2007).

Holste and Fields (2010) highlighted that the perceived competence and professionalism of the source of the tacit knowledge is a more critical determinant of willingness to use such knowledge. He discussed that use of tacit knowledge may present a somewhat larger risk to a professional employee than the act of sharing such knowledge. If a worker chooses to use and apply tacit knowledge provided by another, and the results are not as positive as

expected, the recipient may need to present a responsible explanation to organizational management. Thus, the recipient of tacit knowledge must be confident about the consensus concerning the professional competence of the knowledge source. Knowledge sharing (KS) is important to promote the professional skill and competence in an organisation. Thus, the hypothesis proposed is:

**H2:** There is an influence of tacit knowledge sharing on professionalism.



**Figure 1.1:-** Relationship between Tacit Knowledge Sharing and Personal Competencies

#### **Associated characteristics of Professionalism:-**

**Professional Challenge:** Professional challenge is a fundamental professional responsibility. In this context it is about challenging decisions, practice or actions which may not effectively ensure the safety or well-being of a child or young person or his/her family. Many professional challenges will be resolved on an informal basis by contact between the professional raising the challenge and agency receiving the challenge and will end there.

**Professional Facilitation:** With respect to professional facilitation, the focus on the facilitation of professionals by the actual organizations they are employed in rather than by professional organizations. In working with support groups if they change how they view their own role in creating change. Accordingly, the professional facilitation is more taking place within the setting of specific organizations than on an overall "purely professional" level. This means that the actual organization they are employed by is more important to them than the embeddedness in organizations of professionals. Professionals must know and do certain things to be professional (content) and they must be part of professional organizations (control) to acquire content and be regarded as professionals with special privileges (Noordegraaf, 2007).

**Work engagement:** Work engagement is a "positive, fulfilling work-related state of mind that is characterized by vigor, dedication and absorption (Bakker, Albrecht, and Leiter, 2011). Research has indicated that engaged employees are highly energetic, self-efficacious persons who exercise influence over events that effect their lives (Bakker, 2009; Schaufeli et al., 2011). This suggests that work engagement is important to enhance the discretion of organizations despite protocols and other routines (Butter and Jo Hermanns, 2011). Based on these finding, the sub-hypothesis proposed are:

**H2a:** There is an influence of tacit knowledge sharing on professional challenge.

**H2b:** There is an influence of tacit knowledge sharing on professional facilitation.

**H2c:** There is an influence of tacit knowledge sharing on work engagement.

Three components of professionalism domain are Professional Challenge, Professional Facilitation and Work Engagement are Adapted from shortened version of Utrecht Work Engagement Scale (Schaufeli et al., 2006). The components that have positive impact are selected, while the components that have negative impact have been eliminated.

**Table 1.1:-** Items of the professionalism scales

<p><b>Professional challenge</b></p> <ol style="list-style-type: none"> <li>1. To me working mainly means earning money</li> <li>2. In my work, I have an important societal contribution</li> <li>3. In my work, I can shape a number of my ideals in a practical way</li> </ol>
<p><b>Professional facilitation</b></p> <ol style="list-style-type: none"> <li>1. My work gives me a lot of opportunity to construct tailor-made solutions</li> <li>2. In my work, I often face complex problems</li> <li>3. In my work, I am supported by adequate instruments and methods</li> </ol>
<p><b>Work engagement</b></p> <ol style="list-style-type: none"> <li>1. My work inspires me</li> <li>2. I am proud of the work that I do.</li> <li>3. I am enthusiastic about my work.</li> </ol>

**Tacit knowledge sharing and Lifelong learning:-**

In the knowledge society knowledge is the only resource that grows when shared. It is not easy to convey this kind of knowledge. The only way this can happen if people work together in a harmonized environment, being ready to share their knowledge.

Knowledge is the engine of the modern economy all around the world. Keglovits (2013) highlights and supports the concept of the LLL, meaning people have to learn and develop in every stage of their life, in order to be a beneficial and valuable member of the economy. Learning is an active, goal-oriented, cumulative, and constructive activity, in which prior knowledge plays an important role in hindering or facilitating further learning (Shuell, 1988). Each and every person's knowledge and experience support and enlarge the collective knowledge. Even though the importance of tacit knowledge has been proved, unfortunately, in the work life this type of knowledge is underrated. Thus, the hypothesis proposed is:

**H3:** There is an influence of tacit knowledge sharing on lifelong learning.

**Associated characteristics for lifelong learning:-**

**Self-efficacy:** Self-efficacy (Bandura, 1986), is an enduring concept in human behaviour research, particularly in relation to learning (Pajares, 1997). It represents a person's beliefs and judgements about his/her ability to accomplish a task or succeed in some endeavour, and these beliefs can determine how people feel, think, motivate themselves and behave. The relationship between self-efficacy and learning is strong, and can be influential in different ways (Pajares, 2002) including the choices students make, the effort expended on a learning activity, perseverance and resilience, and the degree of stress and anxiety experienced whilst engaged in learning. Studies have found that self-efficacy is significantly related to personal goals and performance (Mone, 1994), as well as cognitive strategy (Pintrich and DeGoot, 1990) use in the organisation. Firmin and Miller (2005) argue that lifelong learners are motivated to learn through a positive attitude, confidence in themselves and the ability to manage negative feelings effectively. Therefore, individuals with high self-efficacy are more likely to be engaged in lifelong learning (Bath & Smith, 2009).

**Change Readiness:-**

The concept of 'change readiness' has traditionally been examined in relation to psychotherapy and health behaviour concerns such as addiction and obesity (Prochaska, Redding and Evers, 1997), and also within the organisational context, examining workers adaptability, motivation, or willingness to change (e.g., Ingersoll et al. 2000). It is through the relationship to organisational research that change readiness has also been explored in relation to adult learning (Rogers, 1995; Cervero, 1985).

**Openness to experience:-**

Individuals who show openness to experience are described as '...curious, original, imaginative, creative, and unconventional and have a broad spectrum of interests' (Blickle, 1996, 338). Openness can impact on learners' motivation and engagement as well as their use of strategies and persistence after failure (Blickle, 1996). Also, along with need for achievement, openness to experience has been related to intelligence and creativity in a group of adults

(Harris, 2004), as well as decision-making performance in a changing task context (Lepine, Colquitt and Erez, 2000). Moreover, in terms of lifelong learning, Barrick and Mount (1991) found that of the “Big-5” personality dimensions, openness was consistently related to job performance specifically through training proficiency across a range of occupations including all the professionals (Bath and Smith, 2009). Based on these finding, the sub-hypothesis proposed are:

**H3a:** There is an influence of tacit knowledge sharing on self efficacy.

**H3b:** There is an influence of tacit knowledge sharing on change readiness.

**H3c:** There is an influence of tacit knowledge sharing on openness and experience.

The General Self-Efficacy Scale (Sherer et al. 1982) comprises 3 items containing locus of control, interpersonal competence and self-esteem. The scale was designed to measure generalized feelings of competence rather than being specific to a particular situation/behavior. Goldberg’s International Personality Item Pool (IPIP; 1999) includes an Openness to experience scale that includes emotionality, adventurousness and intellect. The third measure was adapted from Kriegel and Brandt (1996) who developed a measure of change-ready traits in relation to personnel and business management; contains three subscales; resourcefulness, adaptability and confidence. All the responses are made on a 5-point Likert agreement scale (1 = strongly disagree, 5 = strongly agree). The snapshot of all scales with items is mentioned below.

**Table 1.2:-** Items of the lifelong learning scales

<p><b>Self-Efficacy:</b> General Self-Efficacy Scale (Sherer et al. 1982)</p> <ol style="list-style-type: none"> <li>1. <i>Locus of Control:</i> I am a self-reliant person</li> <li>2. <i>Interpersonal Competence:</i> I avoid confrontation with others</li> <li>3. <i>Self-esteem:</i> When I make plans, I am certain I can make them work.</li> </ol>
<p><b>Change Readiness:</b> Kriegel and Brandt (1996)</p> <ol style="list-style-type: none"> <li>1. <i>Resourcefulness:</i> I explore everywhere to find solutions</li> <li>2. <i>Adaptability:</i> I do not give up even if the things are not working out.</li> <li>3. <i>Confidence:</i> I prefer to finish my work before deadline.</li> </ol>
<p><b>Openness to experience:</b> Goldberg’s International Personality Item Pool (IPIP; 1999)</p> <ol style="list-style-type: none"> <li>1. <i>Emotionality:</i> I enjoy examining my feelings about myself and my life.</li> <li>2. <i>Adventurousness:</i> I do not prefer to stick to doing things that I know.</li> <li>3. <i>Intellect:</i> I am interested in theoretical discussions.</li> </ol>

#### **Professionalism and lifelong learning:-**

As discussed in Collins (2009) study, Lifelong learning has emerged as one of the major challenges for the worldwide knowledge society of the future. G7-G8 group of countries named “Lifelong Learning” as a main strategy in the fight against Unemployment. He also discussed that Lifelong learning is now recognized by educators, governing bodies, accreditation organizations, certification boards, employers, third party payers, and the general public as one of the most important competencies that people must possess. Promoting lifelong learning as continuous, collaborative, self-directed, active, broad in domain, everlasting, positive and fulfilling, and applicable to one’s profession as well as all aspects of one’s life has emerged as a major global organizational challenge.

In many cases this learning will also involve knowledge development in the context of professional (or daily) life as new knowledge is needed to deal with innovation and new professionalism will be needed in such an organisation to understand and support new ways of learning and to create new learning environments (Weert, 2006). In other words, the concept of LLL has to enable meaningful education harmonized with one’s professional and personal life. LLL is defined by EU Commission (2002) as all learning activity undertaken throughout life, with the aim of improving knowledge, skills and competence, within a personal, civic, social and/or employment, and related perspectives (Dondi, 2004). Thus, the hypothesis proposed is:

**H4:** There is interrelatedness between professionalism and lifelong learning.

### Conclusion and Future Research:-

Knowledge sharing and personal competencies practices in firms contribute to competitive advantage. The conceptual framework consists of two capable factors and three groups of domain of each factor; professionalism (Professional challenge, professional facilitation and work engagement) and lifelong learning (self-efficacy, change readiness, openness and experience). By proposing a model discussed the influence of tacit knowledge sharing on professionalism and lifelong learning which in turn lead to strong personal motivation, high productivity, competitiveness and organizational success. This study contributes to fill the gap existing in the literature. Therefore, the proposed model might be used as an alternative theoretical model for evaluating the relationship among tacit knowledge sharing, professionalism and lifelong learning in future studies.

A number of issues are open to future research. First, more items should be developed for the personal competencies scale, such that its psychometric properties can be adequately studied. Also, increasing the range of items will probably increase the variance of the scale and thereby enhance its success as a predictor in competition with the other aspects of professionalism and lifelong learning. This study will be followed by an empirical study to test the validity of the model. It is believed that this study will increase the understanding of TKS on professionalism and lifelong learning in accruing personal competencies among employees.

### Limitations:-

This study has limitations. First, Constructs of both professionalism and lifelong learning will vary from individual to individual because of diverse workforce. Second, the credibility of tacit knowledge sharing can't be ascertained every-time as the employees reluctant to share it because they consider it important for themselves (Borges, 2012), as it can help them to remain valuable in the organization (Rehman et. al., 2011). The use of tacit knowledge may present a somewhat larger risk to a professional employee than the act of sharing such knowledge. If a worker chooses to use and apply tacit knowledge provided by another, and the results are not as positive as expected, the recipient may need to present a responsible explanation to organizational management (Holste & Fields, 2010). Third, Implementation of personal competencies is difficult without organizational support.

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### RESEARCH ARTICLE

#### IDEAL WARFARIN DOSE ADJUSTMENT IN CARDIAC PATIENTS FOR SAFETY INR OUTCOME.

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##### Key words:-

Warfarin, PT, INR, RHD.

#### Abstract

**Background:** warfarin is effective for the primary and secondary prevention of both arterial and venous thromboembolic disorders. Its variable dose response and narrow time therapeutic range (TTR) mandate periodic monitoring of the international normalized ratio (INR).

**Aims:** monitoring the dose change of warfarin therapy to adjust the INR in ideal values.

**Patients and methods:** this study included 200 patients (103 males and 97 females) on oral anticoagulant, their age ranged from 17 to 66 years' old, classified into group 1(69) patients suffering from rheumatic heart disease (RHD), group 2(115) patients suffering from valve replacement and group 3(16) patients suffering from other cardiac conditions. They were subjected to full clinical examination and laboratory investigations including prothrombin time (PT), prothrombin concentration (PC) and INR, recording and follow up to the dose of oral anticoagulants, the control group included 28 healthy subjects matched in age and sex.

**Results:** The target warfarin dose was 3-4 mg for RHD and 4-5mg for valve replacement; INR in the RHD versus valve replacement was 2/3 ( $p = 0.001$ ). PT in the RHD versus valve replacement was 16/23 sec. ( $p = <0.001$ ).

**Conclusion:** close monitoring of anticoagulant dose is required by blood testing (INR), during the initial stage of treatment, checking may be required daily.

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#### Introduction:-

Warfarin is effective for the primary and secondary prevention of both arterial and venous thromboembolic disorders. Its variable dose response and narrow therapeutic index mandate periodic monitoring of (INR) . Less frequent INR monitoring may be feasible in stable patients (1). Patients who are well-established on a warfarin regimen there is need for routine monitoring of INR to improve safety outcome, and patient satisfaction, but more frequent INR assessment increase the (TTR)(2). TTR is a well-established surrogate outcome that indirectly correlates with the bleeding risk (3). The interpretation of the relationships between TTR and treatment efficacy is complex. More TTR would be associated with the safety outcome (4). INR values are influenced by various patient-related factors including age, sex, body weight, smoking, diabetes mellitus, liver failure, CHF, pulmonary disease, also concomitant use of other medications, particularly amiodarone (5). Also other patient-related factors, such as

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culture and education, socioeconomic status, healthcare and quality of medical service, all these factors have profound impact on the efficacy of warfarin TTR, and safety of drugs (6). So Hospital/clinic specific policies and protocols, alone can't justify coverage, all mentioned factors must be working in combination (7, 8). The maintenance dose of warfarin can fluctuate significantly depending on the amount of vitamin K in the diet. Keeping vitamin K intake at a stable level can prevent these fluctuations (9). VKORC1 polymorphisms explain 30% of the dose variation between patients (10). Particular mutations make VKORC1 less susceptible to suppression by warfarin (11). Lowdose haplotype group (A) and a high-dose haplotype group (B) (12). For warfarin-managed patients, there are variable wide variations in INR control between countries and sites. This has been answered the questions regarding the relevance of the overall data for individual patients, or different countries, with more refined management systems (13).

Important factors responsible suboptimal use of warfarin especially in patients with AF is due to difficult achieving therapeutic anticoagulation, dietary modifications and the necessity for INR assessment, also warfarin require bridging with parenteral anticoagulants at the start of therapy (14). Bleeding risk for patients taking warfarin who are found to have INR prolongation, reversal can be accomplished with fresh frozen plasma, prothrombin complex concentrate (PCC), and vitamin K (15,16). Moreover, clinical outcome data of bleeding patients on warfarin, suggests indirectly that warfarin reversal may not be clinically beneficial (17). Contraindications of warfarin are pregnancy, fetal warfarin syndrome (FWS), warfarin embryopathy(18).

### **Patients and Methods:-**

**Study design and populations:** this study was conducted on 200 cardiac patients on warfarin therapy, at Internal Medicine Department, Sohag University Hospital, approved by the Ethical Committee of Sohag Faculty of Medicine; a written informed consent was obtained from all subjects. Their age was ranged from 17 to 66 years' old with median age 53 years, 103 males and 97 females. 28 healthy control subjects 17males and 11 females, their age ranged from 15 – 55 years' old with median age 46 year, were included.

#### **Inclusion criteria:-**

The study included 200 patients on warfarin therapy; they were classified into the following groups:

Group 1: Consisted of 69 patients suffering from RHD.

Group 2: Consisted of 115 patients with valve replacement.

Group 3: Consisted of 16 patients suffering from other cardiac conditions requiring oral anticoagulants.

#### **Exclusion criteria:**

Pregnancy, bleeding disorders.

#### **Preparation of samples:-**

4 ml of venous blood was drawn from each patient, 1.8 ml of which was added to trisodium citrate tube provided by B.D, centrifuged at 2500 – 3000G unit for 15 min. at 20°C to prepare platelet poor plasma (P.P.P), subjected to the prothrombin time. The remaining blood was subjected to the routine investigations.

#### **Procedures:-**

##### **Prothrombin time (PT):-**

**Reagents:** Thromborel<sup>®</sup> provided by SIEMENS, Cat. No. 54690523, Siemens Health Care Diagnostic Products GmbH.

Reagent: lyophilized thromboplastin prepared from rabbit cerebral tissues, dissolved in 4ml purified D.W. per vial

**Assay:** The test was performed on fully automated SYSMEX-CA1500 (SYSMEX Corporation, Marburg/Germany), USA distributor.

##### **Quality control:-**

Two different levels of control were used, control N Cat. No. 50771820, and control P Cat. No. 50998227.

##### **Recording the dose of oral anticoagulant:-**

Close monitoring the dose change of oral anticoagulant and recording the corresponding change in the INR. The recording system starting from the initial dose then from (4-5 times) from the 3<sup>rd</sup> day to the 2<sup>nd</sup> week to reach the target INR.

**Statistical analysis:-**

Both excel program of Microsoft Office and Scientific Package of Social Statistics (SPSS) program version 19 were used for a comparative evaluation between tests.

**Results:-**

Closed monitoring to INR was performed on 200 patients on warfarin therapy after a written consent, their age was ranged from 17 to 66 years' old and the median age of 200 cases was 53 years' old. The sex distribution in the study showed that 103 cases were males (51.5%) and 97 (48.5%) were females. The control group consists of 28 subjects, 17 males and 11 females (60.3%, 39.7% respectively), their age was ranged from 15 to 55 years' old; the median age was 46 years' old, they were clinically and laboratory healthy. Demographic data were present in table -1. **Diagnosis** of these patients were 69 cases RHD (34.5%), 115 patients with valve replacement classified as follow; 28 cases aortic valve replacement (14%), another 36 with aortic and mitral valve replacement (18%), the last 48 cases within this group with mitral valve replacement (24%), and the rest of other diagnoses were dilated cardiomyopathy, congestive heart failure (CHF), atrial fibrillation (AF) and DVT; all constitutes (8%) referred as other cardiac condition, as in table - 2. The target **dose** of warfarin was 3.8 mg in RHD and 4.7mg in valve replacement patients; with ( $p = 0.01$ ) was significant; as in table -3. The dose within patients with RHD and patients with other cardiac diseases were nearly the same dose so the  $p$ -value was (0.77) non-significant as in Fig -1. As regard **INR** in the RHD patients versus valve replacement patients; we noticed that the target INR of RHD patients was 2.45 and in valve replacement patients was 2.76, the  $p$ -value was (0.01) significant; only non-significant  $p$ -value (0.7) was noticed in the INR of the 1<sup>st</sup> week of therapy as in table- 4. When comparing INR in the valve replacement patients to those with other cardiac condition; the mean of target INR was 2.7 in both groups, ( $p = 0.9$ ) was non-significant. The PC in the RHD patients versus valve replacement patients was 52% and 68%, respectively ( $p = 0.001$ ) as in Fig-2.

**Table 1:-** Demographic data of the studied groups

Item	Rheumatic heart (n =69 )	Valve replacement (n =115 )	Other conditions (n =16 )	p-values
Age in years Range (median) 40 (17 – 66)	41(17 47)	39(28 – 53)	45(38- 63)	0.042 (S)
Male/Female 103/97	34/35	59/56	10/16	0.633 (NS)

**Table (2):-** Clinical diagnosis of 200 patients on warfarin

Item	Frequency	Percent %
1-RHD	69	34.5
2-Valve replacement:		
Aortic Valve Replacement	28	14.0
Mitral Valve Replacement	48	24
Mitral and Aortic Valve Replacement	36	18
Mitral Valve Repair	3	1.5
3-Other Cardiac Condition		
AF	2	1.0
CHF AF	4	2.0
Dilated Cardiomyopathy	4	2.0
DVT	3	1.5
DVT LC	1	0.5
Tight Mitral Stenosis AF	2	1.0
Total	200	100.0

AF atrial fibrillation, CHF congestive heart failure, DVT deep venous thrombosis, LC local complications.

**Table (3):-** Dose in RHD group versus valvreplacement group

Item	Diagnosis	Mean	S.D	T test	P value
Initial Dose mg/day	RHD	2.45	1.13	5.04	<0.001**
	Valve replacement	3.03	0.38		
Frequency	RHD	4.49	1.82	4.59	<0.001**
	Valve replacement	5.68	1.61		
Dose_3d	RHD	2.93	1.43	3.64	<0.001**
	Valve replacement	3.60	1.03		
Dose_1W	RHD	3.56	2.35	2.06	0.040*
	Valve replacement	4.30	2.10		
Dose_2W	RHD	3.80	2.49	2.63	0.009**
	Valve replacement	4.75	2.29		
Target dose	RHD	3.80	2.46	2.58	0.010*
	Valve replacement	4.73	2.30		

RHD rheumatic heart disease, 3d third day, 1W first week, 2W second week

\* Significant p-value <0.5, \*\* highly significant p-value <0.01

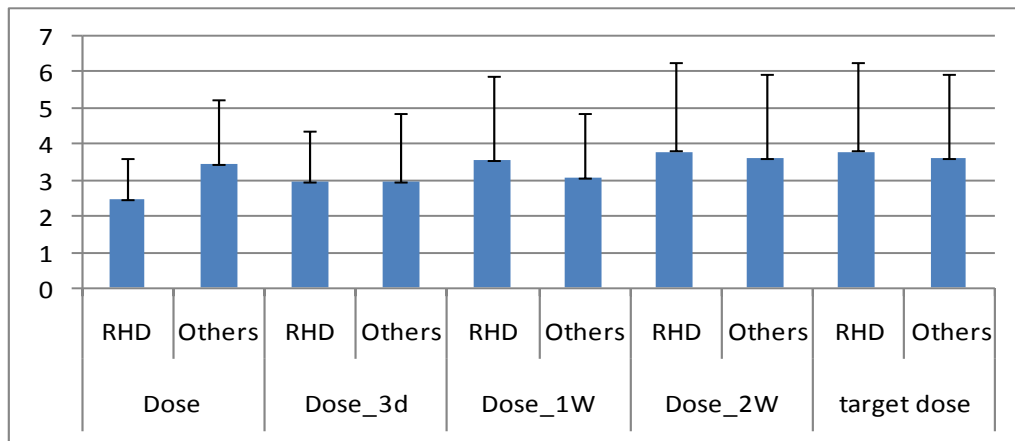
**Table (4):-** INR in RHD group versus valve replacement group

	Diagnosis	Mean	S.D	T test	P value
First INR	RHD	2.11	1.35	3.418	0.001**
	Valve replacement	1.61	0.578		
Frequency	RHD	4.49	1.82	4.595	<0.001**
	Valve replacement	5.68	1.61		
INR_3d	RHD	2.36	1.56	3.268	0.001**
	Valve replacement	1.82	0.620		
INR_1W	RHD	3.05	0.924	0.084	0.933 N
	Valve replacement	3.16	0.39		
INR_2W	RHD	2.44	0.65	3.777	0.01*
	Valve replacement	2.76	0.49		
Target INR	RHD	2.45	0.63	3.722	0.01*
	Valve replacement	2.76	0.49		

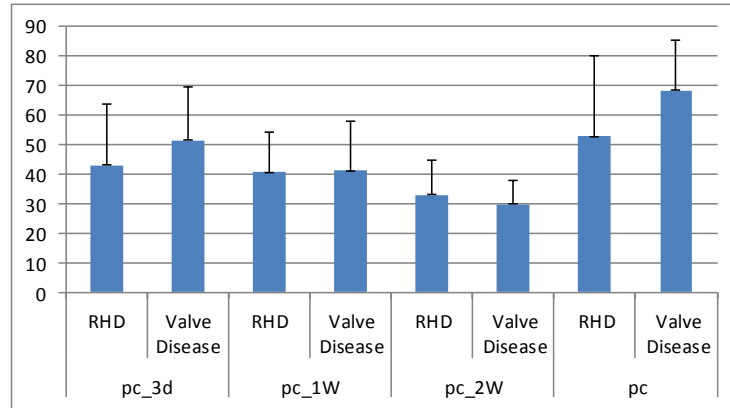
INR international normalized ratio, RHD rheumatic heart disease, 3d third day,

1W first week, 2W second week, \* Significant p-value <0.5, \*\*highly significant

P-value<0.01, N Non significant p-value >0.5



**Fig. (1):-** Dose in RHD group versus other cardiac conditions group



**Fig. (2):** PC in RHD group versus valve replacement group

### Discussion:-

Warfarin is used to decrease the tendency for thrombosis or prophylaxis of further episodes in those individuals who have already had thrombus and help to reduce the risk of embolism (19). Dosing of warfarin is complicated by the fact that it is known to interact with many commonly used medications and even with chemicals that may be present in certain foods (2, 3, 20, 21, 22). These interactions may enhance or reduce its anticoagulation effect. In order to optimize the therapeutic effect without risk of bleeding, close monitoring of the degree of anticoagulation is mandated by measurement (INR) (4). In the present study PT, PC and INR were obtained from 200 patients with RHD, valve replacement and other cardiac conditions that required oral anticoagulants. The target dose of warfarin in RHD patients was about 3-4 mg but in patients with valve replacement; it was about 4-5mg and in those with other cardiac diseases it did not exceed 3mg, we followed up these patients daily from 4 to 6 times to get the target dose after two weeks, the dose in the RHD patients and in those with other cardiac conditions was nearly the same dose, this is in accordance with Hirsh et al, (2007) and Ratib et al, (2016) who had reported that during the initial stage of treatment, checking may be required daily; intervals between tests can be lengthened if the patient manages stable therapeutic INR levels on an unchanged warfarin dose. In healthy people, the INR is about 1.0. For patients on anticoagulants, the INR typically should be between 2.0 and 3.0 for patients with atrial fibrillation, or between 3.0 and 4.0 for patients with mechanical heart valves. However, the ideal INR must be individualized for each patient (23, 13). Although multiple studies by Streiff et al, (2013) had addressed the optimal testing frequency, current guidelines suggest a time interval not exceeding 4 weeks between INR determinations (6). In the current study the target INR of both RHD and valve replacement patients were ranged from 2 to 3, INR in patients with other cardiac disease was ranged from 2-4. The INR in RHD patients versus patients with other cardiac condition was nearly the same 2-3. This is in agreement with study was performed by Schafer et al (2007) and American Heart Association, (2014), who reported that; the target INR ranges of 2.0 to 3.0 or 2.5 to 3.5 have been recommended for most indications because INR values in these ranges are associated with the best combination of thrombosis reduction and bleeding avoidance (1, 5); it also agrees with Majeed et al, (2013) who stated that for patients on anticoagulants, the INR typically should be between 2.0 and 3.0 for patients with RHD; or between 3.0 and 4.0 for patients with AF; for patients on warfarin therapy, an INR recall interval not exceeding 4 weeks has traditionally been recommended; less frequent INR monitoring may be feasible in stable patients (14). In the current study, PC of patients with RHD was about 68% and in patients with valve replacement was about 52%, so warfarin therapy is complicated by a narrow TTR and substantial interpatient variability in dose response as reported by Piccini et al, (2014); if the INR values were not within the target range, anticoagulation service asked and recorded the most appropriate reasons (4). Random variation of INR values may occur in a patient on stable oral anticoagulant dosage, as a result of both biological and analytic variation. These data has been used to evaluate whether a change in the INR represents clinically insignificant random variation, or a clinically relevant change requiring warfarin dose adjustment. It has been calculated that in a patient on fixed dose and steady state warfarin, a change in the INR is significant only if it is greater than 0.28 times the previous INR value (3, 13, and 24).

**In conclusion** careful monitoring the dose response to anticoagulant therapy is mandatory to reach the best value of INR and prevent serious complication of over dose.

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**RESEARCH ARTICLE**

**Ocular Manifestations of Stevens-Johnson Syndrome**

**Kawthar Mohammed Alshammari, Jluwi Al masaud, Hasna Alghubaini, Reem Alshammari and Sarah Alrashidi.**

**Manuscript Info**

**Abstract**

**Manuscript History**

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**Introduction:-**

Stevens-Johnson syndrome (SJS) is a mucocutaneous reactions, most commonly triggered by medications, characterized by extensive necrosis and detachment of the epidermis.

Fever, often exceeding 39°C (102.2°F), influenza-like symptoms precede by one to three days the development of mucocutaneous lesions [70]. Photophobia, itching or burning conjunctiva and pain on swallowing may be early symptoms of mucosal involvement. Malaise, myalgia, and arthralgia are present in most patients.

Ocular involvement is reported in approximately 80 percent of patients. The most common change in the eyes is a severe conjunctivitis with a purulent discharge, but bullae may develop. Corneal ulceration is frequent, anterior uveitis or panophthalmitis may occur. Pain and photophobia are accompanying symptoms. The eye changes often regress completely, but scarring with the development of synechiae between the eyelids and conjunctiva may be late sequelae [80,81].

**Case Report:-**

46 years old female patient came with sever eye dryness and epithelial defect . She had a history of knee pain 1 month and 20 days back for which she was treated with intramuscular voltaren in emergency department. She developed erythematous papular eruptions on the trunk, mouth, and limbs along with pain, redness, and watering from both eyes followed by gross diminution of vision and inability to open her eyes. She was subsequently admitted at the king Khalid hospital and diagnosed with Stevens-Johnson syndrome by dermatologist . The erythematous lesions resolved completely at 4 weeks with medications, but she was unable to open her eyes and she was referred to us for further evaluation and management .

**Ophthalmic Examination At the time of presentation:-**

**Visual acuity:-** 20/400 OU  
 With full EOM

**Eye lids and conjunctiva:-** congested, red conjunctiva, mucopurulent discharge with membrane formation in superior and inferior fornix of conjunctiva .

**Intraocular pressure ( IOP):-** 16 mm of Hg OU.

**Slit lamp:-** low tear meniscus, tear break-up time more than 10 s

**Cornea:-** sever dryness with epithelial defect OU

**AC:-** Deep and quit OU

**Iris:-** Normal OU

**Pupil:-** Equal round reactive to light

**Lens:-** Early posterior sub-capsular cataract OU

B-scan ultrasonography (USG) : acoustically clear vitreous, normal chorioretinal thickness, and normal optic nerve head with an attached retina.

Routine blood examination, blood glucose levels were within normal limits.

The patient was treated for ocular condition with frequent debridement of pseudomembran in superior and inferior fornix to prevent symblepharon formation. At that time we do not have amniotic membrane, although we prescribed for her predforte eye drop for ten days, then optilon eye drop for two weeks, frequent lubrication with artificial tears and punctual plugs.

#### **Outcome and Follow-up:-**

Best corrected visual acuity improved to 20/50 OU. The corneal epithelial defect healed, conjunctival pseudomembran regressed and improvement of the tear film. The patient follow up in ophthalmology clinic at king Khalid hospital with next appointment on fifteen of February 2017.

#### **Discussion:-**

This is the first case report in Hail, Saudi Arabia and there is Very little data is available on the prevalence of Ocular complications of Stevens-Johnson syndrome in general.

patients of SJS are treated by dermatologist in early phases and later referred to an eye care center. Patients often consult an ophthalmologist with severe ocular sequelae only after the resolution of skin lesions, as in our case. It obviously becomes challenging to diagnose and treat this disease .

Management is often effective . It involves keeping the eye moist and preserving the patient's own tears, as well as treating the underlying cause when found.

The selection of treatment modalities for patient with dry eye depends on the severity of their disease . Frequent use of lubricating eye drops and ointments. Punctual plugs always an option in treating dry eye.

#### **Conclusion:-**

In conclusion, a high index of suspicion and combined efforts from dermatologists and ophthalmologists with early treatment is important to improve prognosis and salvage the eye.

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### RESEARCH ARTICLE

#### **DHAM (TRADITIONAL FEAST OF MANDI IN HIMACHAL PRADESH) A COMPLETE FOOD WITH AYURVEDA PERSPECTIVE.**

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Ahara, Ayurveda, Dham, Himachal Pradesh, Mandi, Proper Diet

#### **Abstract**

In Ayurveda, *Ahara* (food) is considered as one of a major tripod of life. As per Ayurveda a good diet consist of all six *rasa* and are taken in proper sequence of *Madhura* followed by *Amla*, *Lavana*, *Katu*, *Tikta* and *Kashaya*. *Dhamis* a popular traditional feast of Himachal Pradesh (H.P.), which is a good example of complete food as per Ayurveda having all six *rasa* and is served in proper sequence. The dish composed of a sweet (*boondikameetha*) followed by *SepuBadi*, *kaddukakhatta*, *kolkakhatta*, *mahkidaal* and in the end of diet *jhol*. Served in *pattal* (plates made of leaves of *Taur -bauhinia vahli*) which have good antioxidant properties. The preservation method used in the region of ingredients of *dham* is also traditional as no chemical is used. All these make up *dhama* complete diet in terms of Ayurveda and also in terms of nutrition. Present study deals with various Ayurveda and scientific aspects of *dham* and its importance.

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#### **Introduction:-**

Food (*Ahara*) is one of the tripods of life as per Ayurvedic classics<sup>i</sup>. Among the three *Upasthambha*, *Ahara* is considered as the best sustainer of life (*Vrittikaranam Sreshtam*)<sup>ii</sup>. Region wise food habits changes, which is important as per the climate and conditions prevailing in the region. But in present era with fast changing food habits and more and more use of canned food, chemical preservatives and junk foods, health is getting compromised. In order to preserve the health, food serves an important factor which must be given due importance. Ayurveda has incorporated various explanations regarding this vital pillar of life. This includes the classification of foods according to the geographical area and also with respect to the bodily *Tri-Dosha* and *Satvikadiguna*, different processing methods of food, importance and role of food on the body and mind, wholesome and unwholesome diets and the pattern of metabolism.

Himachal is a culture in terms of various nutritious traditional food, playing a role in everyday life as well as in festivals. In many families, everyday meals are sit-down affairs consisting of two to three main course dishes, carbohydrate staples such as Rice, varied protein and micronutrient rich accompaniments such as pulses and vegetables, as well as sweets. The people of H.P. have developed traditional food processing technologies for preparing the foods from locally available substrates largely governed by the ethnic preference, agro climatic

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conditions, sociocultural ethos and religion. However, there may be local variation from region to region. A number of traditional foods are prepared and consumed by people in Himachal Pradesh for centuries, and these form a part of sociocultural life of the hill people<sup>iii-iv</sup>.

#### **Aim of study:-**

This review aims at scanning the scattered literature on proper diet in accordance with Ayurveda with special reference to a traditional food called as *Dham* of Mandi, H.P.

#### **Method:-**

Classical texts of Ayurveda as well as PUBMED, MEDLINE database and relevant journals were used for the search of relevant literature and research papers. Papers published between Jan 1960 to Jan 2017 were only considered. The key words used for the search was 'Ayurveda', '*Shad Rasa*' '*Ahara*' 'Traditional food' and '*Dham*' etc. information from conversation from local inhabitant of Mandi were also included in the review to search out and understand proper tradition of preparing, preserving and serving of *Dham*. Only research articles published in English language were considered.

#### ***Dham* (Traditional feast of H.P.):-**

In H. P. during functions and marriages, traditional community meal is prepared which is called *Dham*. *Dham* is a traditional festive meal, cooked only by *botis* (a particular caste of Brahmins who are hereditary chefs). Preparations for this elaborate mid-day meal begin a night before. Food is cooked in big brass utensils or mud pots and everyone sits on the ground in rows to have food<sup>v</sup>. In the present study *Dham* specifically of Mandi is being discussed.

As Sushrut explain the proper sequence of having meals and have mention that a proper diet should include all six *rasa*. In the beginning of food Sweet – *Madhura* dominant food should be taken then in the middle Sour – *Amla* and Salty – *Lavana* dominant food and toward the end of food Pungent – *Katu*, Bitter – *Tikta*, and Astringent – *Kashaya rasa* dominant diet should be taken<sup>vi</sup>.

*Dham* prepared in the traditional way is an example of *shadrasa ahara* (food with all six *rasa*) which is considered as a complete food as per Ayurveda and also served in the proper sequence of *rasa*.

The starters begins with *madhur rasa* (sweet dish), *Boondika Meetha* (prepared from chickpea flour) dipped in sweet syrup along with dry fruits).

The next item comes *Sepu Badi*, It is prepared from fresh spinach leaves and *badi*. *Badi* constitute of *Masha* (black lentil) and *Chana* (Bengal gram) deeply fried with the gravy of coriander and spinach leaves giving it a *Madhura-Amla rasa* (Sweet- Sour).

Then comes *Amla- lavana Rasa* (Sour- Salty) *Kadukakhata* Prepared from pumpkins and giving the dish a blend of sweet and sour taste.

Then comes *kolkakhata* (*makushtabheda -Vigna conitifolia*). Prepared from the pulse commonly known *askol*. It is sour and brings a grimace on face. Added with *Rai powder* it is *Katurasa* (pungent taste) dominant.

Then comes *Mahkidaal* that is *masha* (black lentils) the pulse is prepared with Fennel seeds, two three bay leaves, Green Cardamoms, Black Cardamoms, small stick of Cinnamon, Cloves, Coriander seeds, Bay leaves, Curd, Spinach, pinch of Asafetida, red chili powder, coriander powder and turmeric powder making it a *tiktapradran* (Bitter dominant) dish.

At last *Jhol* which is *iskashay rasa* (Astringent) dominant is regular prepared item in house of every *Mandyali* (native people of Mandi), prepared from curd and water in mud pot. In the local terms it is said “the food wouldn't digest until a glass of *Jhol* is not drunk” goes in accordance with Ayurveda. Its *rukhsaguna* which may help in cleansing of esophagus and gut from *Ghrita* rich food. Moreover as it is made up *takra* (butter milk) as its main ingredient hence it serves as a great *Pachana* (Digestive)<sup>vii</sup> especially of ghee & oil<sup>viii</sup>.

**Eating and Serving Styles:-**

Eating with your hands is considered important in Indian etiquette because a person eating with his hands knows the exact temperature of food before the morsel hits his mouth thus preventing blisters in mouth due to consumption of hot food<sup>ix</sup>. In H.P. specifically in Mandi region, a cleaned *Taur – bauhinia vahli* leaves are most commonly used<sup>x</sup> as a hygienic and visually interesting alternative to plates. The leaves have health benefits too in terms of antimicrobial effect and antioxidant properties<sup>xi</sup>. In addition the plant leaves are completely biodegradable. It also provide job and income to less privileged rural people thus forming one of the important part of rural economy in H.P.<sup>xii</sup>

**Nutritional and medicinal value:-**

Black gram (*Masha - Vigna mungo*) content of *sepubadi* and *mahki dal* is *Snigdha* (unctuous), *Balya* (increases strength), increases *Kapha* and *Pitta*, *Malakara* (increases bulk of faeces), *Sara* (laxative), *Guru* (not easily digestible), *Ushna* (hot in potency), *Vatahara* (mitigate Vata), *Madhura* (sweet in taste), and *ShukraVridhdhikara* (aphrodisiac properties)<sup>xiii</sup>. Black gram is very nutritious as it contains high levels of protein (25g/100g), potassium (983 mg/100g), calcium (138 mg/100g), iron (7.57 mg/100g), niacin (1.447 mg/100g), Thiamine (0.273 mg/100g), and riboflavin (0.254 mg/100g).<sup>xiv</sup> Black gram complements the essential amino acids provided in most cereals and plays an important role in the diets of the people of Nepal and north India.<sup>xv</sup> Black gram has been shown to be useful in mitigating elevated cholesterol levels<sup>xvi-xvii</sup>.

Bengal gram also called as chickpea (*chana dal- Cicer arietinum*) content of sweet and *sepubadi* is useful in throat problems, blood disorders, bronchitis, skin diseases and liver or gall bladder related problems [biliousness]<sup>xviii</sup>. In addition to these applications, the chickpea seeds are also used for blood enrichment, treating skin ailments, ear infections, and liver and spleen disorders<sup>xix</sup>. It is rich in nutritionally important unsaturated fatty acids like linoleic and oleic acid.  $\beta$ -sitosterol, campesterol and stigmasterol are important sterols present in chickpea oil. Calcium, magnesium, phosphorus and especially potassium are also present in chickpea seeds. It is a good source of important vitamins such as riboflavin, niacin, thiamine, folate and the vitamin A precursor,  $\beta$ -carotene<sup>xx</sup>.

*Kolki dal (Vigna conitifolia)*: It is quite different from *Mothki dal* described in Ayurved as it is bigger than original *moth*, and both are available in this region though as per botanical classification the latin name of both these pulses are same but as per locals both type of pulses are available in Mandi region the one commonly known as *moth dal* and the other which is used in *Dham* called as *kolki dal*. *Vigna conitifolia* is rich in (values per 100 gm) calcium 150mg, iron 10.8 mg, magnesium 381 mg, manganese 1.8 mg, phosphorus 489 mg, potassium 1191 mg, sodium 30 mg and zinc 1.9 mg along with thiamine, riboflavin, niacin, panthothenic acid, folate and Vitamin C. Among macronutrients it contains 343 calories, 23 g of protein, 62 g of carbohydrate and 1.6 g of fat<sup>xxi</sup>.

*Jhol* (spiced butter milk): buttermilk is a rich source of Vitamin B12, calcium, Riboflavin and probiotics which help strengthen the digestive system and the immunity of the body. *Takra* (Buttermilk) is very useful in the diseases associated with the *Agni Vikriti*. By means of its Properties it acts as *Tridoshaghana* (Vitiates all three *dosh* of body)<sup>xxii</sup>.

The utensils used for cooking sweet is iron vessels which gives extra benefit of iron, moreover loss of nutrients in iron vessels, brass vessels and mud pot cooking (used for making other dishes of *dham* other than the sweet) are also very less as compared to aluminum and cooker cooking of food.

**Seasonal consideration:-**

During winter season due to the contact with cold wind, the digestive power of healthy people get increased and capable of digesting any heavy food.<sup>xxiii</sup> In cold season *snigdha* and *ushna* food is indicated, hence *masha* (black gram) and *Ghrta* dominant diet is a good and nutritious food in this region<sup>xxiv</sup>. Hence *Dham* is a good food especially for cold hill region of Himachal. Moreover cooking it with plenty of spices and use of *jholat* the end of food also helps in proper digestion of the dish.

**Influence of Mana (Mental Factors) on Digestion:-**

Acharya Charaka mentioned the influence of negative emotions on the digestion of food<sup>xxv</sup>. Healthy and wholesome food if taken even in proper quantity do not get properly digested when the individual is afflicted with grief, fear, anger, sorrow, excessive sleep and excessive vigil. This is also considered in having *Dham* it is served in festive mood, where all people gather and have this dish together sitting on ground with the feeling of equality and happiness.

**Natural Preservation:-**

Rice being the main food is generally preserved by drying in sun<sup>xxvi</sup> and instead of using sodium benzoate (preservative), they use more *rai* which acts as a natural preservative owing to its good antimicrobial activity<sup>xxvii</sup>. And they also have unique way for preserving raw pulses for longer periods, in which they rub the pulses with mustard oil which protects it from pests and fungus. And they also treat the utensils in which these are kept, with smoke of red '*mirchi*' (chili). It helps in longer preservation<sup>xxviii</sup>.

**Conclusion:-**

India is a rich culture. Many of the Traditional practices, food habits have a scientific basis, though with course of time many wrong practice may have prevailed, but some practices like the food habits of different region have been studied from time to time and have been found to have better nutritional value and found in accordance with Ayurveda. One such dish popular in Mandi H.P. known as *dham* have been reviewed and found to follow the definition of proper diet as described in Ayurveda. Hence it can be concluded from the present study that such traditional food should be conserved and be made popular so the people may understand the importance of traditional food, and the method of traditional preservation and sequence of serving should be conserved which is getting changed with time as it may prove detrimental to the benefits which traditionally made and served *dham* may provide. As popularly said in Ayurveda: If one eats *pathya* (Proper food) then there is no need of medicine and if one don't eat *pathya* (takes improper diet) still there will be no need of medicine<sup>xxix</sup>.

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### RESEARCH ARTICLE

#### FLOU IMAGES DECOLORATION VIA DEEP LEARNING.

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##### Key words:-

Deblur, Blur, DNN, and GRNN.

#### Abstract

Image blur kernel calculation is critical to deblur a blind image. Many existing approaches describes blur features that are used only for identifying common blur across the images, which is impractical in real blind images because blur type is unknown. To avoid this problem, we have to identify the blur type for input image patch, and then the kernel parameter of the image This calculation can be done with the help of deep learning based pre-training method i.e., Deep neural network (DNN) which is used to find the blur type and a general regression neural network (GRNN), which is used to calculate its parameter. This method is very useful and easy to identify the different blur type in a mixed input of image blemish which contains various blurs and its parameters. The result of above method is more effectiveness and better compared to the Berkeley segmentation data set and the Pascal VOC 2007 data set.

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#### Introduction:-

Images are used in many everyday applications such as photography, monitoring, medical imaging, astronomy, microscopy, and remote sensing. Digital images are made up of picture elements or pixels which are represented in the form of the grid. Each pixel contains an intensity value which determines the tone of the image. Sometimes, the captured images may be more or less blurry. Taking photos under dim lighting using a hand- camera is very typically today. There are many factors that cause blur such as motion during the capture process, long disclosure times, wide angle lens, camera shake, etc. , There are three ways to increase the brightness of the images reduce the speed of the shutter, use of large aperture, setting a high ISO. despite that, we require two images. We have found that the motion between two blurred/noisy images, when taken in a quick succession, is mainly a translation. This is significant because the kernel estimation is independent of the translation, which only results in an offset of the kernel. The analysis is done on the basis of performance, types of blur and PSNR (Peak Signal to Noise Ratio). A template-based method for estimating the blur type and its parameter is proposed which can identify by laplacian. Nowadays, image deblurring and restoration became an important subfield of digital image processing. Image deblurring is used to make images sharp and useful. The application of image processing is: recovering valuable photograph, watching distant star fields through a ground based telescope, watching space vehicle and satellite, radar imaging, tomography and medical imaging, microscopy, iris recognition.

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**Blurring and its type:-**

Blurring refers to unsharp image areas that are formed or caused by movement of subject or camera, else caused by incorrect or selective focusing. Factors that cause blur in images are motion, defocus, capturing light over the non-zero area of the aperture and pixel, the presence of antialiasing filters on the camera sensor, limited sensor resolution. The different type of blur is box blur, Gaussian blur, alpha channels, motion blur, spin and motion blur, faster motion blur, domain shifting, blurring by Fourier transform, threshold blur, variable blur.

**Deblurring:-**

It removes the blurring artifacts of images such as blur caused by defocusing aberration or motion blur. There are many deblurring techniques used to sharpen images some of them are general linear model, singular value decomposition, Richardson-Lucy deconvolution approach, neural network approach, iterative method, wiener filtering, blind deconvolution approach, sparse representation.

**Related work:-**

In 2015, K. Gu, G. Zhai, X. Yang, and W. Zhang has proposed a paper titled USING FREE ENERGY PRINCIPLE FOR BLIND IMAGE QUALITY ASSESSMENT. Here the components utilized can be partitioned into three gatherings. The main includes the elements propelled by the free vitality rule and the basic debasement display. After component extraction, our calculation uses the bolster vector machine based relapse module to infer the general quality score. Very recently, the topic of noise estimation has obtained intensive researches. One type of methods is scale invariant based noise estimator (SINE) and its variant, which suppose That the kurtosis values tend to be invariant across scales for a natural image and this scale invariance will be deteriorated by the added noise. However, RR IQA still requires unique data by and by, prompting to its contrariness with most existing picture/video handling frameworks that don't allow additional RR data. It is regular that there exists a hole between the genuine scene and the mind's forecast, in that the generative model can't be widespread.

In 2015, Libin Sun, Sunghyun Cho, Jue Wang, James Hays, title EDGE-BASED BLUR KERNEL ESTIMATION USING PATCH PRIORS has proposed To pick legitimate fix priors we look at both measurable priors gained from a characteristic picture dataset and a straightforward fix earlier from engineered structures. In view of the fix priors, we iteratively recoup the halfway inactive picture  $x$  and the obscure piece  $k$ . A complete assessment demonstrates that our approach accomplishes cutting edge comes about for consistently obscured pictures. In this paper, we propose another edge-construct approach utilizing patch priors with respect to edges of the insert picture  $x$ . Patches can display picture structures superior to channel reactions. In our approach, we gauge a "trusted" subset of  $x$  by forcing patch priors particularly custom-made towards demonstrating the presence of picture edge and corner primitives.

In 2015, Wufeng Xue, Lei Zhang, Xuanqin Mou and Alan C. Bovik, GRADIENT MAGNITUDE SIMILARITY DEVIATION: A HIGHLY EFFICIENT PERCEPTUAL IMAGE QUALITY INDEX has proposed to The photo edges are sensitive to picture twistings, while assorted adjacent structures in a mangled picture persevere through unmistakable degrees of corruptions. This goads us to explore the usage of the overall assortment of slant based neighborhood quality guide for general picture quality conjecture. We find that the pixel-wise inclination greatness comparability (GMS) between the reference and mutilated pictures consolidated with a novel pooling procedure—the standard deviation of the GMS guide—can foresee precisely perceptual picture quality. The subsequent GMSD calculation is much speedier than best in class IQA strategies and conveys profoundly focused expectation precision.

In 2015, K. Gu, G. Zhai, W. Lin, X. Yang, and W. Zhang has proposed the paper titled NO REFERENCE IMAGE SHARPNESS ASSESSMENT IN AUTOGRESSIVE PARAMETER SPACE. In this paper, the author proposed means of the examination of AR model parameters, first figuring the vitality and complexity contrasts. In the privately assessed AR coefficients in a pointwise way, and after that evaluating the picture sharpness with percentile pooling to anticipate the general score. We sensibly assume that the balance increments with the distinction of AR parameters. In this way, a 3D sharpness measure can be built up utilizing the weighted aggregate of vitality and complexity contrasts to weight the ARISM demonstrate. It is regular that there dependably exists a hole between the genuine outside scene and the cerebrum's expectation. For the reason that the inner generative model can't be widespread all over.

In 2014, W. Xue, L. Zhang, X. Mou, and A. Bovik, GRADIENT MAGNITUDE SIMILARITY DEVIATION: A HIGHLY EFFICIENT PERCEPTUAL IMAGE QUALITY INDEX has proposed a system that is a critical undertaking to loyally assess the perceptual nature of yield pictures in numerous applications, for example, picture pressure, picture reclamation, and sight and sound gushing. A decent picture quality evaluation (IQA) model ought to convey amazing expectation precision, as well as be computationally productive. The proposed GMSD is much

speedier than most cutting edge FR-IQA techniques; however, supplies shockingly focused quality forecast execution. In the proposed GMSD demonstrate, the pixel-wise similitude between the inclination extent maps of reference and contorted pictures is registered as the LQM of the bent picture. The normal pooling system overlooks this reality and it can't reflect how the nearby quality corruption fluctuates. Utilizing picture inclination to plan IQA models is not new. The picture slope is a prominent element in IQA since it can successfully catch picture neighborhood structures, to which the HVS is very touchy.

In 2013, L. Sun, S. Cho, J. Wang, and J. Hays, EDGE-BASED BLUR KERNEL ESTIMATION USING PATCH PRIORS has proposed to pick appropriate fix priors we look at both measurable priors gained from a characteristic picture dataset and a straightforward fix earlier from manufactured structures. A complete assessment demonstrates that our approach accomplishes best in class comes about for consistently obscured pictures. The test comes about demonstrate that, shockingly, the straightforward manufactured fix earlier can produce a similar quality or far better outcomes than the educated factual earlier. Then again, the littlest groups catch complex surfaces and uproarious structures, and the fix a test inside these bunches can be essentially unique in relation to each other. This earlier can't be excessively expressive, i.e., it ought not to be permitted to express high recurrence surfaces or progressive changes in picture angles. It will begin to suit obscure and clamor in the inert picture, henceforth losing its energy to re-establish sharpness.

In 2013, Wei Hu, Jianru Xue, and Nanning Zheng has proposed the paper titled PSF ESTIMATION VIA GRADIENT DOMAIN CORRELATION. This paper describes an In view of the way that the angles of clean characteristic pictures are roughly uncorrelated to each other, we assessed the autocorrelation capacity of the PSF from the covariance framework of inclination area obscured picture utilizing the proposed fix based picture corruption demonstrate. The PSF is processed utilizing a stage recovery strategy to evacuate the vagueness presented by the nonappearance of the stage. Exploratory outcomes demonstrate that the proposed technique fundamentally lessens the computational weight in PSF estimation, contrasted and existing strategies while giving the practically identical obscuring piece. The watched obscured picture gives just a halfway imperative on the arrangement as there are numerous mixes of PSFs and "sharp" pictures that can be convolved to coordinate the watched obscured picture.

In 2012, A. Liu, W. Lin, and M. Narwaria has proposed the paper titled IMAGE QUALITY ASSESSMENT BASED ON GRADIENT SIMILARITY. This paper describes a Slopes pass on imperative visual data and is critical to scene understanding. Utilizing such data, basic and differentiation changes can be successfully caught. The MAD proposed in yields two quality scores, in particular, perceivability weighted blunder and the distinctions in log-Gabor sub-bands measurements. The two scores are then adaptively joined to get the last quality score. The DMOS estimation of the rest of the pictures can't be "accurately" anticipated from the IQA plot. In any case, can't represent the luminance change/twisting since it utilizes just the slope data as the information and the angle data is not influenced by the noncontract/structure changes.

In 2011, Daniel Zoran, Yair Weiss proposed the paper titled FROM LEARNING MODELS OF NATURAL IMAGE PATCHES TO WHOLE IMAGE RESTORATION. In this paper, we analyze the probability of a few fix models and demonstrate that priors that give high probability to information perform better in fix reclamation. Inspired by this outcome, we propose a bland structure which takes into consideration entire picture reclamation utilizing any fix based earlier for which a MAP (or surmised MAP) gauge can be ascertained. We demonstrate to determine a fitting cost work, how to improve it and how to utilize it to reestablish entire pictures. At last, we exhibit a nonexclusive, shockingly straightforward Gaussian Mixture earlier, gained from an arrangement of common pictures.

In 2011, Alexandre Ciancio, André Luiz N. Targino da Costa, Eduardo A. B. da Silva, Amir Said, Ramin Samadani and Pere Obrador has proposed a paper titled NO-REFERENCE BLUR ASSESSMENT OF DIGITAL PICTURES BASED ON MULTIFEATURE CLASSIFIERS. We begin with the era of a vast genuine picture database containing pictures taken by human clients in an assortment of circumstances, and the conduction of subjective tests to create the ground truth related to those pictures. We test this worldview by outlining a no-reference quality appraisal calculation for obscured pictures which consolidates diverse measurements in a classifier based upon a neural system structure. Exploratory outcomes demonstrate that this prompts to an enhanced execution that better mirrors the pictures' ground truth. At long last, based upon the genuine picture database, we demonstrate that the proposed strategy likewise beats different calculations and measurements in practical obscure situations.

In 2011, the authors **have** proposed the paper titled BLUR KERNEL ESTIMATION USING THE RADON TRANSFORMS. This proposed system works based Camera shake is a typical wellspring of debasement in photos. Re-establishing obscured pictures is testing in light of the fact that both the obscure piece and the sharp picture are obscure, which makes this issue extremely under compelled. Intuitively, different orientations are affected differently by blur, and the set of different edge profiles can be seen as a "signature" of the kernel. Formally, we show that we can recover the Radon transform of the kernel from the blurred edges. These methods tackle a vast arrangement of conditions to locate the sharp picture as well as the obscure piece that recreate the perception while adjusting. To an earlier information about obscure and characteristic pictures, something which is tedious and doesn't generally succeed. We present another probability term that portrays 2D obscure bits by their Radon change.

In 2011, Mariana S. C. Almeida and Luís B. Almeida has proposed the paper titled BLIND AND SEMI-BLIND DEBLURRING OF NATURA IMAGES. This paper describes an A strategy for visually impaired picture deblurring is displayed. The technique just makes feeble suppositions about the obscuring channel and can fix a wide assortment of obscuring corruptions. To conquer the evil posedness of the visually impaired picture deblurring issue, the strategy incorporates a learning system which at first spotlights on the principle edges of the picture and bit by bit considers. The utilization of compelled obscure models proper to the current issue, as well as of various situations, for the most part, enhances the deblurring comes about. In examinations with other best in class techniques, our strategy yields better outcomes and shows to be relevant to a much more extensive scope of hazy spots.

In 2011, the authors Anat Levin, Yair Weiss, Fredo Durand, and William T. Freeman have proposed the paper titled EFFICIENT MARGINAL LIKELIHOOD OPTIMIZATION IN BLIND DECONVOLUTION. This proposed system late research demonstrates that a key to achievement is to consider the general state of the back appropriation  $p(x, k|y)$  and not just its mode. This prompts to a qualification between MAP<sub>x,k</sub> methodologies which gauge the mode match  $x, k$  and frequently prompt to undesired outcomes, and MAP<sub>k</sub> systems which select the best  $k$  while underestimating over all conceivable  $x$  pictures. This paper determines a straightforward approximated MAP<sub>k</sub> calculation which includes just a humble adjustment of basic MAP<sub>x,k</sub> calculations. We demonstrate that MAP<sub>k</sub> can, indeed, be upgraded effectively, with no extra computational many-sided quality

In 2009, the authors Fen Chen and Jianglin Ma proposed AN EMPIRICAL IDENTIFICATION METHOD OF GAUSSIAN BLUR PARAMETER FOR IMAGE DEBLURRING this paper mainly The parameter gauge is browsed a gathering of competitor parameters. The obscured picture is reestablished by these competitor parameters under the presumption that the hopeful is equivalent to the genuine esteem. The gauge is chosen to be the most extreme purpose of the differential coefficients of reestablished picture Laplacian L1 standard bend. Trial results are introduced to exhibit the execution of the proposed technique.

In 2009, the author Anat Levin, Yair Weiss, Fredo Durand, and William T. Freeman proposed the paper titled UNDERSTANDING AND EVALUATING BLIND DECONVOLUTION ALGORITHMS. Late calculations have managed sensational advance, yet numerous parts of the issue stay testing and difficult to get it. The objective of this paper is to break down and assess late visually impaired deconvolution calculations both hypothetically and tentatively. The plenty of late deconvolution procedures makes an exploratory assessment on ground-truth information vital. We have gathered obscure information with ground truth and analyzed late calculations under equivalent settings.

In 2009, the author Anmin Liu, Weisi Lin and Manish Narwaria proposed the paper titled IMAGE QUALITY ASSESSMENT BASED ON GRADIENT SIMILARITY. Inclinations pass on essential visual data and are pivotal

to scene understanding. Utilizing such data, basic and differentiation changes can be successfully caught. Subsequently, we use the slope similitude to quantify the adjustment interestingly and structure in pictures. Aside from the basic/differentiate changes, the picture quality is likewise influenced by luminance changes, which must be additionally represented finish and more hearty IQA. Subsequently, the proposed conspire considers both luminance and contrast–structural changes to viably evaluate picture quality.

In 2009, the author Renting Liu Zhaorong Li Jiaya Jia proposed the paper titled IMAGE PARTIAL BLUR DETECTION AND CLASSICATION. We build up a few obscure elements demonstrated by picture shading, slope, and range data, and utilize include parameter preparing to heartily arrange obscured pictures. Our obscure discovery depends on picture patches, making locale astute preparing and classification in one picture efficient. The outcome in this progression gives helpful high-level in territorial data, encouraging an assortment of locale based picture applications, for example, content-based picture recovery, question-based picture pressure, video protest extraction,

picture improvement, and picture division. It can likewise fill in as one of the criteria for measuring the nature of caught pictures.

In 2008, the author Neel Joshi Richard Szeliski David J. Kriegman proposed the paper titled PSF ESTIMATION USING SHARP EDGE PREDICTION. Picture obscure is brought about by various elements, for example, movement, defocus, catching light over the non-zero zone of the gap and pixel, the nearness of hostile to associating channels on a camera sensor, and constrained sensor determination. Our strategy handles obscure because of defocusing, slight camera movement, and inborn parts of the imaging framework. Our calculation can be utilized to quantify obscure because of restricted sensor determination by assessing a sub-pixel, super-settled PSF notwithstanding for in-center pictures. It works by foreseeing a "sharp" variant of a hazy info picture and uses the two pictures to illuminate for a PSF.

In 2007, the authors Blume Metal proposed THE BLIND DECONVOLUTION OF SEVERAL NOISY IMAGES BLURRED BY An SHIFT-VARIANT POINT-SPREAD-FUNCTION (PSF) FOR BLIND IMAGE DEBLURRING this paper mainly focus on a setting many images of the same object, and transform it between these images is found. This setting occurs frequently in biomedical imaging, for instance in microscopy or in medical ultrasound imaging. Restoration from multiple images degraded by camera motion blurs.

### **Conclusion:-**

This survey is on removing the noise and removing the blur effect from an image. Many methods are proposed for solving super-Resolution and image deblurring by restoration or reconstruction and deblurring the image but it is not suitable for real time video images. If we use supervised learning method using GRNN and DNN to find the blur types and its parameters and apply Grayscale conversion, dilation, erosion and fast Fourier transform on that parameters, we would get a high quality deblurred images which is very useful in many applications.

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### RESEARCH ARTICLE

## FOUNDATIONS AND IMPLICATIONS OF COMPETITIVE INERTIA IN AIRLINES BUSINESS: A STUDY OF THE NEPALI AIRLINES INDUSTRIES

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Competitive inertia, Tactical actions,  
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### Abstract

This paper explores the foundations and implications of competitive inertia in Nepali airlines industry. Eighty respondents answered on a structured Likert type questionnaire in two stages. Results of the field study found a significant relationship between competitive inertia and tactical actions but no relation of competitive inertia with strategic actions. Variables for tactical actions included price cut, promotion with other non-airlines companies and commission to agents while variables for strategic actions included new services and frequent flyer programs. The study found that past history for inertia varied between tactical and strategic actions, the previous being determined more by performance and the second by growth in markets. These outcomes advocate the action of two separate models of the organizational learning, one reactive, the other experimental and that there is competitive inertia in the strategic actions and no competitive inertia in tactical actions. Implications of the findings are discussed.

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### Introduction:-

Organizational inertia is defined as the tendency of a mature organization to continue on its current path (Creative Advantage, n.d.). This inertia can be described as being made up of two fundamentals, viz.: resource rigidity and routine rigidity. Resource rigidity, as stated in Creative Advantage, stems from a reluctance to invest, while regular rigidity stems from a powerlessness to change the patterns and reason that underlie those investments. Resource rigidity relates to the motivation to respond, regular strictness to the structure of that response.

In the words of (Miller, Danney; Chen Ming Jer, 1994) competitive inertia is defined as the level of activity that a firm shows when altering its competitive position in areas such as pricing, marketing, new product or facility introductions, and market reach. Inertia is argued to be determined by managers' incentives to act, their consciousness of action alternatives, and the constraints on their capacity to act. They differ that competitive inertia specifies the number of market-leaning deviations a company makes in trying to appeal customers and outfox players. Inertia will be said to be high when, relative to rivals of similar scale, companies make little alterations in competitive practices. These actions together make up a firm's repertoire of competitive performance.

Similarly, competitive inertia is regarded as major strategic and more minor tactical types of actions, both of which are essential components of all competitive arsenals (Chen M.-J., 1988); (Chen, Smith, & Grimm, 1992). According

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to (Chen, Smith, & Grimm, 1992) both cases are actions that are specific, concrete, and detectable. Tactical actions might include price changes, advertising campaigns, and incremental manufactured goods or service adjustments. Strategic actions may comprise key facilities enlargement, mergers and acquisitions, strategic alliances, and important new products or services. In principle, strategic actions engross a greater expenditure of resources, along time prospect, and a greater departure from the current situation than perform tactical actions (Galbraith & Kazanijan, 1986); (Dutton & Duncan, 1987).

According to (Acharya, 2012), officials of international airlines based in Kathmandu say they observe great potential for enlargement if some of the primary structural challenges to do with safety and infrastructure can be dealt with.

There has been little literature found that are related with the status of domestic airlines of Nepal that can be related with the competitive inertia. Therefore, the study of the current topic is very much relevant to enrich the literature also.

There has been little academic research carried out that is related with competitive inertia in Nepali aviation industry. This study attempts to understand about competitive inertia in Nepali domestic aviation industry. The basic issues the study addresses are:

How does a tactical action lead to competitive inertia in domestic airlines of Nepal?

How does a strategic action lead to competitive inertia in domestic airlines of Nepal?

The objectives of the study are to understand the nature of competitive inertia in the Nepali aviation industry. For this purpose, the domestic airlines are chosen for the current study, as there is no sufficient sample for International airlines operating from Nepal.

Due to the hilly and mountainous terrain the importance of airlines becomes very high. However, airlines business involves high investment that leads to limited market players. This leads to monopolistic situation in the country like Nepal. Therefore, it is important to review the status of competitiveness of airlines in Nepalese context.

### **Literature:-**

The literature on organizational change, culture, and decision making suggests three indispensable classes of factors that activate organizational action and, thus, competitive inertia. Main is the incentive to act, the motivational aspect of action discussed mostly by political decision philosophers and scholars of managerial designation (e.g. (Allison, 1971); (Schelling, 1971); (Staw, 1976); (Miller, Danney; Chen Ming Jer, 1994); and (Milliken & Lant, 1991)). Second is the perception of action requirements and substitutions, the knowledge component of action discussed by most learning philosophers (e.g. Cyert & March, 1963; (Levitt & March, 1988); (Huber G. P., 1991)). Third are the constraints on managerial act, the potential component of act discussed by writers on organizational change, structure, and motion (e.g. (Hannan & Freeman, 1984); (Tushman & Romanelli, 1985); (Meyer & Zucker, 1989); (Amburgey & Minner, 1992); and (Miller, Danney; Chen Ming Jer, 1994)).

According to (Starbuck & Milliken, 1988); and (Milliken & Lant, 1991) competitive inertia will be highest when there are very less incentives to act. Such incentives may be internal or external to the organization. The previous includes poor show that makes managers question the acceptability of their methods and motivates them to exploration for improvements.

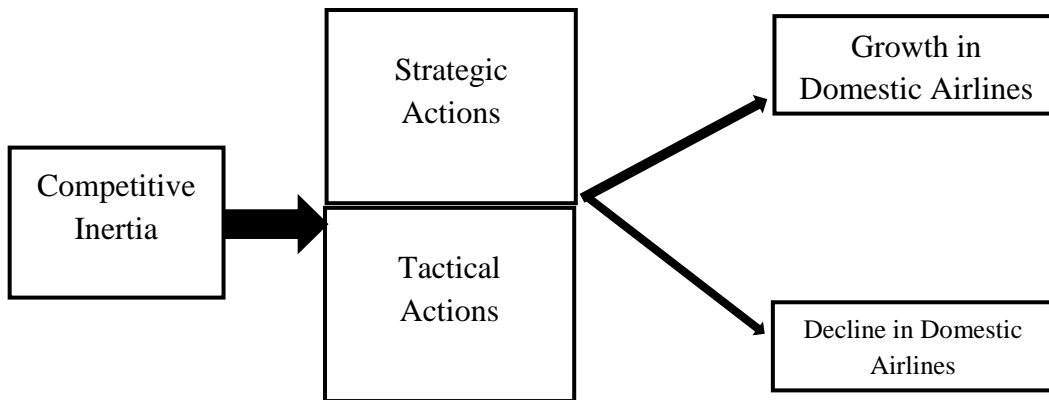
Enticements to act that come from outside the firm might include escalating markets that give managers the self-assurance to invest in the pursuit of innovative chances (Miller D. , 1993). Inertia may also overcome when managers perceive relatively few alternative ways of performing (Huber G. P., 1991 March).

(Miller D. , 1993) and (Chen, Smith, & Grimm, 1992) debate that the encounter in the literature about the impact of performance on inertia can be determined in part by making the dissimilarity between tactical and strategic actions. Further, to add opinion they state that, poor performance may induce tactical changes, as these are normally easy to make, entail few reversals in policy, and create little embarrassment. Strategic decisions may signal changes in policy that violate the preferences and reverse the riches of those in power. Even in the outcome of poor results,

then, managers may resist captivating these actions. Strategic decisions will be less responsive to performance loss than tactical decisions (Miller, Danney; Chen Ming Jer, 1994).

As per (Miller, Danney; Chen Ming Jer, 1994) there is no strong relationship between tactical actions and market growth: Tactical changes may be no more motivated by an expanding than by a falling market. Strategic actions will be far more likely when a growing market provides some large assurances of resources if a shrinking market signs tough times ahead.

(Danney & Chen, 1994) conducted a study in the Aviation industry of U.S. using 21 types of actions to distinguish between tactical and strategic actions supporting competitive inertia. The variables they have taken for the study were: mergers and acquisitions, feeder and inter industry alliances, frequent flyer programs, and new airplane purchases. Similarly, activities that are easy to introduce and easily roll back with less impact to the organization are termed as Tactical actions. For the current study the following variables have been considered as tactical actions: Price Cut, Commission Rates changes for Agents, Promotions with Non Airlines Companies. Similarly, New Service introduction and Frequent Flyer program have been taken as strategic actions. Based on these variables the theoretical framework is designed as given in Fig.1.



**Fig 1:-**Theoretical Framework of Competitive Inertia

Based on the above theoretical framework and the research questions the following hypothesis have been formulated and tested.

**Hypothesis 1:** Strategic actions related to competitive inertia results in growth of domestic airlines.

**Hypothesis 2:** Tactical actions related to competitive inertia and decline in domestic airlines.

### Methods:-

In this study the data were collected in two stage using convenience sampling method. In the first stage, fifty respondents responded to the structured questionnaire at Tribhuvan international airport domestic terminal. For this purpose the questionnaire was used by (Shrestha, 2014). Based on the analysis of responses from the first stage of data, three airlines – Buddha air, Yeti airlines and Nepal airlines- were selected for the second stage of data collection. In this stage, responses on structured questionnaire used by (Sturesson, 2010) was used. Besides questionnaire, unstructured interview was also carried out with the respondents, who were member of travel agents in Kathmandu Valley and are doing domestic ticketing of the selected airlines.

Based on the response three top airlines: Buddha Air, Nepal Airlines Corporation and Yeti airlines were selected for second stage of data collection. The second stage of data collection was focus of the components of tactical and strategic actions adopted by the domestic airlines.

### Results:-

From the analysis of the data collected at the first stage at Tribhuvan international airport domestic terminal it was found that 57 responses with 95% response rate have returned the questionnaire duly filled. Of the respondents



19.30% were female while 80.70% were male, 24.5% were under SLC, 54% were bachelor level and 21.5% of respondent were university graduate.

**Table 1:-** Correlations between Passenger Movement and Competitive inertia

Indicator	Passenger Movement	Price for ticket	Commission to Agents	Promotion with non-airlines companies
Passenger Movement	1	-.028	.396	.153
Sig. (2-tailed)		.931*	.202*	.634**
Number of Observation	12	12	12	12

Remarks:(\* significant at 5%, and \*\* significant at 10%)

The table above shows that passenger movement is correlated with variables of competitive inertia. The passenger movement is significant with commission to the agents and price of ticket at 5% level of significant. Similarly, promotion with non-airlines is significant at 10% level of significant. This supports our first hypothesis, Strategic actions related to competitive inertia results in growth of domestic airlines.

From the correlation analysis, it is seen that passenger movement is not significant with frequent flyer program and new service. Hence we reject our second hypothesis, Tactical actions related to competitive inertia and decline in domestic airlines.

**Table 2:-** Correlations between Passenger Movement and Tactical inertia

Indicator	Passenger Movement	Frequent flyer programme	New Services
Passenger Movement	1	.019	.539
	Sig. (2-tailed)	.953	.070
	12	12	12

Remarks:(\* significant at 5%, and \*\* significant at 10%)

### Discussion:-

The aim of this study was to examine the correlation between competitive inertia and passenger movement in Nepali domestic airlines. Using a field study of 76 respondents it was found that there exist significant relationships. Significant relationship between past performance and tactical actions while moderate relationship between past performance and strategic actions was found. There is an indication that domestic aviation industry in Nepal shows an association with tactical actions. Similarly, aviation industry should focus on the pricing decision, as the price has significant negative relation between passenger movement and pricing decision. This is why aviation companies has various pricing package to offer- full fare, economic price, cost on cancelation and millage is also different based on price of ticket.

Similar study was carried out by ARTUĞER (2013) entitled "The effect of Frequent Flyer Program on Customer Loyalty". The report suggests that members consider the intangible rewards more important than the tangible benefits. Therefore, focus should be given to the millage program as it has significant relationship in the tactical action.

As there is no academic study carried out in competitive inertia in Nepali Organizations, hence this study can be a stepping stone for further research in any form of inertia in Nepali organizations. Further, many of the results, can be understood through the lenses of two separate replicas of organizational learning what might be called "reactive" and "experimental" learning March (1991).

Consistent with the model of reactive learning as mentioned by Lindblom, (1959), Cyert & James (1963) inertia in tactical actions was very much a function of organizational success. Tactical adjustments were more common when poor performance signaled the need to act Cyert & James, (1963), Levinthal & James (1981), Lant & Montgomery (1987). In our study tactical actions such as promotion with non-airlines was found to be introduced. Even there are very little promotional activities carried out by airlines. The reactive learning model functioned less well, however, in forecasting inertia in strategic actions.

**Limitation:-**

The current study is limited in many ways, most important limitations is data collection. It was carried out based on the questionnaire used by (Artuger, 2013) and (Shrestha, 2014). Therefore, the representativeness of the questionnaire may limit the data collections. However, to cater this limitation, unstructured questionnaire was also administered during the data collection phase. Similarly, sample collected may not be sufficient for the generalization of the study. Further, data collection was done only within Kathmandu valley, therefore heterogeneity of respondents may be missing in this study. The domestic aviation industry is dominated by a few players in the market, therefore for first level of study in Nepali context may not be appropriate.

Despite of such limitation, we expect that this study will lay foundation on study on competitive or any other form of inertia in Nepali organization as well as global context. Further, this study will also help to further elaborate the concept of inertia. Continued research is necessary before recommending official or non-official commendation of inertia in Nepali domestic airlines or other airlines in the world.

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### Annexes:-

**Table 3:-** Response on Airlines Travel by Respondents

SN	Name of Airlines	No of Respondent	SN	Name of Airlines	No of Respondent
1	Buddha Air	22	5	Simrik Airlines	5
2	Nepal Airlines	10	6	Manag Air	5
3	Yeti Airlines	8	7	Sita Air	0
4	Air Dynasty	4	8	Shree Airlines	3

**Table 4:-** General Impression of Respondents on Nepalese Airlines

Airlines	Excellent	Good	Total
Buddha Air	28	27	55
Nepal Airlines Corporation	12	13	25
Yeti Air	11	35	36
Shree Airlines	2	17	19
Air Dynasty	6	16	22
Simrik Airlines	4	23	27
Manag Air	0	16	16
Sita Airlines	1	9	10

**Table 5:-** Correlations Matrix-I

		Passenger Movement	Price for ticket	Commission to Agents	Promotion with non-airlines companies
Passenger Movement	Pearson Correlation	1	-.028	.396	.153
	Sig. (2-tailed)		.931*	.202*	.634**
	N	12	12	12	12

(\* significant at 5%, and \*\* significant at 10%)

**Table 6:-** Correlations Matrix-II

		Passenger Movement	Frequent flyer programme	New Services
Passenger Movement	Pearson Correlation	1	.019	.539
	Sig. (2-tailed)		.953*	.070*
	N	12	12	12

Remarks:\*. Correlation is significant at the 0.05 level (2-tailed)



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**RESEARCH ARTICLE**

**THE EFFECTIVENESS OF MUSIC AND MOTHER'S VOICE ON PAIN REDUCTION DURING  
 VENEPUNCTURE IN NEONATES- A RANDOMIZED CONTROL TRIAL**

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 Dhandapani Gunasekaran and Dr. Karuppiyah Pand.**

**Manuscript Info**

**Abstract**

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**Introduction:-**

Until few decades ago, pain was considered as an inappropriate term for neonates and so pain assessment and management was not part of routine care in NICU. In NICU, neonates are exposed to environment stress. During their stay in the NICU, on an average 14 painful procedures are experienced by neonates during the first 2 weeks of life<sup>1</sup>. Studies have shown that repeated painful stimuli can lower pain threshold in neonates<sup>2</sup>. Repeated painful stimuli alters neurodevelopment and programming of the stress system thereby increasing the pain perception in neonates who are born as preterm<sup>3</sup>. Repeated painful stimuli causes abnormalities in brain maturation which persists through childhood and adolescence leading to adverse neuro developmental outcomes<sup>4</sup>. Hence minimizing pain helps in prevention of occurrence of long term neurological outcome.

Musical intervention acts as a source of distraction and positively affects the distress levels and pain perception in neonates<sup>5</sup>. Studies on the positive effect of mother's voice (infant directed speech/singing) on pain reduction and better oxygen saturation, improvements in heart rate and respiratory rates are also available<sup>6,7</sup>. But studies comparing mother's voice and music are not available in Indian context and so, we studied effectiveness of music and mother's voice (infant directed speech) in pain reduction during venepuncture in neonates.

**Methodology:-**

The study was registered in Clinical Trials Registry - India and the Institutional Human Ethics Committee (No: PG/2014/47). After the informed consent was taken this open labeled randomized controlled study was carried out at neonatology unit at Mahatma Gandhi Medical College & Research Institute (MGMCRI), Pondicherry, South India from January 2014 to December 2014. All neonates undergoing venepuncture in the post natal ward were included in this study. The neonates were in awake state. Neonates 1) with intravenous cannula, 2) critically ill, 3) associated with painful conditions, 4) immunized within 24 hrs were excluded. Total 300 neonates were included in the study. They were divided into music, mother's voice and control groups by block randomization method. Each group consisted of 100 subjects. All the neonates were checked for hearing loss by startle reflex given by them to the auditory stimulus in the form of clapping hands by the investigator. The neonates without any hearing loss were included in the study. The neonates in music group were exposed to pre recorded lullaby 5 minutes before starting the venepuncture and during the procedure of venepuncture. Music was played through music player using

speakers placed 30 cm from the neonate. The speaker used was JBL Flip 2 portable wireless stereo speaker with maximum SPL of 86dB and frequency response of 100Hz-20 KHz. The sound decibel of the music played was checked using Benetech GM 1351 digital sound level meter. The volume of the speaker was adjusted such that the NICU environment sound level never exceeded beyond 65 dB.

The neonates in mother's voice group received pre recorded mother's voice [infant directed speech<sup>8</sup>] 5 minutes before and during venepuncture procedure. Both the music group and the mother's voice group received in total 15 minutes of intervention each. The control group received no intervention but received only the standard nursing care during the venepuncture procedure. The pain levels were assessed using NPASS by the investigator. The physiological parameters were assessed by an independent observer. The NPASS was done 5 minutes before, during and 5 minutes after the procedure. NPASS used in our study was commonly used to assess pain response in infants during painful procedures<sup>9</sup> as the score evaluated 5 parameters – crying, behavioural state, facial expression, extremities tone and vital signs. The heart rate, oxygen saturation were monitored using pulseoximeter and the respiratory rate was counted manually. Minimum and maximum possible scores were -10 and 10 respectively. The investigator also noted the duration of crying spells when neonates started and stopped crying by using a stop clock. No neonate was sedated during the venepuncture procedure. Eight neonates were excluded from this study as they were in sleep state and didn't awake after venepuncture. 292 neonates were analyzed. The other neonates were in awake state during the study.

#### Statistical Analysis:-

The results were analyzed by using Kruskal Wallis for comparing all the three groups. Mann Whitney U Test was done for intergroup comparison.

#### Results:-

Results of Neonatal pain, agitation and sedation scale (NPASS) for each of five domains crying, behavior state, facial expression, extremities tone and vital signs), 10-point NPASS for music and control groups are shown in table 1. NPASS score of mother's voice and control group are shown in table 2 and mother's voice and music group are shown in table 3.

All five domains of NPASS- vital signs, irritability, facial expression, behavioral state, tone and the total NPASS have shown significant lower pain perception in music group when compared to control group (P=0.000). All the five domains of pain – vital signs, irritability, facial expression, behavior state, tone and the total NPASS were lower in mother's voice group when compared to control group (p=0.000). There was significant difference in the heart rate, respiratory rate, facial expression and behavioral state and the total NPASS (p=0.000) between the mother's voice and music group. Music was better than mother's voice and control group in pain reduction during venepuncture.

**Table 1:-** Comparison of clinical and behavioural parameters between control and music group

Parameter	Group 1 ( Control)	Group 2 (Music)	p value
<b>BEFORE INTERVENTION</b>			
NPASS	0.01±0.102	0.07±0.412	0.316
<b>DURING INTERVENTION</b>			
Vitals signs	1.65±0.542	1.22±0.682	0.000
Irritability	0.99±0.102	0.82±0.389	0.000
Facial expression	1.6±0.513	1.20±0.609	0.000
Behavioral state	1.51±0.754	0.73±0.635	0.000
Tone	1.46±0.767	0.64±0.63	0.000
NPASS	7.21±2.16	4.62±2.137	0.000
<b>AFTER INTERVENTION</b>			
NPASS	0.74±1.028	0.55±0.954	0.188

**Table 2:-** Comparison of clinical and behavioral parameters between control and mother's voice group

Parameter	Group 1 ( Control)	Group 3 (Mother's Voice)	p value
<b>BEFORE INTERVENTION</b>			
NPASS	0.01±0.102	0.05±0.297	0.319
<b>DURING INTERVENTION</b>			
Vital signs	1.65±0.542	1.476±0.522	0.010
Irritability	0.99±0.102	0.91±0.345	0.019
Facial expression	1.6±0.513	1.47±0.502	0.052
Behavior state	1.51±0.754	1.35±0.644	0.021
Tone	1.46±0.767	0.74±0.438	0.000
NPASS	7.21±2.16	5.94±1.899	0.000
<b>AFTER INTERVENTION</b>			
NPASS	0.74±1.028	0.64±1.115	0.409

**Table 3:-** Comparison of clinical and behavioral parameters between music and mother's voice group

Parameter	Group 2 (Music)	Group 3 (Mother's voice)	p value
<b>BEFORE INTERVENTION</b>			
NPASS	0.07±0.412	0.05±0.300	0.983
<b>DURING INTERVENTION</b>			
Vital signs	1.22±0.609	1.47±0.522	0.014
Irritability	0.80±0.389	0.91±0.324	0.077
Facial expression	1.20±0.609	1.47±0.502	0.003
Behavior state	0.73±0.635	1.35±0.644	0.000
Tone	0.64±0.63	0.74±0.438	0.082
NPASS	4.62±2.137	5.94±1.899	0.000
<b>AFTER INTERVENTION</b>			
NPASS	0.55±0.954	0.64±1.115	0.700

### Discussion:-

Venepuncture is the one of the most common recurring painful health-related procedures in clinical practice. Various measures to reduce pain during venepuncture have been explored, including positioning and restraining the neonate in relatively flexed posture, kangaroo care, breastfeeding, use of oral analgesics, oral sucrose / saccharine solutions, tactile stimulation, skin-cooling techniques, skin-to-skin care, non nutritive sucking pacifiers, music therapy, etc<sup>(7-12)</sup>. Music therapy offers a safe and harmless intervention for reducing pain in neonates.

Joanne Loewy<sup>16</sup> recorded use of culturally based musical tunes in the form of lullabies can improve neonatal function and hence in our study we used lullabies in Tamil language as most of the patient population visiting the hospital spoke Tamil language.

In our study the peak HR(heart rate) was lowest in the music group when compared to mother's voice and control group. The peak HR in the mother's voice group was lower than the control group. This signifies that both music and mother's voice decrease the heart rate during painful intervention and music had more positive effect than pre-recorded mother's voice infant directed speech. These findings were in consistent with the study by Coleman et al<sup>17</sup>, Arnon et al<sup>18</sup> where there was decrease in heart rate after the neonates were exposed to music. Statistically significant difference was found with regard to heart rate when music intervention was done in studies conducted by McIntosh et al<sup>19</sup> and Bo LK<sup>20</sup>.

In our study, the music group had better oxygen saturation than control group with a p value of 0.000. Similar findings were found in Cassidy et al's<sup>21</sup> study where there was statistically significant difference between recorded music and control group. In studies by Burke et al<sup>22</sup>, Chou et al<sup>23</sup> and Standley et al<sup>24</sup>, the degree of fall of oxygen saturation was less in music group when compared to the control group. Caine et al<sup>25</sup>, Collins et al<sup>26</sup>, Whipple et al<sup>27</sup>, Butt et al<sup>28</sup> and Arnon et al<sup>18</sup> recorded statistically significant difference in the behavioural parameters between the mother's group, music group and the control group.

Our study showed significant improvement in all five parameters of Neonatal pain, agitation and sedation scale (NPASS); i.e., facial expression, cry and movements and also in duration of crying spells. There was statistically significant difference in the peak HR, RR(respiratory rate), lowest recorded oxygen saturation, behavioural parameters and NPASS during intervention between the music and control groups. There was statistically significant difference in the maximum NPASS, peak HR, peak RR, least recorded and all the behavioural parameter between control and mother's voice group.

#### **Proposed mechanism of action of music Therapy:-**

When auditory stimuli of music passes through the sound pathway to the cerebral cortex, there is reduction in the signalling in the amygdale. The reduced signalling of amygdale causes reduced level of stimulation of the hypothalamus, pituitary and endocrine glands. Hence there is decreased secretion of the cortisol and glucocorticoids thereby having effect on the autonomic system<sup>29</sup>. This explains the lower heart rate and better oxygen saturation in the music therapy group when compared with the control group. The underlying mechanism is explained by Farhat et al<sup>30</sup> that music has its effects on the limbic and the autonomic system thus music reduces the stress and inducing comfort and relaxation in neonates.

Limitation of our study was the fact that the study was conducted in NICU and not in a sound proof room. Blinding could not be done in this study.

#### **Conclusion:-**

Music and mother's voice reduce the pain perception in neonates during venepuncture and they have beneficial effects on the physical and behavioural parameters. Pre recorded music is better than mother's voice in decreasing pain perception. Hence for routine painful procedures like venepuncture, music therapy could be helpful in neonates in reducing the pain perception.

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### RESEARCH ARTICLE

#### HEMORRHAGIC GLIOBLASTOMA MULTIFORM: PREVALENCE, PREDISPOSING FACTORS AND PROGNOSIS AMONG ADULT KFMC PATIENTS.

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##### Key words:-

Glioblastoma Multiforms, Intracranial cranial hemorrhage, intracerebral hemorrhage, primary brain tumors.

#### Abstract

**Context:** glioblastoma multiform (GBM) is the stage four of glioblastoma tumor(1). It is the most common primary intra-cranial tumors(2). GBM can be presented by intracranial hemorrhage (ICH) with an incidence between 1 – 10 % and usually occur in the late course of the disease. The general prognosis of GBM with ICH is poor and worsen in elderly(8)(5).

**Aims:** Determining the effect of the hemorrhage on the disease prognosis, exploring the prevalence and predisposing factors.

**Methods:** A retrospective medical record review had performed for patients diagnosed with GBM between 2008 through 2013 at national neuroscience institute in King Fahad Medical City. Inclusion criteria are male and female with age more than 18 years old diagnosed with glioblastoma multiform grade four and were followed in the King Fahad Medical City Clinic. The exclusion criteria is any patients with the hemolytic disorder.

**Results:** . A total of 87 out of 530 patients with GBM were identified. 15 (17.2%) of GBM patients have ICH while 72(82.8%) non-hemorrhagic. 61 (70.1%) were male while 26 (29.9%) were female. No difference between prognosis between hemorrhagic and non-hemorrhagic GBM patients. Tumor size, and gender are not predisposing factors.

**Conclusion:** there were no difference in the prognosis and between hemorrhagic glioblastoma multiform and non-hemorrhagic and gender and Tumor size are not predisposing factors.

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**Introduction:-**

Gliomas is a collection of tumors arising from glia or their precursors within the central nervous system. Histopathologically, gliomas are divided into four grades; the most aggressive of these grades is 4 or GBM.(1)

GBM is the most common primary intracranial neoplasm of the central nervous system. It has an incidence for 15% to 20% of all primary central nervous tumors. These GBM tumors can be presented in different forms. Intracranial hemorrhage (ICH) is one of these forms, which can happen to different degrees and extension with variation in degree of prognosis. It has been reported that GBMs can masquerade as traumatic ICH, or intraventricular hemorrhage (IVH).(2)

The prognosis and clinical manifestation depend on multiple factors which share together according to their severity and their stage, namely; tumor size, location, infiltration range, eloquent area involvement, and the extent of the surgical resection. The main histopathological features include micro vascular proliferation, pleomorphic cells, necrosis, increased cellularity, mitoses and microscopic intra-tumoral hemorrhage.(3)

Intracerebral hemorrhage (ICH) is defined as bleeding into the brain parenchyma.(4)

ICH is a common neurological emergency in patients with intracranial tumor, which usually occurs late in the course of disease, in some time it heralds the cancer diagnosis. The presence of ICH in patients of GBM usually occurs by unique mechanisms, especially intratumoral hemorrhage or coagulopathy, whereas hypertensive hemorrhage is rare.(5)

A highly vascularized, malignant primary brain tumor (BT) like a GBM and metastatic BT tends to bleed spontaneously. Glioblastoma multiform should be included in the differential diagnosis of non-traumatic ICH.(6)

In pathogenesis of sudden massive bleeds into cerebral tumors, the ischemic necroses areas are formed.(7)

The general, prognosis for GBM associated with ICH worsens with increasing age in elderly patients. The surgical removal of both the hematoma and the tumor with adjuvant treatment are associated with prolonged survival rate.(8)

In the short-term prognosis of ICH patients with GBM the report demonstrates about 22 % to 31 % mortality at 1 month, and 48 % to 75% have partial or complete independence at discharge. However, in the long-term prognosis of ICH with GBM, the underlying malignancy prognosis are often poor (78 % mortality at 1 year), and ICH generally occurs late in the neoplastic course.(5)

For the median survival rate in the GBM Alone is about 12 months. In 2-3% of the patients have long survival rate with more than 3 years. (22)

In this study we want to see if there is any significant difference between the prognosis of hemorrhagic GBM compare with non hemorrhagic GBM and the predisposing factors.

**Methodology:-**

Retrospective medical record review has performed from 2008 through 2013 on 53 existence data recorded at the national neuroscience institute in King Fahad Medical City. Inclusion criteria was any patients diagnosed with Glioblastoma multiform world health organization grade four both male and female with age more than 18 years old who Fellow in the King Fahad Medical City clinic. The exclusion criteria was any patients have any hemolytic disorder. The research team has reviewed how many patients presenting with ICH among GBM, data of the predisposing factor which is common between ICH GBM (gender, tumor size) and compared it with non hemorrhagic GBM patients. In addition, the study reviewed the prognosis of ICH GBM patients and compare it with non hemorrhagic GBM patients (post operative survival rate, partial or full resection). To look for differences of either age, tumor size and survival rate with hemorrhagic and non hemorrhagic condition, we used (T-test ) analytic method. For the association between the location of tumor and gender with hemorrhagic and non hemorrhagic condition, we used (Chi-square) analytic method.

## Results:-

The study involved 87 subject with GBM divided into two groups hemorrhagic or non-hemorrhagic. The most frequent location of for Hemorrhagic and non-Hemorrhagic GBM is in frontal lobe by 37.8% and the frequent location in hemorrhagic GBM is Temporal. (see CHART 1). 15 (17.2%) of the study population that attended National Neuroscience Institute at King Fahad Medical City in Riyadh City had intracranial hemorrhage and 72(82.8%) had non-hemorrhagic GBM. Most of them were male 61 (70.1%) and 26 (29.9%) were females. The distribution of Hemorrhagic or non-Hemorrhagic GBM and sex is summarized in **Table 1**.

**Table 1:** Distribution of patients in both groups

Hemorrhagic or non-Hemorrhagic	Gender		Total
	Male	Female	
Hemorrhagic	13 (14.6%)	2 (2.3%)	15 (17.2%)
Non Hemorrhagic	48 (55.2%)	24 (27.6%)	72(82.8%)
Total	61 (70.1%)	26 (29.9%)	87 (100.0%)

Independent t-test was conducted to measure the difference between intra cranial hemorrhage and non-hemorrhagic GBM. ICH GBM age Median= 54.40 years with 18.157 standard deviation, tumor size Median= 105.19 cm<sup>3</sup> with 61.990 standard deviation and survival rate Median = 2.07 years with 1.387 standard deviation and non-hemorrhagic GBM age Median= 53.64 with 18.120 standard deviation, Tumor size Median= 106.60 cm<sup>3</sup> with 83.081 standard deviation and survival rate Median= 2.25 with 1.172 standard deviation.

A chi-square test was performed to know if there is significant relationship between the frequency of ICH GBM and non-hemorrhagic GBM in gender  $\chi^2 = 1.511 (1)$ ,  $p = .219$ , tumor location  $\chi^2 = 15.012 (8)$ ,  $p = .059$  and surgery type  $\chi^2 = .803 (3)$ ,  $p = .849$ .

## Discussion:-

In this study, we aimed to find the prevalence of patients who are presented with intracranial hemorrhage and non-hemorrhagic, to find predisposing factors and which GBM group at high risk to develop ICH and difference in the prognosis of GBM with ICH compare with GBM without ICH.

In this study, we found that the prevalence of ICH as a complication of GBM was 17.2 % while the non-hemorrhagic was 82.8 % of 87 adult Patients attended National Neuroscience Institute at King Fahad Medical City in Riyadh. The prevalence of ICH in GBM in the other studies was between 1-2% and other studies reported it between 7% to 10%. (5)

There are no differences between hemorrhagic and non-hemorrhagic in prognosis. So, the survival rate is almost the same in each group with median survival rate of hemorrhagic 2.07 year and median of survival rate of non-hemorrhagic 2.25 year with P value .595. In literature review the prognosis of GBM patient with ICH are 78% mortality by 1 year (5). Chi-square has performed to look for the surgery type either partial or complete resection affect the prognosis and the result show no effect on the prognosis with P value .849. ICH is not affect the prognosis of GBM. Tumor size and gender are not predisposing factors that make the GBM more prone develop ICH. For confirm that we had performed T-test on tumor size and Chi-square on gender but they did not show any differences between hemorrhagic and non-hemorrhagic with .951 P value of Tumor and .849 P value for gender.

For age, we did T-test to see the Age distribution between each group. The results are 54.40 years old for hemorrhagic and 53.64 years old for non-hemorrhagic. So, the aging people are not high risk for GBM developing ICH than younger patients.

no difference between the prognosis of GBM with ICH compare GBM alone may be because the GBM itself has poor prognosis although The ICH alone is known to have poor prognosis. (23) (22) we looked if ICH worsen the prognosis of GBM but the study show it is not.

There are some limitation of the studies as nonrandomized study which are the sample size is small but it is convenient, the study cover one city which is Riyadh City and as retrospective cohort study there is possible for selection bias.

**Conclusion:-**

Our study show that ICH is no affect the GMB prognosis and tumor size and gender are not predisposing factors for developing ICH in GBM patients.

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### RESEARCH ARTICLE

#### SKIN CARE ROUTINE AMONG FEMALE MEDICAL STUDENTS AT KING ABDULAZIZ UNIVERSITY HOSPITAL (KAUH), JEDDAH, SAUDI ARABIA.

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#### Abstract

**Objective:**-To Assess Attitudes and behavior of female medical students related to facial skin care routine and to study factors that influence buying-decisions of skin care products.

**Study design:**-Cross-sectional study.

**Setting:**-King Abdulaziz University Hospital.

**Subjects and Methods:**-Self-administered questionnaire was conducted randomly to 301 female medical students from February 2016 to May 2016.

Descriptive analysis was done for all the data in order to obtain the frequencies and percentages needed.

**Results:**-Results indicated that majority of students (76.7%) do not follow regular skin care routine, Further analysis indicated that (66%) don't use sunblock and (29%) reported to have previous history of sunburn.

Most commonly used skin products were body lotions and moisturizers (74%), The use of makeup was obviously higher than the use of skin care facials.

Among the study sample, factors that were distinguished as an evaluative criteria to participants when buying products were greatly affected by brand of product (68.7%) followed by friend's recommendations (51.3%), one of the factors affects buying behaviour is price of a product, our Students had a little concern regarding price (32%) in comparison to other factors.

Results also revealed that majority of respondents never cared to check ingredients of their products (48%).

**Conclusion:** Our society need to be more educated about the importance of getting a proper skin care routine, further studies with wider distribution of the questioner in different cities and to different age groups is advisable.

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#### Introduction:-

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The skin, is the body's largest organ, it helps to secure the integrity of the host and at the same time, allows the individual to communicate with the outside world. <sup>(1)</sup>

Skin care is an essential part of personal hygiene and well-being. The proper care of skin is important as unclean skin favors the development of pathogenic organisms and infections. <sup>(2)</sup>

Healthy and functioning skin barrier is an important protector against dehydration, penetration of various microorganisms, allergens, irritants, reactive oxygen species and radiation. The skin barrier may be specifically adjusted to allow penetration, for this reason daily skin care may increase skin regeneration, elasticity, smoothness, and thus temporarily change the skin condition. <sup>(3)</sup> A study revealed that the focus is found to be more on skincare in East Asia and on make-up in Southeast Asia and India. <sup>(4)</sup>

Sunscreen use is a modifiable behavior that can help reduce the risk for skin cancer, prevent sunburns, mitigate photo-aging, and treat photosensitive dermatomes. <sup>(5)</sup> Researchers from the Centers for Disease Control and Prevention (CDC) examined the results of a 2013 survey that asked participants how often they use sunscreen when outside in the sun for more than an hour. Only 14.3 percent of men and 29.9 percent of women reported that they regularly use sunscreen on both their face and other exposed skin. <sup>(6)</sup>

Choosing the right ingredient of skin product for each skin type is essential, as various skin care preparations are not tolerated, and they may induce skin irritation. Increasing knowledge and awareness of the benefits and optimal use of skin products can improve outcomes.

In an effort to protect consumers' rights to information and to promote their freedom of choice, the South Korean government has been enforcing a policy called the cosmetics full ingredients list system since 2008, which requires cosmetics manufacturers to list all of the ingredients used in their products <sup>(7)</sup>, this sheds a light on the importance of checking the ingredients before buying products.

Brand satisfaction is perceived as an important issue on skin care industry. Obviously, customers are the important stakeholders in organizations and their satisfaction is a priority to the company. <sup>(8)</sup> In a study was conducted in 14 cities, regarding taking a look at important aspects when buying make-up, results suggested that in Seoul, the criteria for decision-making are different from other cities, with environmental friendliness among the top considerations, alongside good basic quality/functions and brand reputation. In contrast to Hong Kong and Taipei where, in addition to quality/functions, price was an important factor, in all three Chinese cities, reasonable price and brand image rank near the top for both make-up and skincare. <sup>(4)</sup>

To our knowledge, adequate studies regarding the skin care routine and the methods of selecting the correct skin products are still lacking in Saudi Arabia.

Our aim in this study was to explore the skin care routine among female students at King Abdulaziz University, and to focus on their considerations when buying skin care products.

### **Objectives:-**

#### **Primary objective:-**

To explore attitudes and behavior of Female medical students related to facial skin care routine.

#### **Secondary objectives:-**

1. Factors that influence buying decisions related to choosing facial skin care products
2. Identify the most commonly used skin products.

### **Materials and Methods:-**

The study protocol was reviewed and approved by King Abdulaziz University Hospital Health Research and Ethics committee.

This was a Cross-sectional study .

A self-administered questionnaire was conducted randomly to 301 Female students (aged 18-23 years old) at King Abdulaziz Universityhospital,Jeddah, SaudiArabia, during the period (February 2016 to May 2016). There were no exclusion criteria.

Data was collected using a data collection sheet that includes for example demographic information like name, age and nationality.

Regarding Skin care routine we first determined if students wereroutinely using regular facials and sunscreen,consulting dermatologists before choosing skin products and if there was a previous history of skin irritations to cosmetics.

There wasalso few questionsfocusing on skin type and the most important buying behaviors influencing their decision-making when choosing skin/make-up products such as type of ingredients,brand of product, friend's recommendations,price, packaging and convenience.

#### **Statistical Analysis:-**

In the present study, data was coded and entered into the statistical Package for Social Sciences (SPSS version 20). Descriptive analysis was done for all the data in order to obtain the frequencies and percentages needed.

Descriptive statistics (Frequency tables, Cross tabulation and Charts)

#### **Results:-**

A total of 301 female medical students were included in our study. The background characteristics of the study population are shown in (Table 1.)

Most of ourfemale medical students (76.7%) do not follow regular skin care routine,Further analysis indicated that (66%)of students don't use sunblock before sun-exposure and (29%)reported to have a past history of sunburn.

Most commonly used skin products among our study sample were sequentially: body lotions and moisturizers (74%), sunscreen (30%) and also other products as visualized in "Fig. 1".

Results regarding frequency of using makeup products are shown in (Table 2.)

Reactions to different kinds of cosmetics is increasingly recognized as a relevant problem,a lot of our students reported to have history of reaction to some cosmetics (38.7 %) and unfortunately most of them (44.9%) never consulted dermatologists regardingtheir skin concerns nor for their opinion before choosing skin/make-up products.

As shown in "Fig. 2"Factors that were distinguished as being important evaluative criteria in buying products to our participants were greatly affected mainly by brand of product (68.7%) followed by their friend's recommendations (51.3%). One of the factors that can have an effect on buying behaviour is the price of a product, studentshad a little concern regarding price of the product (32%) in comparison to other factors.

In addition to the buying factors related to choosing skin products, ingredients of the product playalso an important role, results revealed that majority of our students never cared to check the ingredient of product before buying it (48.7%), and (33%) of them preferred to choose the natural ingredients while (22%) looked for oil-free ingredients, (10.3%) alcohol-free ingredients, (5%) dye-free, (4.7%) petroleum-free. "Fig. 3"

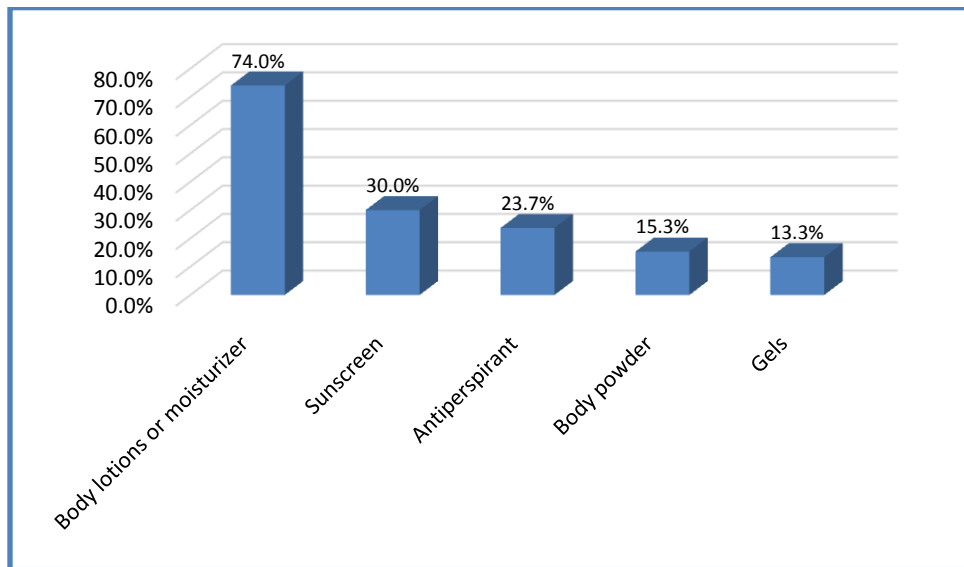
**Table 1:-**Nationality and skin type of participants.

Questions	Value
<b>Nationality</b>	
Saudi	280 (93.00%)
Non- Saudi	21 (7.00%)
<b>Skin type</b>	
Combination skin.	154 (51.20%)
Oily skin	54 (17.90%)

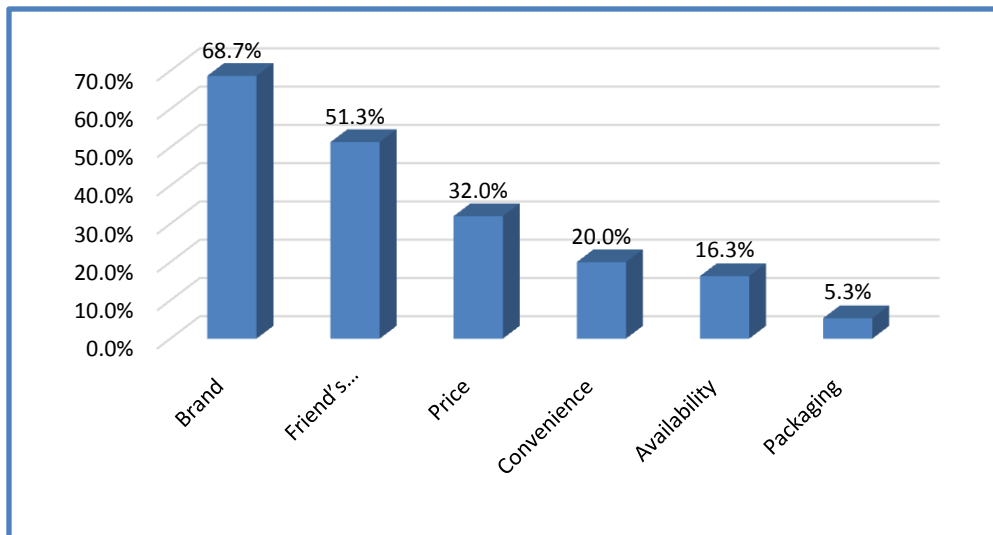
Dry skin	45 (15.00%)
I don't know what is my skin type	24 (8.00%)
Normal skin	24 (8.00%)

**Table 2:-**Frequency of using makeup.

How many times do you wear makeup?			
		Frequency	Percent
Valid	Daily	72	24.0
	3-4 times /week	64	21.3
	Once per week.	60	20.0
	Rarely	104	34.7
	Total	300	100.0

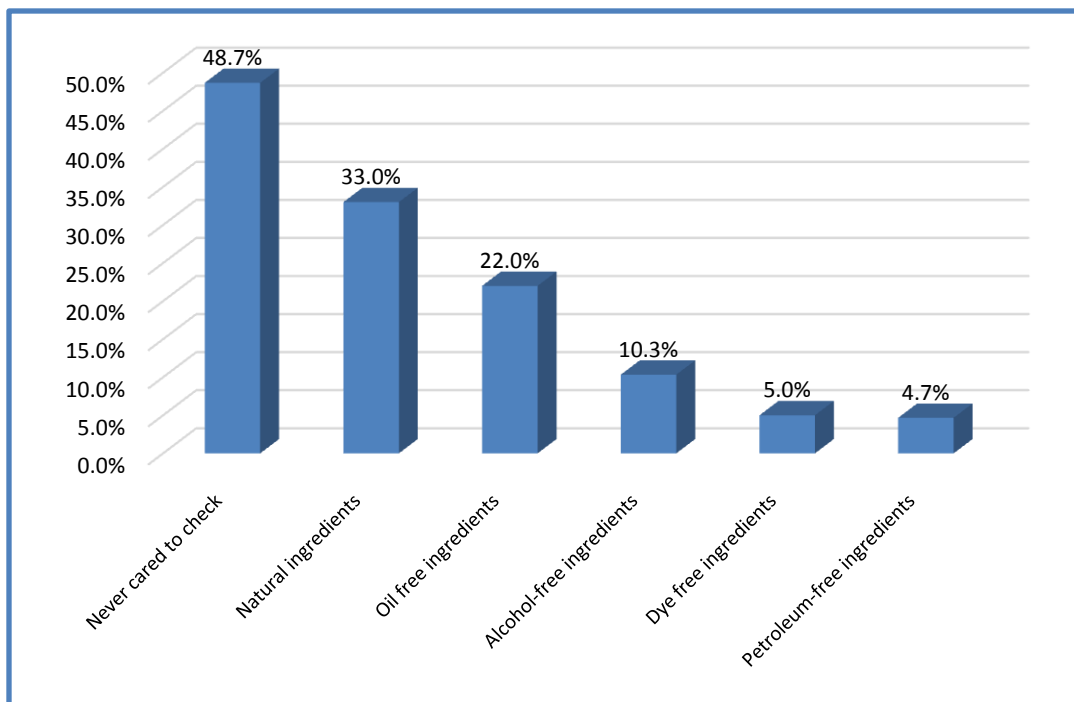


**Figure 1:-**Commonly used skin products.



**Figure 2:-**Buying Behaviors of students.





**Figure 3:-** Products-ingredients Buying factors.

### Discussion:-

To our knowledge and after an extensive literature review, this is the first population-based study in Saudi Arabia to evaluate skin care routine and to study skin products buying factors.

Our study results indicated that only (23.3%) of our students use regular facials as a routine, this rate is very low when compared with similar cross sectional study of a sample size (200), revealed that 100% of their respondents were skin care product users, the majority of respondents were from china. <sup>(9)</sup>

Most of our medical students use make up more often than skin care products, in contrast to another study comparing use of skincare products and make-up products, the use of skincare products was higher in East Asian cities Hong Kong, Taipei, Seoul and the three Chinese cities (Beijing, Shanghai, Guangzhou). Conversely, use of skincare products was higher in Southeast Asia and the two Indian cities (Delhi and Mumbai). It appears that the focus was on skincare in East Asia, including the three Chinese cities, and on make-up in Southeast Asia and India. <sup>(4)</sup>

Most commonly used skin product by our students were body lotions and moisturizers (74%), our study results were consistent with results of previous studies, in which one of them revealed that face lotions were used by at least (50%) of study responders. <sup>(4)</sup> In another study, Results showed that when asked about what kind of facial cream the respondents used, the majority of all women said they use moisturising facial cream (69,6%) <sup>(10)</sup>

We found that most of our students don't use sunblock before sun exposure (66%) and some of them have a previous history of sunburn (29%), in comparison to a study was done in al-Qassim, conducted in 2010 of sample size (1376), results showed that (29.4 %) had a history of suffering from sunburn before, (8.3%) were using a sunscreen as a routine before sun-exposure, only (114) persons (8.3% of study participants) reported use of sunscreen preparation. <sup>(11)</sup>

Results of our study revealed that a large number our students don't care to check the ingredient of their skin care/make up product before buying it (48.7 %), and only (33%) cared about buying natural-ingredients products , in contrast, a study carried out for Finnish women, the respondents were also asked whether they would be willing to pay more for such facial skin care products that consist completely of organic ingredients (product consists of natural ingredients which have also been farmed so that no artificial fertilizers or pesticides have been used), Very

few (15,2%) respondents said they are willing to pay and nearly a half (44,9%) reported they would not be ready to pay more for organic facial skin care products.<sup>(10)</sup>

Brand of the product was obviously the most important factor mattered to our students (78.7%), our results goes along with the results of a study in terms that consumers take relatively less time to shop for brands they are familiar compared to brands that are new to them.<sup>(8)</sup> A study which was done in 14 cities, Showed that in all three Chinese cities, reasonable price and brand image rank near the top for both make-up and skincare, a reasonable price was a common consideration among their women while among our students, women looked for different things other than price, they obviously had a little concern about the product price (32.0%).<sup>(4)</sup>

Approximately (51.3 %) of our students take into consideration their friend's recommendation as an important evaluative factor when buying products and only (5.3 %) had concerns about product packaging, while in comparison to the results obtained from a study conducted also in this field revealed that among young women, the packaging (8,9%), and consistency of a products were not considered very important. On the other hand, only (8.9%) thought friends recommendations as determined factors when choosing one facial skin care product over another.<sup>(10)</sup>

### **Conclusion and Recommendations:-**

Our society need to be more educated about the importance of getting a proper skin care routine, further studies with wider distribution of the questioner in different cities and to different age groups is advisable.

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### RESEARCH ARTICLE

#### THE IMPROVEMENT OF BIOCOMPATIBILITY OF THE DENTAL TITANIUM ALLOY IMPLANTS WITH DLC COATING: *IN VITRO* AND *IN VIVO* STUDY.

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Titanium Alloy (Ti6A14V) -  
Osseointegration - Cell culture -  
Histopathology-DLC coating

#### Abstract

Titanium alloys (Ti6A14V) are biomaterials of choice in dentistry, due to their resistance to the biological constraints of the environment. Their use still causes in a number of cases, problems of osseointegration that urge us to raise again the question of the interface of titanium alloys with mineralized tissues in particular. The purpose of this study is first to evaluate the biocompatibility of these implants in the biological medium while offering alternative proposals for improving the osseointegration of these implants. Two studies were first conducted for this evaluation: *in vitro* study on human fibroblast cell cultures and bacterial colonization in the presence of four bacterial strains (*Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Haemolytic streptococcus*) with and without implants, *in vivo* study on *Wistar wistar* rats (n = 35) which consists in the implantation of the biomaterial at the gingival sulcus and the renal capsule; procurement of target organs of the cytotoxicity (sulcus, kidney and liver) and their morphological study with an optical microscope. Our results showed that the implants of titanium alloy (Ti6A14V) indeed disrupt the cellular structure of the organs studied compared to controls. The proliferation of bacterial strains studied was substantially similar in culture plates with and without implants. The proliferation of human fibroblasts in cell culture showed no significant change between the implants pits and the control pits. We concluded that the implants of titanium alloy (Ti6A14V) were biocompatible *in vitro* but cause some problems *in vivo*. This could explain the negative impact of these implants on osseointegration. The surface of implants could be a limiting factor for the biocompatibility and the osseointegration of titanium alloys (Ti6A14V). We have then showed, with a similar histopathological study, that the coating of the implants of titanium

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alloy with Diamond-Like Carbon (DLC) reduce completely the observed effects in the kidney and the liver rat.

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## Introduction:-

Titanium alloys (Ti6Al4V) are choice biomaterials used in implant and maxillofacial surgery, given their resistance to the biological constraints of the environment. Titanium is an excellent biomaterial whose integration is done by plastic deformation of the bone-implant interface. The metal is permanently incorporated into the bone [1, 2, 3]. The success of osseointegration depends on the existence of multiple factors: biocompatibility of the biomaterial implant-bone interface, the surface of the implant, the impact of the chemical fluids on the material, the adhesion and proliferation of bacteria in the oral cavity on the surface of the implant, and finally the prosthetic imperatives [4, 5, 6, 7, 8, 9, 10, 11, 12]. However, although these biomaterials are already in use, their use still causes problems in a number of cases, that is what led us to raise the question of bio-reactivity interface of titanium alloys with mineralized tissues in particular [6, 7, 13]. To improve the biocompatibility of these implants, the coating by Diamond-Like Carbon (DLC) is often suggested for its good biocompatibility in the oral cavity [14, 15]. In this research, we first reassessed the biocompatibility of titanium alloy implants (Ti6Al4V) by two types of study, with an in vitro human fibroblasts culture and a colonization test with four bacterial strains, and with an in vivo study on *Wistar Wistar* rats by implantation of biomaterial at the level of the lower gingival sulcus and in the renal capsule. Then, in order to improve osseointegration of the titanium alloy implants (Ti6Al4V), we proceeded with the coating of the titanium alloy implants by Diamond-Like Carbon (DLC) already tested biocompatible and not cytotoxic in stomatology.

## Materials and Methods:-

### Biomaterials:-

Implants made of titanium alloy Ti6Al4V (80% titanium, 6% Aluminum, 14% vanadium) were made by using a disk placed on a mandrel carried by a hand-piece, in several samples of 2mm length and 3.75 mm width. Implants were disinfected (by Hexanios G + R, Anios Laboratory) for 15 minutes then sterilized by moist autoclave (Tau Clave 3000, Vacuum) 120° C for 30 min.

### Coating technique:-

The deposition of carbon layers has been made in the laboratory of Condensed Matter Physics of the Faculty of Sciences of Amiens, using the technique of plasma enhanced chemical vapor deposition described by Bharat Bhushan and [7]. Initially, an etching was made at a pressure of 3Pa, power voltage of 250W-770V, subsequently, the amorphous carbon layers were deposited using the following parameters: 1Pa, 250W - 454V for 95min.

### Cell culture:-

The cells used are from a primary culture of human fibroblasts from a gingival biopsy performed during the extraction of a healthy 3rd lower molar imposed by orthodontic indication with the patient's consent. The culture medium used is the HAM'S whose composition is 10% fetal calf serum (Eurobio), 1% L-glutamine (Eurobio), 0.5% penicillin-streptomycin (Eurobio), 5% of the Ultrosor G (Biosepra), 0.5% Fungizone (Sigma). Once they become confluent, the cells were trypsinized, samples of Ti6Al4V titanium implants were placed in culture plates of 12 pits, and cells were seeded at a concentration of  $1 \times 10^5$  cells per ml. Control pits were prepared in the same conditions without implants. All cell cultures were observed daily for a week, using an optical microscope with an inverted stand (Swift Instruments International SA). The cell density was assessed by cell counting in a Malassez's cell according to the exclusion principle of Trypan blue.

### Bacteriological study:-

Four bacterial strains related to the oral cavity and referenced at the Pasteur Institute of Morocco were used for this study (*Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Streptococcus β-Haemolytic*). The culture medium used is the Muller Hinton agar for *Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus* and Muller Hinton blood for *β-Hemolytic Streptococcus*. Samples of Ti6Al4V titanium implants were placed on the surface of agar plates previously seeded with the four bacterial strains at a concentration of  $1 \times 10^8$  bacteria / ml. The experiment was performed three times for each bacterial strain. The negative control plates were prepared in the same conditions without the implant. The total period of incubation lasted seven days. The bacterial growth was observed daily to the naked eye and with the use of a binocular magnifying glass (Olympus VMZ, Japan).

**Histopathological Study:-**

The study was conducted on 25 *Wistar Wistar* rats, adult male and female, body weight of 250 to 350 g, from the Centre for Research and Training of the Faculty of Medicine and Pharmacy in Casablanca. The rats were divided into 3 groups: 10 rats implanted in the sulcus, 10 rats at the left kidney capsule and 5 control rats. The animals were anesthetized intraperitoneally with a solution of 1 g of thiopental (Sandoz GmbH, Kundl, Austria) dissolved in 100 ml of NaCl 9‰ at 1.5 to 2 ml of this solution. No antibiotic therapy was administered in particular. Daily for one month, the side effects: vomiting, diarrhea, hair condition have been observed and identified. Each week, the presence or absence of inflammation and gingival bleeding was noted. The sacrifice of animals was performed 30 days after implantation. Each animal was first anesthetized as described above and samples of liver, kidney and implanted para-symphyseal mucosa were performed. A macroscopic study was performed before fixation in formalin 10%. The samples were embedded in paraffin and cut on a microtome (4µm). A color standard in hematein-eosin was performed and microscopic slides were observed under an optical microscope (Olympus, Japan).

Statistical study

Statistical study was performed by using Epi Info using the Chi-square test for qualitative data.

**Results:-****Cell culture:-**

Cells grown in the presence of titanium alloy implants showed a similar cell proliferation in all wells with or without titanium implants throughout the experimental period. Variances compared to controls were not significant ( $p > 0.05$ ). The morphology and cell behavior were similar in control and experimental pits (Figures 1 and 2c et d).

**Bacteriological study:-**

The proliferation of the four bacterial strains (*Escherichia coli*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Streptococcus β-haemolytic*) studied with different culture media chosen was similar in both culture dishes witnesses in culture dishes in the presence of implant titanium alloy (Ti6Al4V) ( $p = 0,057$ ). However, observations of various boxes of bacterial cultures with a dissecting microscope and found that bacterial growth is important at the periphery of several boxes and decreases gradually up to the implant, with an area of reduced growth below 0.5 mm around the implant. In the remaining boxes, bacterial growth is normal as well as around the periphery of the implant (Figure 2).

**Histopathological study in animal model:-**

During the implantation period, no animal has shown the sought side effects. However, the observation of sections by optical microscope indicated some cytotoxicity in the gum and kidney and manifested by a slight enlargement of the gingival epithelial cells and kidney with low chromatin condensation in renal cell. It also reflected a stimulation of cell proliferation in vivo ( $p = 0,0037$ ). Liver cells and lobular veins and centrilobular hypertrophy are significant in comparison to the control cells ( $p = 0,13$ ) and indicated a cardiovascular failure that is induced by chronic cytotoxicity due to the implant (Figures 3). Observation of sections of the gingiva revealed no difference between control rats and implanted rats.

**Discussion:-**

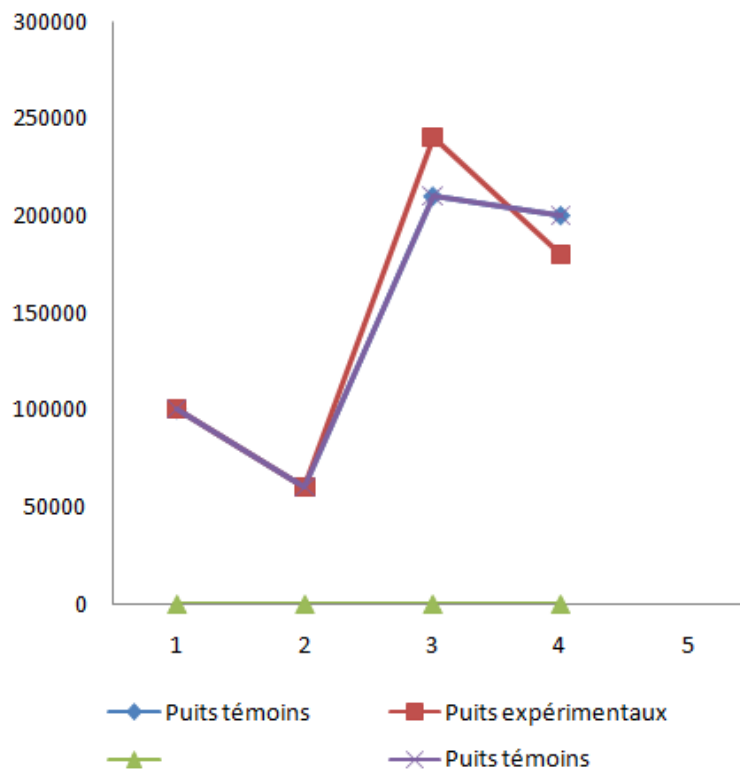
The in vitro study in cultured human fibroblasts of the oral cavity and bacterial colonization has shown that titanium implants Ti6Al4V show no cytotoxicity. However, the in vivo study shows some cytotoxicity of implants in the animal model used. This could be explained by the multiple interactions of the biological environment on the biomaterial that promote low failure rate of osseointegration implantology. Indeed, the topography of the implant promotes contact between cell components and molecular bio-guests and the surface of the implant during osseointegration [2, 16, 17, 18]. According to J. Sternad [9,10,13, 19, 20], roughness, surface chemistry and surface treatment of implants has a great impact on the bone-implant interface. Many current research focuses on changes of surface topography of implant materials to improve osseointegration [2, 3, 18]. The exact role of the surface topography of implants on the early stages of osseointegration of dental implants remains poorly understood. In addition, comparative clinical studies with different implant surfaces are rarely performed [13,20]. The originality of this study is that it is carried by two types of studies in vitro and in vivo for the first assessment bioreactivity and cytotoxicity of titanium alloy implants (Ti6Al4V), which pose still some problems osseointegration and then to improve osseointegration of titanium alloy implants with a coating of Diamond - Like Carbon (DLC).

The results of cell culture and colonization of the four bacterial strains does not confirm this cytotoxicity. This prompted us to consider further studies in vitro assays of enzymes and oxidative stress factors involved. We also used to assess the fibroblasts of titanium alloys, but it might be wiser to work on osteoblasts that are involved in the mechanisms of osseointegration. The fibroblasts, however, have the advantage of being more accessible and widely distributed in all the body. Our results of in vivo studies have shown that implants made of titanium alloy (Ti6A14V) more or less disturb the cellular structure of organs studied compared to controls. We concluded that implants made of titanium alloy (Ti6A14V) are biocompatible in vitro but pose some problems biorectivity vivo. This could explain, at least in part, the impact of those implants osseointegration and mineralized tissues in particular. The surface of implants, would by most authors, the limiting factor of this biorectivity (C, D, E).

To improve the osseointegration of titanium alloys (Ti6A14V), we suggest lining or coating of titanium alloy implants by Diamond - Like Carbon (DLC) already tested biocompatible and not cytotoxic in dentistry [15, 24, 25]. Indeed, in vivo evaluation of titanium alloy coated with DLC carbon in our laboratory has demonstrated the disappearance biorectivity problems described in this study [preliminary results].

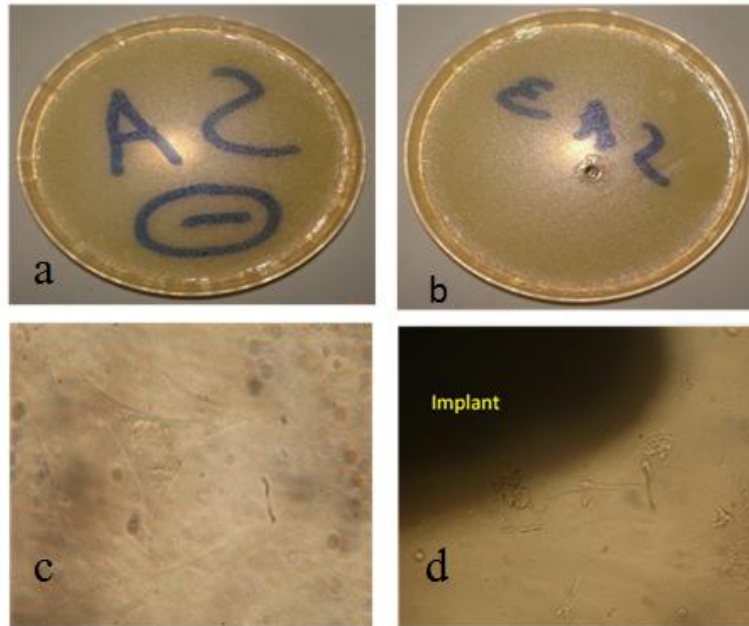
We concluded that the coating of titanium alloys by the diamond-like carbon could improve osteointegration of titanium alloy implants implantology.

#### Cells number:



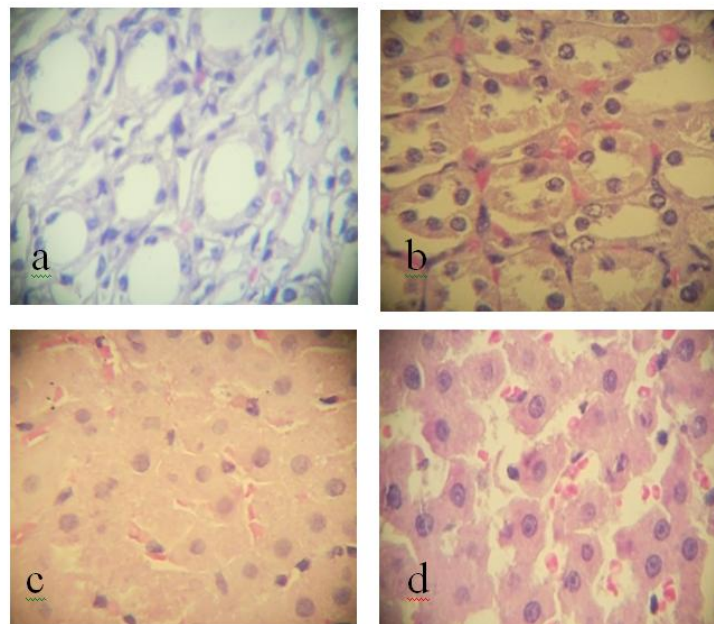
Days number

**Figure 1:-**Proliferation of human fibroblasts from the oral cavity over time in the presence of titanium alloy implant Ti6A14V.



**Figure 2:-** in vitro study on human fibroblast cell cultures and bacterial colonization.

- Staphylococcus aureus* in the absence of titanium alloy (Ti6A14V).
- Staphylococcus aureus* in the presence of titanium alloy (Ti6A14V).
- Shadowing inverted microscope stand of the proliferation of human fibroblasts from the oral cavity without implant.
- Shadowing inverted microscope stand of the proliferation of human fibroblasts from the oral cavity with implant.



**Figure 3:-** Optical microscope observation of target organ cytotoxicity.

- Optical microscope observation of Control kidney (G = 400 x).
- Optical microscope observation of Kidney implanted titanium alloy Ti6A14V (G = 400x).
- Optical microscope observation of Liver control (G = 400 x).
- Optical microscope observation of Liver implanted titanium alloy Ti6A14V (G = 400 x).



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### RESEARCH ARTICLE

#### EPIDEMIOLOGICAL PROFILE OF ORAL CANCER IN CHU IBN ROCHD - CASABLANCA - MOROCCO: ABOUT 83 CASES.

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##### Key words:-

Oral Cancer, squamous cell carcinoma, tobacco and alcohol.

#### Abstract

**Objectives:** We would like to launch the epidemiology of oral cancer in Casablanca - Morocco and target the type of tobacco which brings about the greatest part of oral cancer

**Methods:** An epidemiological study was conducted in Casablanca (Morocco) from the 1st of January 2011 to the 1st of January 2012, at the Oncology Center, the Centre of Consultation and Dental Treatment, the Centre of Otorhinolaryngology and Maxillofacial department. Data collection form helped us to collect the necessary information.

**Results:** The collected total was 83 patients with oral cancer. 92.8% of patients are over 40 years. 68.7% of patients are males. 56.6% of patients are cigarette smokers. 38.3% of patients are alcoholics and smokers. 96.4% of patients have squamous cell carcinoma.

**Conclusions:** From these findings, the epidemiological profile of patients with oral cancer in Morocco is closer to the Western profile which is mainly caused by tobacco and alcohol.

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#### Introduction:-

Oral Cancer is a part of Aero Digestive Tract Cancer Superior. In Morocco, according to the cancer register of Casablanca (2005-2007), it represents 30% of head and neck tumors and 1.77% of total cancers (1). It is more than 90% of squamous cell carcinomas. Men between 50 and 70 years are the most concerned, although, a rejuvenation and feminization of the affected population have been recently seen (2). Nowadays and in general terms survival is approximately 30% in 5 years and from 5 to 10% in 10 years.

Tobacco leads to 90% of oral cancers. Tobacco smoking is a known cause of oral cancer, pharynx and larynx. Epidemiological studies have shown that alcohol is a co-factor of oral cancer, oropharynx, hypopharynx and larynx. Tobacco and alcohol poisoning is often accompanied by poor oral hygiene. Tobacco is the initiator and alcohol is the promoter (3-5).

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In the West, the epidemiological profile of oral cancer is that of an elderly male patient who is addicted to alcohol and smoking (6-8). Unlike the West, the epidemiology of oral cancer in Senegal has shown that a middle aged female patient, who neither smokes nor drinks alcohol has a poor oral hygiene (9). In Morocco, according to official medical sources (2005-2007) several of data are missing or incomplete(1). We would like to launch the epidemiology of oral cancer in Morocco and target the type of tobacco which brings about the greatest part of oral cancer.

### Materials And Methods:-

The epidemiological study was conducted from the 1st of January 2011 to the 1st of January 2012, at the Oncology Center, the Centre of Consultation and Dental Treatment, the Centre of Otorhinolaryngology and Maxillofacial department.

Data collection forms helped us to collect the necessary information including: sociodemographic characteristics (name, age, sex, health), addiction (tobacco poisoning, type and amount smoked, duration of poisoning and alcohol), the localization of the cancer and its type (anatomopathological findings and TNM classification). This information has been given to all of the above centers.

Statistical analysis was performed using theepi info 6.04d.

### Results:-

**Table 1:-** Summary Table of socio demographic characteristics

Characteristics	n	%
Sex		
Male	57	68.70%
Female	26	31.30%
Age		
>20 years	01	1.20%
20-40 years	05	6%
<40 years	77	92.80%
Income		
Low	61	73.50%
Medium	20	24.10%
High	02	2.40%
Study level		
No		
Primary	41	49.40%
Secondary	24	28.90%
University	18	21.70%
	0	0%
Family history of cancer		
Yes	02	2.40%
No	81	97.60%

The collected total was 83 patients with oral cancer. 60.2% are taken from the Oncology Department. The socio-demographic data show that 92.80% of patients are over 40 years and 68.7% of patients are males(Table 1).

**Table 2:-**Distribution of patients according to the type of tobacco smoked

Toxic habits	n	%	Average/ day	Duration (years)
Cigarette	47	56.60%	20.40	27.50 (pack-years)
Alcohol	18	21.70%	1.16	15.38
Hashish	7	8.40%	3	13.57
Kif	6	7.20%	5.66	13.50
Chewing Tobacco	1	1.20%	3	20
Snuff	1	1.20%	10	1

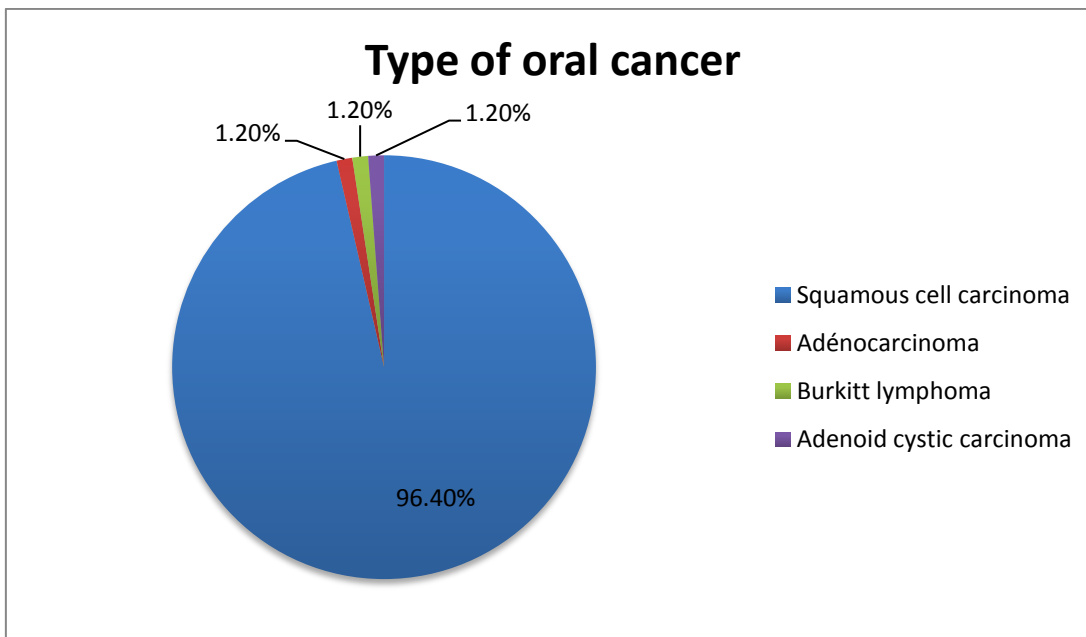
**Table 3:-**Distribution of patients according to the alcoholics and smokers

Variables	N	%
Tobacco	47	56.60%
Alcohol	18	21.70%
Alcoholic and smoker	18	38.30%

As far as addiction in our sample is concerned, 56.6% of patients are tobacco smokers, among whom 8.4% smoke Hashish, (7.2%) use Kif, (2.4%) snuff and chew tobacco. 38.3% of patients are alcoholics and smokers. One patient (5.55%) is female (Table 2) and (Table 3).

**Table 4:-** Distribution of patients according to the localization of oral cancer

Site	n (%)	N (%)
Lip		25 (30.10%)
Upper	3 (12%)	
Lower	20 (80%)	
Corner of the mouth	2 (08%)	
Tongue		20 (24.10%)
Lateral edge	18(90%)	
Ventral face	1(05%)	
Dorsal face	1(05%)	
Gum		12 (14.50%)
Upper	5 (41.7%)	
Lower	6(50%)	
Upper and Lower	1(08.3%)	
Cheek	12 (14.50%)	12 (14.50%)
Floor of mouth	9 (10.80%)	9 (10.80%)
Palatale		9 (10.80%)
Hard	4(44.4%)	
Soft	4 (44.4%)	
Hard+ soft	1 (11.1%)	
Retro-molarregion	9	9 (10.80%)
Other site		
Lung	1	1 (1.20%)



**Fig.1:-** Distribution of patients according to the type of oral cancer

The study showed that the main localization is in their lips (30.10%) and tongues (24.10%), oral mucosa (14.50%), gingival mucosa (14.50%), palatal (10.80%), Mouth Floor (10.80%) and the retromolar region (10.80%). The study also showed that the overall number according to 96 localizations in 83 patients was only one localization in 72 patients (86.74%), two localizations in 9 patients (10.84%) and three localizations in 2 patients (2.41%) (Table 4). 96.4% of patients with squamous cell carcinoma and 84.34% are well differentiated (Fig.1).

### **Discussion:-**

For the distribution of patients according to the age, our results are similar to a study conducted in France. It showed that oral cancers rarely happen before the age of 35, and that the incidence increases from the age of 40 and reaches its peak between 65 and 70 years (9-13).

The study showed that the incidence of oral cancers in men is higher than in women with a sex ratio of 1.79. Similarly, a study in Burkina Faso showed that there is a male predominance with a sex ratio of 2.0 (14,15). In men, the incidence of oral cavity and pharyngeal cancers is high in western and southern Europe, whereas oral cavity cancers have a higher incidence in south-east Asia, southern Africa and Australia. In women, pharyngeal and oral cavity cancers have a relatively high incidence in south-central Asia and oral cancers have a higher rate in south-east Asia and Australia (16).

Our study showed that 43.4% of patients were non-smokers, while the others (56.6%) all smoke tobacco. Among the latter, 8.4% smoke Hashish, 7.2% take Kif, 2.4% snuff and chew tobacco.

Tobacco leads to 90% of oral cancers. its contribution appears smaller in women. The risk is determined by the dose of the carcinogenic (number of cigarettes smoked) and the time of smoking. The dose-effect is constant between the number of cigarettes smoked and the risk of developing head and neck cancer (17,18,19).

The tobacco chewing (small bag of tobacco put into the mouth) is practiced primarily in Sweden and the United States and in other countries around the world including Morocco. The user puts an amount of tobacco between his lower lip and teeth (from 10 to 30 min) and swallows the juice and spits the surplus. The risk of cancer caused by this practice is not yet clear (20). But repeated chemical attacks by friction can cause painful sores or ulcers (18, 21). The correlation between cannabis use and the occurrence of cancer is not yet clear. Cannabis is used as "herb" - or as a resin made by mixing dried leaves and resinous tops of female plants - (Marijuana) or resin secreted by the flowering tops (Hashish). The resin is always smoked with tobacco. The herb is consumed pure or mixed with tobacco (Kif). The use of "Sebsi" (a small tube in which tobacco is put to be smoked) in Morocco favours lip localization. The simultaneous use of tobacco and cannabis makes it difficult to know the effect of cannabis but trials run on smoking machines (22) have shown that smoking marijuana regardless of its mode of use, contains 6 to 7 times more tars and carbon monoxide than the manufactured cigarette and that the resin is associated with the tobacco inhaling benzene 2 times and 3 times of toluene. That is to say, three cannabis cigarettes are equivalent to one packet of manufactured cigarettes.

In our study, 21.7% drink alcohol. According to the literature, this is the 2nd factor which can cause oral cancer (23). All types of alcohol (wine, spirits, beer ...) contribute to increasing the risk, as well as the dose of pure alcohol contained in beverages without threshold effect (18). Epidemiological data show that for oral and pharynx cancers, the risk is multiplied by 2 for a daily consumption of 25g of pure alcohol, by 3 for 50g and by 6 for 100g (24).

In our study, the simultaneous use of alcohol and tobacco affect mainly the tongue (13.63%), the lip, the floor and the retromolar part. In terms of literature, for the alcohol drinkers, cancer of the lateral edge of the tongue is less common than other cancers of the tongue (including the base of the tongue), and cancer of the mouth floor is two times more common than that of the cheek (25).

The effects of tobacco and alcohol do not add up but multiply (3). This synergy is expressed by a 6-fold increased risk for a person who smokes more than 25 cigarettes and drinks less than 35 g of alcohol per day compared to someone who does not smoke and drink less than 35g of alcohol. The risk is multiplied by 103 for the person who smokes more than 25 cigarettes and drinks on average 100g of pure alcohol per day (26). Kumar R and al, suggest that alcohol, tobacco and high-risk Human papilloma virus infection act synergistically or complement each other in the process of Head and Neck Cancers development (27).

In our study, we have a decrease in the frequency of different types of tobacco (chewed, Snuffed and smoked), and this may be due to either the patient's withholding of information or the consumption of this type of tobacco is lower in Casablanca and its suburbs. This requires us to conduct similar surveys around areas where the production of the different types of tobacco is high.

The study showed that the main localization is in their lips (30.10%) and tongues (24.10%). In Australia, there is a high rate of lip cancer due to solar radiation(28). A Retrospective Study of 740 Cases in a Brazilian Population, showed that squamous cell carcinoma (SCC) were found principally on the tongue(29).

The study showed 96.4% of patients with (SCC). According to the literature, SCC accounts for 90–95% of tumours. Other tumours include minor salivary gland tumours, lymphomas and rare tumours such as melanomas, liposarcomas, rhabdomyosarcomas (30).

In conclusion, the epidemiological profile of the patient who has cancer in the oral cavity in Casablanca - Morocco is closer to the Western profile whose main causes are tobacco and alcohol. The results of the topographic distribution of cancers of the oral cavity by the toxic habits are not sufficient to draw generalized conclusions.

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### RESEARCH ARTICLE

#### SIMULATION FOR SEDIMENTATION ASSESSMENT A CASE STUDY OF KUNAR RIVER IN AFGHANISTAN

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Kunar River, Erosion, Sediment-transport, Sedimentation, HEC-RAS model

#### Abstract

Rivers are easily accessible resources of water for miscellaneous uses but the erosion and sedimentation in rivers are unique and great deal of importance. The analysis of flow and sediment in river under different conditions is a base for rivers' behavior and decision making on engineering aspects. Kunar River is an important river of Afghanistan, has considerable interest because of strategic and environmental condition regarding water resources project planning, agriculture, forests, hydropower and industrial scope. This study is carried out to simulate the process of erosion and sedimentation using HEC-RAS model to assess hydraulic parameters and sedimentation processes in 250 Km stretch of Kunar River from Nari district of Kunar province to Pul-e-Kama of Nangarhar Province. The model was calibrated manually for hydraulic parameters of river flow and then sediment transport model was simulated. The changes in transverse and longitudinal profile, velocity and shear stress variation along the river, mass inflow and outflow, bed level change of river and suspended sediment concentration is studied for the modeled length. The sediment transport from river tributaries and gullies joining the river from two sides of narrow valley is also assessed.

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#### Introduction:-

Rivers are the major source of water supply for different purposes, the understanding of river conditions, erosion and sedimentation are the main priorities of engineering projects. River is a dynamic system, undergoes continuous changes. The river is also a self-regulatory system as it changes its characteristics in reaction to any change in environment. The environmental changes can either be natural due to climate change and variation of vegetative cover or artificial due to damming, river training, river diversion, sand and gravel mining, channelization, bank protection and bridges and highway constructions. To restore rivers to equilibrium, they will be adopted to new conditions with changes in bed slope, roughness, bed material size, cross sections shape and meandering pattern. History of each river has dominant influence on the sediment transport rates and the river sediment transport cannot be estimated without sound knowledge of watershed history and dynamics. The phenomenon of sedimentation including the erosion, sediment transport, sedimentation and consolidation of sediments are most important.

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Reasonable estimate of sediment transport in alluvial rivers is important in the context of a number of water management issues. Sediment transport is a widely studied topic in which numerous researches have built models for predicting bed material transport in an alluvial river. Information on soil erosion and its effects on water quality at catchment scales are explored by catchment managers. Among several issues resulted from complicated erosion processes, the deposition of sediments are more important especially in rivers having the ability of high sedimentation level (FarhangAzarang et al, [3]).

Sediment accumulation is a problem in many large reservoirs in Afghanistan and worldwide. Available storage of reservoir is decreasing while demand for water is increasing. The reservoirs of Nughlo dam and Kajaki dam which are major water resources project in Afghanistan facing serious problem of reservoir sedimentation. The present study is carried out on sediment transport evaluation and sedimentation capacity of Kunar River with help of HEC-RAS model. Kunar River basin is a main tributary of Kabul Riverbasin that is upper limit is Karakoram of Himalaya Mountains and also carry flow from the southern slopes of Hindu Kush Mountains.

Kabul River basin has 94267 Km<sup>2</sup> watershed area with all its sub-basins which are Logar, Panjshir, Kunar, Center Kabul and Swat. Kabul riverbasin includes 10.6 % area of Indus Riverbasin. Around 40% (1228 tones/km<sup>2</sup>/year) of the sediments leaving the Karakoram are glacier-derived. The most of sediment is deposited in the plains, reducing sediment delivery to the Arabian Sea to about 230 tones/km<sup>2</sup>/year, leading to high sediment fluxes in the small sub-basins within the Himalaya-Karakoram tectonic zone (David N. Collins 1996, [10]). Kunar Riverbasin as Sub-basin of Kabul River also fed from Karakoram glaciers and has sediment yield around 562.606 tones/Km<sup>2</sup>/Year and hence needs serious consideration of sedimentation problems for planning of any water resources activity on this river.

Since the rate of sediment transport is complex and related to various variables such as physiographic characteristics of river basin, bed and flood plain materials of river, stream power and hydraulic characteristics of river thus sediment transport modeling is difficult. Sediment data is uncertain and transport theory is highly sensitive to a lots of physical variables and modeling parameters.

Mathematical modeling of rivers need more physical relationships for sediment transport processes. The fluvial processes are governed by continuity, flow resistance, sediment movements, river bank stability and variation of channel width and are difficult to be presented. Generally width of river changes simultaneously with variation in river bed profile, slope, channel pattern, river channel roughness etc. All those changes are inter-related which maintains a dynamic state of equilibrium and any imposed factor on the river will be absorbed with combination of above responses (Harinarayan Tiwari et al, [12]).

Hydrologic Engineering Center River Analysis System (HEC-RAS) is a mathematical model for river sediment analysis. HEC-RAS includes mobile boundary and sediment transport capabilities for sediment routing and adopts the channel cross sections in response to sediment dynamics. Sediment transport models require hydraulic parameters, therefore HEC-RAS computes hydraulics before sediment routings or updating cross sections means it keeps flow constant for each flow record, calculate sediment transport on record duration. HEC-RAS 5.0 couples sediment transport computations with either quasi-unsteady hydraulics or unsteady hydraulics.

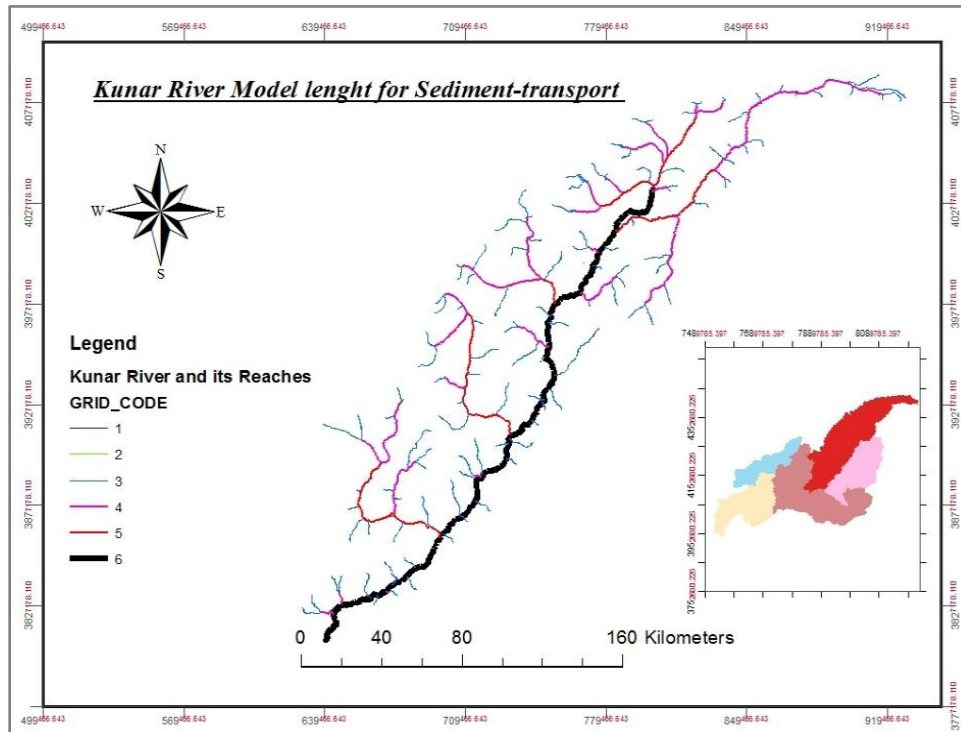
In this study, steady flow backwater equation for series of flow with associated time are solved using quasi-unsteady model and then unsteady flow model is used to solve the Saint-Venant equation implicitly.

The 47 Km length of Sistan River was studied using HEC-RAS model. The purpose of study was to determine the sediment exposed areas of Sistan River. The transverse and change of longitudinal profile of river, shear stresses changes, and sediment transport capacity were examined (Mahdi Motalebian et al. [1]). The HEC-RAS mode was applied to Boshar River, a main upstream reach of Khersan River in Karoon catchment which is located in Kohkeloyeh and Boyerahmad Province-Iran, in order to identify the suitable locations for sand and gravel mining along the river reach. (Mohammad Gharesifard et al. [2]). The simulation of erosion and sedimentation processes and also considering cross section geometric changes, prediction of river and total sediment load of Karun River using HEC-RAS model. The results showed that the Karun River has had sedimentation in its most cross sections while the erosion has been rarely observed. (FarhangAzarang et al. [3])



### Study Area:-

Kunar riverbasin is a major tributary of Kabul river basin which upper limit is Karakoram Range of Himalaya Mountains. Himalaya Mountains supplies the world major part of sediment flux to ocean through the five bigger river of south Asia the amount of sediment is estimated 1.73 Giga tones which is 9% of global sediment flux (David N. Collins 1996, [10]). Another side of this watershed is limited with southern slopes of Hindu Kush Mountains. The river catchment include mountains and highlands which is mostly dominated by natural forests.



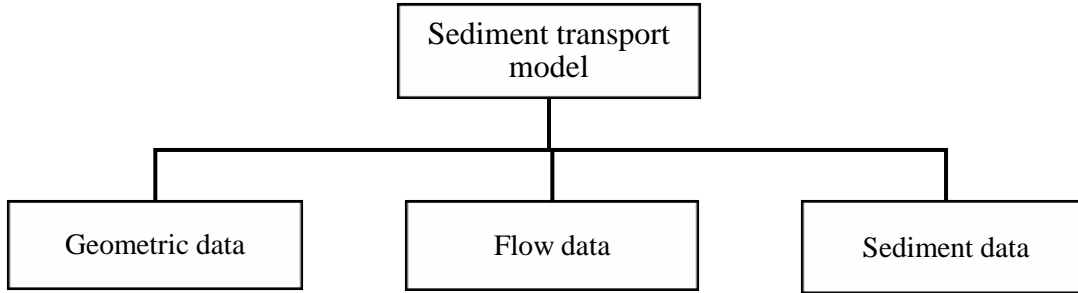
**Figure 1:-**Modeled area of Kunar River for sediment transport.

The modeled part of Kunar River for sediment assessment shown in Figure 1 has around 250 km length starting from location with Northing 800413.817, Easting 4023940.034 and Altitude 2126 meters and ending at Northing 640141.777, Easting 3809967.814 and Altitude 538 meters. The relief between starting and ending of the river is 1588 meters and the average slope is determined as 0.00512 for the river channel indicating its scouring.

Kunar River is divided here into two parts (1) upstream (150 – 250 Km) reach and, (2) downstream (0 – 150 Km) reach as shown in Figure 1. The upstream channel located between mountains with stable bed and banks in this narrow rocky valley. Kunar River is steep sloped with high capacity of sediment transportation. The river bed is changed to a fluvial bed in downstream and the river valley becomes wider with less slope and low flow velocity, thus the river stream has low sediment transport capability. Hence, in the second half part of the river, extreme sedimentation occurs and Kunar River converts its bed to several channels and hilly patterns looking from sediment accumulations inside the river channels.

### Methodology:-

In this work, HEC-RAS 5.0 model which is developed by United States Army Corps of Engineers (USACE) has been used for simulation. The mentioned software is able to simulate the steady flow, gradually varied flow, water quality, and sediment transport. This model has advanced graphic abilities to display the software outputs.



**Figure2:-**Data required in HEC-RAS model for sediment modeling

The part of this model for sediment load has been developed to simulate one dimensional deposition of sedimentation and erosion of the rivers. The three main inputs data needed for sediment transport computations are shown in Figure 2.

In addition HEC-RAS model need to specify the Transportation Function (TF) based on soil properties of basin. The TF given by Acker-White, Yang and Wilcock has been used in present study and accordingly Sorting Method (SM) and Fall Velocity (FV) is chosen.

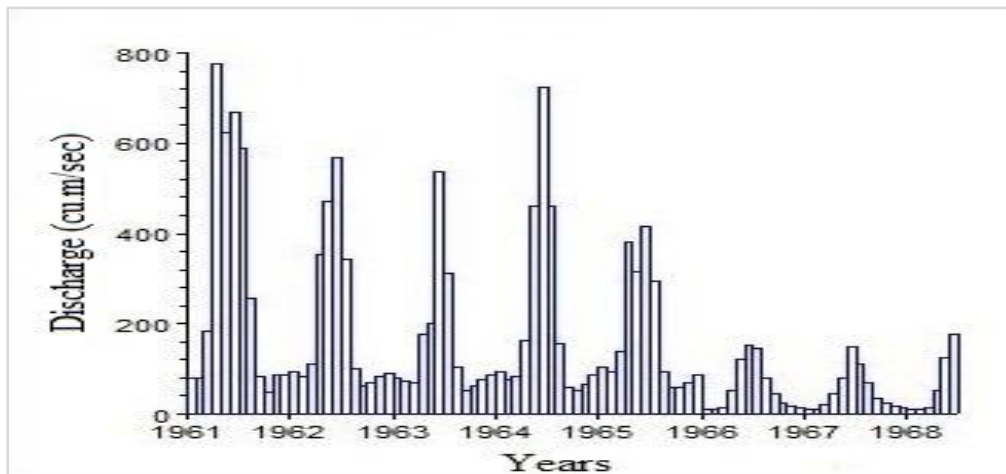
**Geometric Data:-**

For analyzing of a flow problem, geometry is basic input. The geometry is generated using Digital Elevation Model (DEM) in Arc-GIS with help of Geo-RAS. Geo-RAS is an extension of Arc-GIS developed with Hydrologic Engineering Center (HEC) and used to obtain the riveralignment, banks location, flow path and cross section in GIS environment.The geometric data include cross sections, reach lengths and bank locations that is imported to HEC-RAS from ArcGIS.

The Manning’s n value should be introduced for each cross section ofriver, banks and flood plainsseparately. In this study, Manning’s n is considered 0.031 for riverand 0.02 for flood plains as per guide of United States Geological Survey (USGS Water-Supply Paper 2339 [9]).

**Flow Data:-**

In the quasi-unsteady flow, a time series of flowdata is requiredto simulatethe sediment model. The flow datais defined as upstream and downstream boundary conditions. In this study, the Gahwardish stations is the upstream boundary and Pul-e-Kama is the downstream boundary of Kunar River. In addition to this, data of Asmar and Kunari tributaries are added to as flow change locations. The flow hydrograph is given in Figure 3.



**Figure3:-** Flow data for Kunar River as flow series in different years.

**Sediment Data:-**

Sediment data consist of river bed gradation, sediment loads (sediment rating curve). The size of sediment particles plays an important role in erosion and sedimentation processes, each cross section should have a gradation curve in the discrete bed. In this study, the cross sections having statistical data of gradation for river reach from upstream to downstream have been used and the interpolation has been used to generate data for cross sections which do not have data. The rating curve and bed gradation data used in this study are given in Figure 4 and Table 1 respectively.

The rating curve determines the sediment discharge into the river based on the river discharge. The obtained flow discharge-sediment load curve for Kunar River is  $Q_s = 1.4424 Q^{1.7131}$ ,  $Q_s$  is suspended sediment load in tone/day and  $Q$  is river discharge in  $m^3/s$ .

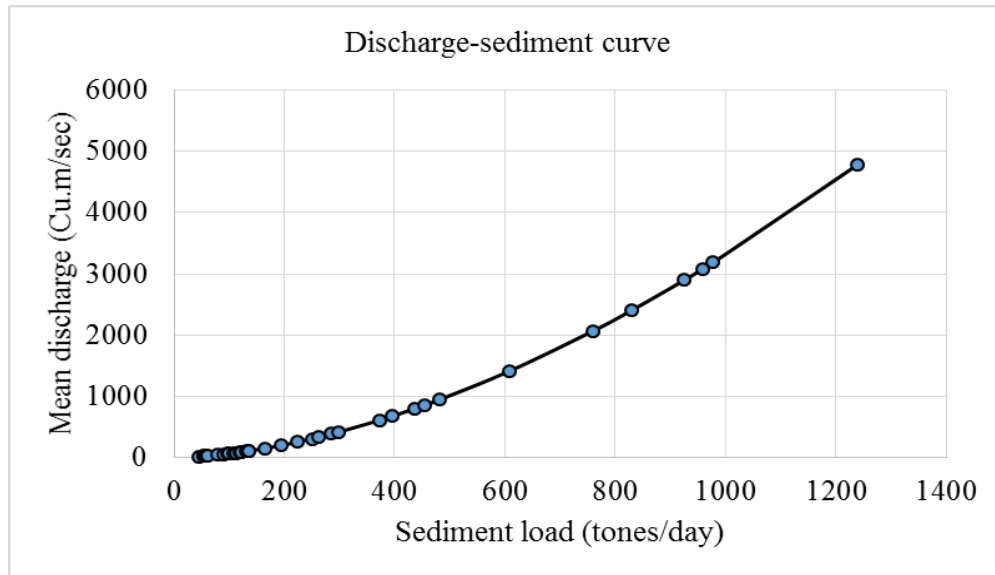


Figure4:-Sediment rating curve for Kunar River.

Table 1:-Bed gradation data

No	Class	Diameter (mm)	Percentage of finer
1	Fine sand (FS)	0.25	0
2	Silty sand (MS)	0.50	8
3	Clay sand (CS)	1.00	24
4	Well graded clay sand (VCS)	2.00	34
5	Very fine gravel (VFG)	4.00	50
6	Fine gravel (FG)	8.00	68
7	Silty gravel (MG)	16	79
8	Clay gravel (CG)	32	85
9	Well graded clay gravel (VCG)	64	95
10	Silty clayey sand with gravel (SC)	128	99
11	Gravelly silty clay with sand (LC)	256	100

**Results and Discussions:-**

The quasi-unsteady flow (unsteady flow analysis) has been carried for given geometric data and flow data of river for sedimentation study in HEC-RAS model. In this software, well known equations are used to determine the total sedimentation load. Predicted change in bed level, maximum change in elevation and other effects are observed which are mentioned in graphical form.

HEC-RAS model for sedimentation give detailed information of erosion/deposition of each cross section, river invert and water surface elevation, flow, velocity, shear stresses, mass changes.

The longitudinal bed profile of Kunar River under the study length is shown in Figure 5. The upstream (150 – 250 Km) reach half of river has more slope than the downstream half-length (0 – 150 Km) reach which causes serious erosions in the upstream half-length and sedimentation in the downstream length of river.

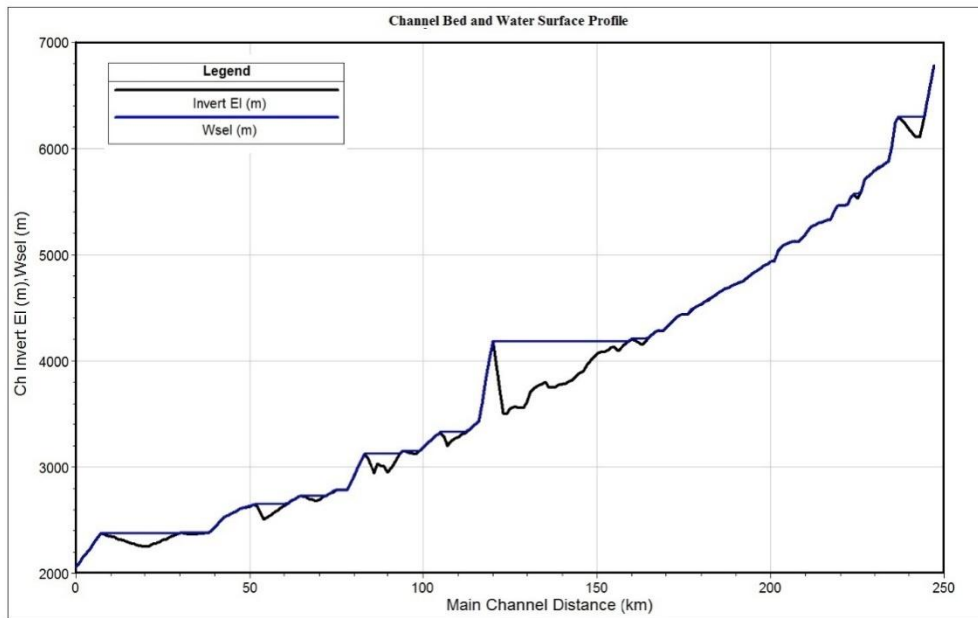


Figure5:-Longitudinal surface water profile along Kunar River

The variation of velocity along length of Kunar River is shown in Figure 6. There is large fluctuations in velocity along the considered reach of channel. The maximum velocity observed is 4.253 m/sec and minimum velocity is very small in some sections where the water depth is more and has a wide surface area.

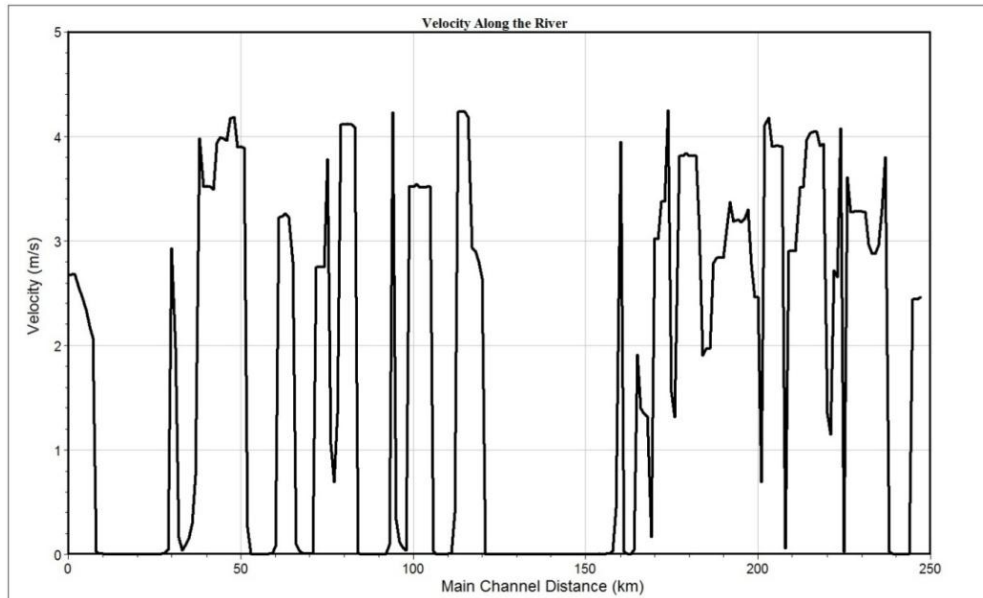
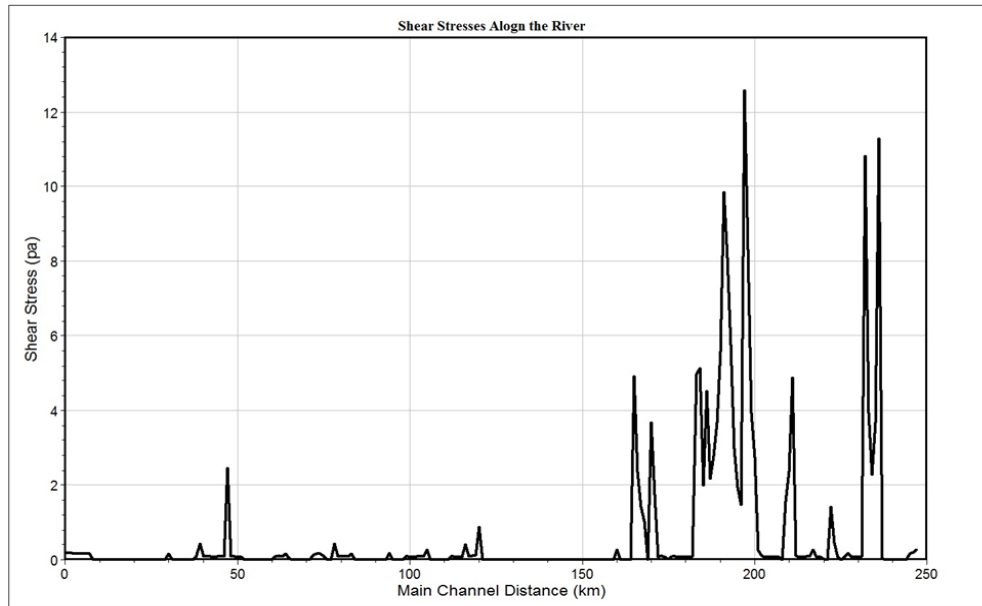


Figure 6:-Velocity distribution along Kunar River

The shear stresses are frictional force which acts against gravity action and they are directly proportional to specific weight of water, hydraulic radius and slope of the channel. Variation of shear stress given in Figure 7 along the

riverstream indicates that there is almost no shear stress in downstream of river(0 – 150km) reach but in upstream (150 – 250 Km) reach shear stresses are more and fluctuating.

Variation of shear stress along Kunar River may be due to variation of bed slope. Maximum shear stress is 12.588 Pa while the minimum stress are 0.252 Pa. The maximum shear stress in upstream reach as seen in Figure 7 gives the idea that Kunar River in upstream flows through rocky and narrow valley resulting more friction losses and leading to severe erosion problems.



**Figure 7:-**Shear stress variation along Kunar River

The variation in mass changes in both positive and negative (sedimentation and erosion) direction along Kunar River in Figure 8 exhibits intermittent happening of both erosion and deposition processes. In the middle, there is no erosion or deposition in 120 Km to 150km reach. The highest erosion and deposition is observed around 50km reach.

The magnitudes of bed level changes in Kunar river is illustrated in Figure 9. The intermediate occurrences of erosion and sedimentation are observed in all parts of the river.

The maximum depth of erosion in these reaches is about -2.449 m which happens in 50 Km and 80 Km river stations and the maximum deposition is about 1.495 m in downstream (30 – 40 Km) reach of river having wide cross section. It is seen that Kunar River experiences sequentially both erosion and deposition.

The sediments are transported by a river in form of dissolved, suspended load, saltation, wash and bed load. Suspended sediments are part of clastic load which move through channel in water column.

Mainly silt and sand are kept in suspension by upward flux of turbulences generated at bed of the channel. Maximum sediment concentration along Kunar river is obtained to be 506,605.9 mg/L. The variation suspended load concentration along Kunar river is given in Figure 10.

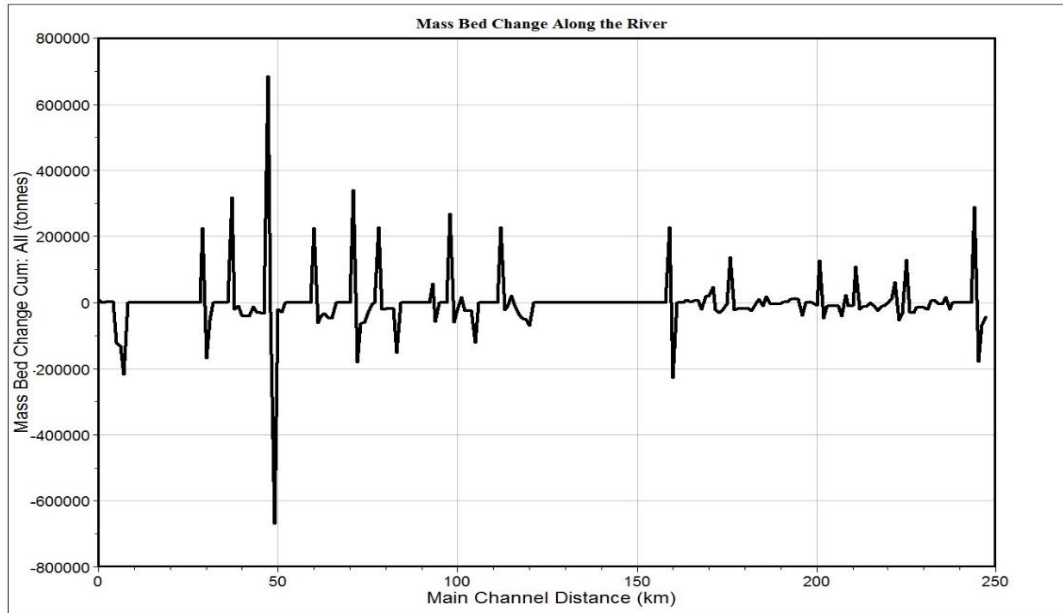


Figure 8:-Mass changes along Kunar River

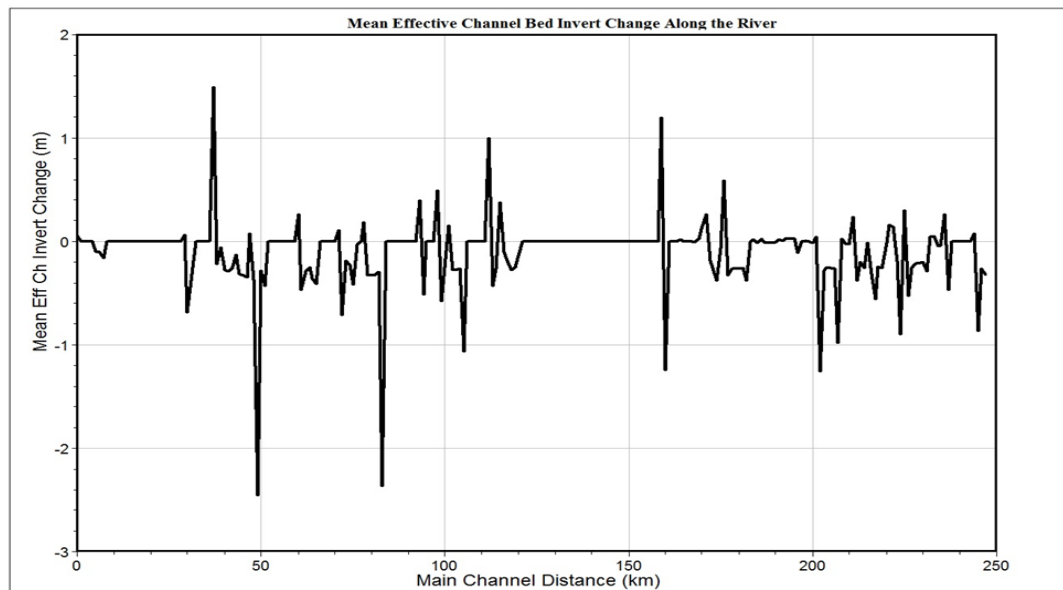
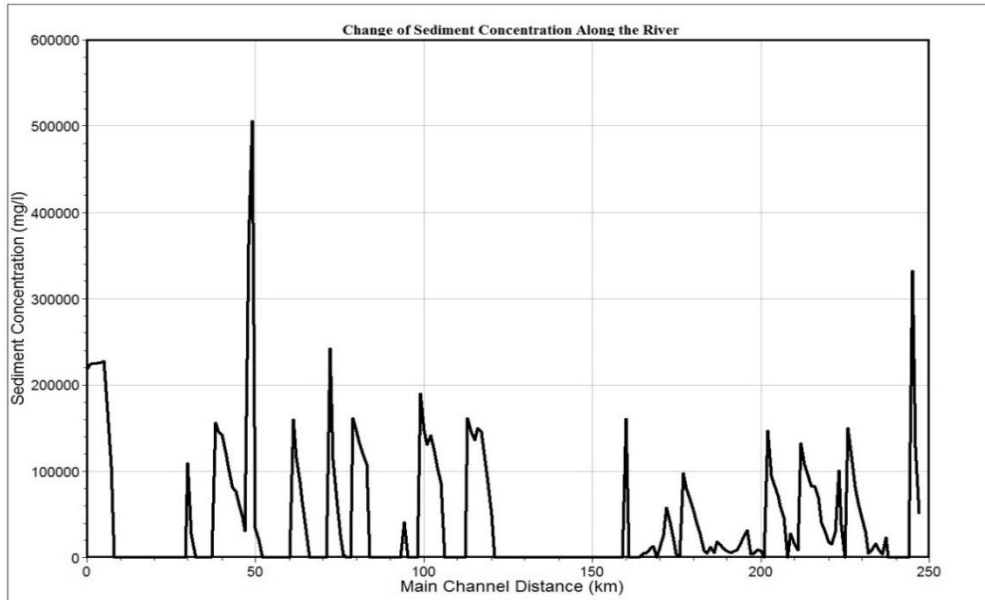


Figure 9:- Bed level changes along the modeled length of Kunar river.



**Figure 10:-**Sediment concentration along Kunar River

Kunar river seems to be a non-aluvial river in upstream because of the river channel passes through rocks. There are also pools that are very deep up to 100m which effectively trap sediments. Without three main right tributaries which flow toward Kunar River, 98 temporary streams that can be called gullies join with Kunar River from right side along the river and 110 gullies join from the left side as an example is shown in Figure 11.

The gullies have very steep slopes which are located at two sides of the valley. Some of the gullies have comparatively large watershed area with steep slope that creates flooding during precipitation and transport huge amount of sediments from high mountains of both sides to river as Kunar River in this part has high ability of transport so flow transports these sediments and Kunar river changes to alluvial nature in downstream part due to huge sedimentation therefore river bed changes and divided into multi channels as seen in Figure 12.



**Figure 11:-**Gullies entering to main stream of Kunar river





**Figure 12:-** Kunar River at downstream reach with multi channeling and sediment hills

### Conclusions:-

1. The model was first calibrated manually using excel sheet for flow hydraulics and then simulating for sediment transport was carried out. The results showed that Kunar river experience erosion in upstream half-length (150 – 250 Km) reach and sedimentation happens in half-length of downstream (0 – 150 Km) reach. There are many pools in upstream length which causing sediments trapping.
2. The maximum erosion is -2.449 m which happens in 50 Km and 80 Km river stations and might have different reason as high flow velocity or alluvial bed materials. Kunar River has steep slope at upstream half length which can be main reason of erosion processes.
3. The maximum deposition is about 1.495 m in downstream (30 – 40 Km) reach length where Kunar River gets multi channeled feature and sediment hills. One of the main causes of the sedimentation phenomenon can be sudden reduction of river longitudinal slope.
4. It is observed that erosion has been more significant in the areas with steep longitudinal slope and tight transverse sections, while the sedimentation was observed more in the area with flat slope and wide transverse section.
5. Formation of large sand bars due to sedimentation and lack of regular dredging of the river have caused numerous problems including reduction of river capacity in passing flood discharge, severe reduction of Kunar River water quality.
6. The annual sediment yield calculated for Kunar river basin is 562.606  $\text{tone}/\text{km}^2/\text{year}$  that is equal to 11.2313  $\text{Mm}^3/\text{year}$  which is near the sediment yield reported by (David N. Collins 1996, [10]) for rivers of Karakoram region.

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### RESEARCH ARTICLE

## COMPARATIVE POTENTIAL EFFICACY OF DELTAMETHRIN (PYRETHROID) AND CARBOFURAN (CARBAMATE) ON TOXICITY AND BIOCHEMICAL PARAMETERS IN THE GONADS OF *CHROTOGONUS TRACHYPTERUS* BLANCHARD (ORTHOPTERA: ACRIDIDAE)

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#### Abstract

Potential toxicity and effect on biochemical parameters of Deltamethrin and Carbofuran on gonads of *Chrotogonstrachypterus* was investigated. LC<sub>50</sub> values (24 hrs.) for Deltamethrin 22.069 ppm, 2.498 ppm and for Carbofuran 14.263 ppm, 1.711 ppm on female and male *Chrotogonstrachypterus* respectively. Toxicity of two insecticides were not similar for both sexes but male having higher degree of toxicity than female adult at 24 hrs of LC<sub>50</sub> values. The effects of sub-lethal doses of Deltamethrin 11.034 ppm, 7.131 ppm; Carbofuran 1.249 ppm, 0.855 ppm on gonads of adult female and male *Chrotogonstrachypterus* were analysed respectively. Investigation of results evaluates the Carbofuran having greater potential toxicity than Deltamethrin. Analysis of biochemical parameters as protein, cholesterol, alkaline phosphatase and ATPase were evaluated at 12, 24 and 48 hr treatment. Hyperproteinemia (p<0.001) exhibited at 12, 24 and 48 hrs after application of Deltamethrin and Carbofuran in both sexes. The acute toxicity of pyrethroid and carbamate were compared by static exposure on *Chrotogonstrachypterus*. Analysis of LC<sub>50</sub> value, evaluate that synthetic pyrethroids are less toxic than carbamates. Synthetic pyrethroid and carbamate insecticides have been developed for major uses to control crop pest in agriculture and public health.

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#### Introduction:-

Agriculture relies heavily on the use of pesticides control of insects and other pests. Synthetic pyrethroid and carbamate insecticides constitute the most important class of present day pesticides which control of a pest species by affecting its unique biochemical system. The surface grasshopper, *Chrotogonstrachypterus* (Blanchard) (Orthoptera- Acrididae) is a destructive pest of wheat, barley, oil seed crops, maize, jowar, sunhemp, bajra, rice, sorghum, groundnut, pearl millet, cotton, vegetables, indigo, opium, red gram in different parts of the World. Deltamethrin and Carbofuran cause differential fluctuations in biochemical constituents (protein, cholesterol, ATPase and alkaline phosphatase) on gonads of *Chrotogonstrachypterus* which leads to sterility. LC<sub>50</sub> values of Monocrotophos 36SL and Cypermethrin 25 EC on both the sexes of *Chrotogonstrachypterus* were 353.9 ppm, 151.0 ppm and 33.11 ppm, 16.38 ppm respectively (Shakeet and Bakshi, 2009). Histopathological studies of

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Cypermethrin and Monocrotophos on expose to sublethal doses (16.56 ppm, 8.34 ppm and 176.95 ppm, 75.5 ppm) at 12, 24 and 48 hrs on both sexes of *Chrotogonstrachypterus* Blanchard greatly influence process of spermatogenesis and oogenesis respectively (Shakeet and Bakshi, 2009a, 2009b).

Deltamethrin belongs to the most commonly used pesticides worldwide. Pyrethroids are divided by characteristic into type I and type II. Both types of toxicity cause neurological symptoms and reduce reproductive potential. Pyrethroids are synthetic analogues of the natural pyrethrins, extracts of the ornamental *Chrysantemum cinerariaefolium* and its related species. Deltamethrin [(s)  $\alpha$ -cyano-3-phenoxy benzyl-(R)-cis-3-(2, 2-dibromovinyl)-2,2-dimethyl-cyclopropane carboxylate] a synthetic pyrethroid type I. It is highly effective against a broad spectrum of insects with potent insecticidal properties (Manna *et al.*, 2006). Pyrethroid caused alterations in biochemistry, hematology and reproduction (Yousef *et al.*, 2006, El-Demerdes, 2004) and that kills insects on contact and through digestion. Synthetic pyrethroids are less persistent and less toxic to mammals and birds (Sayeed *et al.*, 2003), they are highly toxic to a number of non-target organisms such as bees, freshwater fish and insects even at very low concentrations (Oudouet *et al.*, 2004), for this reason, these are extremely used in agriculture and forestry. LC<sub>50</sub> of Deltamethrin on female and male adults of *Chrotogonstrachypterus* were 22.069 ppm and 14.263 ppm respectively. Earlier observation on Fenvalerate and Chlorpyrifos toxicity on *Chrotogonstrachypterus* were 105.1 ppm, 85.52 ppm and 606.1 ppm, 349.9 ppm respectively (Jangir and Bakshi, 2011).

Carbofuran (2,3-dihydro-2,2-dimethylbenzofuran-7-yl methylcarbamate) or Furadan is an anticholinesterase carbamate commonly used as an insecticide, nematicide and acaricide in agricultural practice throughout the world. Carbofuran is highly toxic by inhalation and ingestion and moderately toxic by dermal absorption. As with other carbamate compounds, carbofuran's cholinesterase-inhibiting effect is short-term and reversible. Carbofuran has a potential to cause damage to the reproductive system and to health by prolonged exposure (Nasir Aziz, 2008). LC<sub>50</sub> of Carbofuran on female and male adults of *Chrotogonstrachypterus* were 2.498 ppm and 1.711 ppm respectively. Carbofuran has decreased the contents of carbohydrates and total protein in testicular tissue (Wael M. Al-Amond, 2012). The aim to conduct the present study was to determine the potential toxicity and biochemical alteration in gonads of *Chrotogonstrachypterus* after exposure of insecticides: Deltamethrin, Carbofuran, Cypermethrin, Fenvalerate, Chlorpyrifos and Monocrotophos.

## Material and Methods:-

### Insecticides:-

Carbofuran and Deltamethrin will be selected for study these were purchased from Rathore Beez Bhandar, Sabzi Mandi, Lal Kothi, Jaipur, India.

### Rearing of *Chrotogonstrachypterus*:-

*Chrotogonstrachypterus* were collected from the fields (Rajasthan University ground), low crop ground, bare soil and grass or the waste land. The collected insects were conditioned in the laboratory. Rearing was done at room temperature ranging from 27 to 37°C in summer months and rainy days. During winter, temperature range from 27 to 32°C was maintained in the cages. The rearing was carried out at room humidity 35 to 65 per cent.

### Mode of Application:-

*Chrotogonstrachypterus* were treated by dipping method because of the smaller size and hopping behaviour of the insect. About 5 ml solution of a sub-lethal concentration of the Deltamethrin and Carbofuran was taken in a small crucible, cleared and sterilized. A grasshopper held dorsally at the thoracic region by forceps was just dipped in the insecticide contained in the crucible.

Observations were recorded on the basis of insect's mortality at 24hrs. The results obtained were subjected to Quantal Response Assay. The LC<sub>50</sub> of Deltamethrin and Carbofuran against *Chrotogonstrachypterus* were obtained by using the following formula -

$$\text{Log LC}_{50} = \text{Log } x_0 + \frac{0.50 - P_0}{P_+ - P_0} \Delta$$

Where  $x_0$  be the highest dose that gives a reaction,  $P_0 < 0.50$ ,  $P_+ > 0.50$  and  $\Delta$  = dose step (Ipsen *et al.*, 1970).

**Determination of Sub-lethal Dose of Deltamethrin and Carbofuran against *Chrotogonustrachypterus*:-**

The LC<sub>50</sub> values of Deltamethrin and Carbofuran against female and male *C. trachypterus* were 22.069 ppm, 14.263 ppm and 2.498 ppm, 1.711 ppm respectively. In continuation of above results the sub-lethal dose of Deltamethrin and Carbofuran on female and male adults of *C. trachypterus* was 11.034 ppm, 7.31 ppm and 1.24 ppm, 0.855 ppm respectively when applied by the dipping method. The effects were observed after 12, 24 and 48 h intervals and compared with control.

**Bio-chemical Estimation:-**

1. **Estimation of Protein:** Total protein was estimated by the Lowry *et al.*, (1951) procedure. The absorbance was read at 640 nm against blank. The activity was expressed in mg/g of the wet tissue.
2. **Estimation of Cholesterol:** Total cholesterol was determined by the method described by Zlatkiset *al.*, (1953). Cholesterol has unsaturated bonds and phenanthrene ring structure. The absorbance was read at 540 nm against blank. The activity was expressed in mg/g of wet tissue.
3. **Estimation of Alkaline Phosphatase:** Alkaline phosphatase was estimated by the method after Fiske and Subba-row (1925) for the determination of phosphate liberated with modification including the incubation procedure of Bodansky (1932, 1933) using alkaline buffer. The phosphatase activity is the difference between the inorganic phosphate content of the incubated and control samples and is expressed in terms of Bodansky unit corresponding to the liberation of inorganic phosphorus from the tissue in mg pi/g/h.
4. **Estimation of Adenosine Triphosphatase(ATPase):** For quantitative analysis of the activity of ATPase, the method given by Sickevitz and Potter (1953) was followed. Tissues were homogenized in sucrose. Disodium salt of ATP was used as substrate. The activity was measured in term of inorganic phosphorus liberated from the tissue as for the acid and alkaline phosphatases. The absorbance was read at 640 nm.

**Statistical Analysis:-**

The results obtained were expressed as mean±S.E. The statistical analysis by use of Student's t parametric test was performed to determine significant differences. The significance levels were expressed in 'P' values as

NS = Non significant

P<0.05 = Significant

P<0.01 = More significant

P<0.001 = highly significant

**Results and Discussion:-****Toxicity Results:-**

Results of the bioassay of Deltamethrin and Carbofuran tested against the female and male adults of *Chrotogonustrachypterus* were summarized in table 1.

Effect of Deltamethrin on female adults: Insects mortality at 400, 800, 1100, 1200, 1300 ppm concentration were 3.57, 14.29, 41.18, 76.47 and 100% at 24 hrs respectively (Table 1). LC<sub>50</sub> value for female adults at 24 hrs was found to be 22.069 ppm with confidence limits of 24.06 and 7.81 (Table - 2, fig -1).

Effect of Deltamethrin on male adults: Insects mortality at 200, 400, 550, 600 and 750 ppm concentration were 10, 44.44, 71.43, 88.46 and 96.97% at 24 hrs respectively (Table 1). LC<sub>50</sub> value for male adults at 24 hrs was found to be 14.263 ppm with 95% confidence limits of 17.16 and 11.84 (Table -2, fig -2).

Effect of Carbofuran on female adults: Insects mortality at 0.4, 0.1, 0.12, 0.16 and 0.2 ppm concentration were 3.13, 8.33, 23.53, 66.67 and 95% at 24 hrs respectively (Table 1). LC<sub>50</sub> value for female adults at 24 hrs was found to be 2.498 ppm with confidence limits of 3.11 and 2.00 (Table - 2, fig -3).

Effect of Carbofuran on male adults: Insects mortality at 0.2, 0.5, 0.6, 0.8 and 0.1 ppm concentration were 3.45, 9.52, 33.33, 81.25 and 95.65% at 24 hrs respectively (Table 1). LC<sub>50</sub> value for female adults at 24 hrs was found to be 1.711 ppm with confidence limits of 1.93 and 1.62 (Table - 2, fig -4).

**Effect of Deltamethrin on biochemical parameters:-****1. Protein**

**Male:** -A highly significant (P<0.001) increase was recorded in protein level of male insects after 12, 24 and 48 hrs of treatment (Table 3, Fig. 5).

**Female:** - Protein level highly significant increase ( $P < 0.001$ ) at 12, 24 and 48 hrs in females (Table 3, Fig. 5).

## 2. Cholesterol

**Male:** - There was a highly significant ( $P < 0.001$ ) increase in cholesterol level at 12 and 48 hrs of the treatment which was followed by highly significant ( $P < 0.001$ ) decrease at 24 hrs (Table 3, Fig 6).

**Female:** - Highly Significant ( $P < 0.001$ ) decrease was recorded at 24 hrs in cholesterol level while at 12 and 24 hrs highly significant ( $P < 0.001$ ) raised (Table 3, Fig. 6).

## 3. Alkaline Phosphatase

**Male:** - A significant decrease in alkaline phosphatase activity was recorded 48 hrs after treatment, but slightly significant increase ( $P < 0.01$ ) after 24 hrs and highly significant ( $P < 0.001$ ) increase 12 hrs of the treatment (Table 3, Fig. 7).

**Female:** - A non-significant increase in alkaline phosphatase level at 24 hrs while at 12 and 48 hrs significantly declined (Table 3, Fig. 7).

## 4. ATPase

**Male:** - ATPase level highly significant ( $P < 0.001$ ) increased 12, 24 and 48 hrs. (Table 3, Fig. 8)

**Female:** - ATPase analysis of result in females recorded similar as in males but at 24 hrs slightly fluctuation was occurred (Table 3, Fig. 8).

### Effect of Carbofuran on biochemical parameters:-

#### 1. Protein

**Male:** - A highly significantly increase ( $P < 0.001$ ) in protein level was recorded at 12, 24 and 48 hrs (Table-4, fig-9).

**Female:** - There was a highly significant ( $P < 0.001$ ) increase was recorded in treated females at 12, 24, 48 hrs similar as in males (Table-4, fig-9).

#### 2. Cholesterol

**Male:** - Increase in cholesterol level was highly significant ( $P < 0.001$ ) at 12 and 48 hrs of the treatment and slightly decrease at 24 hrs in cholesterol level (Table-4, fig- 10).

**Female:** - Continuously highly significant ( $P < 0.001$ ) increase in cholesterol level at 12, 24 and 48 hrs were recorded (Table-4, fig-10).

#### 3. Alkaline phosphatase

**Male:** - A highly significant ( $P < 0.001$ ) increase in alkaline phosphatase was recorded at 24 hrs of the treatment. Thereafter a highly significant ( $P < 0.001$ ) decrease in the activity of alkaline phosphatase was recorded at 12 and 48 hrs after the treatment (Table-4, fig-11).

**Female:** - There was a highly significant ( $P < 0.001$ ) increase in the activity of alkaline phosphatase at 24 hrs and decrease the level of alkaline phosphatase on 12 and 48 hrs (Table-4, fig-11).

#### 4. ATPase

**Male:** - A continuous increase of ATPase level which was highly significant ( $P < 0.001$ ) at 12, 24 and 48 hrs after the treatment (Table-4, fig-12).

**Female:** - Experimental result analysis similar as in males (Table-4, fig-12).

Treatment with Deltamethrin and Carbofuran were found potentially effective, quantitative estimation of biochemical parameters viz. Protein, Cholesterol, Alkaline phosphatase and ATPase in the gonads of *Chrotogonustrachypterus*.

**Table 1:-** Effect of various concentrations of Deltamethrin and Carbofuran on female and male adults of *Chrotogonstrachypterus* at 24hrs

Treated Insecticides	Sex	No. of Insects	Dose (ppm)	Dead	Survived	Survived at this & greater dose Sg	Died at this & Smaller Dose Ds	Sg + Ds	Percentage
Deltamethrim (Pyrethroid)	F	10	400	1	9	27	1	28	3.57
	F	10	800	2	8	18	3	21	14.29
	F	10	1100	4	6	10	7	17	41.18
	F	10	1200	6	4	4	13	17	76.47
	F	10	1300	10	0	0	23	23	100.00
	M	10	200	2	8	18	2	20	10.00
	M	10	400	6	4	10	8	18	44.44
	M	10	550	7	3	6	15	21	71.43
	M	10	600	8	2	3	23	26	88.46
Cabofuran	M	10	750	9	1	1	32	33	96.97
	F	10	0.4	1	9	31	1	32	3.13
	F	10	0.1	1	9	22	2	24	8.33
	F	10	0.12	2	8	13	4	17	23.53
	F	10	0.16	6	4	5	10	15	66.67
	F	10	0.2	9	1	1	19	20	95.00
	M	10	0.2	1	9	28	1	29	3.45
	M	10	0.5	1	9	19	2	21	9.52
	M	10	0.6	3	7	10	5	15	33.33
	M	10	0.8	8	2	3	13	16	81.25
M	10	0.1	9	1	1	22	23	95.65	

**Table 2:-** LC<sub>50</sub> values of Carbofuran and Deltamethrin for both sexes of *Chrotogonstrachypterus* at 24 hrs

Treated Insecticide	Sex	LC <sub>50</sub>	95 % Confidence limit	
			Upper Limit	Lower limit
Carbofuran	Female	2.498	3.112	2.004
	Male	1.711	1.932	1.623
Deltamethrin	Female	22.06	24.06	7.81
	Male	14.26	17.16	11.84

**Table 3:-** Biochemical alterations of Deltmethrin on gonads of *Chrotogonstrachypterus* (Blanchard) in control and treated groups.

Parameter	Sex	Group	Time in hrs. after treatment		
			12	24	48
Protien (mg./g.)	Male	Control	61.13 ± 0.5189	58.46 ± 0.7261	62.1 ± 1.5977
		Treated	74.44 ± 0.6739***	81.88 ± 0.9165***	100.15 ± 0.4739***
	Female	Control	43.53 ± 1.1951	54.22 ± 0.4453	61.3 ± 0.5258
		Treated	53.34 ± 0.6478**	64.48 ± 1.8014**	76.64 ± 0.2577***
Cholesterol (mg./g.)	Male	Control	10.47 ± 0.2738	10.2 ± 0.4618	11.36 ± 0.1677
		Treated	21.06 ± 0.085***	18.18 ± 0.0272***	25.7 ± 0.3381***
	Female	Control	8.34 ± 0.1963	9.36 ± 0.1853	9.03 ± 0.0957
		Treated	19.64 ± 0.1399***	17.3 ± 0.2477***	23.41 ± 0.0969***
Alkaline Phosphatase (mgpi/gm./hrs.)	Male	Control	4.23 ± 0.055	4.16 ± 0.0408	3.08 ± 0.0386
		Treated	2.16 ± 0.0708***	2.94 ± 0.1905**	1.74 ± 0.3139*
	Female	Control	3.79 ± 0.2046	3.01 ± 0.1603	3.2 ± 0.0944
		Treated	1.58 ± 0.1905**	3.02 ± 0.4289NS	0.38 ± 0.2578***
ATPase (mgpi/gm./hrs.)	Male	Control	41.85 ± 0.7159	41.41 ± 0.245	42.16 ± 0.0196
		Treated	72.1 ± 0.4903***	121.46 ± 0.5195***	147.08 ± 0.072***
	Female	Control	42.17 ± 0.4769	45.62 ± 0.2851	46.4 ± 0.5076
		Treated	81.96 ± 0.417***	81.47 ± 0.6351***	151.51 ± 0.2944***

Each value represent - Mean±S.E. Significance level – Control vs. Treated NS = Non significant

\*P<0.05 = Significant \*\*P<0.01 = More significant \*\*\*P<0.001 = Highly significant

**Table 4:-** Biochemical alterations of Carbofuran on gonads of *Chrotogonstrachyterus* (Blanchard) in control and treated groups.

Parameter	Sex	Group	Time in hrs. after treatment		
			12	24	48
Protien (mg./g.)	Male	Control	50.24 ± 0.5037	50.18 ± 0.0287	51.34 ± 0.2694
		Treated	58.56 ± 0.2234***	62.56 ± 0.6608***	68.4 ± 0.3103***
	Female	Control	50.34 ± 0.5416	50.13 ± 0.0558	52.15 ± 0.0589
		Treated	56.16 ± 0.0752***	58.12 ± 0.0517***	65.24 ± 0.0944***
Cholesterol (mg./g.)	Male	Control	8.81 ± 0.0027	7.84 ± 0.1362	7.64 ± 0.113
		Treated	17.84 ± 0.0054***	16.21 ± 0.0027***	17.97 ± 0.0276***
	Female	Control	6.88 ± 0.026	6.68 ± 0.0876	7.71 ± 0.0844
		Treated	16.21 ± 0.0027***	17.83 ± 0.0136***	17.55 ± 0.0216***
Alkaline Phosphatase (mgpi/gm./hrs.)	Male	Control	3.1 ± 0.1292	2.91 ± 0.1016	3.19 ± 0.2975
		Treated	0.8 ± 0.2876**	1.85 ± 0.0857**	1.34 ± 0.2103**
	Female	Control	4.07 ± 0.0798	3.9 ± 0.0566	3.17 ± 0.0196
		Treated	1.14 ± 0.0288***	1.52 ± 0.0792***	1.03 ± 0.0384***
ATPase (mgpi/gm./hrs.)	Male	Control	27.25 ± 0.4696	29.76 ± 0.1933	29.85 ± 0.0236
		Treated	60.15 ± 0.0558***	122.04 ± 0.0054***	132.4 ± 0.174***
	Female	Control	29.97 ± 0.0249	30.41 ± 0.162	31.17 ± 0.0249
		Treated	59.43 ± 0.1787***	120.48 ± 0.2749***	140.52 ± 0.2655***

Each value represent - Mean±S.E. Significance level – Control vs. Treated NS = Non significant  
 \*P<0.05 = Significant \*\*P<0.01 = More significant \*\*\*P<0.001 = Highly significant

**Fig. 1:-** Effect of Deltamethrin on protein level in gonads of *Chrotogonstrachyterus*

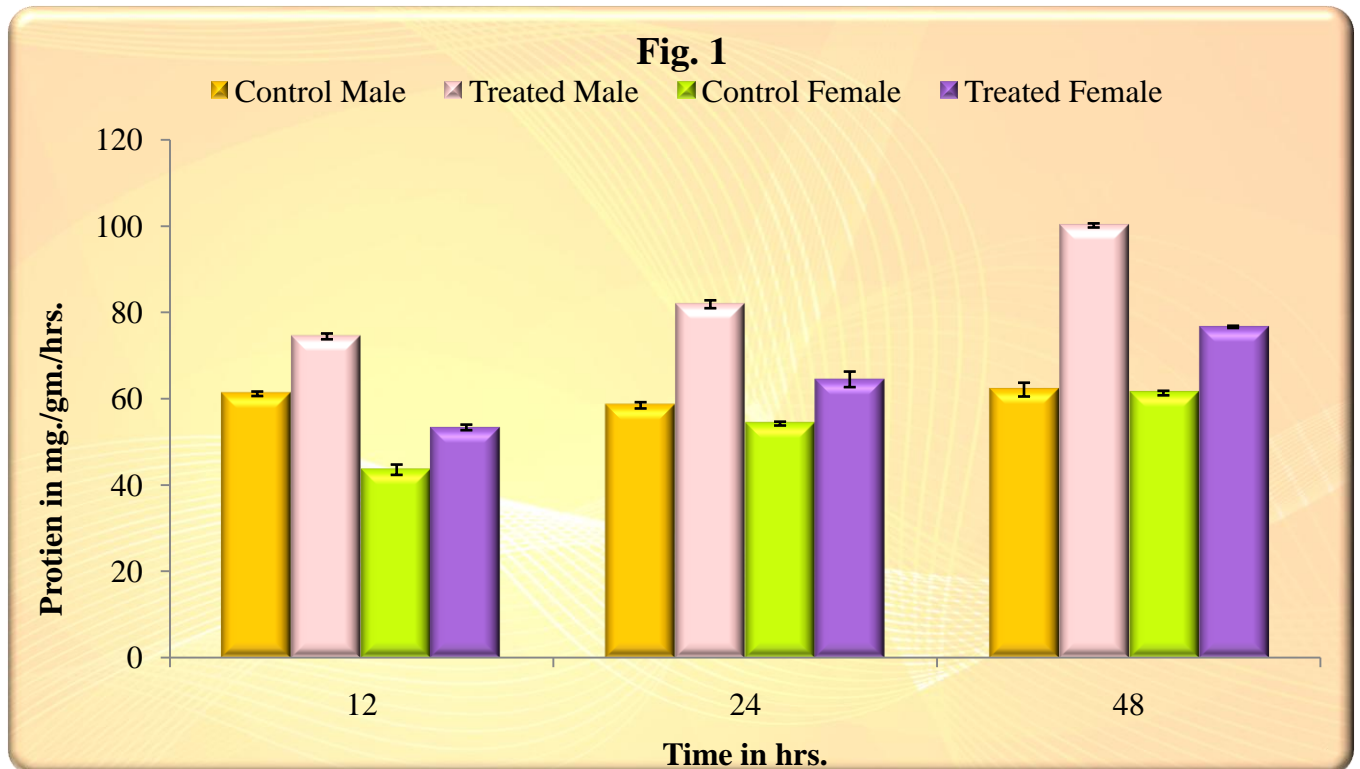




Fig. 2:-Effect of Deltamethrin on Cholesterol level in gonads of *Chrotogonstrachypterus*.

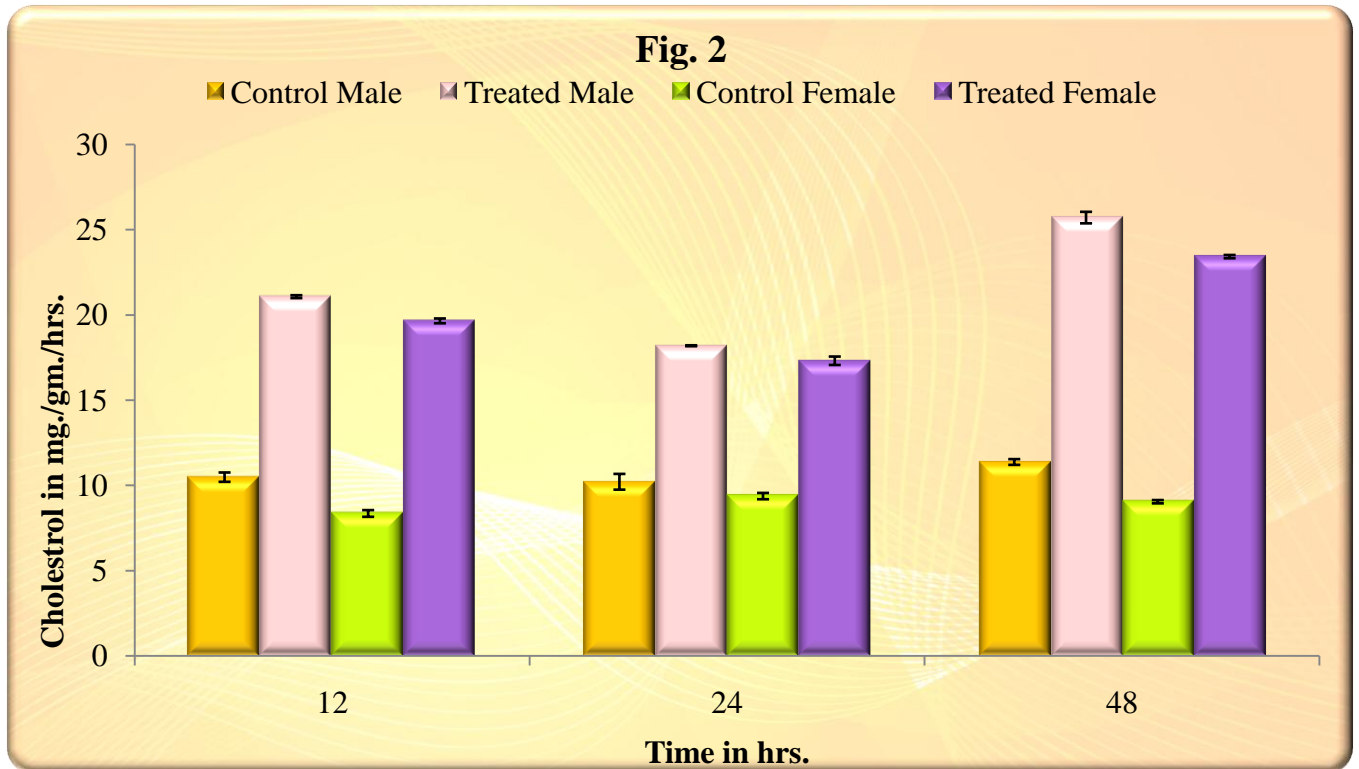


Fig. 3:-Effect of Deltamethrin on Alkaline Phosphatase level in gonads of *Chrotogonstrachypterus*.

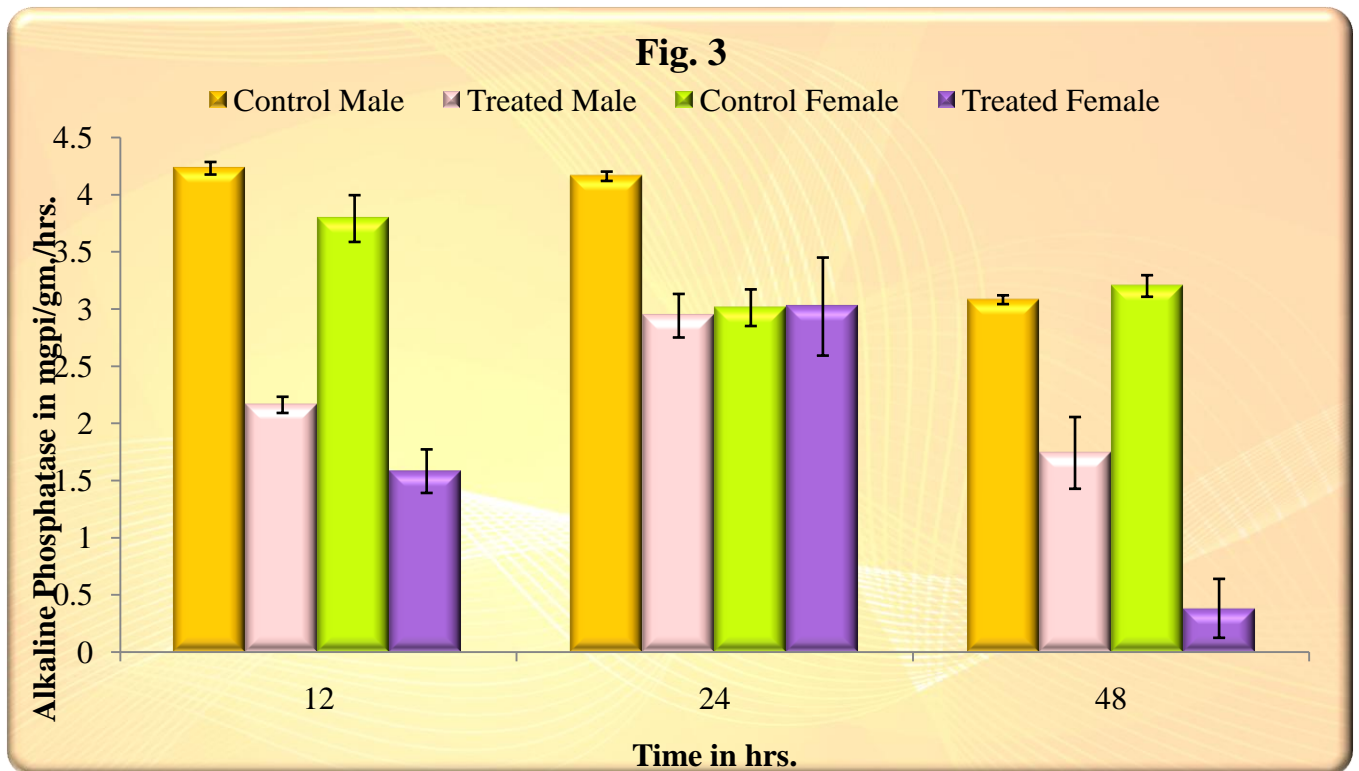




Fig. 4:-Effect of Deltamethrin on ATPase level in gonads of *Chrotogonstrachyterus*

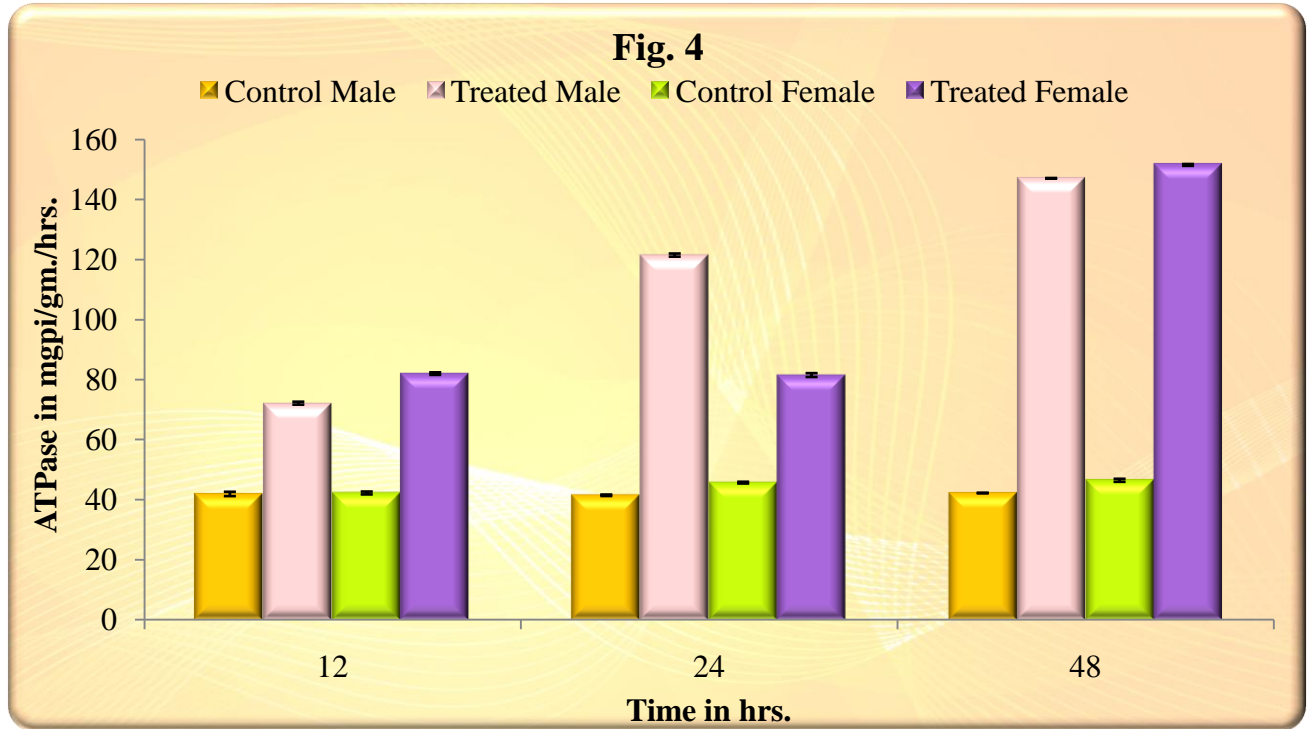


Fig. 5:-Effect of Carbofuran on protein level in gonads of *Chrotogonstrachyterus*

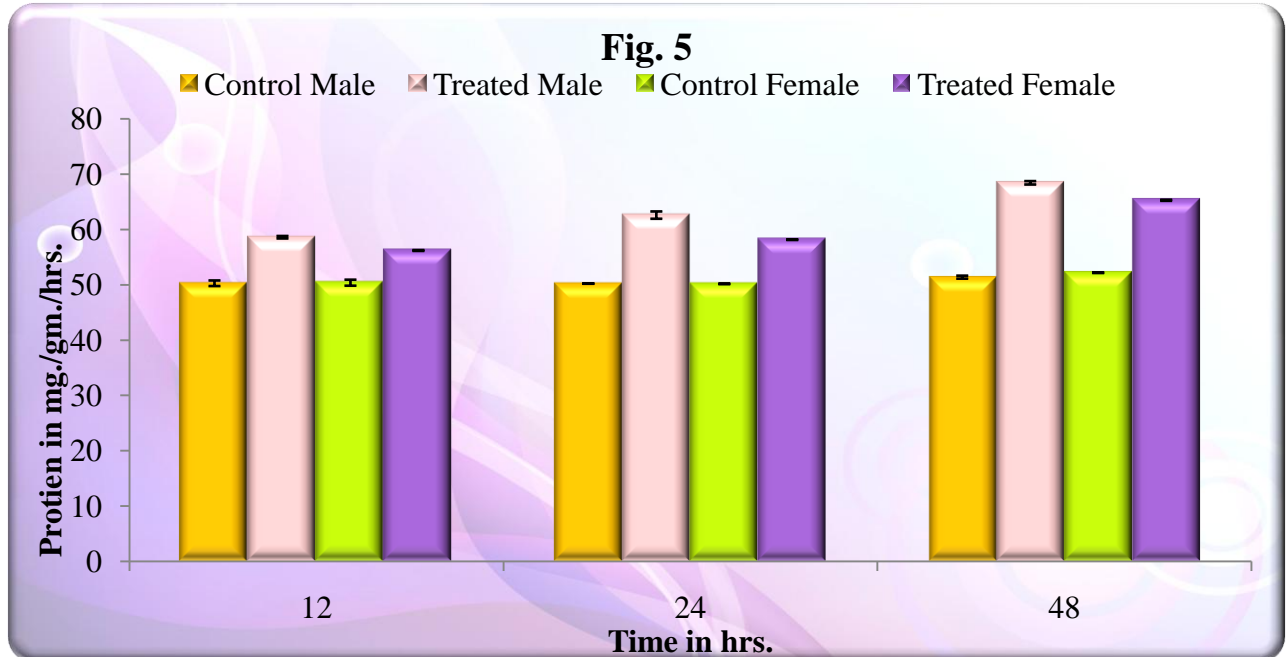


Fig. 6:- Effect of Carbofuran on Cholesterol level in gonads of *Chrotogonstrachypterus*.

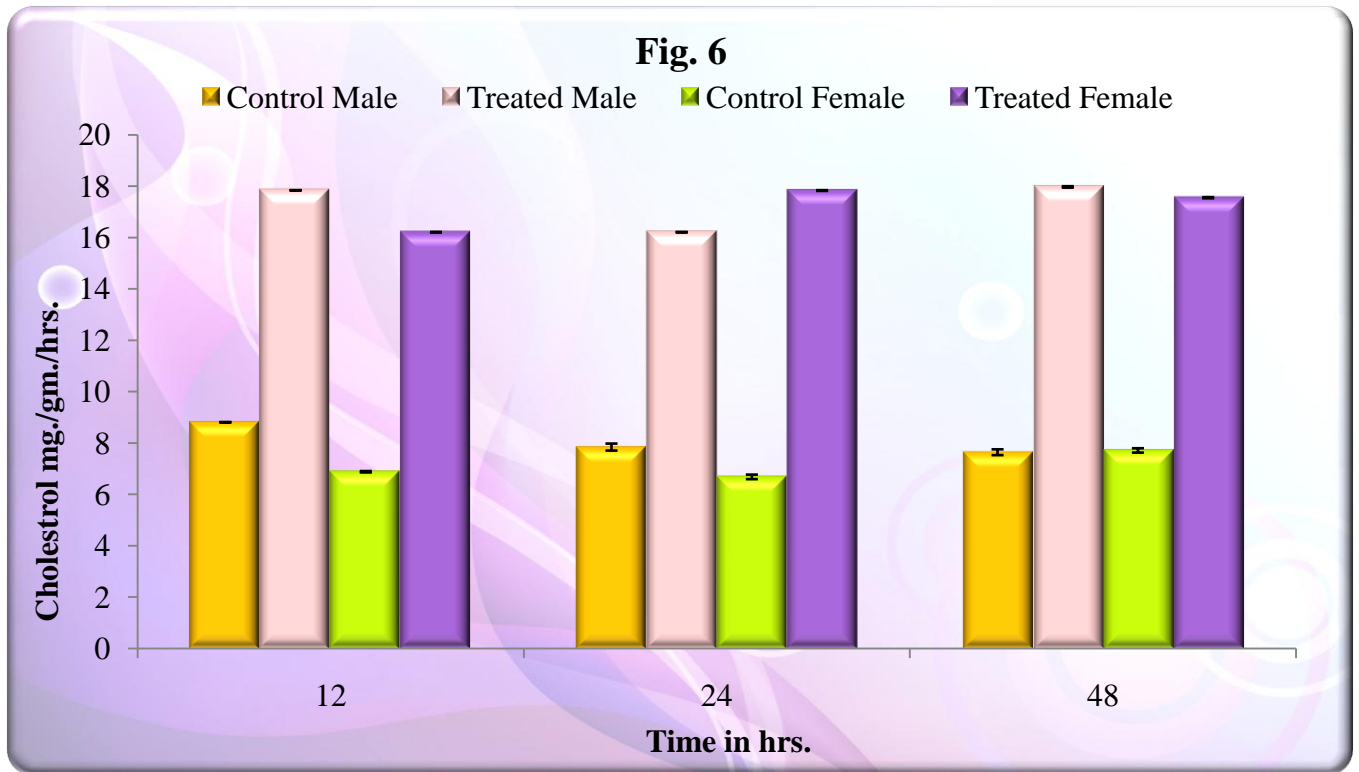


Fig. 7:-Effect of Carbofuran on Alkaline Phosphatase level in gonads of *Chrotogonstrachypterus*.

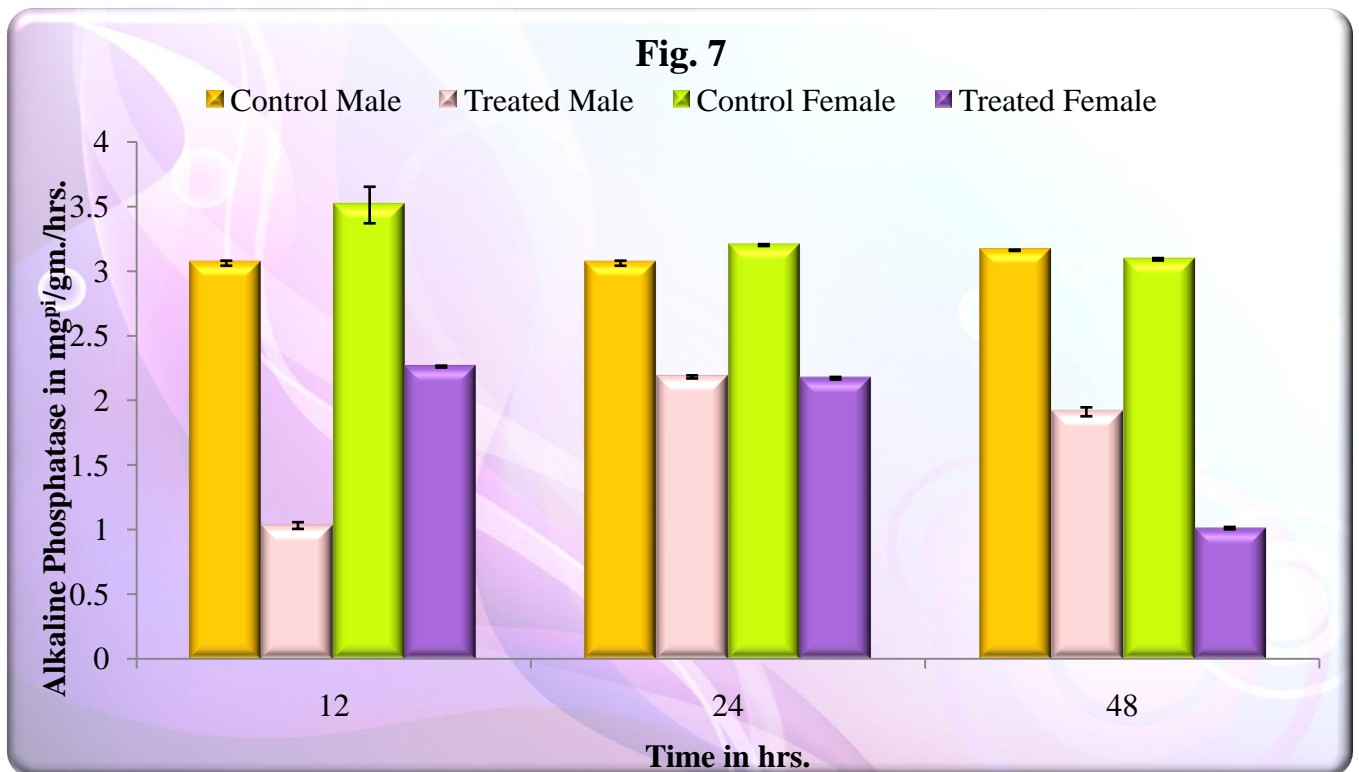
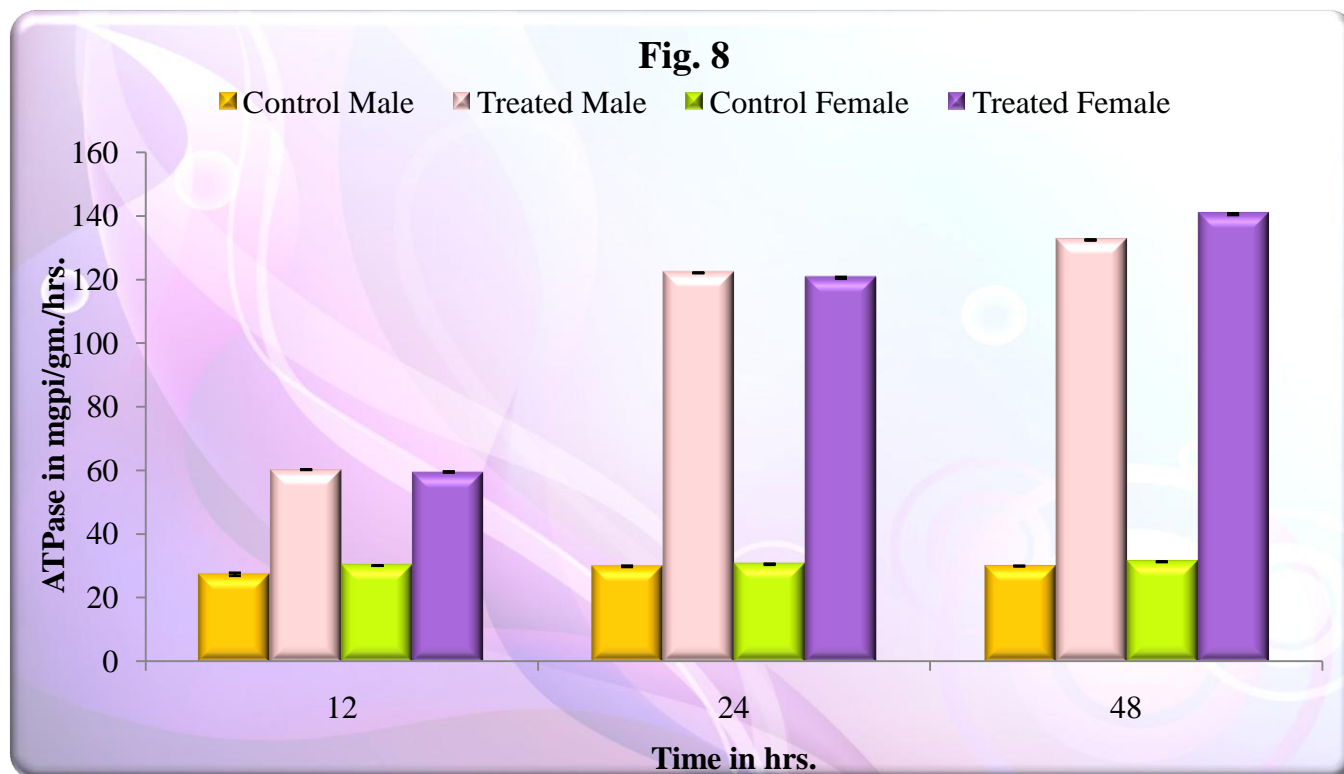


Fig. 8:-Effect of Carbofuran on ATPase level in gonads of *Chrotogonstrachypteris*.

### Discussion:-

#### Potential Toxicology:-

Toxicity of insecticides is highly dependent on the duration, frequency, intensity of exposure and the susceptibility of the target organism which is influenced by age, sex, fitness and genetic variation. The tested insecticides, Deltamethrin and Carbofuran exhibited a fair degree of contact toxicity on female and male adults of *Chrotogonstrachypteris*.  $LC_{50}$  values (24 hrs.) for Deltamethrin and Carbofuran on female and male *Chrotogonstrachypteris* were 22.069 ppm, 14.263 ppm and 2.498 ppm, 1.711 ppm respectively. Observation findings emphasize that male adults were more susceptible to compounds than female adults. Results directly reflected that more mortality of male *Chrotogonstrachypteris* also reduce the fertility. Earlier observations revealed that the  $LC_{50}$  value of Monocrotophos 36 SL and Cypermethrin 25 EC against female and male adults of *Chrotogonstrachypteris* by dipping method, were 353.9 ppm, 151.0 ppm and 33.11 ppm, 16.38 ppm respectively (Shakeet P. and Bakshi S., 2009). Jangir N. and Bakshi S. (2011) also observed that Fenvalerate (85.52 ppm) is more toxic than Chlorpyrifos (349.9 ppm). Present findings also supported by Choudhary *et al.* (2000), that Fenvalerate (pyrethroid) were more toxic than chlorpyrifos (phosphate) when they investigate relative toxicity of insecticides against *Acrotylushumbertianus* grasshopper. Toxicity on subterranean termite *Coptotermes formosanus* were determined on Deltamethrin (pyrethroid)  $LD_{50}$  was most toxic and Chlordane least toxic (Su, Nan- Yao *et al.*, 1990). According to Blair D. Siegfried (1993), the acute toxicity of three pyrethroids (permethrin, cypermethrin, bifenthrin) greater than one organophosphate insecticide (chlorpyrifos). Radka Dobsikova (2003), revealed that test of acute toxicity with Carbofuran confirmed the high toxicity of the chemical to selected species of aquatic organism than terrestrial organism. According to Nitin Sood and Sharma D C (2004), synthetic pyrethroids have higher persistent toxicity than neem derivatives. Experimental results also exhibit both the insecticides have shown to be consistent effective in controlling *Chrotogonstrachypteris* in field crops. The present findings derive ample support in pest management and saving the crops against damage from the pest *Chrotogonstrachypteris*. Conclusion of the present investigation analyse that the carbamates are more toxic than synthetic pyrethroids and organophosphates. Potential effect of toxicity on insecticides were -

Chlorpyrifos (349.9 ppm) <Monocrotophos (151.0 ppm) <Fenvalerate (85.52 ppm) <Cypermethrin (16.38 ppm) <Deltamethrin (14.26) <Carbofuran (1.71) (Table - 2)

### Biochemical Parameters:-

#### Protein:-

Current study results summarize *Chrotogonstrachypterus* treated with sub-lethal dose of Deltamethrin and Carbofuran exhibited hyperproteinemia or increase the protein level in both sexes till 48 h when the experiment was terminated. Smitha and Rao (2010), evaluate sublethal dose of selenium on silk worms showed significantly increase in females at 12hrs after treatment and also showing hyperproteinemia on all exposure periods. The effect of *Bacillus thuringiensis* var. *kurstaki* on biochemical alteration in haemolymph found protein content increase in experiment (Tripathi and Singh, 2002). Toxicant influence of Fenvalerate the proteins and glycogen levels totally decreased in various tissues of *Channapunctatus* (Bloch) (Satyavardhan, 2010). Biochemical alterations after effect of sub-lethal doses (176.95 and 75.5 ppm) of Monocrotophos on gonads of female and male *C.trachypterus* as protein, cholesterol and alkaline phosphatase decrease and ATPase level increase (Shakeet and Bakshi, 2010a). Deltamethrin induced a significant decline in serum total protein concentration, albumin and globulin at third day of first, second and fourth week after application of Deltamethrin in buffaloes (El Nabarawy., 2008). Histochemical results revealed that animals given Carbofuran had decreased contents of carbohydrates and total proteins in the testicular tissue. Treating mice with Carbofuran and vitamin C showed an improvement in testicular damage (Wael M. Al-Amoudi, 2012). Significantly reduced total head protein after 24, 48, and 72 h treated of *Ageratum conyzoides* L. and *Artemisia vulgaris* (L.) in third and fourth instar larvae of *Spodopteralitura* (Renuga and Sahayaroj, 2009).

#### Cholestrol:-

Earlier observation of Shakeet and Bakshi (2010b), effect of Cypermethrin on biochemical parameters on gonads of *C.trachypterus* as the protein, cholesterol, acid phosphatase and ATPase increase in level and decrease the level of alkaline phosphatase. Current results showed that cholesterol level was highly significantly ( $p < 0.001$ ) raised at 12, 48 hrs and slightly decline at 24 hrs after exposed to Deltamethrin and Carbofuran in both sexes. The effects of sub-lethal doses of Cypermethrin on the sixth instar larvae of *T. castaneum* (Saleem *et al.*, 2005) the high cholesterol level on gonads of *L. augur* parasitized by *H. vishwakarma*. Level of cholesterol level significantly increased in mice after exposure of carbosulfan and adverse effects on liver functions leading to physiological impairment (R.L. Ksheerasagar1, M.B. Hiremath and B.B. Kaliwal, 2011). It is expected that the changes in the cholesterol level in the tissue may contribute to the dis-functioning of hormonal balance due to disturbed metabolism and affecting reproduction.

#### Alkaline Phosphatase:-

A non-significant increase in alkaline phosphatase activity treated with Deltamethrin at 24 hrs was recorded in female adults and significantly declined ( $p < 0.01$ ) at 12, 24 and 48 hrs in male adults. While after application of Carbofuran, highly significantly ( $p < 0.001$ ) increase in alkaline phosphatase level at 12 and 48 hrs in male adults and slightly fluctuations at 24 hrs in both sexes. Spinosad caused depletion in alkaline phosphatase activity while increase in acid phosphatase activity in treated *T. castaneum* (Hussain, 2009). Methomyl (carbamate) induced gonadal dysfunction, biochemical contents and enzyme activities in male albino mice. Biochemical studies of testis and epididymis showed methomyl at doses of 2, 3 and 4 mg/kg/day and in 4 mg/kg /day for 10 and 20 days of methomyl treatment caused significant decrease in the levels of DNA, RNA, protein, glycogen and sialic acid whereas cholesterol increased significantly and alkaline phosphatase and ATPase decreased (Manawadi S.I. and Kaliwal B.B., 2010).

#### ATPase (Adenosine Triphosphatase):-

The activity of the energy enzyme ATPase obtained highly significant increase in both the sexes treated with Deltamethrin and Carbofuran. The finding of the present investigation reveals that enough energy is consumed during metabolism due to the effect of the Deltamethrin since an increase in the activity of ATPase. Helena Cristina Da Silva de Asiset *al.*, (2009) found that Deltamethrin inhibited the activity of gills and heart  $\text{Na}^+$ -  $\text{K}^+$  ATPase., induced liver total CYP 450 as well as the liver EROD activity.

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### RESEARCH ARTICLE

#### ANALYSIS OF STRESS ON TWO POSTS WITH DIFFERENT LUTING SYSTEMS – THREE DIMENSIONAL FINITE ELEMENT STUDY.

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Ceramic Post, Glass Fibre Post, Luting Cements, Stress.

#### Abstract

**Aim:** The aim of this study was to investigate, by means of three-dimensional finite element analyses (3D-FEA), the influence of post materials and luting cements on stress distribution within posts, root dentin and their displacement under 100N identical perpendicular loading,

**Materials and Methods:** A 3 mm section of endodontically treated canine tooth was scanned and reconstructed for 3-D modelling and Finite Element analysis (FEA). A ceramic post (CP) and a glass fibre post (GFP) were tested individually with four luting cements zinc phosphate (ZPH), glass ionomer (GI), resin modified glass ionomer (RMGI) and resin based cements (RC). A push-out test was conducted by subjecting all models to 100 N perpendicular loading at the post.

**Results:** The maximum stresses generated along the CP-cement interface were significantly higher than corresponding stresses in the GFP-cement interface regardless of the cement type. GFP generated seven times higher stresses within the root dentine than metal posts when ZPH and GI were used, and three times higher when RMGI and RC were used. The displacement of GFP was double (20 $\mu$ ) the displacement of CP (50 $\mu$ ) in all groups.

**Conclusions:** The low elastic modulus of GFP generated lower stresses along its interface and higher stresses within the root dentine, therefore the probability of debonding and root fracture in the GFP group was lower.

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**Abbreviations and acronyms:-**

FEA = finite element analysis; GFP = glass fibre post; GI = glass ionomer; CP = ceramic post; PDL = periodontal ligament; RC = resin based cements; RMGI = resin modified glass ionomer; ZPH = zinc phosphate.

**Introduction:-**

The criteria for the use of a cast metal, metal ceramic or all ceramic restoration of a tooth that has been damaged to the extent that it must be reinforced or protected to withstand the masticatory load without fracture. Most individual teeth requiring cemented restorations, as well as many fixed partial denture abutments, have been damaged enough to require modification of classic preparation design. The amount of tooth structure destroyed is only one factor to consider in selecting a restorative material and designing a preparation.

Endodontically treated teeth usually undergo several changes due to loss of blood supply, dehydration, alteration of the physical and mechanical properties of the tooth, let alone the loss of significant sound tooth tissues. Subsequently endodontically treated teeth become susceptible to crack or fracture especially when posts are considered for restoring these teeth.<sup>1</sup>

Restoration of endodontically treated teeth is a common problem in restorative dentistry, related to the fractures occurring in such teeth. Endodontically treated teeth are affected by a higher risk of biomechanical failure than vital teeth. The access preparation for endodontic treatment causes the loss of the roof of the pulp chamber, which may account for the relatively high fracture incidence documented in pulpless teeth.<sup>2</sup>

The clinical decision as to whether to restore an endodontically treated tooth by provision of an intracoronal or extracoronal restoration is empirical. When the endodontically treated tooth is left with limited supraosseous tissues, a post might be considered for their restoration to provide a platform for retention, either for an intracoronal or extracoronal restoration. Various in vitro and in vivo research advocated improved root fracture resistance, the reported success rate for post and core restorations was 83–97%.<sup>1</sup>

On the contrary, post-induced stresses within root dentine, particularly in debonded posts, are the main factors in initiating crack formation which might lead to root fracture. Some studies suggested that a post should only be considered when there is insufficient coronal remaining tissue to retain the core and support the definitive restoration.

Fibre reinforced posts have several advantages over other posts owing to their elastic modulus which is similar root dentine and bonding potential when resin based luting cements are considered. The clinical performance of fibre posts and direct composite full cuspal coverage was comparable to indirect metal crowns over a period of three years in clinical service.

The ultimate aim of bonding fibre reinforced composite post is to create a monoblock within the root canal system, as the elastic modulus being similar to root dentine, in order to improve the root fracture resistance and reduce the problems associated with debonding of fibre posts.

The purpose of this study was to investigate, by means of three-dimensional finite element analyses (3D-FEA), the influence of post materials and luting cements on stress distribution within posts and root dentine, and their displacement under 100 N identical perpendicular loading.

The hypothesis to be tested in this study was that no difference exists between ceramic posts and glass fibre posts cemented with different luting cements in terms of their stress generation and the risk of root fracture under occlusal loading.

**Materials and method:-**

An endodontically treated canine root was scanned using micro computed tomography. Scans were imported by for segmentation and masking depending on pixel density. Subsequently, a 3-D model was developed to represent a post (ceramic or glass fibre), cement, root dentine, periodontal ligament (PDL) and alveolar bone (Figure 1-7). Four luting cements [zinc phosphate (ZPH), glass ionomer (GI), resin modified glass ionomer (RMGI) and resin based cements (RC)] were employed and divided into two groups: Ceramic post (MP) (n = 4) and glass fibre post (GFP) (n

= 4) groups. Finite element (FE) meshing was carried out by AnsysPreprocessor to create eight FE models, each of which was 3 mm thick; within these eight models the thickness of PDL and cement was identical (0.2 mm)(Figure 7,8).

Care was taken to concentrate elements in the region of greatest interest of stress distribution pattern. The element was defined as 10 nodes having degrees of freedom at each node; the elements were constructed so that their size aspect ratio would yield accuracy. elastic modulus and coefficient of poisson which were obtained from the literature. The FE model comprises 20165nodes and 15904 hexahedral elements, and the aspect ratio throughout the model was close to 1:1. All the vital tissues (cortical bone,PDL, dentin), ceramic post, and four luting cements zinc phosphate (ZPH), glass ionomer (GI), resin modified glass ionomer (RMGI) and resin based cements (RC) except glass fibre post (GFP) were presumed to be linearly elastic, homogenous and isotropic. Glass fibre post (GPF) was considered orthotropic.

The corresponding elastic properties such as young's modulus and Poisson's ratio of bone, periodontal ligament, dentin, luting cements, ceramic post and glass fibre post were determined using literature survey(Table 1). All eight models with ceramic and glass fibre post and four luting cements were used for load application and load analysis. A 100N push out force was applied vertically to calculate the stresses in root dentin, post and luting cement and the amount of displacement induced.

These different models were analyzed by the processor and displayed by post processor of the finite element software (Ansys, version 8.0) using von mises stresses analysis. Von mises stress values are defined as the beginning of deformation for ductile materials. Failure occurs when von mises stress values exceed the yield strength of a material.<sup>3</sup>

### Results:-

The study is done using three-dimensional finite element analyses (3D-FEA), to study the influence of post materials and luting cements on stress distribution within posts and root dentine, and their displacement under 100N identical perpendicular loading.

**Table 2** and **Table 3** show the comparative values of principal stress, post stress, dentin stress, cement stress and deformation with ceramic and glass fibre post.

**Figure 4-8** show the comparative values of stress distribution among the four luting agents [ zinc phosphate, GIC, RGIC, RC]

### Discussion:-

Post and core systems are commonly used for the restoration of endodontically treated teeth when the teeth have suffered coronal damage. Loosening of the post and core or fracture of remaining dentin root are most frequent problems observed.

Several methods have been used to analyze the effects of the post-core system on the stress distributions in dentin. Experimental methods and the finite element method are commonly used. Experimental methods include tensile test, shear loading test, and photoelastic analysis. Photoelasticity is based on the property of some transparent materials to exhibit colorful patterns when viewed with polarized light.

In the two dimensional (2D) method, models are fabricated using a transparent plastic sheet. However, 2D finite element models are regarded as inadequate since the tooth structure and the loading forces are not two-dimensional. A 3D finite element method is a more accurate way to analyze the stresses in a tooth using ANSYS software. The finite element method has been used for more than two decades for stress analysis of teeth.<sup>4-8</sup>

All mechanical properties are measures of the resistance of a material to deformation, crack growth, or fracture under an applied force or pressure and the induced stress. An important factor in the design of a dental prosthesis is strength, a mechanical property of a material, which ensures that the prosthesis serves its intended functions effectively and safely over extended periods of time.



In this 3-D FEA study, a section of the upper canine root was from segmented micro CT data to create a sophisticated model which was subjected to a push-out pressure at the post area to estimate post displacement and stress distribution in different cement types and post materials. 100N Push Out Test was performed and the Stress Distribution was studied along ceramic post(P1), glass fibre post(P2) and four luting agents; zinc phosphate, glass ionomer, resin modified GIC, resin cement [TABLE 2,3]

The stresses generated in ceramic post using four luting agents were (23.782Mpa, 23.849Mpa, 22.268Mpa, 23.269Mpa) respectively which were uniform

Post and core systems are commonly used for the restoration of endodontically treated teeth when the teeth have suffered coronal damage. Loosening of the post and core or fracture of remaining dentin root are most frequent problems observed.

The stresses generated in glass fibre post using four luting agents were (18.256Mpa, 18.266Mpa, 18.405Mpa, 18.341Mpa) which were uniform among four cements. The stresses generated were more in ceramic post than the glass fibre post irrespective of the luting agents.

The stresses generated in ceramic post are less when RMIC was used (22.268Mpa) and more when ZP was used (23.782Mpa) when four luting cements were used. The stresses generated in Glass fibre post are less when RC was used (16.554Mpa) and more when GIC was used (17.318Mpa) when four luting cements were used.

The stresses generated among cement interface was less when glass fibre post was used with RC (12.529Mpa) and more when ceramic post was used with ZP (20.673Mpa).

The stresses generated within dentin were less when glass fibre post was used with RC (9.369Mpa) and more when ceramic post was used with RC (16.425Mpa.)

The deformation of the post was less when glass fibre post is used with RC (0.02mm) and more when ceramic post was used with RMIC (0.05mm).

The elastic modulus of fibre posts which is lower than the ceramic post and similar to root dentine generated lower stresses along the post-cement interface compared with ceramic posts. The stresses generated within the root dentine were much less in the Glass fibre post groups as the elastic modulus of glass fibre post is similar to dentin.

The findings of this study are in agreement with another recent 3-D FEA study which indicated that stress within root dentine is lower in the GFP group than their counterparts, the risk of root fracture is lower in the fibre post group.<sup>9-10</sup>

Root cracks are usually initiated after posts debonding takes place; the level of induced stresses will be dramatically increased and become concentrated at the small surface area of the root dentine. When these concentrated stresses exceed the tensile strength of root dentine, it will subsequently result in a clinically or radiographically detectable root fracture.<sup>11,12</sup>

Creating a monoblock within the root canal system with post having similar modulus of elasticity to root dentin is a key for long-term survival of posts. Therefore, fibre posts bonded to root dentine with dual-cure bonding resin cement is a prerequisite for a durable restoration.<sup>13</sup>

Glass ionomer and resin modified glass ionomer cements have bonding potential to root dentine, lower solubility, higher tensile strength and fluoride release. However, they suffer some limitations like solubility and microleakage which makes them susceptible to hydration and expansion, and subsequently debonding and failure of the whole restoration.<sup>14</sup>

Resin based luting cements are most widely used in bonding posts to root dentine. However, some studies have cast doubt on their bonding strength to root dentine and indicated that degradation and disintegration might happen over time. Subsequently, this might lead to microleakage along the dentine-cement interface.<sup>15-16</sup>

Conversely, other reports indicate resin based cements improve fracture resistance of endodontically treated teeth and reduce microleakage compared to other cements. In light of the findings of this study, it has been demonstrated

that resin cement along with fibre posts reduce, to a great extent, the stress along the root-cement interface and post displacement and subsequently root fracture which was in agreement with another push-out FEA study.<sup>17</sup>

#### **Summary:-**

Post-core restored endodontically treated teeth are complex systems due to the small dimensions, structural complexities, multiple components with significantly different material properties, and variations in loading directions and the magnitudes. A 3D finite element model has been developed, which includes dentin, PDL, bone, post and luting agent. Because of their elastic modulus being similar to dentin, the cementum is included in the dentin portion of the tooth. All components have been assumed to be perfectly bonded, and all materials have been assumed to be homogenous, isotropic, linear and elastic.

The geometrical model has been built using Pro/Engineer and the commercial finite element analysis package ANSYS has been used for the generation of the finite element model, stress calculations and post processing. A convergence test has been conducted to determine the proper number of the elements. Principal stresses in dentin, posts, luting agent and the deformation have been calculated, and the results have been shown in graphic forms.

#### **Conclusion:-**

Within the limitations of this FEA ANSYS software study, the following conclusions were made;

1. A post with high elastic modulus causes high stress concentrations in dentin and the posts.
2. The stress distributions in both dentin, post and cement interface were high in ceramic post when compared with glass fibre post.
3. Deformation of the post is more in ceramic post(50 $\mu$ ) when compared to glass fibre post(20 $\mu$ ).
4. Among the luting agents resin cement and resin modified GIC showed lower stress concentrations when used with ceramic and glass fibre post.
5. High stresses in dentin are highly undesirable because they may cause the fracture of dentin and failure of the restored tooth.

#### **Acknowledgement:-**

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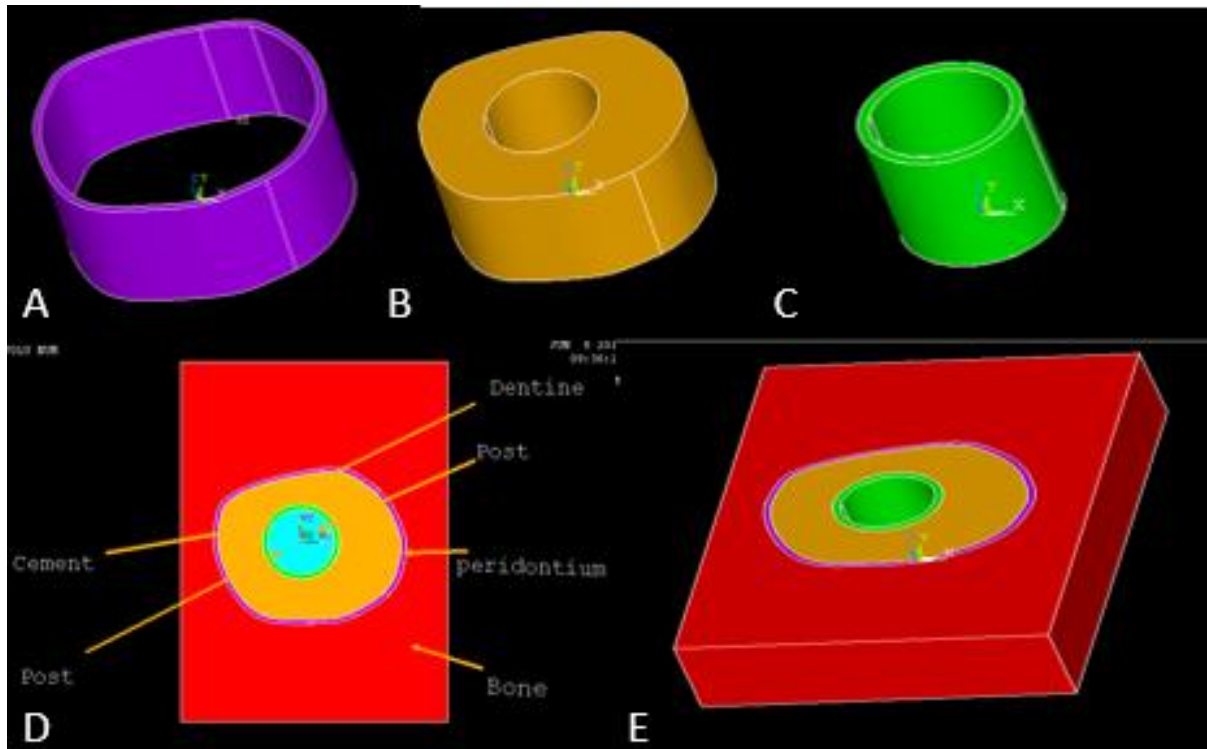


Figure 1:- Fea Model Of A,Periodontal Ligament; B.Dentin; C.Luting Agent; D.Post; E.Without Post

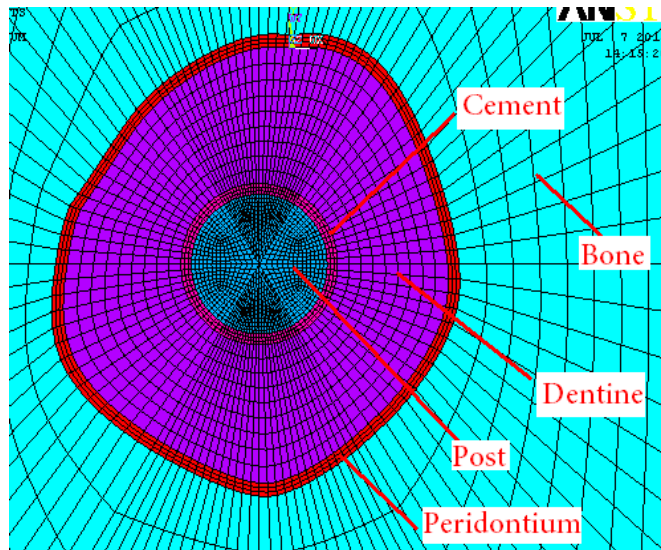


FIGURE 2: Mesh Plot

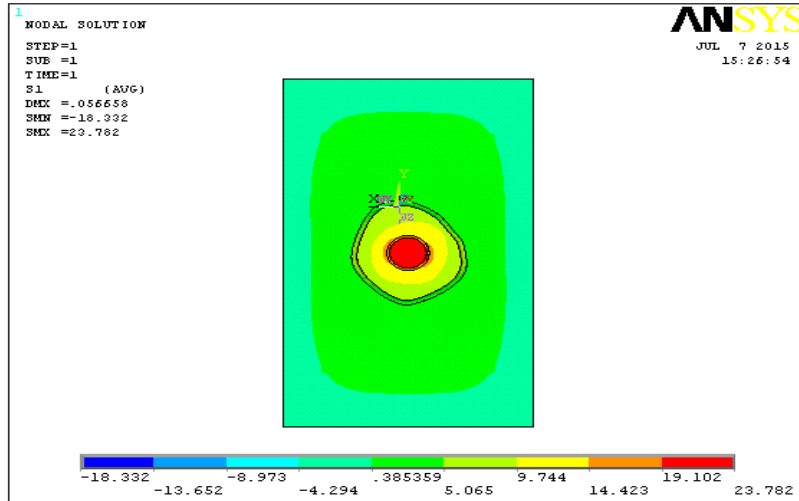


FIGURE 3: Overall Stress

Table 1:-

	Elastic modulus (Mpa)	Poisson's ratio
Zinc phosphate	22400	0.25
Glass ionomer	16900	0.30
RMIC	4000	0.30
Resin cement	7000	0.27
Dentine	18600	0.31
PDL	69	0.45
Bone	14000	0.15
Ceramic post	69000	0.28
Glass fibre post	37000	0.27

	POST 1			
	CEMENT 1	CEMENT 2	CEMENT 3	CEMENT 4
DEFORMATION	0.0566	0.0567	0.0577	0.0572
PRINCIPAL STRESS	23.782	23.849	22.268	23.269
POST STRESS	23.782	23.849	22.268	23.269
CEMENT STRESS	20.673	20.409	17.658	19.024
DENTIN STRESS	16.035	16.025	15.678	16.425

TABLE 2:- Comparative values of principal stress, post stress, dentin stress, cement stress and deformation with ceramic post

	POST 2			
	CEMENT 1	CEMENT 2	CEMENT 3	CEMENT 4
DEFORMATION	0.0202	0.0204	0.0208	0.0201
PRINCIPAL STRESS	18.256	18.266	18.405	18.341
POST STRESS	17.151	17.318	17.078	16.554
CEMENT STRESS	14.262	14.07	13.339	12.529
DENTIN STRESS	10.643	10.341	10.79	9.369

TABLE 3:- Comparative values of principal stress, post stress, dentin stress, cement stress and deformation with glass fibre post

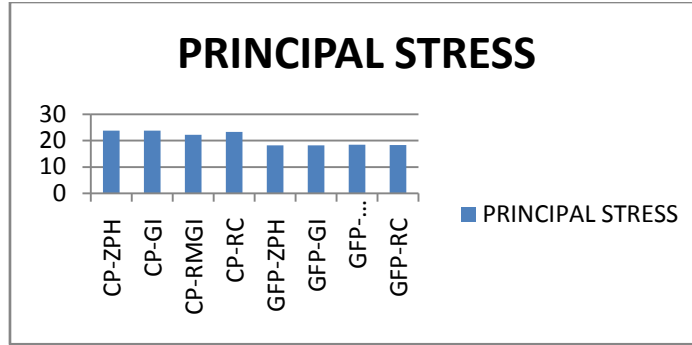


Figure 4

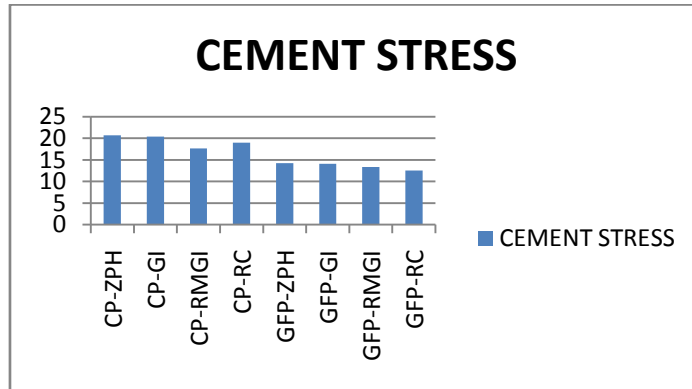


Figure 5

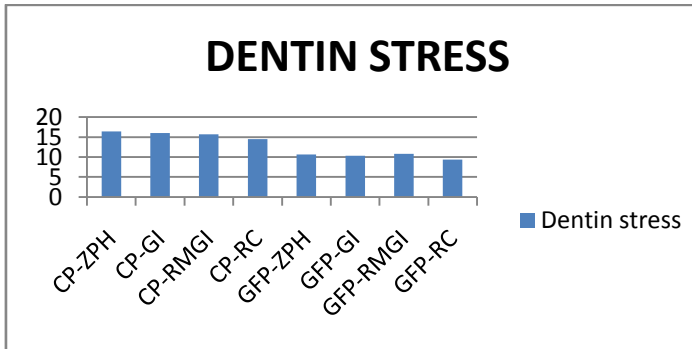


Figure 6

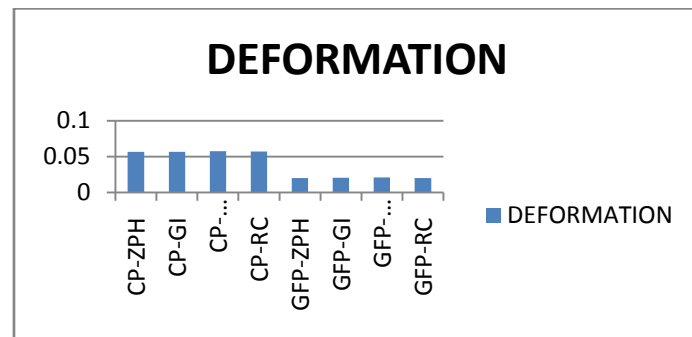


Figure 7

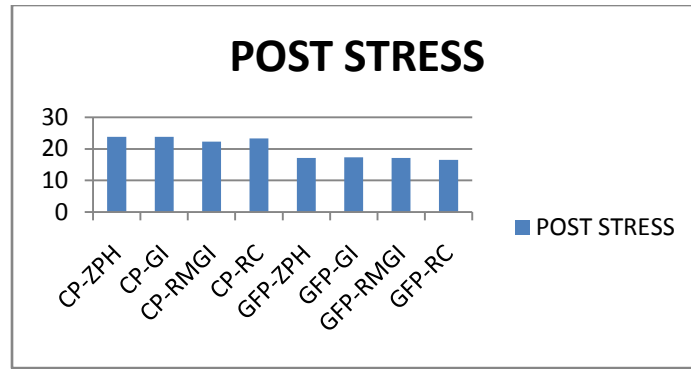


Figure 8

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### RESEARCH ARTICLE

#### THE PREVALENCE OF ANTIBIOTICS MISUSE AMONG SENIOR MEDICAL STUDENT AT UMM AL-QURA UNIVERSITY FACULTY OF MEDICINE, MAKKAH.

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 MohammedAlsharif MBBS, Mahmoud BardisiMBBS, HodaKassab and Nada Abdulqader.

#### Manuscript Info

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#### Abstract

Misusing of antibiotics has been increasing in our society especially with easy access and the deregulations from the authority of selling antibiotics without medical prescriptions. With the misusing of the antibiotics, the resistance increased in our community and hospitals. Many reasons had led us to this problem other than the easy access to the antibiotics, lack of education from health caregiver, stop antibiotic when feeling better, using leftover antibiotics, using antibiotics in viral illness such as upper respiratory tract infection. The aim of this study is to evaluate the awareness of misusing antibiotics in the senior medical student at Umm Alqura University. This study is a cross-sectional study was done in march 2016 to October 2016, and a total number of 170 of senior medical student males and females participate in this study and it showed female were the higher percentage in using the antibiotics, 69% of abused drug in female was Augmenting.

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#### Introduction:-

Antimicrobial resistance a drug become less powerful against some type of microorganism which makes treating the infectious disease more challenging and increasing in the mortality from infectious disease [1, 2]. 2 million people acquire infections with resistance bacteria that are resistant to one or more of the antibiotics that developed to treat that infection and 23,000 people annually dies as result of antibiotic resistant in the United States [11]. Most of these infections are a common organism and this what makes the problem more serious. As we can see the number is really high and it has been increasing recently and it consider as a global health issue [2]. There are many reasons behind this antibiotic resistance but the main reason is misusing OTC antibiotic and self-medication with the lack of medical background [4,6,7] other reasons like saving time and money, feeling better with same antibiotics in a previous illness, leftover medicine available [12]

The prevalence of antibiotic misuse seems to be much higher in developing countries and it's increasing more and more comparing to the developed countries, which have more strict rules when it comes to prescribing antibiotics, and making the only way to get antibiotics is with medical prescription [10][3]. It has been estimated that tow third of antibiotics that people take orally is misused and shouldn't be taken [5].

The aim of this study is to assess the antibiotic misuse and to evaluate the awareness of the medical student when it comes to deal with over the counter antibiotics in Umm Alqura University Makkah Saudi Arabia

**Method:-**

This is a cross-sectional study was done on senior medical student males and females at Umm Alqura University, with a sample size (170), calculated by ROASOFT, sample size calculator with a 5% margin of error, 95% confidence level and 50% response distribution.

Data was collected through an online questionnaire using Google survey.

SPSS software (version 21) was used for data analysis and P value less than 0,05 used for significance, the chi-square used to assess the association between variables.

Approval of the ethical committee and the student consent to participate in this study has been taken.

The aim of this study measures the prevalence of antibiotics misuse among senior medical student in Umm Alqura University.

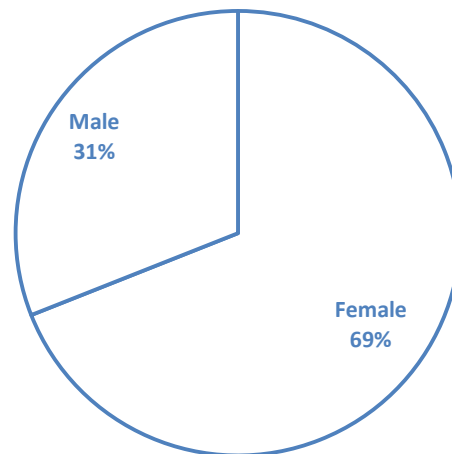
The study was a self-funding study.

**Result:-**

Among 170 of senior medical student males and females participants (85 males and 85 Females). The total percentage of antibiotic misuse was 10.58% (n=170) of all participants. Regarding of the gender, the higher proportion of female senior medical student misuses the antibiotic when compared to male. And the augmenting where is the most used antibiotic 66.3%

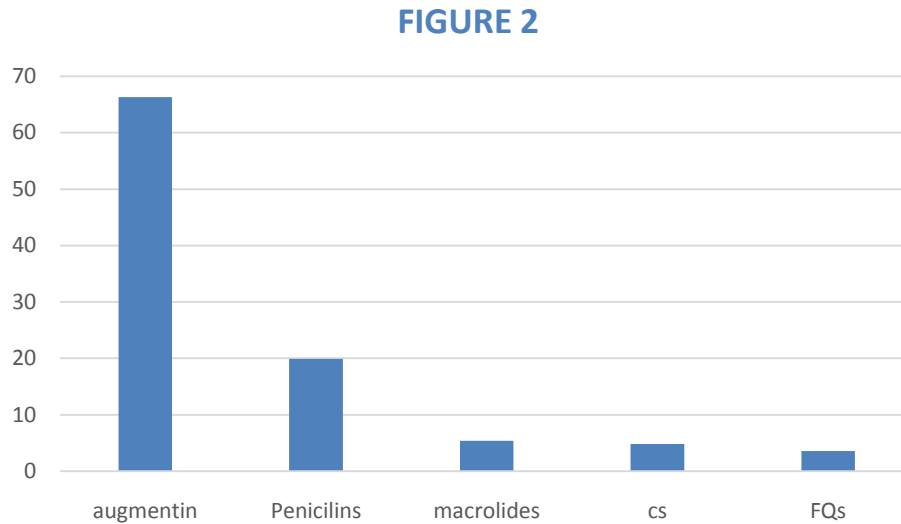
**The results showed the percentage of antibiotic were show height percentage in female by 69 % *figure (1)*.**

**FIGURE 1**





The results shows the percentage of the most antibiotic used was be Augmentin by 66.3 % figure (2).



CS:cephalosporin. FQs: fluoroquinolones

### Discussion:-

In this study we found that majority of participants were familiar with different types of antibiotic abuse, our finding agrees with general reports in different countries.

Based on high response rate from each group, it can be stated that the result obtained in this investigations are representative of the target population.

The results indicated that female was higher than male by 69% of the total participants, and we observed that the Augmentin was the highest antibiotic use among all antibiotic by 66.3%.

In general, there are several limitations in this study, low sample size that may introduce nonresponsive bias. And this study may offer important exploratory findings for a senior medical student in Saudi Arabia. Future studies could attempt a different study design to gain more insight into factors contributing to antibiotic abuse.

### Conclusion:-

The prevalence of antibiotic misuse among senior medical student in Makkah region considers high. Female misuse the antibiotic more frequently than male and the Augmentin is the most used. We recommend the creation of continued public health education about their side effect. Further investigation and studies could be conducted to assess the educational level and the awareness of their side effect.

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## RESEARCH ARTICLE

### THE INVESTIGATION OF GRATIFICATION CRIME: AN ANALYSIS OF CRIMINAL LAW ENFORCEMENT IN INDONESIA.

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##### Key words:-

Criminal Law, Criminal Justice System,  
 Investigation, Synchronization

#### Abstract

This study examines the essence of investigation authority against gratification crimes. This study aimed to provide an overview of the synchronization and harmonization of investigation systems on gratification in criminal law enforcement in Indonesia. The study was carried out by using a normative research, primary legal, secondary and tertiary materials, with deductive-reasoning method. The results of study showed that the investigative authority against corruption in general and gratification in particular are given the responsibility to the police, judiciary and the Corruption Eradication Commission of Indonesia. The third of law enforcement agencies, in addition to the authority to conduct investigations, was also given authority as coordinator, supervisor and controller of gratification crime investigation under the Act that became the legal basis respectively. Act that become investigation basis for both judiciary and the Corruption Eradication Commission rule out the concept of coordination and supervision as defined in the provisions of the Criminal Procedure General in this regard is the Code of Criminal Procedure. Therefore, the concept of inter-agency coordination, in addition not have a strong legal foundation is also a potential conflict of interest and the main obstacle in law enforcement against gratification crime.

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#### Introduction:-

The strategic role between agencies, especially the eradication of corruption in law enforcement is a unity of integrated legal system. The term of integration in the context of enforcement agencies' role in the criminal justice sphere, known as the integrated criminal justice system.

According to Larry J. Siegel and Joseph J. Senna, looking at the criminal justice system as follows: -

“Criminal justice may be viewed or defined as the system of law enforcement, adjudication, and correction that is directly involved in the apprehension, prosecution, and control of those charged with criminal offenses”<sup>1</sup>

<sup>1</sup> Larry J. Siegel and Joseph J. Senna, *Essentials of Criminal Justice*. (USA : Thomson Learning, 2007), page 28

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B.N.Arief,<sup>2</sup> argued there are 4 (four) components of the criminal justice in power subsystems, namely: 1. the power of investigations; 2. the power of prosecution; 3. the power to prosecute and convict; and 4. the power of criminal execution. While, I.S.Adji,<sup>3</sup> divides 4 (four) institutions that carry out the criminal justice system, namely: 1. Police institute; 2. Prosecution institute; 3. Judiciary institute; and 4. Penitentiary. The authority of law enforcement agencies above is the authority of attribution which comes from the 1945 Constitution and Act.<sup>4</sup>

Indeed, from the aspect of formal crime legal,<sup>5</sup> the handling of special crimes, the police have the authority as the investigation and investigator bodies<sup>6</sup> although it has itself regulation, not many differences in the handling of corruption special criminal of the police and the prosecution institute, including ad hoc institution such as Corruption Eradication Commission.

One particularity of the Act of the Eradication of Corruption concerns the material criminal law of gift and receipt of gratification. Regulatory review that gratification can be considered bribery act, if it associated with his/her position and contrary to his/her obligations and duties. In other words, gratification has a negative impact and can be abused, especially in service delivery for the public sector in the government, so entered into the legislation concerning corruption crime.

Correspondingly, when observe the implementation of duties for the third of law enforcement agencies above, the handling of corruption associated with the gratification, can be ascertained that the Corruption Eradication Commission is a body of investigation, investigator and prosecutor are very prominent and optimized to eradicate gratification in law enforcement for corruption cases. The granting of authority to the police officers, prosecutors, and the Corruption Eradication Commission to investigate corruption cases did not cause corruption diminish but that seems on the surface is the pull of authority between the institutions that impact on the delay of the law enforcement process. For example, in District Court of Ciamis ever happened a corruptor acquitted because the judge considers that the competent institution to investigate is prosecutor not police consequently corruptor were released.

Overlapping between subsystems within the criminal justice system about who is authorized to conduct investigations on corruption cases.<sup>7</sup> In grammatical, the meaning of a sentence based on the criminal law referring to Act No. 8 of 1981 on the Criminal Code, because in addition to the Criminal Code there is no other criminal procedure law applicable in Indonesia.

In Indonesian's criminal justice system, the position of the Prosecutor has a central role. It is not independent of the prosecutor authority in terms of determines whether a case can be filed to the trial or not. The authority to determine whether a case can be continued or not based on valid evidence is *Dominus Litis* owned by Indonesian prosecutor.<sup>8</sup>

Under the provisions of Article 35 of the Act No. 16 of 2004 on the attorney that: "The Attorney General has the duty and authority to: a) establish and control of law enforcement and justice policies within the scope of duties and authority of the prosecutor; b) streamline the process of law enforcement provided by law. "The provision authorizes the prosecutor to control the investigation, including the investigation of corruption crime in which there is a criminal act of gratification.

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<sup>2</sup>Barda Nawawi Arief, *Kapita Selekta Hukum Pidana tentang Sistem Peradilan Pidana Terpadu (Integrated Criminal Justice System)*, Semarang: Diponegoro University Press 2011), page.15

<sup>3</sup>Indriyanto Seno Adji, *Arah Sistem Peradilan Pidana*, (Jakarta: Prof. Oemar Seno Adji, S.H & Co. Law firm, 2001), page. 49

<sup>4</sup>The authority of police institution as stipulated in Article 30 paragraph (4) of the 1945 Constitution that: "National Police of the Republic of Indonesia as the state's instrument to maintain the public security and orderliness shall be assigned to protect, serve the public, and reinforce the law".

<sup>5</sup>Formal criminal law contains regulation that regulates how the criminal law that is abstract must be applied in concrete. Often, the person mention the type of this law as criminal law in P.A.F. Lamintang, *Dasar-Dasar Hukum Pidana Indonesia*, (Bandung: Sinar Baru, 1984), page.10

<sup>6</sup>Article 5 and 7 Act No. 8 of 1981.

<sup>7</sup>Roy, Subir Kumar. (2016). "Consumer Justice: A Symbol of Economic Prosperity and Social Progressiveness." *Hasanuddin Law Review*, 2(2): 170-181. DOI: <http://dx.doi.org/10.20956/halrev.v1n2.302>

<sup>8</sup>Marwan Efendi, *Kejaksaan R.I. Posisidan fungsinya dalam Perspektif Hukum*, (Jakarta : Gramedia, 2005), page. 105

Furthermore, the investigator of Indonesian National Police are given authorities as coordinator and investigation supervisory, as defined in Article 7 paragraph (2) of Act No. 8 of 1981 on Procedure of Criminal.

The third of investigators - the police, judiciary and the Corruption Eradication Commission are given the authority to investigate criminal such as gratification, each is given authority as coordinators, supervisors and controllers. Thus, the system of coordination between institutions that built does not have a strong legal foundation, and can give rise to multiple interpretations which resulted disharmonious and not synergetic in the coordination of inter-institutions.

In this context, corruption as a violation of social and local economy rights as an extraordinary crime, the eradication measures can no longer be done "as usual" but "demanded by extraordinary enforcement."<sup>9</sup>

#### **Identification of the Issue:-**

The issue to be discussed in this article is about "how the synchronization of gratification crime investigation in law enforcement in Indonesia."

#### **Method of the Research:-**

Type of this study was normative. The study examines the concept of investigation authority for gratification crime in criminal law enforcement in Indonesia, so it can be constructed the concept of synchronization synergistically in the investigation system. The data used were secondary data that consists of primary law materials in the form of legislation, tertiary legal materials such as reference books, expert opinion or the results of previous research, and tertiary legal materials such as dictionaries, scientific laws dictionary and black law dictionary.

The method of analysis in this article begins by abstracting primary, secondary and tertiary legal materials, in order to know the essence of investigative authority for gratification crime in criminal law enforcement in Indonesia, to analyze the weaknesses of legality for each investigative institutions, conduct systematically and lastly by using deductive-syllogism reasoning.

#### **Analysis and Discussions:-**

##### **The Scope of Gratification in Criminal Justice System:-**

Recently, the eradication of corruption is no longer just a national issue for a country only, but has become an international problem involving many countries. Corruption has become a transnational crime whose eradication requires cooperation from various countries. The condition was confirmed in the United Convention Against Corruption (UNCAC), which states:

*"Convinced also that the globalization of the world's economic has led to a situation where corruption is no longer a local matter but a transnational phenomenon that affects all societies and economies, making international cooperation to prevent and control it essential."*

Many poor and developing countries in Asia and Africa as a victim states are very experienced negative impact as a result of corrupt practices. Even then corruption is regarded as one of the causes of sluggish economic growth and leads to a low level of social welfare.

In a study conducted by the IMF donors in 1996, states that corruption can have consequences significantly decelerate economic growth. Based on the formulation of corruption substances in the United Nations Convention Against Corruption as described above, it can be understood that the arrangement of corruption law material are not formulated specifically about gratification. Observing the formula above, it can be concluded that gratification were formulated in Act No. 31 of 1999 on Corruption Eradication in Indonesia is the interpretation of elaboration of bribery substance.

Bribery crime in the formulation of the United Nations Convention Against Corruption is always followed by the key elements, namely: a) Act or refrain from acting in the execution of his official duties; b) Trading in influence; c) misappropriation of influence; d) Abuse of functions; e) Trading in influence; f) Illicit enrichment. Elements of such actions are bribery and gratification elements in Indonesia Corruption Act. Therefore, the limitation of difference between bribery and gratification becomes blurred or unclear.

<sup>9</sup>ErmansyahDjaja, *MemberantasKorupsiBersama KPK, KomisiPemberantasanKorupsi*, (Jakarta :SinarGrafika, 2009), page. 28.

United Nations Convention against Corruption is also advocate and emphasize to each member state, in order to adopt the legislative action and other measures necessary to establish into the substance in the Acts or national laws regarding corruption meets international standards. Therefore, the corruption eradication acts should be amended in accordance with the substance of the United Nations Convention Against Corruption, in order that the Acts meets international standards and facilitate the Indonesian state in the process of law enforcement against corruption within the scope of corruption outside the jurisdiction (international).

Gratification elements can be obtained from the elucidation of Article 12B of Act No. 20 of 2001, the gift in a broad sense, including money, goods, rebate (discount), commissions, interest-free loans, travel tickets, lodging, tours, free medical treatment, and other facilities. Such gratification whether received at home and abroad and carried out by using electronic means or not.<sup>10</sup>

The definition shows that gratification is actually meaningful gift that is neutral. A gift becomes a gratification as bribe if related to the position and contrary to the obligation or duty of the recipient.<sup>11</sup>

Basically, gratification is a new type of criminal. According to Eddy Omar Sharif, a professor of criminal law in faculty of law, GadjahMada University, argued that “the differences of gratification and bribes lies on whether or not a meeting of mind at the time of receipt. On the crime of bribery, there is a meeting of mind between the giver and recipient of bribes, while in gratification crime there is no meeting of mind between the giver and the recipient. Meeting of mind is another name of consensus or things that are transactional.”

According to AdamiChazawi, mentioned differences gratification and bribery, that “the provisions of gratification has been no malicious intent (*mens rea*) of the recipient at the time the money or goods received. Malicious intent exists when such gratification is not reported within 30 working days, so that after passing the time regarded bribe until proven otherwise. Whereas the provisions on bribery, the recipient has malicious intent when money or goods are received.”

Settings and the mention of gratification specifically known since the enactment of Act No. 20 of 2001 on Amendments to the Act No. 31 of 1999 on the Corruption Act. The Act provides for the obligation of public servants or state officials to report to the Corruption Eradication Commission any gratification associated with the position and contrary to the duties or obligations of the recipient. If the gratification that considered as bribery is not reported to the Corruption Eradication Commission, then there is a risk of violation of the law both in the realm of administrative or criminal.

#### **The Authority of Investigation in Gratification:-**

In addition to police investigators, prosecutors and the Corruption Eradication Commission, there are also some institution of civil servant investigators are authorized to handle the interrogation of criminal related to the field of duty or legislation on which the respective law. There are some investigative institutions which according to existing legislation is given the authority to conduct investigations.

In practice, it is possible to avoid overlapping of authority, especially in complex cases associated with some legislation. In the absence of a particular institution that integrates the distribution of authority in the investigation process, the mechanism of coordination and supervision in the investigation process was very difficult in practice. Each investigator often operate on their own and thus potentially creating conflicts among investigators itself due to the overlap of authority.<sup>12</sup>

#### **Police Investigator:-**

Pursuant to Article 14 letter g of Act No. 2 of 2002 on the Indonesian National Police, that:

<sup>10</sup>KomisiPemberantasanKorupsi, *PedomanPengendalianGratifikasi*, (Jakarta: KPK, 2015), page. 9.

<sup>11</sup>*Ibid*, page. 9.

<sup>12</sup>Sukardi, *IllegalLoggingdalam PerspektifPolitikHukumPidana: KasusPapua*, (Yogyakarta: UniversitasAtmaJayaPress, 2005), page.128.

“The Indonesian National Police assigned to conduct investigations and inquiries to all parties in accordance with the criminal law procedure and other legislation”.

The process of corruption handling by police investigators using procedure as a case of common criminal, which is based on the Criminal Procedure Code.<sup>13</sup> Any investigation conducted by the Police always followed up with a Notice of Commencement of Investigation to the public prosecutor, and then public prosecutor conduct pre-prosecution, to examine the completeness of case files, both formal and its material and to give instructions.<sup>14</sup>

Under the terms of Act No. 8 of 1981 on Criminal Law Procedure which is some formal provisions applicable in general, the Indonesian National Police is the institution that given “the responsibility of management” in the investigation of crime. Therefore, for synergy and harmonization of criminal investigation system, then all institutions of the investigator should be in a system of coordination and under the supervision of the Indonesian National Police Investigator.

#### **Attorney Investigator:-**

The provisions of Article 1 (1) of Act No. 16 of 2004 regarding the Attorney of the Republic of Indonesia determined that prosecutors were functional which is authorized by this Act to act as a public prosecutor and the executor of court decisions that have acquired the force of law and other authority under Act. The Attorney of the Republic of Indonesia as a state institution of government that implements state power in the prosecution must be free from the influence of government power and other.

According to EviHartanti,<sup>15</sup> attorney as a public prosecutor in a criminal case must know clearly all work to be done investigator from the beginning until last things to be done by law. Attorney will account for all of treatment of the accused began to suspect investigated, then examined his/her case, then arrested, and finally whether the prosecution conducted by the attorney is valid and correct or not according to the law, so it’s really a sense of justice are met.

The enactment of Act No. 8 of 1981 on Criminal Law Procedure abdicates the authority of investigation of attorney agencies and fully handed over to the Police. With the enactment of the Criminal Code, the authority of investigation is only charged to the Police as a single investigator. However, with the provisions of Article 284 paragraph (2) still allow other investigator beside police that is attorney to conduct an investigation for certain crime perpetrators, including corruption.<sup>16</sup>

The authority of attorney as investigation controller defined in the provision of article 35 letter a Act No. 16 of 2004 on the attorney is unclear because few considerations: The Attorney General has the duty and authority to set and control the policy of law enforcement and justice within the scope of duties and authority of the attorney.

#### **The Corruption Eradication Commission Investigator:-**

The Corruption Eradication Commission<sup>17</sup> is the state institute in conduct its duties and authorities are independent and must be free from any influence, it is similar to other institutions have the authority to carry out duties and its objectives. In outline, the authority of the Corruption Eradication Commission in Act No. 30 of 2002 on the Corruption Eradication Commission can concluded with the details; the authority as duties of the Corruption Eradication Commission, the rights to exercise authority, the authority relating to technical implementation of duties and others.

The duties and authority of the Corruption Eradication Commission as gratification investigator in Article 6 paragraph (1) letter c of Act No. 30 of 2002 on the Corruption Eradication Commission as follows: conduct an inquiry, investigation, and prosecution of corruption. The authority of investigation by the Corruption Eradication

<sup>13</sup>Said Karim Mispansyah, Harustiati A. Moein Irwansyah. “Justice in Granting Remission for Corruption Prisoners (A Review of Indonesian Criminal Justice System).”*International Journal of Scientific & Technology Research*, 4(11): 208-213

<sup>14</sup>Andi Hamzah, *Pengantar Hukum Acara Pidana*, (Jakarta: Ghalia Indonesia, 1983), pages. 75 - 77

<sup>15</sup>EviHartanti, *Tindak Pidana Korupsi: Edisi Kedua*, (Jakarta: Sinar Grafika, 2007), page. 32

<sup>16</sup>Faisal Salam, *Hukum Acara Pidana Dalam Teori dan Praktik*, (Bandung: Mandar Maju, 2001), page. 138.

<sup>17</sup>The Komisi Pemberantasan Korupsi (KPK) is the Indonesian Corruption Eradication Commission, which was formed after special consideration on the extraordinary nature of corruption in Indonesia, which has become systemic and widespread, and has violated the human rights of the Indonesian people. The KPK was formed under Act No. 30 of 2002 on the Corruption Eradication Commission.

Commission is special investigative procedures were given authority to the Corruption Eradication Commission. However, the special authority override the general procedure set forth in the provisions of the criminal law procedure, that is in Act No. 8 of 1981 on Criminal Law Procedure. It is as defined in Article 38 paragraph (2) of Act No. 30 of 2002 on the Corruption Eradication Commission, that:

1. All authorities related to inquiry, investigation, and prosecution as stipulated in Act No. 8 of 1981 on Criminal Law Procedure applied also to investigators, and public prosecutors at the Corruption Eradication Commission.
2. The provisions referred to in Article 7 paragraph (2) of Act No. 8 of 1981 on Criminal Law Procedure does not apply to the corruption investigator as defined in this Act.

Related to the existence of investigation by the Corruption Eradication Commission, it interesting to observe considerations of the judge in the decision of pretrial in the District Court of South Jakarta No. 36/Pid.Prap/2015/PN.Jak/Sel. Based on consideration of the judge mentioned above, it can be understood that the judge in interpreting the provisions of the Act do not just use grammatical interpretation alone in interpreted the word of case of Act as the everyday sense, but also judges using teleological interpretation as interpretation of the purpose of law by law maker.

In this case, the judge to try to understand the will or intent contained in the formulation of article purpose by the maker. In addition, the judge also uses a systematic interpretation by looking the provisions of Corruption Act as one element in the criminal law system; therefore, the Act must not conflict with other both horizontally and vertically.

The consideration of judge about the existence of Corruption Eradication Commission investigators are sourced from police officers who had been dismissed as police investigators, reinforce the belief that the legality of the Corruption Eradication Commission investigators can affect the legality of legal products in the form of administrative and investigation actions and investigations conducted by the Corruption Eradication Commission investigators.

#### **The Concept of Coordination Synergic Between Investigator:-**

Coordination is the process of integrating the objectives and activities of distinct units (functional departments) within an organization to achieve objectives efficiently and effectively.<sup>18</sup> According to E.F.L. Brech in his book, "The Principle and Practice of Management", the coordination is to balance and move the team to give the location of activities appropriate to each and maintain the activities carried out with proper alignment between the members themselves.<sup>19</sup>

Based on the definition above, it may be mentioned that coordination has requirements that:

- a. Sense of Cooperation, the feeling of working with each other, looked per section.
- b. Rivalry, in large organizations, often held a competition between departments, in order to compete with each other
- c. Team Spirit, one another per section should be mutual respect.
- d. Esprit de Corps, a part of mutual respect will be more excited.

Nevertheless, in practice the coordination between law enforcer, including the level of coordination of the criminal justice system is still showing lack of a common vision in the direction of law enforcement.<sup>20</sup> This is possible due to a variety of interests and differences in the interpretation and perception of the existence of gratification itself, whether arising scientifically and influenced by a variety of interests and other aspects such as politics, economy and social culture.

Gratification crime is a case that multi-dimensional involves various agencies and stakeholders that exist. Therefore, the law-enforcement efforts also would involve various agencies and institutions involved. Coordination with agencies/related-government officials in relation to corruption in order to handle cases with indications of

<sup>18</sup>T. Hani Handoko, *Manajemen*, (Yogyakarta: BPF, EdisiKedua, 2003), page.195

<sup>19</sup>SoewarnoHandayaningrat, *PengantarStudiAdministrasidan Management*, (Jakarta: GunungAgung, 2002) page. 54

<sup>20</sup>Arie, M. (2016). An Approach of Legisprudence Theory to Assess the Quality of Local Regulation. *Hasanuddin Law Review*, 2(3), 371-384. doi:<http://dx.doi.org/10.20956/halrev.v2i3.699>



gratification, in fact is very difficult. Concerned agencies are often less transparent/support in the disclosure of gratification occur.

This is consistent with the theory put by SoerjonoSoekanto,<sup>21</sup> that the success of law enforcement is not solely concerning the enforcement of applicable law, but depends also on several factors:<sup>22</sup>

First, the law, the legislation should be made to follow the principles that apply, such as the legislation is not retroactive, that are specifically override the general laws; it made by higher authorities have a higher position as well; it that apply later to overturn legislation in force earlier, it is not inviolable. Similarly, the legislation should be eligible in philosophical/ ideological, jurisdiction terms and socio-logical, it means the legislation are made must not conflict with the ideology of the state and it must be made in accordance with the provisions governing the authority of legislators as set out in the state constitution, and it must be in accordance with the needs and conditions of the society in which it is enforced.

Second, the law enforcer, the parties directly involved in the field of law enforcement that includes law enforcement and peace maintenance. Law enforcement must conduct their duties properly in accordance with their respective roles that have been regulated in legislation. In conduct these duties by emphasizing fairness and professionalism, so that it becomes a model for community and trusted by all parties, including all members of society.

Third, the means or facilities to support law enforcement. The facilities include a means or manpower that have been educated and skilled, good organization, adequate equipment, adequate financing, and so on. Availability of adequate facilities is a necessity for the success of law enforcement.

Fourth, the community, the community environment in which they may apply or applied. It means, that community should know and understand the laws that apply, as well as complying with the law would apply to full awareness and necessity of the law to peoples' lives.

Fifth, the culture, as a result of the work, creativity and taste which is based on human initiative in social life. In this case the culture includes the values underlying the applicable law, the values of which are abstract conceptions of what constitutes good so embraced, and what is considered bad so avoided.

### **Conclusion:-**

In general, the authority of investigation against corruption and gratification in particular are given to the police, judiciary and the Corruption Eradication Commission. The third of law enforcement agencies, in addition has authorities to conduct investigations, was also given authority as coordinator, supervisor and controller of gratification investigation system. Act as basis of investigation against judiciary and the Corruption Eradication Commission rule out the concept of coordination and supervision as defined in the Indonesian Criminal Procedure Law. Therefore, the concept of coordination between investigative agencies, in addition to not have a strong legal foundation, is also a potential conflict of interest and the main constraint in law enforcement against gratification criminal acts.

Needed a revision of the related-Act to realize the coordination systems are synergic and harmony between law enforcement agencies. The judiciary as the only agency of the prosecution, ideally just given responsibility as the prosecution and not charged for investigation authorities, to be more professional in the field of prosecution. Meanwhile, the Corruption Eradication Commission as investigator should ideally be recruited as a civil servant investigators and coordination system and investigative supervision under the Police investigator.

<sup>21</sup>SoerjonoSoekanto, *Faktor-faktor Yang Mempengaruhi Penegakan Hukum*, (Jakarta: Rajawali Press, 2008), pages. 5-8.

<sup>22</sup>HibnuNugroho, *Efektivitas Fungsi Koordinasi dan Supervisi dalam Penyidikan Tindak Pidana Korupsi oleh Komisi Pemberantasan Korupsi*, (Paper).Purwokerto: Universitas Jenderal Soedirman, pages. 398-399

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### RESEARCH ARTICLE

#### PROGNOSTIC SIGNIFICANCE OF IMMUNOHISTOCHEMISTRY AND PROLIFERATIVE ACTIVITY IN COLORECTAL CANCER USING SURVIVIN, COX2, S PHASE FRACTION AND DNA PLOIDY.

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#### Abstract

**Background:-** Aggressiveness of neoplasm may be linked to the biological characteristic of tumor cells, represented by the level of expression of specific molecular markers. **Aim:** was to examine the co-expression of survivin, COX-2, DNA ploidy and S phase fraction (SPF) in colorectal carcinomas and assess its prognostic value. **Material and Methods:-** neoplastic tissue from 100 patients with primary non treated colorectal adenocarcinomas were assessed by immunohistochemistry and flow cytometry. Statistical analysis evaluated the correlation of marker expression with clinicopathological variables and with the expression of other markers. **Results:-** Survivin and COX-2 cytoplasmic immunoreactivity was detected in 65% and 73% respectively of the studied adenocarcinomas. Flow cytometry revealed that 62% of carcinomas were aneuploid and 47% had high SPF. COX-2, DNA aneuploidy and high SPF showed significantly association with lymph nodes (LN) involvement and Dukes' stage (P = 0.04, P = 0.02 and 0.03, respectively for LN and P = 0.03, P = 0.01 and 0.04, respectively for Dukes' stage). DNA aneuploidy was positively associated with histological grade (P = 0.03). High SPF and DNA aneuploidy were positively associated with tumor localization (P = 0.03 for both). COX-2 displayed positive association with survivin expression and with recurrence (P = 0.04 and P = 0.02 respectively). High SPF significantly associated with survivin, COX-2 and DNA ploidy (P = 0.005, P = 0.004 and 0.02, respectively). The expression of more markers by each carcinoma was positively correlated with LN involvement (P = 0.04) and advanced stage (P = 0.001). **Conclusions:** Our analysis demonstrate that the score of markers co-expression correlates significantly with the poor prognosis of patients with colorectal adenocarcinomas.

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#### Introduction:-

Colorectal malignancy is included as one from the most common malignancy around the world, and is regarded as one of the major reasons of cancer related mortality [1]. The growth and development of colorectal carcinoma

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proceeds via sequences of multistep genetic alterations including the stimulation of cancer causing genes and damage of tumor suppressor genes. The majority of colorectal carcinomas develop on top of dysplasia of benign adenomas that progressively enlarge and transform into a villous adenomas. The continuous gathering of genetic changes (e.g., DCC, ras, p53, and APC) drive the evolution of normal colonic and rectal epithelium to adenoma as well as the transformation to dysplasia and malignant adenocarcinoma [2].

Despite the progresses in surgical techniques and adjuvant chemotherapeutic regimens have decreased the earlier elevated local recurrence rates of colorectal cancer and have provided patients with better survival [3], many patients presented with local recurrences or distant metastasis following seemingly curative surgical operations resulting in low survival [4]. Evaluation of prognostic molecular factors that is linked to a certain prognostic outcome would as a result, be helpful for detection of cases who are probable to improve with adjuvant treatments, resulting in better prognosis [5].

Survivin is considered to be one of the members of the group of inhibitor of apoptosis protein (IAP). It is involved in controlling the physiological development of embryonic cells and monitoring the cycle of the cell, with double jobs that block apoptosis and stimulates cellular multiplying. Overexpression of survivin stops apoptosis via several mechanisms, which is favorable to the divisions of abnormal cell and promotes neoplastic transformation [6-8].

The fetal tissues and majority of neoplastic tissues show expression of survivin while; negative expression is detected in normal mature tissues. Survivin displays highly discriminating positive expression in malignant neoplasms, and its expression is associated with the high cellular proliferative activity, the resistance of neoplasms to cancer therapy, high metastatic capability of tumors, high recurrence potential, and the unfavorable outcome of patients. As a result, survivin had considered to be an important diagnostic marker for wide variety of tumors and a molecular target for successful cancer therapy [9-11].

Cyclooxygenases are important enzymes that catalyze the cellular alteration of arachidonic acid to prostaglandins. In humans, two types of cyclooxygenase enzymes have been detected, the constitutive form COX-1 and the inducible form COX-2 [12]. The upregulation of COX-2 in transformed tissues and in several types of malignancy is proved by epidemiological and experimental studies, and as a result, it is essential in neoplastic transformations. It is approved that expression of COX-2 is implicated in differentiation, angiogenesis and apoptosis of the neoplasms. [12, 13] Many researches have revealed that the expression of COX-2 occurs at high levels in 80–90% of the adenocarcinomas of colon and rectum. [14, 15], and selective suppression of COX-2 decrease tumorigenesis of the colon and rectum in various carcinogenesis models [16].

DNA ploidy and S-phase fraction (SPF) measured flow cytometry, are significant and independent prognostic factors in patients suffering from colorectal carcinoma [17]. Most investigators [18-20] agree that there is association between the presences of aneuploid cell populations by flow cytometry and unfavorable outcome.

We aimed to study the co-expression of immunohistochemical staining of survivin and COX-2 proteins, DNA ploidy and the proliferative activity using SPF in colorectal carcinomas and their correlation with patient's clinicopathological characteristics to assess their prognostic value.

## **Materials and Methods:-**

### **Patients and Tissue Samples:-**

Our research was done at the Departments of Pathology and Surgery, Faculty of Medicine, University of Zagazig in the period from January 2012 to May 2016. One hundred neoplasms were obtained from patients with primary sporadic colorectal carcinoma. The age, the sex, the location of the tumor, Dukes' stage and other clinicopathological variables were gotten from surgical and pathological sheets. All of the cases had no history of hereditary colon cancer syndromes. There was no chemotherapy or radiation given to the cases before the operation; but after surgery, patients with stage III tumor and stage IV tumor received chemotherapy without any radiation for both colon and rectal cancer. The committee of ethics of Zagazig University approved this research and all patients gave a consent of agreement prior to their inclusion in the research. All samples were fixed with formalin and implanted into paraffin, the blocks were sectioned at 3- microns and stained with ordinary H&E stain to confirm the diagnosis and grade the neoplasms.

**Immunohistochemical Staining:-**

The Sections of 3- $\mu$ m thick were cut from paraffin blocks of the collected colorectal neoplasms. Sections were deparaffinized and rehydrated and deposited in 0.5% hydrogen peroxide in methanol for 10 min to stop endogenous peroxidase activity. Antigen retrieval was achieved by keeping in 0.01 M citrate buffer (pH 6.0) for 5 minutes in a pressure cooker. The primary antibodies were added to the sections at room temperature for 60 min. The strept avidin-biotin-peroxidase complex technique was applied for antibodies against survivin (monoclonal anti-survivin antibody, Clone 12C4, Code M3624, Santa Cruz Biotechnology, Santa Cruz, California, USA, Dilution 1:100) and against COX-2 (rabbit polyclonal Anti- COX-2, RB-9072-R1; Lab Vision corporation, Neo Markers, Dilution 1:200), by utilizing diaminobenzidine (DAB) as the chromogen. Negative control slides in the lack of primary antibody were considered for each staining. A colon carcinoma, which intensely expressed survivin mRNA by RT-PCR [21], was considered as a positive control. As a positive control for COX-2, we used a normal kidney tissue or an intestinal metaplasia.

**Scoring Criteria for survivin:-**

According to previously described reports [22,23], the mean proportion of positive carcinoma cells in at least five fields using high power was established and allocated to one of five groups: (1) 0, <5%; (2) 1, 5% to 25%; (3) 2, 25% to 50%; (4) 3, 50% to 75%; and (5) 4, >75%. The intensity of survivin immunostaining was recorded as (1) weak, 1+, (2) moderate, 2+; and (3) intense, 3+. The proportion of positive tumor cells and staining intensity were multiplied to get a final score for each neoplasm. In neoplasm showing heterogeneous immunostaining, the predominant staining pattern was evaluated for scoring. Neoplasms having final scores < 1 were described as negative; the rest of neoplasms were stated as positive.

**Scoring Criteria for COX-2:-**

For COX-2 evaluation [24], intensity of immunostaining was scored as 0 (negative), 1 (weak), 2 (medium), and 3 (strong). Extent of immunostaining was assessed as 0 (0%), 1 (1–25%), 2 (26– 50%), 3 (51–75%), and 4 (76–100%) depending on the proportions of areas with positive immunostaining in relation to the entire tumor area. The sum of the intensity and extent score was used as the final staining score (0 –7) for COX-2. Neoplasms were recorded as positive when having a final immunostaining score > 2.

**For flow cytometry:-**

Two to four 50  $\mu$ m sections for DNA FCM were located into glass tubes. The neoplastic tissue for FCM was first deparaffinized by using two bathes of toluene (10 minutes, each), Rehydration in gradually decreasing concentrations of alcohols for 10 minutes in each grade. At the end, the tissue was washed in refined water. The tissue was then milled with blades and yielded to 0.5% pepsin digestion for half an hour. Then, the cells were taken with a syringe and filtered with using a 50- $\mu$ m filter mesh and put on a two layer sucrose cushion to remove the debris. ANase and propidium iodide were put for half an hour prior to the process. The sample then analyzed with a flow cytometer equipped with an argon laser light beam (wavelength 488 nm.) [25].

**DNA Quantitation and S- phase fraction Estimation:-**

The machine computes the DNA index (DI), coefficient of variation (CV) and cell cycle indices including S-phase fraction (SPF). For each slide, 20 lymphocytes were used as an internal diploid DNA content standard for that slide. At least 200 nuclei which is non-overlapping from each slide were then measured. Peak statistics are depended on employer distinction of the histogram. The CV of each peak is measured in the standard deviation of demarcated peak divided by the mean. Histograms were considered as uninterpretable for ploidy if the CV for the DNA diploid G0/G1 peak was > 8. The histograms were regarded as diploid when a solitary peak present at the diploid position (DI range 0.90- 1.10) and less than 15% of cells were present at the tetraploid position. If an extra distinct peak was detected, the lesion will be categorized into one of the 5 non-diploid groups based on DI. Thus the lesion will be regarded as DNA hypodiploid for DI<0.9, hyperdiploid for DI in the range of 1.1-1.90 tetraploid for the DI in the range of 1.9-2.10 and hypertetraploid for DI more than 2.10 .If more than one non-diploid peak was detected, the lesion will be categorized as multiploid. For tetraploid lesion, the extra peak should be detected in the tetraploid region and should have  $\geq$ 15% of cells in the presence of identifiable G2/M peak. The aneuploidy term is used to designate hypodiploid, hyperdiploid and hypertetraploid subgroups of nondiploid tumors as single category. According to Taylor and associates (26), S-phase >5 % was considered hyperproliferative and  $\leq$ 5% was considered as normoproliferative.

**Statistical Analysis:-**

Analysis of the result was done by using SPSS, version 10.0 (SPSS, Inc., Chicago, IL, USA). Categorical data were expressed as frequencies (and percentages) and continuous data were expressed as the mean  $\pm$  standard deviation. The chi-square test was used to assess any possible association among survivin immunoeexpression, COX- 2 immunoeexpression, ploidy of DNA and the fraction of S phase and the clinicopathological variables. Statistical significance was reflected for P values  $< 0.05$ .

**Results:-****Clinicopathological results:-**

The mean age of the studied 100 colorectal adenocarcinomas patients at initial surgery was  $59 \pm 10$  years, rang (40-75years), 70% were males and 30% were female, 31% were proximal tumors and 69% were distal tumors. All colorectal carcinoma patients' clinicopathological variables are outlined in Table 1.

**Table 1:-** Clinicopathological characteristics of 100 patients with colorectal cancer.

Characteristic	No. of patients (%)
<b>Age (years)</b>	
Mean $\pm$ SD	59 $\pm$ 10
Median (Range)	58 (40-75)
<b>Age</b>	
<65years	49 (49%)
$\geq 65$ years	51 (51%)
<b>Sex</b>	
Male	70 (70%)
Female	30 (30%)
<b>LN involvement</b>	
No	55 (55%)
Yes	45 (45%)
<b>Histopathological grade</b>	
I,II	71 (71%)
III	29 (29%)
<b>Distant metastasis</b>	
No	68 (68%)
Yes	32 (32%)
<b>Dukes' stage</b>	
A,B	47 (47%)
C, D	53 (53%)
<b>Localization</b>	
Proximal tumors	31 (31%)
Distal tumors	69 (69%)
<b>Recurrence</b>	
Yes	36 (36%)
No	49 (49%)
Unknown	15 (15%)

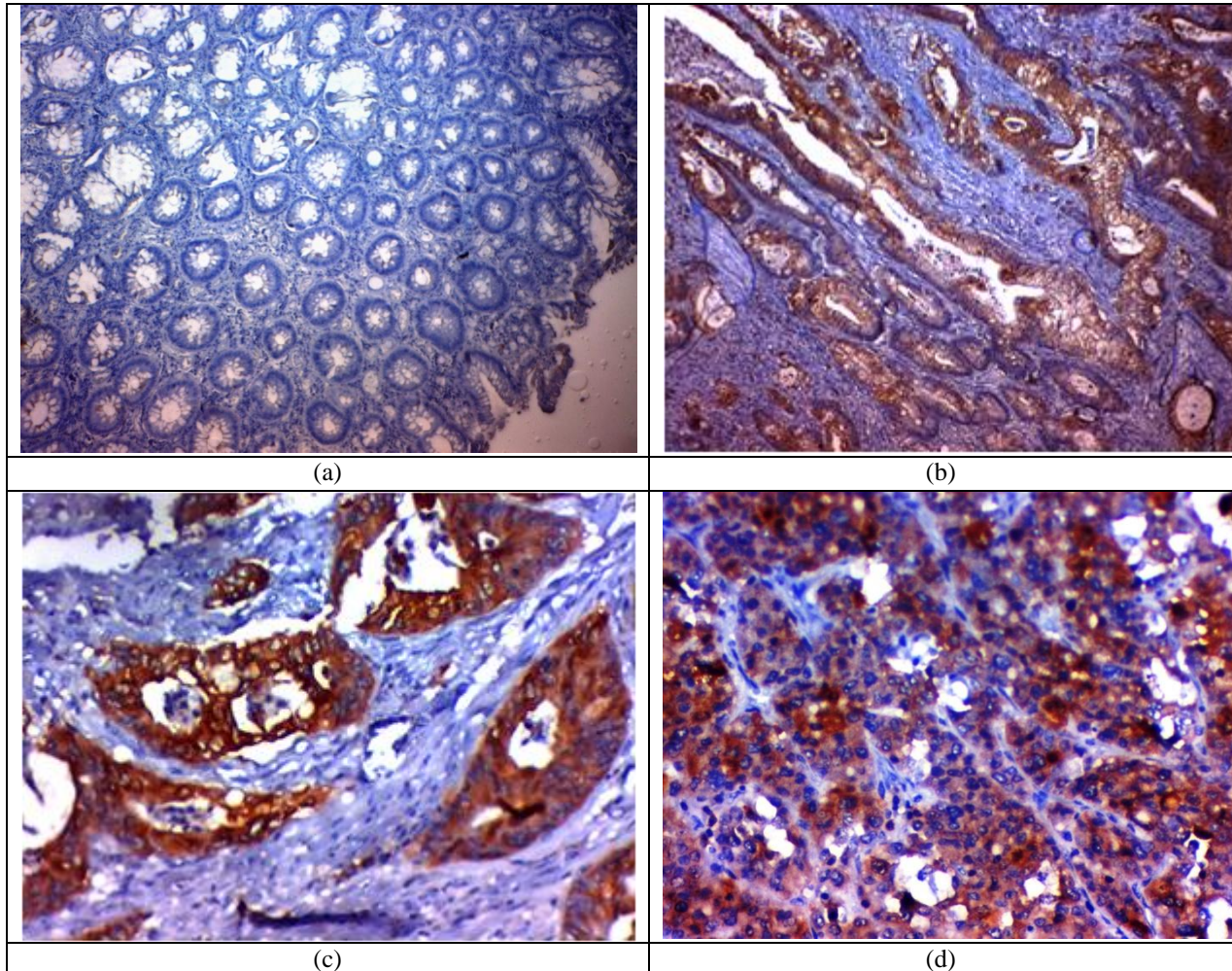
**Immunohistochemical Expression of Survivin in Colorectal Carcinomas:-**

Survivin immunoreactivity was expressed mainly in the cytoplasm of adenocarcinomas cells but minimal nuclear reactivity was also seen in a few cases. In contrast, no survivin expression was identified in either the tumor stromal cells or in the nearby normal mucosa (Fig.1). Based on final scores, 65 (65%) colorectal carcinomas were considered as Survivin positive and 35(35%) colorectal carcinomas were described as Survivin-negative (Table 2).



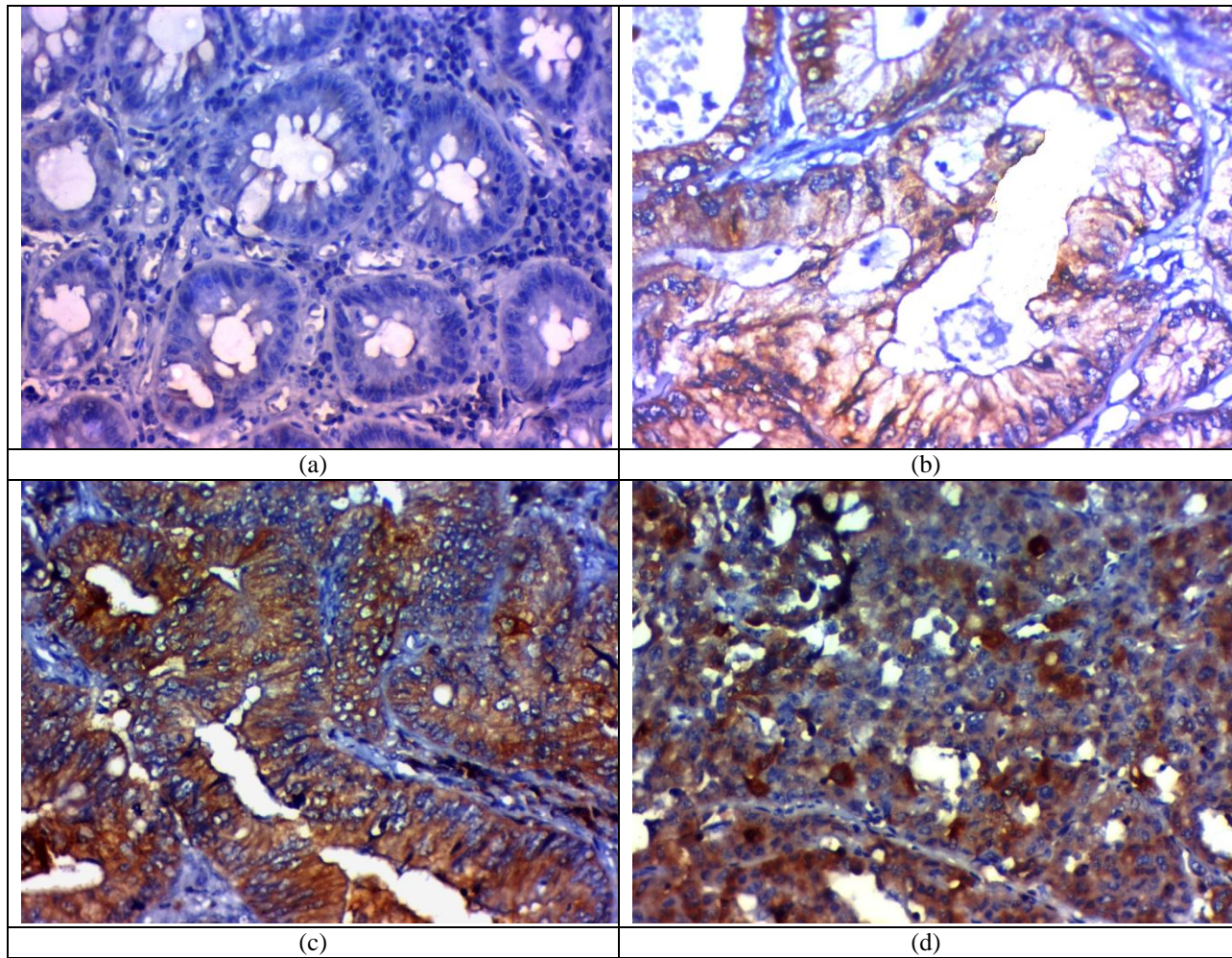
**Immunohistochemical Expression of COX-2 in Colorectal Carcinomas:-**

Immunohistochemical staining of the colorectal cancer specimens revealed that COX-2 expression was restricted to the carcinoma cells and was not demonstrable in the stromal compartment of the cancers. Immunostaining pattern of COX-2 within the tumors was mainly in the cytoplasm, adjacent non neoplastic colonic mucosa was negative for COX-2 immunoreactivity (Fig. 2). 73 of 100 (73%) colorectal carcinomas analyzed, revealed expression of COX-2 immunoreactivity (Table 2).



**Fig. 1:- Representative samples of survivin immunorexpression in colorectal carcinoma.** (a) Normal colonic mucosa displayed no expression of survivin. (x 200) (b) Colorectal carcinoma GI-II showed diffuse moderate survivin immunoreactivity (x 200). (c) Colorectal carcinoma G II showed diffuse intense survivin immunoreactivity (x 400). (d) Colorectal carcinoma GIII showed diffuse intense survivin immunoreactivity (x 400).



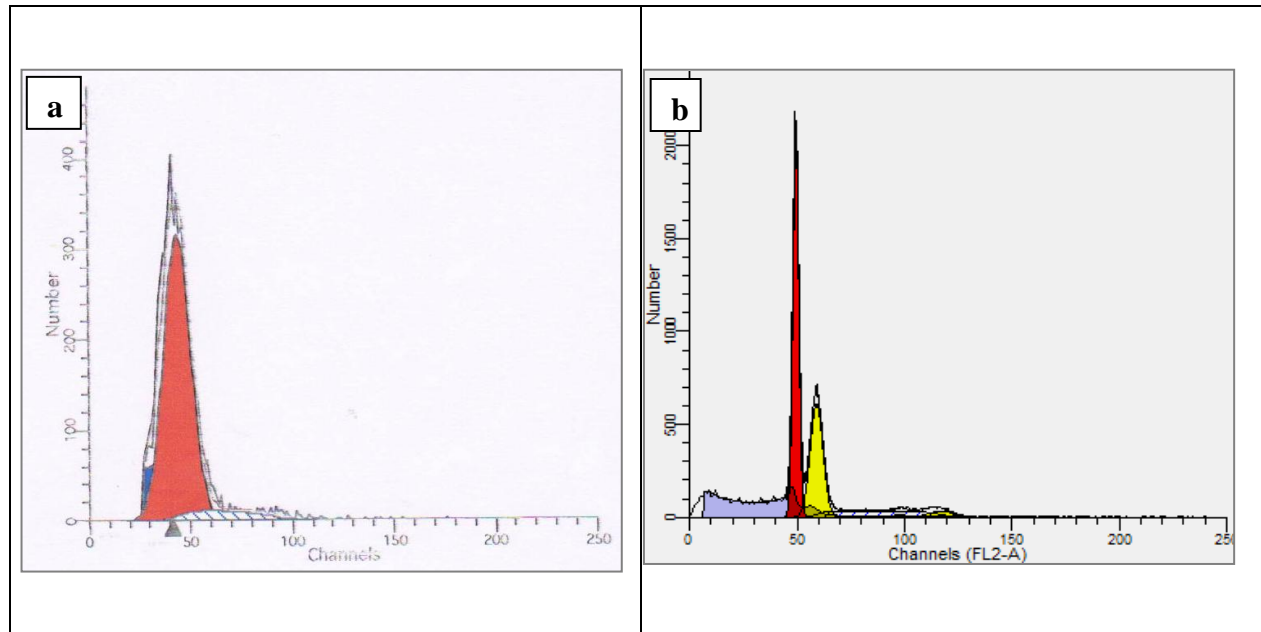


**Fig. 2:- Representative samples of COX2 immunoeexpression in colorectal carcinoma.** (a) Normal colonic mucosa exhibited negative expression of COX-2. (d) Colorectal carcinoma GII displayed weak immunohistochemical staining for COX-2. (d) Colorectal carcinoma GII displayed strong immunohistochemical staining for COX-2. (d) Colorectal carcinoma GIII displayed moderate to strong immunohistochemical staining for COX-2. (X400)

#### Flow cytometric analysis:-

Of the 100 carcinomas examined, 38 (38%) were designated as DNA diploid and 62 (62%) as DNA aneuploidy (Table 2). Aneuploid tumors had mean DI of 1.75 (range, 0.93–3.21). These colorectal cancers had SPF ranged from 7.5% to 45.6%. The median SPF was assessed to be 18.3%. There was a significantly higher SPF in DNA-aneuploid tumors when compared with DNA-diploid tumors (29.3%, 16.6%, respectively,  $P = 0.001$ ) (Fig. 3). Depending on the median value of SPF as point of cut-off, neoplasms were consequently separated into high ( $>18.3$ ) and low ( $\leq 18.3$ ) SPF neoplasms (Table 2).





**Fig. 3:-** Flow cytometry DNA histogram of colorectal cancer showing diploid peak (DI=1.01) and the SPF was (9.98) (a) and diploid & aneuploid peaks (DI=1.01&1.77) and the SPF was (19.86) (b).

**Table 2:-** Patients Distribution depending on the result of immunohistochemical expressions and flow cytometry.

Marker	No of patients (%)
<b>Survivin</b>	
Negative	35 (35%)
Positive	65 (65%)
<b>COX-2</b>	
Negative	27 (27%)
Positive	73 (73%)
<b>DNA ploidy</b>	
Diploid	38 (38%)
Aneuploid	62 (62%)
<b>SPF</b>	
≤ 18.3%	53 ( 53% )
> 18.3%	47 (47%)

**Association of survivin expression, COX-2 expression, DNA aneuploidy and high SPF with tumor clinicopathological variables and markers expressions:-**

The result of markers expression was investigated in associations with the following variables: patient's gender, age, lymph nodes involvement, distant metastasis, Dukes' stage, histological grade, localization and recurrence as well as expression with the other markers examined (Table 3). COX-2, DNA aneuploidy and high SPF showed statistically significant association with lymph nodes involvement and Dukes' stage ( $P = 0.04$ ,  $P = 0.02$  and  $0.03$ , respectively for LN involvement and  $P = 0.03$ ,  $P = 0.01$  and  $0.04$ , respectively for Dukes' stage). DNA aneuploidy was positively associated with histological grade ( $P = 0.03$ ). High S phase and DNA aneuploidy were also positively associated with tumor localization ( $P = 0.031$  and  $P = 0.036$ , respectively). COX-2 displayed also positive association with tumor recurrence ( $P = 0.021$ ). No association was observed with other clinicopathological variables. Between marker expressing tissues, high S phase showed statistically significant association with survivin, COX-2 and DNA ploidy ( $P = 0.005$ ,  $P = 0.004$  and  $0.02$ , respectively). In addition, there was association between survivin expression with COX-2 ( $P = 0.04$ ).

**Table 3:-** Marker expressing colorectal carcinomas in associations with clinicopathological variables and co-expression with other markers

Number of positive carcinomas for survivin, COX-2, DNA aneuploidy and high SPF (% of each category see Tables 1 and 2)				
	Survivin	COX-2	DNA aneuploidy	High SPF (> 18.3%)
Gender				
Male	45(64.2%)	52(74.2%)	44(62.8%)	31(44.2%)
Female	20(66.6%)	21(70%)	18(60%)	16(53.3%)
	P=0.9	P=0.8	P=0.8	P=0.6
Age				
<65 years	36(73.4%)	35(71.4%)	28(57.1%)	20(40.8%)
≥65 years	29(56.8)	38(74.5%)	34(66.6%)	27(52.9%)
	P=0.4	P=0.8	P=0.6	P=0.4
LN involvement				
No	30(54.5%)	51(92.7%)	45(81.8%)	17(30.9%)
Yes	35(77.7%)	22(48.8%)	17(37.7%)	30(66.6%)
	P=0.2	P=0.04	P=0.02	P=0.03
Distant metastasis				
No	46(67.6%)	51(75%)	38(55.8%)	29(42.6%)
Yes	19(59.3%)	22(68.7%)	24(75%)	18(56.2%)
	P=0.7	P=0.7	P=0.3	P=0.4
Dukes' stage				
A, B	29(61.7%)	46(97.8%)	17(36.1%)	14(29.7%)
C, D	36(67.9%)	27(50.9%)	45(84.9%)	33(62.2%)
	P=0.7	P=0.03	P=0.01	P=0.04
Histological grade				
I, II	47(66.1%)	53(74.6%)	53(74.3%)	32(45%)
III	18(62%)	20(68.9%)	9 (31%)	15(51.7%)
	P=0.8	P=0.8	P=0.03	P=0.7
Localization				
Proximal tumors	20(64.5%)	21(67.7%)	10(32.2%)	7(22.5%)
Distal tumors	45(65.2%)	52(75.3%)	52(75.3%)	40(57.9%)
	P=0.9	P=0.7	P=0.03	P=0.03
Recurrence				
Yes	22(61.1%)	32(88.8%)	25(69.4%)	16(44.4%)
No	39(79.5%)	39(79.5%)	32(65.3%)	28(57.1%)
Unknown	4(26.6%)	2(13.3%)	5(33.3%)	3(20%)
	P=0.1	P=0.02	P=0.4	P=0.2
Survivin				
Negative	0(0%)	34(97.1%)	25(71.4%)	6(17.1%)
Positive	65(100%)	39(60%)	37(56.9%)	41(63%)
		P=0.04	P=0.4	P=0.005
COX-2				
Negative	26(96.2%)	0(0%)	13(48.1%)	24(88.8%)
Positive	39(53.4%)	73(100%)	49(67.1%)	23(31.5%)
	P=0.04		P=0.3	P=0.004
DNA ploidy				
Diploid	28(90.3%)	24(77.4%)	0(0%)	7(22.5%)
Aneuploid	37(59.6%)	49(79%)	62(100%)	40(64.5%)
	P=0.2	P=0.9		P=0.02
SPF				
≤ 18.3%	24(45.2%)	50(94.3%)	22(41.5%)	0(0%)
> 18.3%	41(87.2%)	23(48.9%)	40(85.1%)	47(100%)
	P=0.04	P=0.04	P=0.02	

There was also associations between the clinicopathological variables and the number of markers expressed by each carcinoma (Table 4). The expression of more markers was positively correlated with lymph nodes involvement (P = 0.04) and advanced stage disease (P = 0.001).

**Table 4:-** Number of tumor markers expressed by colorectal carcinomas in relation to clinicopathological variables.

Variable	Expression of survivin, COX-2, DNA aneuploidy and high SFP Number of tissues (percentage %)			P value
	4 (-)	1(+)	2or3or4(+)	
Gender				
Male	10(14.3)	20(28.6)	40(57.1)	0.09
Female	9(30)	10(33.3)	11(36.7)	
Age				
<65 years	11(22.4)	17(34.7)	21(42.9)	0.2
≥65 years	8(15.7)	13(25.5)	30(58.8)	
LN involvement				
No	12(21.8)	21(38.2)	22(40)	0.04
Yes	7(15.6)	9(20)	29(64.4)	
Distant metastasis				
No	14(20.6)	18(26.5)	36(52.9)	0.5
Yes	5(15.6)	12(37.5)	15(46.9)	
Dukes' stage				
A, B	13(27.7)	19(40.4)	15(31.9)	0.001
C, D	6(11.3)	11(20.8)	36(67.9)	
Histological grade				
I, II	12(16.9)	22(30.9)	37(52.2)	0.7
III	7(24.1)	8(27.6)	14(48.3)	
Localization				
Proximal tumors	9(29)	10(32.3)	12(38.7)	0.1
Distal tumors	10(14.5)	20(28.9)	39(56.6)	
Recurrence				
Yes	9(25)	13(36.1)	14(38.9)	0.1
No	8(16.3)	10(20.4)	31(63.3)	
Unknown	2(13.3)	7(46.7)	6(40)	

### Discussion:-

In the present research, the prognostic significance of the result of immunohistochemical staining of survivin and COX-2, DNA ploidy and SPF in colorectal cancer tissues was studied by associations with the clinicopathological variables of colorectal cancer patients. Our analysis revealed that: (I) Expression of three of the four markers (expression of COX-2 with DNA aneuploidy and high SPF) was independently associated with lymph nodes involvement and Dukes' stage whereas one or two markers were also associated with histological grade, tumor recurrence and tumor localization. Furthermore, some of the clinicopathological variables were also associated with the number of the expressed markers by each neoplasm, the more expression of markers associated with lymph nodes involvement and advanced Dukes' stage. (II) There was association between high SPF and survivin, COX-2 and DNA aneuploidy. In addition, there was also association among the immunoexpression of survivin and COX-2, probably indicating that they might have a common molecular pathway in the carcinogenetic process.

The prognostic value of survivin, COX-2, DNA ploidy and SPF in colorectal adenocarcinomas patients had been presented in many previous researches. However, in this study we attempted to evaluate the prognostic value of their co-expression score.

In our analysis, Survivin expression was detected in 65% of the colorectal carcinomas, mainly cytoplasmic within the tumors with no staining in normal colonic epithelium, which is generally in agreement with previous reports, Kawasaki et al. [27], Suga et al.[28] and Sarela et al.[29] stated that survivin staining was observed in the majority of colorectal carcinomas included in their studies. Survivin immunoeexpression was non correlated with any of the examined histopathological variables of colorectal carcinomas, and this result is in concordance with previous related studies [27, 29]. In contrast to our finding, others found that survivin expression is significantly associated with the histological differentiation of colorectal carcinoma [30, 31]. This different reports may be explained by using different primary antibody clone, different immunohistochemical technique and different method in assessments of marker staining.

In our series, 73% of the colorectal carcinoma expressed COX-2 with immunostaining pattern, predominantly cytoplasmic within the cells of the tumors. The non-neoplastic colonic mucosa nearby to the carcinomas displayed no immunostaining for COX2, which is in alignment with previous studies [32-34]. We found that COX-2 overexpression, though not correlated with the other clinicopathological features, was significantly associated with Dukes' stage (P=0.03), lymph node positivity (P=0.04), and recurrence (P=0.02). These observations are in concordance with previous studies [35, 36].

In our study, we found that 62% (62/100) of carcinomas had an aneuploid DNA content, this is in agreement with others [37-39]. In both our study and some previous studies [39, 40], a significant association between DNA ploidy and lymph nodes involvement (P=0.02), Dukes' stage (P=0.01), histological grade (P=0.03), and tumor localization (P=0.03), were found. Finally, similar to previous reports [38, 40], DNA ploidy in our series was not related to other clinicopathologic parameters.

In our study, we found the median SPF of the whole series to be 18.3%, which is similar to findings of others [39]. We also detected a statistically significant correlation among SPF and lymph nodes involvement (P=0.03), Dukes' stage (P=0.04), and tumor location (P=0.03), which is in agreement with others [40].

Regarding the markers co-expression in our investigations, high SPF showed statistically significant association with DNA ploidy (P=0.02), that is similar previous reports [39, 40]. In addition, there is highly significant association between survivin and high SPF (P=0.005), a result that agree with Ito et al., [41] who reported that survivin expression strongly associated with the proliferation index and overexpression of survivin lead to an increase in the SPF in human hepatocellular carcinoma. In addition, Kawasaki et al., [42], found that survivin immunoeexpression was positively associated with the labelling index of Ki-67 in colorectal cancer. Moreover, Sarela et al., [43], reported that there was positive significant linear correlation among survivin final scores and proliferative index (P=0.001) in pancreatic cancers.

Regarding COX-2 expression in our series, we found statistically significant association among COX-2 and high SPF (P=0.004), a result that come to an agreement with Mrena et al., [44] who informed that the expression of COX-2 was associated with the labelling index of Ki-67 (p=0.013) and SPF (p<0.0001) in gastric cancer. Moreover, Yamagishi et al., [45], told that the expression of COX-2 was correlated with the labelling index of Ki-67 in human advanced gastric cancer.

There was also association between survivin expressing with COX-2 (P = 0.04) in our study. Similar finding in gastric cancer have been published by Yu et al., [46], where association between survivin and COX-2 overexpression was detected at both mRNA (P=0.001) and protein levels (P=0.041). Also, our analysis were in agreement with findings of Barnes et al., [47], indicating that the presence of cytoplasmic survivin correlates with the expression of COX-2 in mammary adenocarcinoma. Yang et al., [48], stated that COX-2 expression showed significantly strong correlation with Survivin (r = 0.659, P<0.001) in hepatocellular carcinoma.

In conclusion, we displayed that the co-expression score of survivin, COX-2, DNA aneuploidy and high SPF in colorectal cancer tissues correlates significantly with the poor prognosis of patients with colorectal adenocarcinomas and might be of clinical routine. These results may help in understanding the carcinogenesis of colorectal carcinomas and help the advance of therapeutic strategies like suppression of COX-2 or survivin silencing.

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### RESEARCH ARTICLE

#### KNOWLEDGE, ATTITUDE, AND BEHAVIOR AMONG MEDICAL STUDENT AT UMM- AL-QURA UNIVERSITY TOWARD EVIDENCE-BASED MEDICINE.

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#### Abstract

**Objective:** This study aims to evaluate the knowledge, attitude and behavior toward evidence based medicine (EBM) among undergraduate medical student in Saudi Arabia and to highlight barriers preventing the use of EBM effectively.

**Methods:** This cross sectional study was conducted on sixth year medical students at Umm Al-Qura University (UQU) by distributing a self-administered questionnaire manually and electronically between November 2014 to January 2015.

**Results:** The survey completed by only 32.5% (n=87) students, all sixth year medical students at UQU showed a good knowledge and a positive attitude towards evidence based medicine. Most of the students find their evidence on the internet, while 52.9% (n=64) never used reliable and peer reviewed sources (Cochrane database) in their searches. There are 58% of student who spend an hour or less daily looking up evidence, while 32.2% (n=28) do not spend any time during their usual day. Lastly, 65% believe that EBM takes too much time for busy medical students and only 29.9% believed that EBM is clearly incorporated during teaching sessions.

**Conclusion:** Good level of knowledge and positive attitude towards evidence based medicine was reported by the students. On the other hand, there is a gap in their actual behaviors of practicing EBM. Accordingly, improvement on education system of EBM is needed to increase the quality and effectiveness of student's skills and their ability of applying EBM in their future by incorporate the EBM in various teaching activities. Further studies are required on a larger scale for generalizing the results.

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#### Introduction:-

Evidence-based medicine is defined as a particular approach that incorporate the patient values, the best available scientific evidence, and clinical expertise.<sup>1</sup> Since there's a great discrepancies between the huge variety of the new updated information and health care practice, the need of evidence based medicine is becoming mandatory among physician and undergraduate health care provider.<sup>2</sup>

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Practice supported by evidence usually improves the outcomes. There is a clear improvement in the quality of care given to the patients along with cost and results satisfaction as well as physician gains better clinical judgment and decision making with EBM practice.<sup>3</sup> One of the key elements to fully applied evidence based medicine is having a good grasp on the use of searching techniques on databases, in order to obtain trustworthy and reliable information and also greatly helps in overcoming the difficulties and diversity in the medical literature.<sup>4</sup>

Weak understanding of statistic and EBM concepts were found in many medical students and physicians which reflected as a barrier in practicing evidence based medicine, thus many countries felt the need to implement lectures and materials in their curriculum regarding the evidence based medicine. In addition to some other hindrances to effectively teach and use EBM on daily basis are lack of access to the materials needed to engage EBM, and more importantly the lack of time.<sup>5,6</sup>

Since EBM had been greatly emphasized in medical sciences, therefore assessing and identifying the factors that affect its proper use is essential. Taking all this into account this study examine the perception, knowledge and attitude among undergraduate sixth year medical student at Umm- Al-Qura university, in order to determine the current attitude of the students and to highlight the main barriers preventing the use of EBM effectively as daily practice.

### **Materials and Methods:-**

This cross-sectional study was conducted by distributing a questionnaire among 6th year medical students from Umm Al-Qura University, Makkah, Saudi Arabia, to assess the level of awareness toward evidence based medicine (EBM), the data collection carried out from November 2014 to January 2015. Both males and females were included as they had completed their academic curriculum and clinical rotations, 325 students in total (161 males and 164 females).

The questionnaires were distributed to the students by two methods. First, a questionnaire manually distributed to the students in their classroom. After that, an electronic one, shared through Google Form and their personal emails. They were requested to use, one of the two methods. Informed consent were taken, for the voluntary participation and their personal information will be confidential. The ethical approval was obtained from *Ethics Committee for Scientific Research* at the college of medicine, Umm Al-Qura University prior to conducting this study.

In this study a descriptive survey entitled " knowledge, attitude, and behavior questionnaire (KAB questionnaire) " have been used, which is a valid questionnaire to assess the awareness about the evidence based medicine, particularly for undergraduate medical student, as it cover the students' perspective regarding their knowledge, attitude and behavior toward evidence base medicine.

The KAB questionnaire is derived from a comprehensive literature review by Dr. Janice M Johnston and other experts, and permission was granted from the authors to use this questionnaire, and to edit as suitable to make other correlations. The internal reliability for this survey with Cronbach's alpha is 0.71–0.88. The questionnaire had 43 questions and we added questions regarding the students' cumulative GPA and their previous exposure to EBM education or practice. The measurement of Construct validity was by correlating the factors with other measures of EBM. Responsiveness of the questionnaire was tested through paired t-tests of the pre-factor and postfactor mean scores (Johnston et al., 2003; Brown et al., 2010). Responsiveness was reported to be reliable and valid (Johnston et al., 2003). Data entry and statistical analysis was done using SPSS version 20.

### **Results:-**

Our total population is 268 of sixth year students at UQU medical college, 127 students were males and 141 females. Of the responders, only 87 students completed the EBM-KAB questionnaires. Out of these, 46 were males and 41 females, GBA of the majority of the students (47.1%) were less than 3.0, and (18.9%) 3.0 or more. Overall, 56 students were previously exposed to EBM; 37 students during curriculum, 13 from attended an extra curriculum lecture, and formal EBM training (certified courses) for 6 students. On the other hand, 21 students without previous exposure to EBM.

Most students 67.7% (n=59) have a clear understanding of what evidence-based medicine means. And 73.5% (n=64) agreed that effective searching skills, accessible bibliographic databases, and evidence sources are essential to

practicing EBM. Almost 80% (n=70) were aware that to determine the quality of research, critical appraisal skills is needed. When asked how frequently they access to medical evidence in general, majority of students 29.9% (n=26) access every month, 21.8% (n=19) every week, and only 4.6% (n=4) every day. While 22% (n=19) reported had never accessed to medical evidence. Table 1 shows the frequent accessing, to different sources of medical evidence.

Compared to one year ago, 24 students reported that they now looked up evidence as information relating to the patient's condition approximately for 2-3 times, during or after clerking each patient on the ward or in the clinic, 22 only one time, and 20 did not look up for evidence.

Fifty-one students spent 1 minute to an hour, every day to find or look up evidence, compared to the previous year, this time does not include their study time. In addition, when they clerked a patient, 47 students took up to 30 minutes to look up the evidence relating to his/her illness, and the remaining 40 students did not look up evidence for their patient, this time was only spent on retrieving the evidence material. Moreover, about 30% (n=26) students believed that EBM practice can affect the management or outcome of their patients. Furthermore, it was found that most 59.7% (n=52) students familiar to use internet as source when looking up for evidence after clerking a patient, while only 8% (n=7) students were using text book. The percentage of using different sources of evidence after clerking a patient shows in figure 1.

They were asked about how much they felt that evidence increasing their understanding of the disease or condition. It was found that 20.7% (n=18) reported that the evidence increased their knowledge by over 80%, 31% (n=27) noted an increase of between 61% and 80%, and other 31% (n=27) stated an increase up to 60%. Fifteen students (17.2%) reported an increase in understanding by 40% or less when using EBM.

Regarding the frequency of raising the role of current best evidence at clinical rounds/sessions, the students answers showed 15.1% (n=13) never, 65.4% (n=57) sometimes, and 19.5% (n=17) often. During teaching rounds or bedside teaching, 29.9% (n=26) of students reported that when discussing a particular clinical problem, current best evidence is moderately used, and 35.6% (n=31) were prepared for the clinical teaching sessions in the last month, while the majority 60.9% (n=53) were unprepared.

Almost 27% (n=24) have changed the way they learn after practicing of evidence based medicine, similar number considered the practice of EBM is somewhat a routine part of their learning. However, 42.5% (n=37) believed they have some confidence to clinical decision-making. Most 78.1% (n=68) believed that EBM will be useful in future practice as doctor, and 72.3% (n=63) are willing to practice evidence based medicine as a doctor in the future. Table 2 shows details students' answers toward EBM practice. Fifty-one students (61%) agreed it is easy to find the evidence in order to practice evidence-based medicine while 39% (n=32) disagreed, 57 students (65%) believe that EBM takes too much time for busy medical students, on the other hand 78.2% (n=68) agreed that evidence based medicine should be an integral part of the undergraduate medical curriculum. Table 3 outlines a summary of students responds to other EBM attitudinal questions.

**Table 1:-**The Different Sources That Used to Access to Medical Evidence.

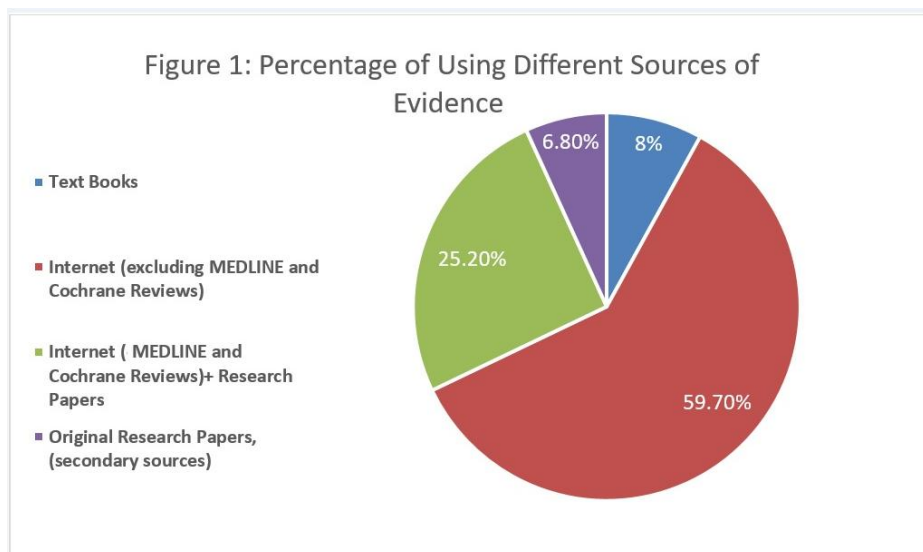
	Every day, and Otherday N (%)	Every (month, and week) N (%)	Never N (%)
Internet (excluding MEDLINE and Cochrane Reviews)	17(19.6)	53(60.9)	17(19.5)
Original research papers	9(10.3)	41(47.1)	37(42.5)
Textbooks	18(20.7)	39(44.8)	30(34.5)
Cochrane database	10(11.5)	31(35.6)	46(52.9)
ACP Journal Club, the journal Evidence-Based Medicine, POEMs (Patient-oriented evidence that matters) or CATs (Critically appraised topics)	14(16.1)	28(32.2)	45(51.7)
InfoRetriever	16(18.4)	26(29.9)	45(51.7)

**Table 2:-** Details Answers toward EBM Practice.

	A lot, and completely N (%)	A little, somewhat, and moderately N (%)	Not at all N (%)
The effect of practicing the EBM, on your patient's management and outcome	32(36.8)	48(55.2)	4(4.6)
The frequent of discussion about the best evidence, related to the patient's condition (during teaching settings)	15(17.2)	64(73.6)	8(9.2)
Considering the practice of EBM, as routine part of the learning process	20(23.1)	59(67.8)	5(5.7)
The influence of EBM practice, over the way you learn	27(31)	52(59.8)	4(4.6)

**Table 3:-** Summary of Students Responds to Different EBM Attitudinal Questions.

Attitudinal Questions	Agree (%)	Disagree (%)
EBM is a "cook-book" medicine that disregards clinical experience.	53(60.9)	34(39.1)
No personal reason to adopt EBM, because it is just a "fad" (or "fashion") that will pass with time.	25(28.7)	62(71.3)
EBM is the future of clinical medicine and will become the standard of care.	66(75.9)	21(24.1)
The validity of EBM, makes anyone can see patients and do what doctors do.	34(39.1)	53(60.9)
EBM ignores the "art" of medicine	36(41.3)	51(58.7)
EBM should not be practice, in general, because medicine is about people and patients, not statistics.	20(22.9)	67(77.1)
Choosing the best treatment for a patient, by work experiences is more important than a research findings,	39(44.)	48(55.2)
Appreciating the advantages of practicing EBM.	62(71.2)	25(28.8)
Personal observation and experience, that EBM is being practiced currently in Saudi Arabia	50(57.4)	37(42.6)

**Summary of Results:-**

Overall, all 87 of sixth year medical students at UQU, showed a good knowledge and a positive attitude towards evidence based medicine, 37 of them were previous exposed to EBM during curriculum, 58% of them spent up to 1 hour, every day to find or look up evidence, In addition, when they clerked a patient, 47 students take 30 minutes in

maximum to look up the evidence relating to his/her illness, it is found that 59.7% (n=52) students more familiar to use internet when looking up for evidence after clerked a patient.

### Discussion:-

This study was designed to evaluate the knowledge, attitude and behavior toward EBM among medical students. There are multiple modalities to teach EBM as mentioned in the literature: workshops, journal clubs, the problem-based method, or the integration in the curriculum in the basic science and clinical years.<sup>7</sup> Umm Al-Qura University use integration of EBM in the clinical years curriculum as the modality of teaching EBM. The target participants in this study were the final sixth year medical students because they were exposed to clinical training and bedside teaching since fourth year, in addition to their supposed familiarity with EBM concept and practice.

Majority of participants 76.7% (n=67) declared that they have a clear understanding of what is the concept of EBM. This good percentage reflects the college's plans as (Research and evidence) module has been considered as a vertical module in the new reformed curriculum at the faculty of medicine in Umm Al-Qura University. Vertical modules were designed to deliver holistic understanding of medical phenomena and cases, while being studied through the curriculum from the second year till the sixth year.

Forty-two percent of the participants 42.5% (n=37) stated that their previous exposure was only during the curriculum, while there are 24.1% (n=21) claimed that they never exposed to EBM before. Our students have been exposed to EBM, according to the curriculum's objectives and plans, but still small proportion do not realize the integration of EBM in the curriculum, for unclear reasons. Therefore, more efforts are needed to clarify this integration in their daily education. 14.9% (n=13) attended an extracurricular lecture and only 6.9% (n=6) got formal EBM training in certified courses. *Barghouti et al.* concluded that 2-week short, intensive course in EBM conducted on fifth year medical students had significantly improved their EBM skills and knowledge.<sup>8</sup>

Low levels of knowledge about EBM were reported among Persian medical students and Omani medical residents.<sup>9</sup> <sup>10</sup> In Ireland, occupational therapy students were knowledgeable and aware of the required EBM skills.<sup>11</sup> In Netherland, *Scholten-peeters et al* compared the level of EBM knowledge in four groups: physical therapy students, their teachers, supervisors and physical therapist, they found that the highest level is in the teachers' group while students ranked their knowledge from insufficient to average.<sup>12</sup> *Johnston et al.* reported lower score for medical students in second and third years compared to their colleagues in fifth year.<sup>13</sup>

Over half of the participants 59.8% find their evidence on the internet (excluding MEDLINE and Cochrane Reviews), 25.3% on the internet and research papers, 6.9% from original research papers and secondary sources. Only, 8.1 % (n=7) use textbooks as a source of evidence. Students in this study are not aware enough about the value of using a peer reviewed sources as well as the important of extracting the information from reliable source like Cochrane library or PubMed search engine, instead they rely on easy access sites from the internet, despite that Cochrane library is considered as the main source of systemic reviews and meta-analyses.<sup>9</sup> That's why it is a must to support and encourage students to adapt this important concept during their search and to get familiar with such databases and overcoming the difficulties and diversity in the medical literature. Similarly, some studies reported that many students still rely on textbooks and seniors' opinion mainly to solve clinical problems.<sup>12</sup>

Most of Irish occupational therapy students reported that they were prepared with evidence when they were on the fieldwork placement, which indicate their positive attitude and effective behaviors to practice EBM.<sup>11</sup> Also, many other studies reported the same positive attitudes toward EBM by undergraduate students.<sup>12-14</sup>

In the view of EBM current practicing, 52.9% look up evidence during or after clerking each patient in the ward or the clinic. While, last third 23% do not look up for any evidence at all. It is recommend that the academic educators to consider EBM practicing as an essential part of daily sessions and their objective during the exams in order to evaluate the required skills and knowledge levels on periodic occasions as well as to illustrate the way of using EBM in relation to clinical experiences under various clinical scenarios.

More than half of participants spend an hour or less daily finding or looking up evidence while 32.2% do not spend any time during their usual day looking up evidence. Furthermore, 65% students believe that EBM takes too much time for busy medical students. So encourage the students to use EBM on a regular basis during their bedside training along with teach them how to search the available databases effectively to get the updated evidences in

minimal time is very important. In Umm Al-Qura University, good resources and access for many publishers are available, but there is a need to periodic classes to guide students on how to search effectively the available databases. *Stronge and Cahill* found that over half of occupational therapy students assessed evidence every day or every other day and only one third of them spend over than an hour looking up evidence.<sup>11</sup> *Johnston et al.* reported positive correlation between the future use of EBM and the frequency of practicing EBM and the need of evidence per day.<sup>13</sup>

Among many studies discussing teaching EBM effectively, only a few ones focused on how medical student perceive, utilize and apply their EBM knowledge in clinical practice.<sup>7</sup> In Saudi Arabia this study is one of the very few studies to assess undergraduate's perception of EBM with using a tested questionnaire for its reliability and validity. KAB questionnaire is considered one of the view tools developed specifically to assess undergraduates EBM knowledge, attitude and behavior.<sup>13</sup> Never the less, out of the 268 questionnaires that had been distributed, only 87 students participated voluntarily with response rate of 32.5% , which was much lower compared to *Johnston et al.* (author of the KAB questionnaire) who reported 99% response rate among fifth year medical students in Hong Kong university as they found that response rate to be higher in fifth year medical students compared to their colleagues in second and third years.<sup>13</sup> In addition, *Scholten et al.* and *Al-amrani et al.* reported even lower response rates than this study (20% and 21% response rates consecutively).<sup>12</sup> From authors point of view, this low response rate mainly due to the long list of questions (43 questions in 5 pages), this questionnaire took about 12 to 15 minutes to be completed. In addition, a major part of the students returned the questionnaire with uncompleted questions especially from the last page. Never the less, other factor could play a role like high workload of students, method and timing of distribution. The knowledge and skills of evidence base medicine and its integration in the learning process and application on the clinical practice is a highly complex and dynamic process that cannot be easily measured and analyzed. The use of subjective questionnaire (as KAB- questionnaire) could give a biased results than the actual situation. Despite that there are many tools which designed to measure this process, an objective and easy to use assessment of EBM is needed to address the actual level of the required skills and knowledge among student.

The low response rate and the fact that this is a cross-sectional study, may have affected the generalizability of the results which limit the representativeness of our data. Therefore, we advise that our data must be interpreted with cautions. In addition, the long term effects mastery of EBM behaviors among our students still unknown and need to be evaluated by robust assessment tools. Therefore, longitudinal study with different subsets and multiple occasions is strongly required.

### **Recommendations:-**

In a previous study conducted among physicians in Saudi Arabia, lack of knowledge and basic skills were the main barriers to implement EBM in clinical practice.<sup>15</sup> *Al-Almaie et al.* found the lack of training in EBM to be the major barrier in Damman region.<sup>15</sup> In Asir region, *Khoja and Al-ansary* reported the patient overload and unavailability of a local library are the main perceived barriers.<sup>16</sup> In another study in Riyadh region, *Khoja and Al-ansary* found the patient overload and lack of personal time to be the two main barriers.<sup>17</sup> In Western region, *Al-Omari and Al-Asmary* found that the unavailability of distributed updated clinical letters, journals or guidelines is the major barrier to practice EBM.<sup>18</sup>

Accordingly, the authors emphasize on the importance of teaching and applying EBM effectively to undergraduates and insuring that they have the required knowledge and skills to bring EBM to real clinical practice with confidence. Therefore, it is recommended to incorporate the EBM in various teaching activities such as: small group teaching, task assignment, morning meetings, ward rounds and journal club with continued evaluation by academic educators.<sup>19</sup> Furthermore, the academic educators have to become EBM role models themselves for the student.<sup>20</sup> Also, training students to search effectively the available resources like electronic and online databases of systemic review and EBM summaries on daily or weekly bases is an important element in teaching.<sup>21</sup> Further studies are needed to assess how viable is the educational curriculum to prepare the Saudi medical graduates with EBM practice to meet the Saudi community health needs.

### **Conclusion:-**

This study gives us an insights into the knowledge, attitude and behavior toward EBM of sixth year medical students at UQU as well as small representation of Saudi Arabia, which shows that the majority were knowledgeable and have a positive attitude. However, improvement and focusing on EBM education system in pre-graduate student,

both are needed to increase the quality and the effectiveness of student's skills as well as their ability to apply EBM in the future, and further studies are required on a larger scale for precise identification of the problems in order to improve the quality of our graduates.

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### RESEARCH ARTICLE

#### INTERNATIONAL TRADE TAX REVENUE AND TRADE LIBERALIZATION, A CASE STUDY OF PAKISTAN.

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#### Abstract

This paper tries to find out the implications of trade liberalization on international trade tax revenues and its macroeconomic implication on Pakistan economy. The theoretical approach of trade reforms and its impact on the direction of change of revenue is ambiguous because of its dependence on the productivity of 'trade tax revenues'. By using the data of twenty five years, the paper first establishes the productivity of 'trade tax revenues' in Pakistan, then by an econometric analysis exploration of the relationship between trade revenues and trade liberalization in Pakistan is done. It was observed through our analysis that there is high productivity of trade tax revenues, further, our results show a positive and significant relationship between trade liberalization and collection of trade tax revenue. To support this relationship, a second test of Granger's causality is also performed which confirm the causal relationship between trade tax revenues and trade liberalization. It was suggested that supportive macroeconomic policies are prerequisite for successful trade liberalization.

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#### Introduction:-

With the changing of time, economists are very strongly referring economic development to international trade and feel a strong international trade become an integral part of economic development. The world is rapidly transforming into a global village. Trade has contributed to this transformation more significantly than any other factor. In fact, the high economic, social, cultural, political, human and intellectual integration witnessed in the world in the recent past is due to trade among its different countries. Further, trade has contributed much more to the development of the world economies than any other factor. Thus, trade and development go hand in hand and therefore the strategies adopted in the case of the former have a strong bearing on the latter.

After second world war many trade related agreements took place and the most important problem which had been faced by developed as well developing countries are different international trade taxes. GATT tried to overcome the issue of trade tax and by encouraging the elimination of both qualitative and quantitative restrictions, it facilitate free trade activities. After some time it replaced by WTO and the concept of trade liberalization has become a common strategy for trade policy among countries. And this trade liberalization is accepted greatly by developing as well as developed countries and is further enhanced by the way of globalization.

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A number of market-oriented moves have surged during the last couple of decades in the world. In the wake of these moves, the global trend has also witnessed the liberalization of the capital account, foreign exchange, credit, domestic consumption and trade in different countries. However, the area which has received unprecedented emphasis in various economies is trade liberalization. Trade liberalization denotes the reduction in barriers to the movement of goods and services in international trade. In the words of Bhagwati and Krueger, "any policy which reduces the anti-export bias will lead towards liberalization of trade". A new explanation by Edwards (1993) describes a liberal trade regime as one in which all trade distortions including import tariffs and export subsidies are completely eliminated. Globalization is a relatively new concept in the social sciences and is acquiring a critical importance for the academic as well as the political agenda of the twenty-first century. In social theory the universalizing tendencies and transnational structural transformations bound up with globalization.

Other than benefits, some costs are also associated with trade liberalization. A substantial problem arising from reducing trade barriers in the wake of trade liberalization is the loss in tariff revenue that accounts for 10-20 percent of government revenue in developing countries [B.Yasmin ,Z.Jehan, M.A.Ch (2003)]. If tariffs are reduced or eliminated, these countries will have to impose large increases in other taxes in order to keep their budgets in line, causing some economic distortions.

Economists have different argument about the effect of trade liberalization on the productivity of trade tax revenue, so the relationship of trade tax revenue and trade liberalization is ambiguous. The higher tariff stimulate importer for seeking exemptions so it may affect the productivity of tax system. the lower tariff in some areas become a cause to increase in the tax base by lowering the marginal benefit to avoid taxation, hence liberalization leads to rise in revenue (Prithett and Sethi (1994)). So this is not always the case that the reduction of tariff due to liberalization leads to the reduction in revenue.

In case of developing economies, where the large portion of government revenue is based on the collection of tariff and other international trade taxes, trade liberalization proves a negative impact on revenue collection, according to Keen and Ligthart (1999), Fiscal problems will arise when trade restrictions drop below their revenue-maximizing level of around 10 percent to 15 percent. In these countries, the collection of direct taxes is very poor. After the trade liberalization, the tax system also failed to overcome this collection problem. So the revenue collections by government become lower than before trade liberalization.

Pakistan has made significant efforts in liberalizing its trade regime during the last two decades. The maximum tariff rate had declined from 225 percent in 1990-91 to 45 percent by 1996-97. It was further reduced to a maximum tariff rate of 25 percent (barring automobile sector) during fiscal year 2007-08. The average tariff rate stood at just 6 percent in fiscal year 2007-08 as compared to 65 percent in 1990-91. The number of tariff slabs was reduced from 13 to 4 during same period. Quantitative import restrictions have already been eliminated except those relating to security, health religious and cultural concerns. The number of statutory orders that exempted certain industries from import duties was phased out by June, 2004 and import duties on 4000 items were reduced. Import liberalization measures were adopted for agricultural and petroleum products. Restrictions on agriculture exports were also removed.

A sound fiscal position is vital for achieving macroeconomic stability, which is increasingly recognized as being critical for sustained economic growth and poverty reduction. The sooner Pakistan improves its fiscal position by making sharp fiscal adjustments, the lesser the price is likely to pay for its fiscal indiscipline. A sharp fiscal adjustment can reduce large external current account imbalances, restore the confidence of global investors, ease financing constraints, support growth and contain inflation. Pakistan's fiscal policy position remained focused on sustained economic growth in unison with declining debt services, alleviating poverty and investing in physical and human infrastructure. During the last 17 years, tax-to-GDP and hence revenue-to-GDP ratios have shown a declining trend, owing mainly the structural deficiencies in the tax collection system (Economic Survey, 2008). The combined result of such characteristics is the low and stagnant tax-to-GDP-ratio, which represents the country's fiscal effort, has remained stagnant in the neighborhood of 12 to 14 percent over the last three decades. (ibid.). Along with the reduction of tariff and non-tariff barriers for liberalizing the trade, the government has initiated successive reforms in tax system since 1990. Induced largely by trade liberalization, the customs collection declined sharply over the past decade, but rose sharply from FY2002-03 because of higher imports. As a share of GDP, customs collection declined from 55% during 1990-91 to 25% during 2007-08. With the rationalization of import tariff regime in the country whereby the average tariff rates have come down from 55% in 1995 to 17 percent in



2004 have obviously influenced the volume of international trade in the economy (Schuler (2004)) Such a large slippage on the fiscal side has already caused severe macroeconomic imbalances. The hard-earned macroeconomic stability underpinned by fiscal discipline appears to have been lost and Pakistan is likely to pay a heavy price in terms of deceleration in growth and investment, reversal in poverty trends, widening of current account deficit, rise in public and external debt, depletion of foreign exchange reserves and mounting pressures on the exchange rate.

This paper try to evaluate the implications of the process of trade liberalization on revenue generation from trade restrictions. The paper focused on quantitative restriction in form of tariff but at the same time it also focused on the theoretical explanation of the effect of trade liberalization on trade tax revenue by hypothesizing the crucial fact that the trade liberalization leads to a significant affect in trade tax revenue.

### Overview of Relevant Literature:-

By the emergence of WTO and then introduction of trade liberalization, most of the developing countries were attracting toward it, to see their dream come true to be industrialized nation. Trade liberalization may help them a lot, but we intended to see the fiscal impact of trade liberalization, in Pakistan which can better analyze with the help of research experience done in other countries.

**Tanzi (1989)** hypothesized a several wide-ranging issue to check the relationship of different macro economics variables, he also included inflation, exchange rate and most prominently tax revenues. He observe there is often an inverse relationship between a country's tax revenue and real level of its exchange rate, he is of the view that overvaluation has a direct effect by suppressing import and export bases measured in domestic currency term. This in turn reduces the collection of international trade taxes and sales and excise taxes, which are usually levied upon domestic and imported consumption. On other hand he also concludes that, the tax collection method is different in different countries. It is therefore not possible to generalize about the effect of changes in trade liberalization and the surrounding macroeconomic environment on tax revenues without examining the structure of the different components of revenues and the importance of each different component in the total.

**Reisen (1990) and Seade (1990)**, formulate hypotheses on similar issues and tested the relationship of tax revenue and exchange rate, they also found an inverse relationship between them,

**A. Matlanyaneand Harmse (2002)**, highlight the implications of trade liberalization on international trade tax revenue and the macroeconomic implications thereof in the context of the **South African economy**. It follows quantitative restrictions in the form of tariffs for liberalizing trade in South Africa.. By using econometrics techniques, it is estimated that customs revenue highly influenced by trade liberalization. It was suggested that Government should couple the liberalization polices with other macroeconomic policies such as exchange rate liberalization that would woThe main focus of the paper is on quantitative restrictions in the form of tariffs. Customs revenue is used as a measure of trade tax revenue. The estimation results show that customs revenue is highly productive. In addition, trade liberalization has a significant influence on customs revenue and that an increase in imports may lead to a reduction in trade tax revenue. On the other hand the results suggest that supportive macroeconomic policies.

**Ali Zafar(2005)** World Bank Policy Research Working , observed that **Niger** has suffered major fluctuations in revenue since the 1970s. The revenue/GDP ratio has fallen from 14 percent in 1980 to 10.6 percent in 2002. Using data collected during several operational missions, this study finds that the principal reasons for low revenue mobilization are: the adverse fiscal impact of trade liberalization, the defiscalization of agriculture in the 1970s, the collapse of the uranium boom in the 1980s, and the poor record of the VAT in mobilizing revenue. The large reduction in tariffs during the 1980s and 1990s in the context of structural adjustment programs and West African regional integration initiatives had adverse effects on trade tax revenue during the period 1980-2003. However, higher import levels after 1994 succeeded in partially mitigating the revenue losses. The experience of Niger demonstrates that without accompanying macroeconomic policies, parallel improvements in tax and customs administration, and success in mobilizing domestic taxes, most notably the VAT, trade reform can have adverse fiscal consequences.

**Dutta D, and Ahmad N (2006)** by using the data of 1973-1995, they empirically analyze the relationship of trade liberalization and industrial growth in **Pakistan**, with this relationship, they also analyze the impact of trade liberalization and revenue collection of a country, in this context, they use two method for empirical analysis, the

Co-integration analysis and error correction modeling have been used. It is suggested that there exists a unique long run relationship among the aggregate growth function on industrial value added and its major determinants of the real capital stock, the labor force, real exports the import tariff collection rate and the secondary school enrolment ratio.

**Bushra Yasmin, Zainab Jehan, Muhammad Ali Chaudhary (2006)**, empirically analyzed how trade liberalization has affected economic development in **Pakistan**. Its effects have been examined with respect to four measures of economic development: per capita GDP, income inequality, poverty and employment over the period from 1960-2003. The analysis shows that, over the study period, trade liberalization has not affected all the chosen indicators of development uniformly. It has affected employment positively but per capita GDP and income distribution negatively. However, it has not affected poverty in any way. The obvious message is that trade liberalization has not affected all the indicators of development favorably in Pakistan. It thus implies the need of a cautious move towards liberalization. The focus of trade liberalization should be to bring about improvement in the performance of mediating factors and to focus exports on labor-intensive products.

**An IMF working Paper (2006)**, "Fiscal Implications of Multilateral Tariff Cuts" The paper contributes to the discussion about the revenue implications of trade reform by assessing the approximate fiscal revenue impact of different liberalization formulae under consideration in multilateral trade negotiations for a group of low- and middle-income countries. The study applies a linear optimization framework to data for bound tariffs, applied tariffs, and imports at the HS-6 digit level for 58 developing countries, and simulates results for different sets of import demand elasticities and developing country "flexibilities." While only a small number of countries face a significant impact, results point toward the need for complementary fiscal measures in the countries most affected by revenue loss.

**Joseph Pelzman and Amir Shoham(2007)** focusing on the experience of the **Israeli economy** in the twenty year period (1984-2005) where Israel undertook both major tariff liberalization and a related domestic tax reform, with no reversion to border taxes. The Israeli experience highlights the initial budget revenue concerns associated with tariff liberalization, and quickly moves the issue away from border tax substitutes to domestic issues concerning enforcement. By de-linking the two issues the paper demonstrates that it is feasible to successfully tackling both external and internal tax reforms. Furthermore, it demonstrates that it is possible not to fall into the trap of looking at border taxes as a cure for internal high costs of tax revenue. The appropriate prescription for other developing or newly industrialized countries is to de-link the two tax issues, focus on the collection side of the domestic tax structure while at the same time reducing local taxes and broadening the tax base.

**Panel Data** very broadly covers the relationship of trade liberalization and revenue effect, in fact the trade liberalization impact in panel data analysis helps us to examine the policies of different countries in order to adopt trade liberalization and other countries can learn from their experience.

**Khattry and Rao (2002)** investigate the issue of fiscal impact and trade liberalization, on the basis of the data of 1970-1998 from 84 countries, by applying the fixed effect model, they conclude that with trade liberalization, lower and middle income countries had experienced lower fiscal income as a result of fall in trade related tariff and income and trade liberalization is negatively correlated with total tax revenue and international trade tax revenue.

**Agbeyegbe T, Stotsky J, and WoldeMariami (2004)** on the basis of empirical evidence find out the relationship of trade liberalization, exchange rates and tax revenue. By using the panel data of 22 African countries of the period of 1980-1996, they try to check this relationship, for this purpose they use Generalized Method of Moment Method. They prove a sensitive and negative relationship between trade liberalization and tax revenue. According to them in general, trade liberalization is not strongly linked to aggregate tax revenue, it is basically linked with higher income tax revenue. They suggest that to adopt trade liberalization, the countries should be careful to apply some macro economic policies to preserve the overall revenue yield.

By using the data from 125 countries, **Baunsgaard and Keen (2004)** give their point of view about the relationship of trade liberalization with tariff revenue, they find that after trade liberalization middle-income countries had been able to recover between 35 and 55 cents per dollar of income from lost trade income, whereas lowest income countries had recovered basically none.

**Methodology:-**

Econometric methods of analysis are used to achieve the above objectives. The following equation, adapted from the work of Osoro (1993) is estimated using the method of ordinary least squares to determine the productivity of trade tax revenue;

$$\ln T = \ln \phi + \alpha \ln Y + \mu \dots \dots \dots (1)$$

Where **T = customs revenue**

**Y = GDP**

**α ..= a measure of revenue productivity/ tax buoyancy**

In order to test the main hypotheses, trade revenue is specified as a function of the import base, the exchange rate, the average tariff rate and a dummy variable representing trade liberalization. The specific equation to be estimated is;

$$\ln TR = \gamma_0 + \gamma_1 \ln M + \gamma_2 \ln w + \gamma_3 Lib + \gamma_4 r + \eta \dots \dots \dots (2)$$

Where **TR** is customs revenue as a percentage of GDP,

**M:** is imports as a percentage of GDP representing the import base,

**W :** is the exchange rate,

**Lib:** is a variable for trade liberalization which is calculated as import duties as percentage of total imports.

and **TR :** is the average overall tariff rate and □

**η :** is the error term.

The import GDP ratio is included in this equation to isolate the effect of trade liberalization on international trade, which can then be related to the effect on revenue, while the exchange rate is used to represent the macroeconomic effects of this policy. The tariff reform Liberalization and the average tariff rate will then indicate the direct effect of the reduction in the average tariffs on trade tax revenue.

**Estimation Techniques and data:-**

Ordinary least squares is used to estimate the productivity of trade tax revenue and to establish the effect of trade liberalization on tariff revenue. The equations are estimated in linear logarithmic form. The exchange rate is expressed as Rupee per US dollar. This means that an increase in the exchange rate represents a depreciation of the Rupee. Customs revenue is used as a proxy for international trade tax revenue. Because of data efficiencies, the overall average tariff rate was calculated from the series on customs revenue and that of the value of imports. Although not all imports are subject to trade restrictions, this measure gives an ideal of the average tariff based on all import commodities. Annual time series data ranging from 1971 to 2007 has been used.

**Estimation Results:-**

This section presents and discusses the estimation results of the above equations.

**Table 1:-**Dependent Variable: LOG(CUSTOM)

Variable	Coefficient	t.statistics
C	2.059167	1.684347*
LOG(GDP_RS_)	0.802002	17.97399**
R-squared=0.902252	F-statistic=323.0642	Prob(F-statistic)= 0.000000

\*Sig at 10% level of significance \*\*sig at 1% level of significance

**Table: 1** shows the estimation results of the productivity of trade tax revenue. The results exhibit a good fit of 90 percent. The coefficient of GDP is positive and significant as expected a priori. This implies that a rise in output will lead to an increase in international trade tax revenue. A one percent increase in output will increase customs revenue by approximately 10 percent. This coefficient also shows that tax revenue is highly responsive to changes in output. This relationship is significant at 1% level of significance. On other hand the overall model is also highly significant, which can be analyzing by the value of F-statistics. The overall model presents a good and significant picture of data.

**Table2:-**Dependent Variable: LOG (TR)

Variable	Coefficient	t.statistics
C	-3.634763	8.808166***
LOG(M)	0.484176	2.238925***
LOG(W)	-0.030953	1.018211
LIB	2.357378	2.476208***
TAR	18.19182	3.380701***
<b>R-squared=0.978407</b>	<b>F-statistic=362.4953</b>	<b>Prob(F-statistic)=0.0000</b>

\*\*\*sig at 1% level of significance

The estimation results of the determinants of import and trade tax revenues are shown in Table2. The dependent variable in this regression is customs revenue as a percentage of GDP. The coefficient of the exchange rate is negative but not significant. This result has two implications. Firstly, it means that when the depreciates takes pace in the currency, the volume of imports falls and hence leads to a loss of trade tax revenue. Secondly however, the fact that this coefficient is not significant in statistical terms implies that the value of imports rises in Dollar terms and partially makes up for the loss in revenue resulting from lower trade taxes. The coefficient of the import-GDP ratio is positive and significant at 1 percent level of significance. A one percent increase in the import-GDP ratio results in a increase in customs revenue- GDP ratio by approximately 0.48 percent. This indicates that even if the volume and value of imports increase (by a higher proportion than GDP) as a result of trade liberalization, import tax revenue actually has increased. This could imply that although a combination of lower tariffs and the depreciation of the current depreciation of the local currency may increase imports both in terms of volume and value, the effect of these two factors on revenue as well.

The relationship of imports as a percentage of GDP with trade Liberalization is positive and significant at 1% level of significance. This states that by the increase in the volume of imports there is an increase in the trade tax revenues of a country. On other hand the relationship of trade liberalization and trade tax revenue is positive and highly significant at 1% level of significance. The coefficient of the average tariff rate is positive and significant as expected. This confirms the hypothesis that a reduction in the tariff rates results in a significant loss of customs revenue as indicated by the coefficient of the import GDP ratio. The coefficient liberalization is positive , indicates the positive impact of trade liberalization in Pakistan economy, implies that with the trade liberalization , there is more increase in revenue and economy as well the fiscal implication of the liberalization have positive impacts as well. This implies that liberalization policies have been able to significantly affect international trade tax revenue in short as well as in long run.

Two main conclusions can be drawn from this analysis. Firstly trade liberalization in the form of tariff reforms has not reduced trade tax revenue significantly. Secondly, macroeconomic policies that support the prevailing macroeconomic environment can significantly facilitate successful trade liberalization. In this regard, the government can take advantage of the depreciation of the Rupee to increase exports and thus the fiscal implication of liberalization is positive.

**Granger’s causality Test:-**

Granger causality test has also been performing to check the causal relationship trade liberalization and Trade tax revenue

$$TR_t = \alpha LIB_{t-1} + \beta TR_{t-j}$$

$$LIB_t = \lambda TR_{t-i} + \gamma LIB_{t-j}$$

For this purpose upto two lags of both variables has been taken and with one lag we got the result that trade liberalization has a strong causal effect on Trade tax revenue but on other hand trade tax revenues has no casual effect on trade liberalization. So it is concluded that trade liberalization has a strong causal effect on trade tax revenue which is significant at 1% level of significance.

**Table 3:-** Granger causality with lag “1”

Regression	Granger causality test
LIB on TR	12.2742* (0.00134)**
TR on LIB	1.61558* (0.21260)**

\* F-value \*\* Probability value

From the Granger's causality test the causal relationship of trade liberalization and trade tax revenue has been proved at one lag and it indicate that the direction of causality is from trade liberalization to trade tax revues

**Table 4:-** Granger causality with lag "2"

Regression	Granger causality test
LIB on TR	8.18624* (0.00146)**
TR on LIB	6.71527* (0.00389)**

\* F-value \*\* Probability value

From the Granger's Causality test, the relationship between trade tax and trade liberalization has been proved from table 4 which basically indicates two way causal relationships between these two variables. So by the results it is conclude that the trade liberalization has a causal effect on trade tax revenues but at the same time the trade tax revenues also has a causal effect on trade liberalization.

### Concluding Remarks:-

This paper set out to establish the effect of trade reform on government revenue. This task is executed by an econometric analysis of the determinants of trade tax revenue. From the analysis, it can be concluded that trade liberalization in Pakistan has led to a significant improvement in trade tax revenue in both short as well in long run. Even, given the significant positive effect of the import-GDP ratio on customs revenue, it is imperative for government to couple the liberalization policies with other macroeconomic policies such as exchange rate liberalization that would work to mitigate budgetary pressures. One of the important conclusions that can be drawn from the analysis is therefore that a sound macroeconomic policy environment can significantly facilitate successful trade liberalization. In this particular case, prudent exchange rate policies are crucial. Taking advantage of the depreciation of the Rupee by increasing import earnings could ensure enough earnings from imports to offset the loss in revenue from trade taxes due to lower taxes. The results for Pakistan economy are quite different from many developing countries. Granger causality supports the argument that the trade tax revenue has increased by the trade liberalization mainly because of tax reforms initiative from Federal Board of Revenue and growth of GDP during the period. This relationship encourages liberalization policies accompanied by macroeconomic policies to increase GDP and economic growth in the economy.

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**RESEARCH ARTICLE**

**TEACHING WRITING SKILLS USING SHORT STORIES.**

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**Abstract**

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**Introduction**

The most important purpose of learning and teaching a foreign language is to be able to communicate it in different situations for expressing thought and information. Nowadays, concentrating only on spoken English is not enough, written competency has also become indispensable for an EFL learner. Also, they have to respond to questions in the form of written assignments, essays and many other ways. So, there is a need for the language learner to explore and express the ideas properly. If we, the teachers change the strategy or implement the new technique in English language teaching, can enhance the students' English Language Learning Performances.

This can be done through the use of literary texts in the classroom which will augment the language learning process not only interesting but also enjoyable. Engaging the students in the process of reading and listening a literary text will result in enhancing the productive skills speaking and writing. According to HouriaElhabiri (2013), literary texts can be a valuable resource for enhancing students' response to texts due to the fun and interest imbedded in them and particularly, short stories which will develop the writing skills.

Literature text has the capability to express human values and culture, applying this teaching strategy promotes better expression of ideas. The language style and use of vocabulary in the literary texts can enrich the students' knowledge. ParvinGhasemi (2011), proposes a variety of strategies with the use of short story to improve reading and writing skills. These techniques include pre reading activities, in-class oral reading, textual analysis and post reading assignments. Particularly using a short story in the classroom will provide a chance to the learners to learn new vocabulary and different writing styles. Gradually, students can use the selective vocabulary in their writings and also construct the sentences and paragraph in a perfect way.

Moreover, using short stories in the EFL classroom can create a positive learning environment. The short story's distinctive features create interest among the EFL learners. If the teachers select a suitable short story according to the proficiency level of the learners, this strategy can stimulate an intellectual and emotional involvement among the EFL learners. According to Pardede, P. (2011), short story can be used a powerful and motivating tool for ESL/EFL learners to develop their writing skills, as it can serve both as a model and give a context for creative writing. Thus, this paper tries to prove that suitable selective short story facilitates the students and can develop EFL learners' language learning process. Also, short story can be used as a valuable tool for improving the sub skills of writing, i.e. vocabulary development, development of ideas, grammar and the logical and critical thinking.

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### Problems Faced by the Arab Students

Arab learners, in particular, the students in graduate level first year are not able to utilize the opportunity to speak in English in their formal school classrooms because of their mother tongue interference. The students are exposed to the English Language instructions only for a few hours per week. These instructions focus more on written form than listening and speaking. Moreover, the school curriculum was not concentrating English Language; their primary focus is only on the courses which are all in Arabic. Because of this barrier the students are not showing interest to learn or know about English Language. The main problem is their mother tongue influence in the classroom teaching. Students are not getting chance to learn the language in a systematic way. The students concentrate only on their marks and to pass. In addition to that, they also prefer to read online translation materials in Arabic although there is an option to change into English.

Writing in English involves several processes namely, collecting data/information, organisation, and other mechanics such as prewriting, revising and rewriting. Saudi learners find it all the difficult to write, which is mainly due to the limitation of vocabulary, complex grammatical structures, style, cultural hindrances, lack of exposure, practice and less experience in using the rhetorical structures of English language.

### Aim of the study

The aim of this study is to use short stories to create a positive environment and develop the writing skill in an enjoyable way.

### Participants

The participants of this study were thirty students, who have taken up English as their major in the Bachelor's degree from the fourth level.

### Using Short Stories in the Writing Class room

This research study used the short stories of Oscar Wilde to determine if the use of short stories can help in the development of writing skills of students. Oscar Wilde's story was selected as he was considered to be a major figure of the aesthetic revival in English art. This study was done by selecting five short stories of Oscar Wilde for the duration of one semester, and employed them in the classroom, and then checked the progress of the students through small written tests and presentations. In order to measure the effects of writing progress, a qualitative approach was used. The design assessed if short stories are used in the classroom, it helped in the active participation of the learners, in turn, enhanced the writing skills of the learners.

### Methods to Use Short Stories

The text book which is used for Writing-I course is Interactions-I Middle East Edition. This text focuses on the sub skills of writing, i.e. vocabulary development, development of ideas, grammar and the logical and critical thinking. Short story was selected according to the interest of the students. Moreover, all students are interested to listen to stories, especially, the Arab students who are not much exposed to stories in their young age.

### Oscar Wilde's 'The Model Millionaire'

First, brainstormed the students by showing clippings related to the story and then asked the students to create a vocabulary chart of what they have observed.







(Pictures selected from

[https://www.google.com.sa/search?q=the+model+millionaire&safe=strict&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiowfDD\\_e7RAhWethQKHx4-FYQ\\_AUICCG&biw=1078&bih=501](https://www.google.com.sa/search?q=the+model+millionaire&safe=strict&source=lnms&tbm=isch&sa=X&ved=0ahUKEwiowfDD_e7RAhWethQKHx4-FYQ_AUICCG&biw=1078&bih=501))

After this activity discussed the clipping shown, and then provided a paragraph with blanks to be filled up with the vocabulary list given on top. By this way, the students understood the meaning of the words and how to use the vocabulary.

#### **An extract from ‘The Model Millionaire’**

Unless one is wealthy there is no use in being a charming fellow. Romance is the privilege of the rich, not the profession of the unemployed. The poor should be practical and prosaic. It is better to have a permanent income than to be fascinating. These are the great truths of modern life which Hughie Erskine never realised. Poor Hughie! Intellectually, we must admit, he was not of much importance. He never said a brilliant or even an ill-natured thing in his life. But then he was wonderfully good-looking, with his crisp brown hair, his clear-cut profile, and his grey eyes.

Subsequently, a paragraph was provided to the students to be read. After reading the paragraph, the same paragraph was offered with blanks. In this manner, the students recognized how to employ the vocabulary appropriately.

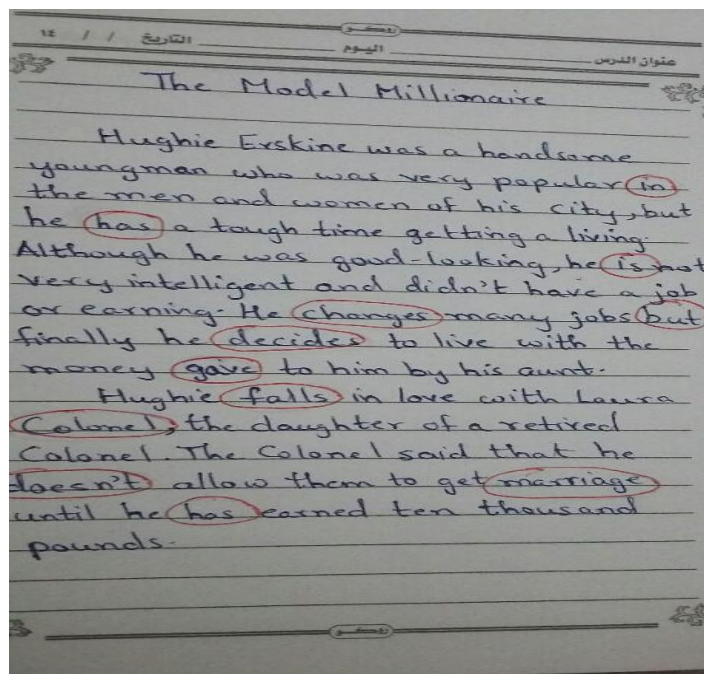
To make matters worse, he was in love. The girl he loved was Laura Merton, the daughter of a retired Colonel who had lost his temper and his digestion in India, and had never found either of them again. Laura adored him, and he was ready to kiss her shoe-strings. They were the handsomest couple in London, and had not a penny-piece between them. The Colonel was very fond of Hughie, but would not hear of any engagement.

'Come to me, my boy, when you have got ten thousand pounds of your own, and we will see about it,' he used to say; and Hughie looked very glum on those days, and had to go to Laura for consolation. (Extracts taken from <http://www.wilde-online.info/the-model-millionaire.html>)

#### **Video**

Next, played the video of the story (<https://www.youtube.com/watch?v=HEqTmN5EPWQ>) and then provided the opening lines of the story to be developed into a paragraph. Majority of the students developed the first part of the story in a logical way. This activity is carried out to enhance the logical and critical thinking skills of the students. While performing this activity, the students' grammatical level can be observed. After analysing the errors, measures are taken to rectify the inaccuracies.





### Conclusion

This study made known that short stories have an immense effect on students learning process and can be used as a powerful tool to enhance the sub skills of writing. It was also found that the students feel it more appealing when they are allowed to think outside the text and develop their ideas in an interesting way. Moreover, it can be established that employing any short story will create a positive environment for the development of learning writing skills. This can be one of the strategies which will be beneficial to enhance the writing skills of the students. Teachers can adopt suitable strategies according to nature of the classroom.

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### RESEARCH ARTICLE

#### IMPLEMENTATION OF ENVIRONMENTAL POLICY AND PLANNING: SUGGESTIONS AND RECOMMENDATIONS FOR ECO-FRIENDLY INDIA.

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Environment, Policy, Planning,  
 Sustainable Development.

#### Abstract

This paper examines implementation of environment policy and planning particularly on making India eco-friendly. Environment policy and planning maintained of environmental quality, it is essence of requirement for improving quality of life leading to sustainable development. Environment considered have been an integral part of the Indian culture the need for conservation and sustainable use of natural resources has been expressed in Indian scriptures, more than three thousand years old and is reflected in the constitutional, legislative and policy framework as also in the international commitments of the country.

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#### Introduction:-

An environmental policy being interdisciplinary in nature draws together technology, economics, and natural and social sciences. In order to develop sustainable policies, therefore, it is necessary to have sound knowledge of the actual and potential environmental impacts of certain activities and some knowledge of the technical characteristics, economic costs, social acceptability and possible side effects of alternative policy options. Environmental policies involve certain measures aimed at achieving a sound environment. They are usually developed in the context of public policy, based on economic theory, which focuses more on the level of costs and benefits associated with the implementation of environmental policies than on the quality of the environment. When governments propose and subsequently implement strict standards, sectors that pollute the environment will have to take measures, and this cannot be achieved without incurring extra costs. Polluting industries are, therefore, often keen to highlight the likely costs they have to incur due to the proposed environmental measures. Annan Kofi, the former UN Secretary General, had observed: "Perhaps the biggest challenge of our times is the task of achieving a transition to sustainability, a transition that will enable people around the world to live free from want and fear without compromising the ability of future generations to do so as well", (quoted by Kasemir B. 2003:1). World Development Report 2003: *Sustainable Development in a Dynamic World-Transforming Institutions, Growth, and Quality of Life* has shown that such a transition is a manageable challenge. It requires, on one hand, an appropriate modeling of a dynamics of socio-economic development and designing operationally viable and result-oriented policy-mix which includes an environmental policy, and on the other hand, implementation of policies with utmost vigilance. Obviously, the stakeholders - the state and the citizens have a crucial role to play in this mission.

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**Aim and objectives:-**

The aim of the study is to evaluate the impact on environment that has occurred already with the following objectives:

1. To assess the existing air quality.
2. To assess the extent of pollution of water bodies due to developmental activities.
3. To assess the quality of soil and extent of soil pollution and soil degradation.
4. To assess the extent of noise pollution.
5. To assess the quantities and types of solid wastes generated, assess the efficacy of present disposal method and to propose suitable methods disposal.
6. To assess the amounts of sewerage generated and its quality.
7. To assess the efficiency of existing sewage system and propose sewage treatment facilities.

**Provision of environmental law in India:-**

Apart from international laws, every country has enacted laws regarding environment protection, pollution control etc. In India, there are several acts for environment protection that says protection of environment is the duty of government. Also the purpose of state is welfare of citizens and establishment of such a society that ensures people a human dignity a human living and finally an equal and humane socio-economic relationship. The intermeshing of human rights can be seen from the fact that ecology and environment are today considered control focus of a person's entitlement.

In India a separate ministry namely The Department of Environment was established in 1980 to ensure a healthy environment for the country. The main acts for environment protection in India are as follows:-

1. The Forest Conservation Act, 1980.
2. The Prevention of Air and Water Pollution, 1974, 1981
3. (The Central Pollution Control Board) (CPCB) was constituted under this act.
4. The Air Prevention and Control of Pollution, 1981.
5. The Atomic Energy Act. 1982.
6. The Environmental Protection Act, 1986.
7. (It came into force soon after the Bhopal Gas Tragedy)
8. The Environmental Conservation Act. 1989.
9. The National Environmental Tribunal, 1995.
10. National Environmental Appellate Authority Act, 1997.
11. National Environment Management Act (NEMA), 1998
12. Handling and Management of Hazardous Waste Rule in 1989.
13. The Public Liability Insurance Act (Rules and Amendment), 1992.
14. The Biomedical Waste Management and Handling Rules, 1998.
15. The Environment (Siting for Industrial Projects) Rules, 1999.
16. The Municipal Solid Waste (Management and Handling) Rules, 2000.
17. The Ozone Depleting Substance (Regulation and Control) Rules, 2000.
18. The Biological Diversity Act 2002.

**Environmental Challenges: Causes and Impacts:-**

The key environmental challenges that India faces relate to the nexus of environmental degradation with poverty in its many dimensions, and economic growth. These challenges are intrinsically connected with the state of environmental resources, such as land, water, air, and their flora and fauna. The proximate drivers of environmental degradation are population growth, inappropriate technology and consumption choices, and poverty, leading to changes in relations between people and ecosystems, and development activities such as intensive agriculture, polluting industry, and unplanned urbanization. However, these factors give rise to environmental degradation only through deeper causal linkages, in particular, institutional failures, resulting in lack of clarity or enforcement of rights of access and use of environmental resources, policies which provide disincentives for environmental conservation (and which may have origins in the fiscal regime), market failures (which may be linked to shortcomings in the regulatory regimes), and governance constraints. Environmental degradation is a major causal factor in enhancing and perpetuating poverty, particularly among the rural poor, when such degradation impacts soil fertility, quantity and quality of water, air quality, forests, wildlife and fisheries. The dependence of the rural poor, in particular, tribal societies, on their natural resources, especially biodiversity, is self-evident. Women in particular

face greater adverse impacts of degradation of natural resources, being directly responsible for their collection and use, but rarely for their management. The poor are also more vulnerable to loss of resilience in ecosystems. Large reductions in resilience may mean that the ecosystems, on which livelihoods are based, break down, causing distress. The loss of the environmental resource base can result in certain groups of people being made destitute, even if overall, the economy shows strong growth. For the poor, several environmental resources are complementary in production and consumption to other commodities, while a number of environmental resources are a source of income or food. Poverty and environmental degradation are also reinforced by, and linked to population growth, which in turn, depends on a complex interaction of diverse causal factors and stages of development. Poor environmental quality has adversely affected human health. Environmental factors are estimated as being responsible in some cases for nearly 20 percent of the burden of disease in India, and a number of environment health factors are closely linked with dimensions of poverty. It has been shown that interventions such as reducing indoor air pollution, protecting sources of safe drinking water, protecting soil from contamination, improved sanitation measures, and better public health governance, offer tremendous opportunities in reducing the incidence of a number of critical health problems. It is also evident that these environmental protection measures would be difficult to accomplish without extensive awareness raising, and education, on good practices with respect to public and private behavior.

### **Suggestions:-**

The existing legal provisions are inadequate to control the enormous problems of environmental pollution of various types in the country. Therefore, the judiciary has to play a more active and constructive role. This has become all the more essential in view of the lack of awareness in the masses of the pollution problems; lack of planning and the plenty of the industries and the local bodies in this regard. New jurisprudential techniques have to be devised to deal adequately with the problems of pollution control and protection of environment.

1. Environmental law should be implemented effectively by adopting new instruments, mechanisms and procedures like environmental impact assessment and environmental audit and incorporate environmental objectives in manufacturing processes, minimum usage of hazardous materials and toxic chemicals, careful usage of toxic gases will reduce environmental load.
2. Legal provisions granting a perspective right to pollute air and water should be constructing restrictively by the courts.
3. Legal provisions intended to prevent or control pollution should be interpreted in such a way that even the subtle invasions of the anti-pollution laws are covered.
4. Government must initiate the programmes to create public awareness with regard to relation between human rights and environmental protection and also related laws.
5. Sincere commitment to good environmental practices must be supported throughout the globe for sustenance of life and adopting green technologies, viz, using solar energy, low CFC emitting technology, those which are highly innovative, cost-effective, eco-friendly technologies.
6. The decision of the Supreme Court in the case of Ratlam Municipal Council should be treated as containing the basic guidelines in determining the primary responsibility of the local bodies as also of the industries.
7. Coordinating efforts globally between all states and locally among governments centre and states, private groups, organizations, operational and financial institutions and people at large in appropriate aspects of their respective activities through Exchange of information, sharing of expertise knowledge, developing arrangements for technical cooperation is needed.
8. The sentencing policy should place emphasis on abatement of pollution of environment rather than imposition of fines or traditional penalties.
9. Public interest litigation for protection of the natural environment should be permitted In view of the wider social interests affected by environmental pollution. The court has to inculcate new methods and devise new strategies for the purpose of providing access to justice to large masses of people who are denied their basic human rights. Especially having regard to the peculiar socioeconomic conditions prevailing in the country where there is considerable poverty, illiteracy and ignorance obstructing and impeding accessibility to the judicial process.
10. Promoting programmes to sensitize decision makers, including public officials, legislators and members of the judiciary, as to the need to develop a sense of commitment to the protection of human and environmental rights and to adopt more holistic approaches to integrating the requirements of sustainable development in the interpretation and application of national and international norms for the protection of those rights and sustainable development concepts.

11. Among all the laws on the subject, Sec. 133 of Cr. P.C. 1974 can play a pivot role in controlling all types of pollution viz, air, water and noise. Being a speedy and summary remedy every one can use it effectively by raising the guns of section 133 to go in to action, whenever there is a public nuisance caused by pollution to the environment.
12. The Magistrate and the Courts must invoke the provisions of Sec.133 for achieving the social justice by ordering the abatement of public nuisance caused by pollution to the environment.
13. United Nations and governments of nations can do three key course of action: 1. Proper information regarding seriousness of the environmental problem. 2. Incentives may be provided to those who develop standards to meet the challenge of environmental pollution. 3. To set up a unified Research center and implement the principles of sustainable development.
14. This is a very small step when what are needed are giant strides in an eco friendly direction. The crying need of the hour is to educate the public and make them aware of their rights as citizens of this country to a clean environment, to clean water, clean air and clean surroundings. They must act together to fight corruption in governance and ruthless exploitation by the captains of industry. A strategy for environmental protection could be adopted.
15. Reduce fertility rates and control population, reducing pressure on natural resources. Educate and inform the people about the gains of environmental protection and sustainable development. They must stand up for their rights

It is high time that the general public, public entities, state and central government realize the damage, which our developmental process has made to the living environment. The extent is such that it cannot be resorted. There a necessity to think about the needs of present and future by compulsion and also need to balance the public interest and environment protection. It is to be noted that unless the humanity rises to the occasion for the prevention and control of the pollution and protection of environment with necessary zeal and speedy trial, the progressive and prosperous living and to procure welfare state will become a nightmare. There is still hope for us. We can, to a certain degree, reverse the process of degradation of our surroundings, for Mother Earth is forgiving and able to heal her wounds if we do not inflict more grievous ones on her. As Paul Bigelow Sears said, "How far must suffering and misery go before we see that even in the day of vast cities and powerful machines, the good earth is our mother and that if we destroy her, we destroy ourselves." So we should act today for a better tomorrow for our children.

### **Recommendations:-**

As the measures suggested above are important and even several NGOs and Government agencies try to spread awareness about them, it has been observed that the implementation of these measures fails to a greater extent. The extravagance of the celebration of this spiritual festival continues to degrade the environment and increase the levels of pollution. The problem identified through the study is the ineffective communication of these measures which must be communicated effectively if they are to be implemented successfully. Several NGOs and Government agencies are trying to communicate the measures to masses but the communication needs to be done on a greater scale. The recommendations for the effective communication of these measures are presented as below:

1. All these measures can be incorporated in the syllabus of the subject 'Environmental studies' in primary schools and colleges.
2. Awareness programmes such as slide-show presentations, street-plays can be organized on a greater scale in schools, colleges and at public places.
3. The government agencies, NGOs, schools and colleges may form groups for carrying out such awareness programmes on a greater scale.

### **Conclusion:-**

The moot point then is what does the future hold in terms of environmental policy. If the past is anything to go by, the likelihood is that social concerns will continue to play second fiddle to the management of the environment. yet, legal and policy spaces will continue to emerge through which proponents of an alternative vision of environmental management and development will launch their struggles. Such struggles must engage more deliberately with existing neo-liberal discourses of good governance and the market instead of shy away from them. Communities are already enmeshed in the market and located in geographical spaces that will eventually come into the gamut of good governance strategies. Instead of being swallowed up by these discourses as is currently happening, communities and those who speak for them need to help shape them instead. The market and good governance rhetoric are after all as bad or good as the ideological context in which they are located.

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### RESEARCH ARTICLE

#### THE PREDICTIVE VALUE OF HEPATIC ELASTOGRAPHY IN DIAGNOSIS OF HEPATIC FIBROSIS IN PATIENTS WITH CHRONIC HEPATITIS C VIRUS INFECTION.

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Fibroscan, Diagnostic Test, Imaging, Chronic HCV.

#### Abstract

**Introduction:** Hepatic elastography (HE) is a noninvasive technique that measures liver stiffness and is used to diagnose hepatic fibrosis. It can help patients who are thought to have early-stage disease avoid a staging liver biopsy, but only when confounding variables that increase liver stiffness are excluded. Chronic inflammation from hepatitis C virus (HCV) infection is not considered to be one of these variables.

**Aim of the study:** To detect whether histologic and biochemical inflammation could confound the predictive value of hepatic elastography in patients with chronic hepatitis C virus infection.

**Patients and methods:** Study population included 68 patients with HCV and METAVIR fibrosis scores of 0 – 2 in 288 patients with chronic liver disease, patients were  $49.6 \pm 9.0$  years old, 64.3 % were male, and they had an average body mass index of  $26.7 \pm 4.1$  kg/m<sup>2</sup>.

**Results:** Inflammation (based on histologic analysis) and level of alanine aminotransferase

(ALT) were associated with liver stiffness. The chances of a patient having a level of stiffness that indicates cirrhosis increased with grade of inflammation and level of ALT. By using a conservative 14.5-kPa cutoff for the diagnosis of cirrhosis, grade 3 inflammation had an odds ratio of 9.10 (95% confidence interval, 2.49 –33.4). Likewise, levels of ALT greater than 80 and 120 IU/L had odds ratios of 3.84 (95% confidence interval, 2.10 –7.00) and 4.10 (95% confidence interval, 2.18 –7.69), respectively. The effect of the level of ALT persisted when analysis was restricted to patients with fibrosis scores of F0 to F1.

**Conclusions:** Patients with HCV infection and early-stage fibrosis, increased levels of ALT correlate with liver stiffness among patients in the lowest stages of fibrosis (METAVIR scores 0–2). Patients without fibrosis but high levels of ALT could have liver stiffness within the range for cirrhosis. Inflammation should be considered a confounding variable in analysis of liver stiffness.

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**Introduction:-**

Hepatic elastography (HE) depends on ultrasound and shear waves to measure the liver stiffness. It is a validated and reproducible, noninvasive method for making the diagnosis of liver cirrhosis. At the opposite end of the fibrosis spectrum,

However, the predictive value of HE is a matter of ongoing study. Of chief interest for the practicing hepatologist is how chronic inflammation, as in the case of hepatitis C, affects the predictive value of HE. It is already recognized that certain conditions intrinsic to liver pathophysiology such as acute hepatitis, sinusoidal congestion, and obstructive cholestasis increase liver stiffness independent of fibrosis stage (1).

Hepatic inflammation, when acute and severe, has an effect on the visco-elasticity of the liver and results in an overestimation of liver fibrosis stage by HE, as is the case with hepatitis B flares and reappearance hepatitis C after liver transplantation (2, 3).

In the setting of smoldering inflammation (e.g., chronic hepatitis C or steatohepatitis), however, the impact of inflammation on the predictive value of HE is less certain. Liver stiffness measurements (LSMs) did not correlate with varying degrees of necro-inflammation in chronic hepatitis C; likewise in steatohepatitis, there are reports of no correlation between LSM and necro-inflammatory activity or alanine aminotransferase (ALT) (4, 5). However, Oliveri et al concluded that necro-inflammation was independently associated with liver stiffness, even though in hepatitis B-infected individuals. There is sufficient animal model evidence that visco-elasticity of the hepatic parenchyma is decreased before the deposition of collagen scar (6), the etiology of this dynamic, physical property is poorly defined, although cellular edema and cyto-skeletal changes are possible contributors. Patients with advanced fibrosis (METAVIR F3-4) were excluded and focused specifically on the earliest stages of fibrosis (METAVIR F0-2) to determine whether histologic and biochemical inflammation confounds the predictive value of hepatic elastography.

**Patients and Methods:-**

This is a prospective study of liver stiffness by transient elastography (TE) in patients with chronic liver disease undergoing liver biopsy has been in place since 2009, with correlation of LSM to clinical data and histologic grade and stage of disease by METAVIR score. LSM was evaluated by using the FibroScan between December 2009 and September 2013. The total study population included men and women of at least 18 years of age with viral hepatitis.

*Inclusion criteria:* Patients with diagnosis of chronic hepatitis C (detectable serum HCV RNA), successful LSMs (kilopascals [kPa]), and liver biopsy obtained within 3 months of each other.

*Exclusion criteria:* active malignancy, uninterpretable biopsy specimen, hepatitis C virus (HCV) therapy within last 6 months, other chronic liver disease (including Wilson's disease, alpha<sub>1</sub>-antitrypsin deficiency, cholestatic liver disease, or hemochromatosis), clinical ascites, body mass index (BMI)  $\geq 40$  kg/m<sup>2</sup>, pregnancy, or an implantable cardiac device. The study was restricted to those patients with F0–F2 fibrosis. All patients provided written informed consent. Data collected were age, sex, BMI, stigmata of liver disease, ALT levels at the time of TE, and imaging results. Hepatitis B virus coinfection was ruled out by routine serology. LSMs (kPa) were determined as previously described. FibroScan was considered accurate if patients had at least 8 successful measurements, a minimum 60% success rate, and an interquartile range/median liver stiffness ratio of  $< 0.3$ . The reproducibility of HE has been well-established in prior studies, with published intraoperator and interoperator agreement statistics of 0.98 (7). This finding is generalizable across studies that compare patients with the same underlying disease (8).

Intraoperator and interoperator variability was evaluated at one center. Measurements taken by 2 different people on the same day (interoperator) and measurements taken by the same person 1 week apart (intraoperator) had coefficients of variability of 2.97% and 5.37%, respectively. Liver biopsies were obtained within 12 weeks of TE, and the METAVIR stage and grade were determined by one of two blinded, experienced hepatopathologists. The length of each liver biopsy specimen was established in centimeters. Fibrosis was staged according to METAVIR scoring system, a 0–4 scale: F0, no fibrosis; F1, portal fibrosis without septa; F2, portal fibrosis and few septa; F3, numerous septa or bridging fibrosis without cirrhosis; and F4, cirrhosis. Inflammatory activity was graded on a 0–3 score; 0, none; 1, mild; 2, moderate; and 3, severe. Steatosis was categorized as grade 0 ( $< 5\%$ ), grade 1 (5%–32%), grade 2 (33%–65%), and grade 3 ( $> 66\%$ ) on H&E staining.



The number of patients who met inclusion criteria was 68 from a total number of 288 patients with available LSMs. The reason for exclusion from the study was a stage of fibrosis on biopsy of F3 or F4. The mean age of our study was  $49.6 \pm 9.0$  years, with 64.3% men, and most patients had HCV genotype 4 infection (90.8%). The average body mass index was  $26.7 \pm 4.1$  kg/m<sup>2</sup>, which is considered overweight. The mean biopsy size was  $1.74 \pm 0.6$  cm. Nine patients had stage F0 fibrosis (14.0%), 32 had F1 (47%), and 27 had F2 (39%).

Two patients had grade 0 histologic inflammation (3%), 38 had grade 1 (57%), 26 had grade 2 (37%), and 2 had grade 3 (3%). 25.4% of patients had ALT < 40 IU/L, 45.6% of them had ALT between 40 and 80 IU/L, 14.4% had ALT between 80 and 120 IU/L, and 14.6% had ALT > 120 IU/L. 43.7% of patients had Steatosis and 7.2% of patients had diabetes (Table 1).

**Table 1:-** Basic characteristics of study population divided by METAVIR score. Age, grade of histologic inflammation, and liver stiffness differ significantly across stages of fibrosis.

Total, N = 68	F0 fibrosis (n = 9)	F1 fibrosis (n = 32)	F2 fibrosis (n = 27)	P value
Age (years)	$47.3 \pm 9.2$	$49.1 \pm .1$	$51.0 \pm 8.5$	0.001
Sex (Male; Female)	5 ; 4	21 ; 11	18 ; 9	NS
BMI (kg/m <sup>2</sup> )	$26.0 \pm 4.2$	$26.6 \pm 4.1$	$27.0 \pm 4.1$	NS
ALT (IU/L)	$62.9 \pm 44.11$	$76.3 \pm 88.7$	$82.0 \pm 65.2$	NS
Steatosis (yes; no)	5 ; 4	13 ; 19	12 ; 15	NS
Grade of inflammation	$1.04 \pm 0.48$	$1.31 \pm 0.52$	$1.62 \pm 0.54$	< 0.001
LSM (kPa)	$7.2 \pm 7.1$	$7.42 \pm 4.3$	$9.2 \pm 7.4$	0.001

The statistical analysis of the study was modified according to the nature of the variable. Patients' demographics given as mean  $\pm$  standard deviation. Table 2 showed that the grade of inflammation was transformed into a continuous variable, and ALT was represented in multiples of the upper limit of normal (ULN) (40 IU/L). Student t testing for 2 variables with Normal distribution (Table 3), one-way analysis of variance with Scheffé method for multiple comparisons for more than 2 variables of normal distribution (Tables 1 and 3), regression techniques, and other descriptive statistics were performed. (Tables 2 and 4).

**Table 2:-** Effect of Inflammation on Odds of Falsely Significant LSMs in Patients with F0–F1 Fibrosis.

		9.5-kPa cut-off for $\geq$ F3 fibrosis <sup>4</sup>	10.3-kPa cut-off For $\geq$ F3 fibrosis <sup>7</sup>	11.9-kPa cut-off for cirrhosis <sup>7</sup>	12.5-kPa cut-off for cirrhosis <sup>4</sup>	14.5-kPa cut-off for cirrhosis <sup>9</sup>
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
ALT	> ULN (40 IU/L)	2.46 (1.24–4.88)	2.22 (1.08–6.24)	2.34 (0.95–5.75)	2.34 (0.88–6.24)	2.41 (0.69–8.34)
	> 2 $\times$ ULN (80 IU/L)	5.64 (3.30–9.59)	3.25 (1.83–5.75)	4.27 (2.15–8.49)	3.76 (1.80–7.85)	4.82 (1.91–12.15)
	> 3 $\times$ ULN (120 IU/L)	3.90 (2.01–7.56)	2.02 (1.00–4.10)	2.42 (1.17–5.01)	3.49 (1.5–8.10)	3.62 (1.32–9.98)

## Results:-

Controlling for stage of fibrosis, the most significant associations with liver stiffness was in grade of histologic inflammation and ALT levels. First a univariate analysis with a number of variables that could possibly impact liver stiffness. There were 4 significant relationships: grade 3 histologic inflammation (beta 9.68, P = 6.96E-07), ALT expressed as a multiple of ULN (beta 0.76, P = 5.30E-10), gender (beta 0.072, P = 0.003), and BMI (beta 0.19, P = 0.0009). Age, Steatosis, and diabetes did not significantly impact liver stiffness. From then, by using the variables found to be significantly associated with liver stiffness by univariate analysis, and by using multiple linear regression analysis, again controlling for fibrosis. Here, only grade 3 histologic inflammation (beta 9.07, P = 1.15E-06) and ALT expressed as a multiple of ULN (beta 0.69, P = 1.85E-08) were significant.

Because of the association of inflammation with liver stiffness, we examined the effect of inflammation on the false positive staging of patients in whom elastography suggested advanced fibrosis (METAVIR F3-4), as defined by

criteria set forth by Castera et al,<sup>4</sup> Fraquelli et al,<sup>7</sup> and Zioli et al.<sup>9</sup> Among these, the lowest cutoff for F3 was from Castera et al (9.5 kPa).

The proportion of our patients who met these criteria by ALT was as follows: 12.0% (ALT < 40 IU/L), 15.2% (ALT < 80 IU/L), 17.8% (ALT < 120 IU/L), and 44.8% (ALT > 120 IU/L). As the grade of inflammation or ALT level increased, an increasing proportion of patients received false-positive stiffness measurements. Although the greatest effect of histologic inflammation appeared to occur at grade 3, the effect of inflammation measured by ALT appeared to be linear.

When the analysis is restricted to patients with F0-F1 only, many patients met elastographic criteria for significant fibrosis.

Many still met criteria for cirrhosis. Although no more than 5.2% of patients with ALT < 40 IU/L met any of the criteria for cirrhosis, of the patients with ALT > 120 IU/L, 26.1% were cirrhotic by the criteria of Fraquelli et al<sup>7</sup> (11.9 kPa), 19.6% by those of Castera et al<sup>4</sup> (12.5 kPa), and 13.0% by those of Zioli et al<sup>9</sup> (14.5 kPa). Many more met the criteria of Castera et al for F3 (9.5 kPa): 9.5% (ALT < 40 IU/L), 11.5% (ALT < 80 IU/L), 17.1% (ALT < 120 IU/L), and 39.1% (ALT > 120 IU/L).

**Table 3:-** Association of Study Variables with Liver Stiffness

Variable	Univariate linear regression			Multivariate linear regression		
	$\beta$	Standard error	P value	$\beta$	Standard error	P value
Grade of inflammation						
Grade 1	1.45	1.58	0.36			
Grade 2	0.52	0.48	0.28			
Grade 3	9.68	1.93	6.96E-07	9.07	1.85	1.15E-06
ALT (x ULN)	0.76	0.12	5.30E-10	0.69	0.12	1.85E-08
Steatosis (yes/no)	0.41	0.13	0.18			
Age (per year)	0.04	0.026	0.09			
Gender	0.072	0.24	0.003			NS
BMI (kg/m <sup>2</sup> )	0.19	0.06	0.0009			NS
Diagnosis of diabetes (yes/no)	0.84	0.47	0.08			

Table 4 shows the odds of inflammation causing patients with F0–F2 fibrosis to receive LSMs that meet cutoffs for > F3 and > F4 fibrosis by elastography. Castera et al<sup>4</sup> concluded that effective cutoffs to diagnose F3 and F4 fibrosis are 9.5 kPa and 12.5 kPa, respectively. Fraquelli et al<sup>7</sup> used cutoffs of 10.3 and 11.9 kPa for F3 and F4 fibrosis, respectively. Finally, Zioli et al<sup>9</sup> used a 14.5-kPa cutoff for F4 fibrosis. For this analysis, variables were chosen according to their statistical significance in the multivariate regression: grade of necroinflammation and ALT as a multiple of its ULN (40 IU/L).

The effect of histologic inflammation on the odds of a false-positive measurement by elastography (Table 4) was first examined. By comparing the proportion of patients in each grade of histologic inflammation that met the above criteria for advanced fibrosis, we determined the odds ratio (OR) for obtaining a falsely significant result as a function of inflammation.

We repeated this analysis for the effect of histologic inflammation restricted to those patients with F0-1 fibrosis. In this restricted stage of fibrosis, there were some patients with grade 2 inflammation and fewer patients with grade 3 inflammation.

The effect of inflammation as reflected by the ALT level was examined. There was a significant effect of ALT on elastography, whether the data were analyzed by using patients with F0-2 (Table 4) or only F0-1 fibrosis (Table 2). ALT levels > 40 IU/L (ULN) exhibited a trend toward a significant effect for patients with F0-2 (OR, 1.51–1.71 with CIs that cross 1) but significantly increased the odds that a patient's LSM would meet criteria for F3 fibrosis for patients with F0-1 (OR, 2.46; 95% CI, 1.24 – 4.88 for 9.5-kPa cutoff and OR, 2.22; 95% CI, 1.08 – 6.24 for

10.3-kPa cutoff). For ALT levels > 80 and > 120 IU/L, there was a reliable, sizable effect on false-positive LSM results, irrespective of the inclusion of F2 patients (Tables 2 and 4).

**Table 4:-** Effect of Inflammation on Odds of Falsely Significant LSMs in Patients with F0–F2 Fibrosis

		9.5-kPa cut-off for ≥ F3 fibrosis <sup>4</sup>	10.3-kPa cut-off For ≥ F3 fibrosis <sup>7</sup>	11.9-kPa cut-off for cirrhosis <sup>7</sup>	12.5-kPa cut-off for cirrhosis <sup>4</sup>	14.5-kPa cut-off for cirrhosis <sup>9</sup>
		OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
ALT	> ULN (40 IU/L)	1.51 (0.86–2.62)	1.60 (0.88–2.84)	1.60 (0.73–3.5)	1.62 (0.71–3.71)	1.71 (0.61–4.78)
	> 2 × ULN (80 IU/L)	3.37 (2.29–4.97)	2.94 (1.96–4.40)	3.70 (2.27–6.02)	3.49 (2.1–5.81)	3.84 (2.10–7.00)
	> 3 × ULN (120 IU/L)	3.75 (2.37–5.92)	2.92 (1.81–4.67)	4.01 (2.36–6.82)	3.83 (2.20–6.66)	4.09 (2.18–7.69)
Grade of inflammation	≥ Grade 1	4.27 (0.56–32.5)	3.52 (0.46–26.9)	2.03 (0.27–15.7)	1.81 (0.24–13.9)	1.19 (0.15–9.2)
	≥ Grade 2	1.88 (1.33–2.72)	1.84 (1.25–2.71)	1.53 (0.96–2.40)	1.51 (0.93–2.46)	1.18 (0.66–2.11)
	Grade 3	3.68 (1.05–12.9)	4.48 (1.28–15.4)	7.87 (2.23–27.8)	5.85 (1.61–21.2)	9.10 (2.48–33.4)

## Discussion:-

In this study of patients with chronic hepatitis C and early fibrosis, we showed that inflammation increases liver stiffness.

For a large number of patients with F0–F2 fibrosis, inflammation significantly increased the odds of receiving a liver stiffness score indicative of advanced fibrosis and cirrhosis. TE is generally accepted for its ability to diagnose cirrhosis and exclude clinically significant fibrosis in published data on studies with hepatitis C (4, 7 and 9). There is ongoing open discussion about the interpretation of TE in clinical practice, particularly because of the confounders intrinsic to acute and chronic liver disease that might also increase liver stiffness. The variable with the most conflicting evidence to date is the presence of chronic inflammation, as in the case of hepatitis C and NASH (4, 5, 10 and 12).

Our results provide further evidence for a viscoelastic property of the liver that is influenced by conditions other than fibrosis, similar to that observed in cases of acute flares of hepatitis B or the reappearance of hepatitis C after orthotopic liver transplantation. A potential mechanism is that parenchymal edema increases stiffness in the absence of fibrosis and is responsible for the dramatic shift of stiffness seen with acute inflammation. Because more than one-half of liver biopsies are performed for the staging of chronic hepatitis C, it is necessary that the hepatologist understands how to interpret elastography findings in the presence of chronic inflammation.

Our study showed the following findings: *First*, we showed that some patients with chronic hepatitis C and F0–F2 fibrosis are being read as cirrhotic on TE. This includes 40%–50% of patients with grade 3 histologic inflammation and 18.8%–28.1% of patients with ALT levels > 120 IU/L, depending on the stiffness cutoff used. *Second*, by multiple regression, we showed that the only variables with a significant impact on liver stiffness aside from fibrosis are markers of inflammation (ALT and histologic grade). *Third*, we quantified the effect of inflammation with the odds that a given ALT or grade of inflammation will cause a reading of F3 or F4 fibrosis. *Fourth*, we found that when we restrict our analysis to only the lowest stages of fibrosis (F0–F1); the effect of grade of inflammation is not measurable, whereas the effect of ALT level remains strong. In summary, chronic necroinflammation, best reflected by ALT, can lead to an overestimation of liver fibrosis by HE.

We chose to isolate the earliest stages of fibrosis for 2 reasons: (1) it is at the opposite end of fibrosis spectrum (stage F4) where the positive predictive value of elastography is already considered reliable and where the relative contribution of inflammation is overwhelmed by the effect of total collagen and scar, and (2) the decision to avoid a staging liver biopsy (in any case other than cirrhosis) very much depends on predictive values at the lowest stages of

fibrosis. In an aim to assessment and prioritizing of patients for the decision-making for liver biopsy, it has been suggested that elastography measurements in the cirrhotic range ( $> 12.5$  or  $14.5$  kPa) do not need biopsy, and results in the intermediate ranges (between  $7.3$  and  $12.5$  kPa, for example) would need biopsy only if a specific stage of fibrosis is desired to make treatment decisions (1). Our study evaluates the diagnostic implications at the lowest stages of liver fibrosis.

It was shown that stiffness increased during flares of hepatitis (2 and 13) and acute hepatitis (10) and decreases after virologic response to treatment (14). Others found that higher ALT for a given METAVIR score correlated with higher stiffness (10,12 and 15). Conversely, a meta-analysis supports the accuracy of HE across many disease types even in the presence of inflammation (16) However, none of the above studies focused solely on early-stage fibrosis in hepatitis C.

Castera et al <sup>4</sup> in 2005 showed that in 183 patients with hepatitis C and F1–F4 fibrosis, the effect of necroinflammation on stiffness is negligible when controlling for fibrosis in a multiple regression. Our data from 68 patients with hepatitis C and F0–F2 fibrosis suggested an association between LSM and both histologic and biochemical measures of necroinflammation. This difference with our data is best explained by the fact that Castera et al had 0 patients with F0 fibrosis and 100 patients with F1–F2 in their study.

The utility of our findings should be evaluated in a context where minimal fibrosis is proportionate with HE reading of  $kPa < 5.5$  or  $kPa < 7.3$  kPa. Our data strengthen the negative predictive value of widely held criteria, while weakening the positive predictive value of measurements that fall within an intermediate and advanced range. This interpretation is a reflection of the potential viscoelastic alterations caused by a chronic inflammatory state of the liver. We conclude that for chronic hepatitis C, TE readings  $< 7.3$  kPa should be regarded as accurate for excluding F3-4 fibrosis regardless of the grade of inflammation. Elastographic results in the intermediate range (between  $7.3$  and  $13$  kPa) should be interpreted with caution, and  $ALT > 2 \times ULN$  is more likely to exert this confounding influence. An alternative to biopsy in such cases is to use noninvasive serologic markers of fibrosis, because concordance would add predictive value.

So the grade of histologic and laboratory-based inflammation seen in chronic hepatitis C is positively correlated with liver stiffness at the lowest stages of fibrosis (F0 –F2). As a result, the predictive value of TE is compromised when intermediate and advanced scores (kPa) are obtained but strengthened when low scores are obtained. This might lead the hepatologist to consider many more patients for therapeutic intervention or liver biopsy, when in reality they have a clinically less significant stage of fibrosis. The hepatologist should recognize this limitation and account for chronic inflammation when interpreting TE results.

### **Recommendation:-**

Future studies could look specifically at combining patients with early-stage fibrosis and divergent elastographic measurements with a noninvasive serologic panel of fibrosis markers. This “second opinion” might provide more confidence in differentiating the true-positive from the false-positive result.

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### RESEARCH ARTICLE

#### PHYSICOCHEMICAL AND MICROBIOLOGICAL CHARACTERIZATION OF SEWAGE SLUDGE FROM SETTAT CITY'S TREATMENT PLANT DOMESTIC WASTE WATER (MOROCCO).

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#### Abstract

For the purpose of technological valorisation of sewage sludge resulting from the treatment plant domestic waste water from Settat city (Morocco), a Physicochemical and microbiological characterization was carried out.

The results obtained showed up that sewage sludge collected from the first sample are full in fertilizers. Metallic traces elements are clearly inferior to european standards.

Micro-organism composition of the sewage sludge is similar as the waste water treated by the station.

Composition of this sewage sludge suggest there valorisation by composting or direct manuring.

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#### Introduction:

Les développements démographique et économique du Maroc se sont accompagnés d'une augmentation de la demande en eau pour la consommation humaine et les activités industrielles et agricoles. Ceci génère des quantités d'eaux usées de plus en plus grandes qui étaient déversées directement dans la nature, sans aucun traitement. Cependant et suite aux sécheresses successives qui sévissent et qui ont rendu l'eau une denrée précieuse, le Maroc a considéré que les eaux usées constitueraient une ressource hydrique mobilisable, après épuration. En effet, le volume des eaux usées rejetées qui était de 600 millions de mètres cube en 2005, devrait atteindre 900 millions de mètres cube à l'horizon 2020 [1].

Les eaux usées ainsi épurées sont actuellement réutilisées en agriculture, pour l'irrigation des espaces verts ou pour le lavage de la matière première en industrie minière [2].

Cependant, le traitement des eaux usées s'accompagne d'une production de grande quantité de boues dont les débouchés pour leur élimination sont de plus en plus restreints. Le devenir des boues est donc un problème préoccupant, étant donnée qu'elles sont considérées comme déchets à risques, vues leurs compositions physico-chimique et microbiologique [3]. Il est à noter que l'élimination et le traitement des boues résiduelles représente l'un des plus grands problèmes auxquels sont confrontés les gestionnaires des stations d'épuration [4]. C'est pourquoi, elles doivent subir des procédés de gestion à fin de limiter leurs nocivités, par traitement, recyclage et valorisation [5,6].

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Plusieurs possibilités sont offertes pour la gestion des boues telles que l'incinération, l'épandage ou la mise en décharge contrôlée. Cependant, le choix est tributaire de la nature des boues, du coût de mise en œuvre, de la valeur ajoutée du produit qui en résulte et de l'impact que pourrait avoir la filière retenue sur l'environnement.

C'est dans ce cadre que cette étude a été réalisée dont le but est la caractérisation physico-chimique et microbiologique des boues issues de la première collecte de la station d'épuration des eaux usées domestiques de la ville de Settat. Ceci est dans l'objectif d'une valorisation future de ces boues en vue d'une production de produit de haute valeur ajoutée et minimisant les risques de pollution.

## **Matériel et Méthodes:**

### **Présentation de la ville de Settat et sa station d'épuration:-**

La ville de Settat est située dans la région de la Chaouia (centre du Maroc) à 290 m d'altitude.

Le climat est de type continental et la température moyenne est de 17.3 °C. La pluviométrie annuelle moyenne est de 372 mm. En 2014, la ville de Settat comprenait 141 637 habitants.

La station d'épuration des eaux usées de la ville Settat a été mise en service en 2006. Elle est gérée par la régie autonome de distribution de l'eau et de l'électricité de la Chaouia. Le système de traitement est le lagunage naturel avec trois niveaux de traitement (bassins anaérobie, facultatif et de maturation). La capacité de traitement de 13 500 mètres cube par jour, soit l'équivalent de 6100 Kg DBO<sub>5</sub> par jour. Le niveau de traitement est tertiaire. Les eaux épurées sont exploitées par une association d'agriculteurs de la région, en partenariat avec l'agence du bassin hydrique de Bouregreg et de la Chaouia et les délégations des ministères de l'agriculture de la santé publique.

L'opération de curage des boues a été effectuée pour la première fois, au mois d'avril 2016, par la société M-Terratube par le procédé géotube (sac constitué d'une membrane de polypropylène unique, spécialement conçue pour laisser passer l'eau et retenir les solides). Après pompage et injection de coagulant suivi d'une filtration, les boues ainsi obtenues ont été séchées puis stockées pour atteindre une siccité minimale de 33%. Le volume de boues ainsi extrait était d'environ 25 000 mètres cube.

### **Echantillonnage:**

Les analyses ont été effectuées sur un échantillon composite de 10 kg. Des carottages ont été effectués au niveau de plusieurs ouvertures des sacs. Chaque mesure est effectuée en triple et les résultats sont exprimés en pourcentage par rapport à la matière sèche.

### **Analyses physico-chimiques:**

#### **Mesure du pH:**

Le pH est mesuré à partir d'une solution de boues diluée au 1/5, à température ambiante à l'aide d'un pH-mètre préalablement étalonné.

#### **Taux d'humidité:**

Le taux d'humidité est déterminé sur un échantillon de boues, après séchage dans une étuve à 105°C pendant 48 heures [7].

#### **Dosage de l'Azote total:**

L'azote total a été déterminé par la méthode Kjeldahl après minéralisation, distillation et dosage de l'ammonium [8].

#### **Dosage de carbone organique total:**

Le taux de matière organique est déterminé après calcination et combustion totale de la matière organique. Le pourcentage du carbone organique total est alors déduit [9].

#### **Dosage du phosphore:**

Le dosage du phosphore total a été réalisé par colorimétrie après minéralisation à chaud en milieu acide [10].

#### **Dosage des éléments traces métalliques:**

Après calcination et dessiccation acide. La détermination des métaux étudiés a été réalisée par spectrophotométrie d'absorption atomique [11].

**Dosage de l'azote ammoniacal:**

L'ammonium est dosé par distillation en milieu alcalin. L'ammonium se transforme en ammoniac qui est récupéré de l'acide borique puis dosé par l'acide sulfurique en présence d'indicateur coloré.

**Dosage de l'azote nitrique:**

L'azote nitrique est dosé en présence de soude et d'alliage de Devarda, après distillation et titration avec l'acide sulfurique.

**Analyses microbiologiques:**

La recherche des coliformes totaux est effectuée sur une gélose lactosée biliée au cristal violet et au rouge neutre et incubation à 30°C pendant 24 heures. Les coliformes totaux se colorent en rouge violacée.

La recherche d'*Escherichia Coli* se fait sur une gélose tergitol 7 au TTC (Triphenyl Tetrazolium Chloride) et incubation à 44°C pendant 24 heures. *Escherichia coli* donne des colonies de couleur jaune d'œuf résultant de l'absence de réduction du TTC et par la formation d'un halo jaune visible, dû à la fermentation du lactose. La confirmation se fait par le test à l'oxydase et le test d'indole.

La recherche des *Entérocoques* intestinaux a été effectuée sur une gélose Slanetz Bartley et incubation à 36°C pendant 48 heures. Les colonies des *Entérocoques* intestinaux se colorent en rouge suite à la réduction du TTC. Pour confirmation, on transfère sur milieu BEA (gélose Bile Esculine Azide). Après 2 heures d'incubation à 44°C, on note l'apparition d'un halo noir dû à la réduction de l'esculine en présence de la bile.

La recherche des *staphylocoques* pathogènes (*Staphylococcus aureus*) est effectuée sur le milieu de Baird Parker au quel on ajoute du jaune d'œuf et du tellurite de potassium et incubation à 37°C pendant 48 heures. Les colonies caractéristiques sont les colonies noires entourées par halo clair. L'identification de *Staphylococcus aureus* est effectuée par le test à la coagulase.

La recherche des Salmonelles est effectuée après enrichissement dans de l'eau peptonnée à 37°C pendant 24 heures, puis sur milieux Rappaport Vassiliadis et Müller- Koffmann suivi d'une incubation à 41°C et 37°C pendant 24 heures. L'isolement se fait sur milieu sélectif (EKM Edel et Kampelmacher et Hektoen).

**Résultats et Discussion:**

Le volume des boues résiduaires de la station d'épuration des eaux usées domestiques de la ville de Settat, produite par curage, est de 25 000 mètres cube. Cette opération de curage, qui devrait être effectuée initialement en 2011, n'a eu lieu qu'en avril 2016.

Les boues ainsi obtenues ont été mises en sacs et stockées aux bords des bassins, en attendant leur évacuation. Actuellement, il n'existe aucune loi au Maroc qui encadre directement la gestion des boues des stations d'épuration. Considérées comme déchets et sur la base de cette définition (loi 28-00 relative à la gestion des déchets et à leur élimination), la valorisation des boues reste alors la seule issue écologique. C'est pourquoi nous sommes intéressés à la caractérisation physico-chimique et microbiologique de ces boues à fin de choisir la meilleure filière de valorisation.

Le tableau I regroupe l'ensemble des résultats des analyses physico-chimiques obtenues.

**Tableau I :** Composition physico-chimique des boues de la station d'épuration des eaux domestiques de la ville de Settat. (Les résultats sont exprimés en % par rapport à la matière sèche).

Détermination	Résultats
pH (extrait 1/5)	7,01
Matière sèche	28,7
Humidité	71,3
Matière organique	25,4
Carbone organique	14,7
Azote total	2,11
Phosphore total	0,93



L'analyse des résultats obtenus montre que les boues analysées sont sèches. En effet, leur teneur en eau ne dépasse guère 72%. Ceci est dû au procédé de séchage et de stockage comme exigé par le cahier de charge établi entre le gestionnaire de la station et la société ayant procédé à l'extraction des boues et qui garantit une siccité minimale de 33%.

Les boues analysées sont neutres (pH égal à 7,01) par comparaison à celle issues de la station d'épuration de la ville de Marrakech qui sont alcalines avec un pH de l'ordre de 8,3 [12]. Cette différence est sûrement due à la qualité des eaux usées traitées et à la nature du sol sur lequel a été établie la station d'épuration.

Les boues de la station d'épuration de la ville de Settat sont très riches en matières organiques, qui représentent plus du quart de la matière sèche totale. Le carbone organique représente 14,7%, l'azote total 2,11% et le phosphore total 0,93%. La teneur en azote ammoniacal était de 297 mg par kg de matière sèche et celle des nitrites était de 69 mg par kg de matière sèche. Le rapport C/N est de 6,97. Ce même rapport est égal à 20,8 pour les boues issues de la station d'épuration des eaux usées de la ville de Marrakech [12]. Ces boues se caractérisent par des teneurs en carbone organique et azote total de 31,2% et 1,5% respectivement. Le taux d'humidité est relativement élevé (46,46%).

Les boues de la station d'épuration de Choutrana (banlieue nord de la ville de Tunis) se caractérisent par une teneur plus élevée en carbone organique (29,01%) et une teneur plus faible en azote (1,47%), ce qui donne un rapport C/N de 19,73 [13].

L'analyse des éléments métalliques présents dans les boues issues de la station d'épuration de la ville de Settat a donné les résultats qui figurent sur le tableau II :

**Tableau II:-** Composition métallique des boues de la station d'épuration des eaux domestiques de la ville de Settat. (Les résultats sont exprimés en % par rapport à la matière sèche).

Détermination	Résultats
Conductivité	3,98 mS/cm
Chlorures	0,15
Calcium	9,64
Magnésium	4,17
Sodium	0,36
Potassium	0,28

Comparée à la composition physico-chimique moyenne des boues au Maroc [14], on remarque que les boues analysées se caractérisent par des teneurs élevées en magnésium (4,17 au lieu de 1,26), calcium (9,64 au lieu de 6,76). Par contre la teneur en potassium est identique (0,28). Ces différences trouvent, en partie, leur explication dans la composition des eaux traitées et leurs origines. En effet, les eaux de la ville de Settat, issues de la nappe phréatique de la région sont réputées avoir une dureté et une salinité très élevées [15-18].

L'analyse de la composition en éléments traces métalliques présents les boues issues de la station d'épuration de la ville de Settat a donné les résultats qui figurent sur le tableau III.

**Tableau III:-** Composition en éléments traces métalliques des boues de la station d'épuration des eaux domestiques de la ville de Settat. (Les résultats sont exprimés en mg/kg de matière sèche).

Eléments	Résultats
Manganèse	99,4
Cuivre	42,6
Zinc	34,2
Bore	13,2
Molybdène	8,30
Chrome	7,65
Cadmium	5,80
Nikel	4,91

Cobalt	4,10
Mercure	4,00
Sélénium	3,50
Arsenic	3,10
Plomb	2,61

Les résultats obtenus montrent que les teneurs en éléments traces métalliques sont très faibles et nettement inférieures aux valeurs limites tolérées par certains pays européens comme la France ou l'Allemagne [19-21]. Ceci est, en effet, dû à l'absence de rejets industriels étant donné que la zone industrielle de la ville de Settat n'est pas raccordée au réseau d'assainissement urbain. Par contre, dans le cas de la ville de Marrakech, certains éléments traces comme le chrome est présent dans les boues à des concentrations qui dépassent deux fois les limites tolérées. Ceci est à cause des rejets de certaines unités industrielles de la ville de Marrakech [12].

À part l'origine industrielle, les causes de la présence des métaux dans les boues sont variées et spécifiques à chaque métal. Il s'agit généralement des eaux de ruissellements des voies de circulation, des canalisations ou des produits d'usages domestiques.

L'analyse microbiologique des boues issues de la station d'épuration de la ville de Settat a donné les résultats qui figurent sur le tableau IV.

**Tableau IV:-** Analyses microbiologiques des boues résiduelles de la station d'épuration des eaux usées domestiques de la ville de Settat

Coliformes totaux	1,1 x 10 <sup>-3</sup> UFC/g
Escherichia coli	6 x 10 <sup>-3</sup> UFC/g
Entérocoques intestinaux	2,2 x 10 <sup>-2</sup> UFC/g
Staphylocoques pathogènes	6 UFC/g
Recherche de Salmonelles	Absence (UFC/25g)

La composition microbiologique des boues reflète celle des eaux usées traitées par la station d'épuration. Ces germes sont normalement présents dans les matières fécales rejetées dans les réseaux d'assainissement des eaux usées et donc inévitablement présents dans les boues brutes.

### Conclusion:

La richesse des boues issues de la station d'épuration des eaux domestiques de la ville de Settat en éléments fertilisants et les faibles teneurs en éléments toxiques leur confèrent un intérêt agronomique certain pour les sols et les plantes par épandage direct ou après compostage avec un co-substrat végétal. Cependant la réutilisation éventuelle de ces boues doit tenir compte des besoins nutritionnels des plantes sans toutefois compromettre la qualité des sols ni celle des eaux superficielles et souterraines. C'est pourquoi il est nécessaire de maîtriser les risques éventuels liés aux micro-organismes et aux métaux par des limitations d'usage telles que les distances à respecter vis à vis des habitations, des points d'eau, des cours d'eau et les délais à respecter avant l'installation de cultures maraîchères ou avant la mise au pâturage des animaux. Ceci doit se faire dans un cadre juridique et réglementaire. À l'échelle internationale plusieurs normes existent, au Maroc un projet de loi relatif à la protection environnementale du sol est en cours d'élaboration.

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### RESEARCH ARTICLE

#### A CASE OF A SHARED PSYCHOTIC DELUSION BETWEEN TWO SISTERS.

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Shared delusional disorder, Folie à deux,  
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#### Abstract

Shared Psychotic Delusion (SPD) is a fascinating yet poorly understood psychological phenomenon. characterized by the transference of delusions from an individual who suffers already from a psychotic disorder, to mentally sane individual or individuals who are in close association and relative social isolation in a frame of complex and dependent relationship. In our case present a case of schizophrenic young female that transmitted her bizarre delusion of misidentification to her mentally sane sister after a period of total isolation and in a frame of a complex dependent relationship. Successful management plan composed of using antipsychotic that had led to significant improvement of the primary schizophrenic patient and simple physical separation cured the other

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#### Introduction:-

Shared Psychotic Delusion (SPD) is a fascinating yet poorly understood psychological phenomenon. This disorder was referred to as Folie à deux and Induced Psychotic disorder. However, it is nowadays known as Shared Psychotic Disorder (SPD) as mentioned in DSM-5. SPD is characterized by the transference of delusions from an individual (the primary patient), who suffers already from a psychotic disorder, to mentally sane individual or individuals (the secondary patient) who are in close association and relative social isolation in a frame of complex and dependent relationship. [2]

#### Methodology:-

Interviews and full mental state assessment were held for both sisters before and after treatment. Family members were also involved throughout the process of diagnosis and treatment.

#### Case History:-

Miss (A) is a 26 years old Saudi female, college graduate. She lives with her sister Miss (B) who is a 29 years old, college graduate. They come from a religious family with an average socioeconomic status. Miss (A) has a domineering personality and a stubborn character with a special interest of astronomy and fortune telling. On the contrary, her sister Miss (B) is known to be passive and kind.

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Miss (A) became psychotic with multiple bizarre delusions, including that her parents are imposters, her father seems to be some sort of special DNA mixture of multiple historically famous figures and current celebrities, and that her biological mother is the former Indonesian housemaid.

According to these delusions, Miss (A) started to isolate herself and gradually became hostile towards all her family members. These delusions were transferred to her mentally sound sister Miss (B), after living in total isolation for 6 months' duration. One month prior to presentation, Miss (A) started to express aggressive behavior such as destroying properties, threatening others to be out of her life and eventually threatened her mother with a knife.

Miss(A) was forced to get admitted to a private hospital. There, she was diagnosed to have schizophrenia and was put on antipsychotics. Later on, Miss (B) was brought to our service where she was admitted for diagnosis. Miss (B) was found to have the same delusion but with a lesser extent and a less bizarre way, as mentioned by her family members. Simple separation of the sister was enough to shake and eventually resolve the delusion of the secondary patient (Miss B). While the primary patient was presented to our service for follow up and to keep on getting antipsychotic drugs (Zyprexa 10 mg PO BID, Risperdal 50mg IM every two weeks) with excellent responses later on.

Finally, both sisters were gradually allowed to contact each other and thus returned to live in the same house.

### **Discussion:-**

In 1651, Harvey was the first to describe an induced psychosis of phantom pregnancy in two sisters. The term Folie à deux dates to a classic report by Lasègue and Falret in 1877. In 1942 [4], Gralnick published a classification of four Folie à deux subtypes, as follows:

- Subtype A is termed folie imposée. The delusions of a person with psychosis are transferred to a person who is mentally sound. Both persons are intimately associated, and the delusions of the recipient disappear after separation.
- Subtype B is termed folie simultanée. The simultaneous appearance of an identical psychosis occurs in two individuals who are both intimately associated and morbidly predisposed.
- Subtype C is termed folie communiqué. The recipient develops psychosis after a long period of resistance and maintains the symptoms even after separation.
- Subtype D is termed folie induite. New delusions are adopted by an individual with psychosis who is under the influence of another individual with psychosis.[5]

Our case fulfills the criteria of induced delusional disorder according to ICD10 and DSM IV with a specific Subtype A known as “ folie impose”.

As stated through literature, the most common psychiatric disturbance is schizophrenia and the most common delusions are of persecution [6]. While our case involves delusion of misidentification.

Major cases in literature involve members of a nuclear family, most commonly is between mother and a child, husband and a wife or siblings. As suggested by other case reports, the primary patient is usually of an advanced age, have superior intelligence and a forceful aggressive character. While the secondary patient is younger in age, passive, dependent and less intelligent than the primary one. However, In our case, the primary patient is neither older nor superior in intelligence, but has more dominating and stronger personality traits.

Furthermore, this relatively rare disorder has no systematic treatment regimen found to be effective. Inconsistencies in literature regarding treatment modalities exist between either one of two; Separation, as the sole treatment for the secondary, or psychotherapy and medical intervention in conjunction with separation, for cure of the secondary [6]. In our case, we separated them physically by admitting the primary patient to the psychiatric ward and receiving antipsychotics. Individual psychotherapy and psychoeducation, were enough to cure the secondary patient.

### **Conclusion:-**

It is crucial to recognize such rare cases in order to identify the exact approach of management. Such cases need intervention in a timely manner to understand the psychodynamic and plan for regular follow ups to help the patients to overcome such disorder.

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### RESEARCH ARTICLE

#### CYTOGENETICS AND MOLECULAR GENETICS ON FEMALE INFERTILITY WITH SPECIAL EMPHASIS ON POLYCYSTIC OVARIAN SYNDROME

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Female infertility, Polycystic Ovarian Syndrome, Cytokinesis-block micronuclei (CBMN) assay

#### Abstract

Female infertility is defined as the inability to conceive naturally or to carry a pregnancy to full term. It occurs for almost 15% of all women worldwide. The etiology of infertility is an important criterion for recognition and characterization of infertile women. The common factors for infertility in females are anovulatory disorder, tubal factors, endometriosis, uterine and cervical factors. Infertility affects 40% of women with PCOS and is the most common cause of female infertility. The present study was undertaken to evaluate the cytogenetics and molecular genetics on female infertility with special emphasis on polycystic ovarian syndrome by investigating the various anthropometric and clinical aspects of the subjects. Seventy five female subjects with infertility and 50 healthy women without any chronic illness were involved in this study. Reproductive hormones namely leutinizing hormone (LH), follicle stimulating hormone (FSH), prolactin and estradiol were estimated in each subjects after obtaining their informed consent. Cytokinesis-block micronuclei (CBMN) assay was also carried out in the lymphocytes of the subjects to assess the somatic DNA damage. The study demonstrated that the micronuclei frequency significantly elevated in the study subjects than control subjects. Infertile women with various risk factors such as increasing age, BMI, family history of infertility, family history of cancer, menarche, endometriosis etc. can lead to increased genetic instabilities and the severity of infertility. Lifestyle modification with diet and exercise will reduce the risk for infertility.

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#### Introduction:-

Female infertility is defined as the inability to conceive naturally or to carry a pregnancy to full term (Gaware et al., 2009). The incidence of female infertility is rising and varies from 10 to 20% (Moghadam et al., 2013). Female infertility is caused by genetic, hormonal, or environmental factors. In addition, pelvic inflammatory disease, uterine fibroids, age-related factors, tubal blockage, and hostile cervical mucus can cause infertility in females (Olooto, 2012). Female infertility occurs in about 37% of all infertile couples (Unuane et al., 2011).

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The etiology is an important criterion for recognition and characterization for infertile subjects. Advanced age, high body mass index, age of onset of sexual activity, prior pelvic surgeries and stress were the most significant risk factors associated with women's infertility (Romero et al., 2008). Problems regarding menstruation (amenorrhoea, menorrhagia polymenorrhoea, dysmenorrhoea) along with insanitation are the major danger alarms (Maeda and Tsukamura, 2006). Any cause leading to irreversible or non-compensable damage to the genital tract, uterus, fallopian tubes or ovaries may cause inability to conceive (Jain et al., 2004; World Health Organization, 2003).

The polycystic ovary syndrome (PCOS) affects 7 to 8% of women (Azziz et al., 2004) and may be the most common cause of female infertility (Norman et al., 2002). Women with PCOS have an increased risk of miscarriage, gestational diabetes, preeclampsia and preterm labour (Boomsma et al., 2006).

Accumulating evidence suggests that genetic factors contribute to the etiology of female infertility in humans (The ESHRE Capri Workshop Group, 2008; Matzuk and Lamb, 2008). Genes involved in meiosis are also good candidates for genes contributing to female infertility (Sanderson et al., 2008). Karyotype analysis is also performed in women presenting with primary amenorrhoea, premature menopause, and recurrent pregnancy loss (ESHRE Capri workshop group, 2000). The sex chromosome aberrations and the presence of constitutional inversions, translocations, or small supernumerary marker chromosomes (sSMC) can lead both to infertility and repeated abortions (Liehr et al., 2004; Shah et al., 2003). Diminished ovarian reserve (DOR) is a primary infertility disorder characterized by a reduction in the number and/or quality of oocytes, usually accompanied by high follicle-stimulating hormone (FSH) levels and regular menses (Broekmans et al., 2007). Cytogenetic studies of female patients enrolled in an intracytoplasmic sperm injection (ICSI) programme reviewed by Gekas et al., (2001) have shown an unexpectedly increased incidence of abnormal karyotypes, ranging from 1.1 to 9.8% when cases with low level sex chromosome mosaicism were included.

As many as 20% of women with infertility problems (including fecundability and early pregnancy loss) have been diagnosed with PCOS (Diamanti et al 1998). PCOS is the most common cause of menstrual irregularity that leads to infertility. There is now a greater focus on the management of the metabolic consequences of PCOS, primarily through lifestyle interventions to achieve weight loss and increase physical activity (Sevendsen et al., 2005). The investigation and management of female infertility can be done by changing lifestyle, regular exercise, dieting etc. and this is one of the debated topics. No serious attempts were made earlier to correlate DNA damage and female infertility with polycystic ovarian syndrome. Hence the present study was undertaken to correlate various cytogenetics and molecular genetics on female infertility with polycystic ovarian syndrome.

### **Materials and Methods:-**

Seventy five study subjects with a clinical diagnosis of infertility referred from various infertility centers of Kerala to Genetika, Centre for Advanced Genetic studies, Trivandrum. Fifty healthy subjects without any chronic illness were also selected as control for this study. Detailed demographic, clinical and biochemical characteristics of the subjects were recorded using proforma. In this study, Cytokinesis Block Micronuclei (CBMN) assay was carried out in each subject. CBMN assay was performed by using Cytochalasin B for quantitating the extent of somatic DNA damages.

Seven ml of blood sample was collected by venepuncture. Two ml of blood was transferred into sodium heparinized vacuutainers for quantifying the extent of somatic DNA damages by Cytokinesis-Block Micronuclei (CBMN) assay. The remaining five ml of blood was transferred into a plain tube. Blood was allowed to clot, serum separated immediately. Blood sugar and lipid profile were estimated using semi-automated clinical chemistry analyzer.

Two ml blood was added to a culture tube containing 10 mL RPMI 1640 supplemented with 100units/mL penicillin, 100µg/mL streptomycin, 15% fetal bovine serum and 100µg/mL phytohemagglutinin. Cytochalasin B was added to the cultures at a final concentration of 4.5µg/mL (Sigma) after 44<sup>th</sup> hours of initiation of cells with phytohaemagglutinin. Cells were harvested after 72 hr incubation, and they were treated with a hypotonic solution (0.075M KCl) for 1 min and fixed in fresh fixative solution (methanol: acetic acid, 3:1). The cells were dropped onto slides and the slides were air dried and stained with 10% Giemsa. Micronucleated cells were analyzed under light microscopy at 100X magnification. The number of micronuclei is not less than 1000 binucleated cells were scored and the distribution of micronuclei among binucleated cells was recorded.



**Results:-**

In the present study 75 individuals were taken as the study subjects and 50 healthy individuals were taken as the control subjects. The study subjects showed a mean CBMN frequency of 13.18 while the control subjects showed a mean CBMN frequency of 10.63. This difference in mean CBMN frequencies showed a statistically significant difference.

**Table 1:-** Distribution of mean CBMN frequency according to various demographic characteristics

Category	Variables	Total	Percentage (%)	Mean CBMN Frequency
Age (Years)	20-28	40	53.3	13.01
	29-36	35	46.6	13.38
Birth Order	<3	51	68	13.02
	4 to 6	20	26	13.46
	7 to 9	4	5.3	13.76
Residence	Coastal	8	10.6	12.98
	Rural	52	69.3	13.11
	Urban	15	20	13.54
Parental consanguinity	Yes	8	10.6	13.45
	No	67	89.3	13.15
Duration of married life (Years)	1 to 5	52	70	13.14
	6 to 11	23	29.3	13.27
Social Status	High	9	12	13.69
	Low	2	2.6	13.11
	Medium	64	85.3	13.11
BMI (Kg/m <sup>2</sup> )	<20	1	1.33	12.06
	20 to 25	42	56	13.02
	>25	32	42.66	13.33

The subjects were grouped on their demographic characteristics such as age, birth order, residence, parental consanguinity, duration of married life, social status and BMI (Table 1). Among the 75 study subjects, 40 subjects (53.3%) were between the age of 20 to 28 years and showed a mean CBMN frequency of 13.01. The highest mean CBMN frequency of 13.38 was shown by 35 subjects (46.6%) of age between 29 to 36 years. The highest mean CBMN frequency (13.76) shown by subjects between 7 to 9 birth order. Majority of the study subjects were belonged to rural (69.3%) followed by urban area (20%) and coastal area (10.6%). The highest mean CBMN frequency was observed in urban area (13.54). Subjects with parental consanguinity showed highest mean CBMN frequency of 13.45. Subjects having 6 to 11 years of married life showed highest mean CBMN frequency of 13.27. From the study subjects, 9 (12%) subjects were showed a high social status with a highest mean CBMN frequency of 13.69. 64 subjects (85.3%) were belonged to middle social status and showed a mean CBMN frequency (13.11). On the basis of BMI, subjects with <20 Kg/m<sup>2</sup> showed mean CBMN frequency of 12.06 and 20 to 25 Kg/m<sup>2</sup> showed mean CBMN frequency of 13.02. Highest mean CBMN frequency (13.33) showed by subjects with BMI >25 Kg/m<sup>2</sup>.

**Table 2:-** Distribution of mean CBMN frequency according to various clinical characteristics

Category	Variables	Total	Percentage (%)	Mean CBMN Frequency
Family H/o infertility or subfertility	Yes	6	8	13.19
	No	69	92	13.18
Family H/o cancer	Yes	3	4	13.22
	No	72	96	13.18
Family H/o chronic illness	Yes	71	94.6	13.19
	No	4	5.3	12.93
H/o X-ray exposure	Yes	70	93.3	13.19
	No	5	6.6	13.05
Menstrual periods	Irregular	38	50.6	13.21
	Regular	37	49.3	13.16

Menarche (years)	13 to 15	69	92	12.87
	16 to 18	6	8	13.21
Endometriosis	Yes	9	12	13.22
	No	66	88	12.91
Contraceptive drugs used	Yes	12	16	13.18
	No	63	84	13.16
Clinical conditions	Abortion	30	40	13.35
	Infertility	45	60	13.07

The subjects were grouped on their clinical characteristics such as family history of infertility or subfertility, family history of cancer, family history of chronic illness, history of X-ray exposure, menstrual periods, menarche, endometriosis, contraceptive drugs used and clinical condition (Table 2). Subjects with family history of infertility/subfertility (8%) showed highest mean CBMN frequency of 13.19. Subjects with family history of cancer showed higher mean CBMN frequency (13.22) than subjects without family history of cancer. Family history of chronic illness was reported in 71 out of 75 study subjects with mean CBMN frequency of 13.19. Subjects with irregular menstrual periods showed high mean CBMN frequency of 13.21. Majority of study subjects (n=69; 92%) attained menarche between 13 to 15 years of age and the remaining 6 subjects attained menarche between 16 to 18 years. Those who attained menarche between 16 to 18 years of age showed highest mean CBMN frequency of 13.21. Nine subjects had endometriosis with mean CBMN frequency of 13.22. Consumption of contraceptive drugs was reported in 12 out of 75 study subjects and their mean CBMN frequency was 13.18.

**Table 3:-** Distribution of mean CBMN frequency according to various biochemical and endocrinological characteristics

Category	Variables	Total	Percentage (%)	Mean CBMN Frequency
Fasting blood sugar (FBS) (mg/dl)	70 to 100	7	9.33	13.17
	101 to 126	30	40	13.19
	>126	38	50.6	13.20
Total Cholesterol (mg/dl)	<200	26	34.6	13.04
	≥200	49	65.2	13.2
HDL (mg/dl)	21 to 31	18	24	13.27
	32 to 42	44	58.6	13.22
	43 to 51	12	16	12.95
LDL (mg/dl)	<100	6	8	13.13
	100 to 150	32	42.6	13.18
	>150	37	49.3	13.19
TG (mg/dl)	<150	53	70.6	13.04
	150 to 250	19	25.3	13.10
	>250	3	4	13.22
Follicle stimulating (FSH) (mIU/ml)	<25	41	54.6	13.09
	25 to 30	12	16	13.24
	>30	22	29.3	13.37
Luteinizing hormone (LH) (mIU/ml)	<45	16	21.33	13.04
	45 to 60	41	53.33	13.18
	>60	19	25.33	13.30
Estradiol (pg/ml)	<25	8	10.6	12.84
	25 to 75	36	48	13.20
	>75	31	41.3	13.24
Prolactin (ng/l)	<25	24	32	13.02
	≥25	51	68	13.53

The subjects were grouped on their various biochemical and endocrinological characteristics such as FBS, total cholesterol, HDL, LDL, TG, FSH, LH, Estradiol and Prolactin (Table 3). Normal FBS was reported in 7 (9.33%)

subjects and remaining subjects were pre-diabetic and diabetic. The mean CBMN frequency of pre-diabetic subjects and diabetic subjects were 13.19 and 13.20. Normal serum total cholesterol was reported only in 26 (34.6%) study subjects and the remaining subjects were hypercholesterolemic (>200 mg/dl). The mean CBMN frequency of hypercholesterolemic subjects were 13.2. Subjects with triglyceride value <150 mg/dl showed mean CBMN frequency of 13.04. Highest mean CBMN frequency (13.22) was shown by subjects with triglyceride value >250 mg/dl. The study subjects showed FSH value >30 mIU/ml had higher mean CBMN frequency (13.37) compared to <25 mIU/ml (13.09) and 25 to 30 mIU/ml (13.24). Study subject with LH level >60 mIU/ml showed highest mean CBMN frequency of 13.30. Subjects with >75 pg/ml value of estradiol showed highest mean CBMN frequency of 13.24. Majority of the subjects have prolactin level  $\geq 25$  ng/l and showed highest mean CBMN frequency of 13.53.

### **Discussion:-**

The prevalence of female infertility varies worldwide ranging from 3% to 7%. Polycystic ovarian syndrome is a common condition estimated to affect 4-18% women in the reproductive age. PCOS is associated with reproductive, psychological, metabolic and cardiovascular diseases (Boomsma et al., 2006).

According to Zlotogora, (2006) in communities with a high level of consanguineous marriage, diagnosis of a recessive disorder in one or more members of the same family is generally indicative of a recent mutation, whereas the presence of a rare disorder in several families suggests an older mutational event or previous admixture through marriage with a person from another community. In the present study, subjects with parental consanguinity showed highest mean CBMN frequency.

Mokhtar et al., (2006) revealed that females with the age of menarche more than 15 years were more risky to develop infertility than those with age of menarche less than 15 years. In the present study, the subjects with advancing age of menarche were showed a high mean CBMN frequency.

BMI is a common feature in women with PCOS, with prevalence of 30-70%. Certain single nucleotide polymorphism associated with obesity and it contributed to elevate the body mass index in PCOS (Ewens et al., 2011). The present study showed a high CBMN frequency among the subjects with obesity.

According to Wijeyaratne et al., (2005) those with PCOS had significantly higher median BMI. Regarding BMI, 69.2% of overweight/obese patients had polycystic ovary morphology. The higher incidence of overweight may be linked to the lack of exercise amongst women and fatty food habits. Increasing BMI was significantly related to an increasing trend in the proportion of women with the metabolic syndrome. PCOS is one of the most common risk factor among female infertility. Thus in the present study it is showed that mean CBMN frequency increases with increasing the BMI.

According to Guastella et al., (2010) patients with polycystic ovaries have statistically significant higher LH levels and LH/FSH ratios than patients with normal ovaries. In the present study, majority of the subjects were shown hormonal disturbances and also increased mean CBMN frequency.

### **Conclusion:-**

The present study involves Cytogenetics and Molecular Genetics on Female Infertility with Special Emphasis on Polycystic Ovarian Syndrome. The distribution of mean CBMN frequency according to demographic, clinical and biochemical characteristics of the study subjects was observed. Age, birth order, parental consanguinity, and BMI etc. showed increased level of mean CBMN frequency. The level of mean CBMN frequency was high among those who have the family history of infertility, family history of cancer and family history of chronic illness. FBS, total cholesterol, FSH, LH, prolactin and estradiol were also found to be significantly elevated in study subjects. These findings suggest that the women with PCOS have a high risk for infertility. While PCOS cannot be prevented or cured, it can be controlled, with varying degrees of success, by maintaining a healthy diet and by exercising. Healthy lifestyle factors, including exercise, are associated significantly with reduced DNA damage.

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### RESEARCH ARTICLE

#### PRE-OPERATIVE AND POST-OPERATIVE VOLUMETRIC ANALYSIS OF ORBIT IN UNILATERAL ORBITAL FRACTURE.

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Orbital fracture, enophthalmos, orbital volume, CT scan

#### Abstract

**Background And Objective:** Loss of vision, Diplopia and Enophthalmos are major complications of orbital fracture, possibly leading to functional eye impairment and disturbed facial appearance.

**Aim:** we compared the changes in orbital volume of patients with unilateral orbital fractures treated surgically and conservatively with normal contralateral orbit.

**Method:** We measured volumes of hard tissue defects of orbit in 54 patients by facial CT scan, and degree of enophthalmos by Hertel's exophthalmometer, post trauma, 7<sup>th</sup> day and at 3 months interval and compared it with normal contra lateral orbit. Patients having orbital fracture with no deficit were managed conservatively and those with any ophthalmic defect, were surgically treated.

**Result:** Out of 54 patients, 23 patients were treated surgically and rest were managed conservatively. Among 53 patients, 18 patients showed enophthalmos, four patients showed diplopia and five showed extraocular muscle entrapment and two had complete loss of vision.

**Conclusion:** Patients who were surgical treated showed significant improvement in ocular activity and restoration of normal orbital volume.

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#### Introduction:-

The face occupies the most prominent position in the human body and renders it vulnerable to injuries quite commonly. The zygomatic bone or zygoma is a strong buttress on lateral portion of middle third of facial skeleton and is responsible for midface contour and protection of orbital contents. The prominence of zygomatic bone predisposes it to bear the brunt of facial injuries. The etiology of the zygomatic complex fractures include road traffic accidents, assaults, falls, sports and missile injuries.

Zygomatic complex fractures are more prevalent in males. They range in age from 18-70 years, with a mean age of 32 years<sup>[1]</sup>. Patients in the 21-30-year age group are most often involved. There is a significant association between road traffic accidents and fractures among the age groups.

Common clinical features of zygomatic complex fractures include diplopia, enophthalmos, subconjunctival ecchymosis, flattening of the cheek, gagging of the occlusion and sensory disturbances. Diagnosis of zygomatic complex fractures is usually clinical, with radiographic confirmation. In this study, the volumetric analysis of hard tissue defects of orbit was measured by facial CT, and degree of enophthalmos and exophthalmos by Hertel's

Exophthalmometer after injury and after healing of zygomatico-orbital fractures and compared with healthy contra lateral eye.

### **Material and Methods:-**

Fifty four patients with unilateral zygomatico-orbital fracture reported to the casualty and interdepartmental referral patients of Sri Aurobindo Institute of Medical Sciences was evaluated with a follow up at three month. Facial CT (Somatom, Definition AS, 64 slices) for axial images (start at the mid-orbit and work upward and downward), for coronal images (work anteriorly and posteriorly from the mid-orbit) & for sagittal images (work from medial to lateral), was taken after injury and after healing of zygomatico orbital complex and the change in orbital volume & soft tissue volume due zygomatico-orbital fracture was evaluated and compared with healthy contra lateral eye. The following parameters was evaluated: (a) Magnitude of displacement (minimal, moderate, severe), (b) direction of displacement of zygomatic complex at frontozygomatic suture, (c) location and extent of internal orbital fractures, (d) anteroposterior and mediolateral dimensions of internal orbital fracture defects, (e) the overall volume of healthy & fractured orbit, (f) Time gap between the occurrence of fracture and surgery, enophthalmos measured by Hertels Exophthalmometre. Patients with unilateral zygomatico-orbital fracture were included in the study. Patients with bilateral zygomatico-orbital complex fracture and who was unable to follow the instructions of the study protocol, or to comprehend information about this study and give voluntary consent were excluded.

### **Results:-**

A total of 54 patients of zygomatico-orbital complex fracture between the year 2012- 2014 were included in this study. The CT examination and the orbital volume measurement in all these patients was made and compared to the non involved side. The mean patient age was 27 years. The time interval after injury to surgical intervention was between five -seven days

Isolated blowout fracture with severity ranging from minimal or undisplaced to severely displaced was present in 54 patients. Among these 32 had right side and 22 on left side. These patients were further divided into two groups based on treatment protocol Group A (n =23) was surgical management and group B (n=31) was conservative management. In Group A, 21 patients were males (91.3%) and two patients were female (8.7%). In Group B, 29 patients were males (93.5 %) and remaining two were females (6.5 %). These data shows that more than 90% of patients with orbitozygomatic complex fracture were males.

### **CT Measurements:-**

CT measurement were done according to the following parameters: Anteroposterior (AP), Mediolateral (ML), and Superoinferior (SI) distance were measured in the normal and involved eye pre operatively and post operatively.

### **Group A – Surgical Treatment:-**

#### **Linear Measurements:-**

The mean of ‘anteroposterior measurements’ in the normal eye was 45.647 mm. (SD +/- 3.5) The pre operative measurement of the involved eye was 46.304 mm. (SD of +/- 3.5). Post operative measurements were calculated at seventh day (45.721 mm.) and at three months (45.735 mm.) with SD +/- 2.8.

The mean of ‘mediolateral distance’ of patients of the normal eye was measured at 35.469 mm. The mean pre-operative measurement of involved eye was 37.047 mm. indicating a significant increase in ML distance. Post-operatively the mean measurement on the seventh day (36.528 mm.) and three month post-op (36.273 mm.) shows a mild improvement from pre-operative measurement but not a complete restoration towards normal eye measurements.

The mean of ‘superoinferior measurements’ of the patients were at 38.508 mm. and the mean measurement of involved eye was 45.222 mm. shows significant increase due to trauma. The post-operative mean measurements at seventh day 39.449 mm. and three months post-op 39.270 mm. showing significant improvement post-operatively.

### **Volume Measurements:-**

The mean volume measurement of the uninvolved eye was 27.558 mm<sup>3</sup>. (SD +/- 3.56) whereas the mean orbital volume of involved eye was around 29.504 mm<sup>3</sup>. (SD +/-3.3). On the seventh post-operative day the mean orbital

volume was reduced to 28.604 mm<sup>3</sup> and it was further reduced to 28.360 mm<sup>3</sup> at three months after surgery. (Table 1). Here a significant decrease in the volume post-operatively was recorded. (Fig.3)

### **Group B – Conservative Management:-**

#### **Linear Measurements:-**

The mean AP measurements in the normal eye were 45.300 mm. (SD +/- 3.5) and 45.493 mm. in involved eye (SD +/- 3.6). The mean measurement at seventh day and three months follow up was 45.558 mm. (SD +/- 3.5) and 45.461 mm. (SD +/- 3.5). The mean ML measurement in the normal eye 33.754 mm. (SD +/- 3.0) and in involved eye was 34.297 mm. (SD +/- 3.1). The seventh day and three month follow up the measurements were 34.297 mm. (SD +/- 3.1) and 34.242 mm. (SD +/- 3.1). The SI measurement in the normal eye 38.358 mm. (SD +/- 4.6) and in involved eye was 38.822 mm. (SD +/- 4.7). The seventh day and three month follow up the measurements were 38.822 mm. (SD +/- 4.7) and 38.790 mm. (SD +/- 4.7).

#### **Volume measurements:-**

The mean volume measurement of the uninvolved eye was 28.418 mm<sup>3</sup>. (SD +/- 3.7) whereas the mean orbital volume of involved eye was around 28.816 mm<sup>3</sup>. (SD +/- 3.6). On the seventh follow up day the mean orbital volume was reduced to 28.793 mm<sup>3</sup>. and by three months follow up it remains unchanged i.e. 28.793 mm<sup>3</sup>. (Table 2.) This indicates that there is restoration of the orbital volume towards normal but still some discrepancy remains. (fig.4)

#### **Ophthalmologic Evaluation:-**

Among 54 patients all the patients had circumorbital ecchymosis, subconjunctival hemorrhage and periorbital oedema associated with involved eye. 18 patients (33.9%) showed enophthalmos as compared to normal contralateral eye and out of which 14 patients (60.9%) were treated surgically. four patients (7.5%) had diplopia and five patients (9.4%) had restricted eye movements. two patients had loss of vision, one reported with corneal laceration and one with blurred vision. (fig. 5)(Table 3.)

Out of 54 patients, 18 (33.9%) had fracture of infraorbital and lateral wall of orbit, 31 (56.6%) had infraorbital wall fracture, two (3.7%) had supraorbital wall fracture, one (1.9%) had medial wall fracture and two (3.7%) had infraorbital and medial wall fracture. (Table 4)

Among the patients treated surgically one patient (4.3%) had minimally displaced fracture, 13 (56.5%) had moderately displaced fracture and nine (39.1%) had severely displaced fracture. Whereas the patients managed conservatively 22 patients (71%) had minimally displaced fracture, eight (25.8%) had moderately displaced fracture and one patient (3.2%) had severely displaced fracture. (Table 5)

#### **Measurement of Enophthalmos:-**

In our study 18 patients were found to have enophthalmos among which 12 patients had enophthalmos less than 2 mm. and six patients had enophthalmos greater than 2 mm. Based on the clinical features like severity of fracture, presence of diplopia, restriction of eye movements 14 patients were treated surgically and four patients were managed conservatively.

Based on the treatment protocol Group A was evaluated for enophthalmos using Hertel's exophthalmometer. The maximum enophthalmos in our study group was found to be 4 mm. These patients underwent early surgical intervention with orbital floor exploration, release of muscle entrapment, retrieval of fat tissue and reconstruction of floor with titanium mesh. There was a significant improvement up to 2 mm. in enophthalmos post operatively. one patient had complete resolution of enophthalmos after three months (0 mm.). Pre operatively the mean enophthalmos in affected eye was 1.39 mm. (SD +/- 0.499) and post-operatively after three months it improves to 1.34 mm. (SD +/- 0.507) showing highly significant ( $P=0.00$ ) according to paired sample test ( $P>=0.05$ ). In Group B the mean of pre-operative enophthalmos was 1.87 mm. (SD +/- 0.341) and during the final measurements with conservative treatment protocols also the enophthalmos has improve to 1.45 mm. the improvement is shown to be significant ( $P=0.00$ ) according to paired sample test ( $P<=0.05$ ).

#### **Discussion:-**

Orbital fractures in maxillofacial trauma are frequent findings. These fractures are of obvious ophthalmologic importance as the orbit houses the eye and soft tissue structures supporting the globe. Direct or indirect injury to

orbit may lead to ophthalmic functional impairment and aesthetic deformity. The management of the orbital fractures has evolved with the advent of surgical techniques, imaging modalities and use of various alloplastic materials. Accurate diagnosis and treatment can limit the late complications like diplopia, enophthalmos and motility defects. Very few studies were performed to assess the quantitative and qualitative defects of these injuries. Here, in this study we measured the quantitative defect of orbit after trauma through CT scan and qualitative improvement after treatment.

Orbital fractures have been classically classified into blow out and blow in fractures by Smith and Regan. The treatment plan in either type of fractures has been generally based on the severity of the fractures, associated functional impairment and evident aesthetic deformity. When treatment options have been considered according to Edward Ellis III<sup>[2]</sup> et al the CT scans were examined for the details like magnitude of ZMC displacement (minimal, moderate, severe), direction of ZMC displacement/ rotation at the fronto-zygomatic suture region, location of internal orbital fracture defect, anteroposterior and mediolateral dimensions of the internal orbit fracture defect and the vertical dimension of orbital soft tissue prolapse into the sinus.

In our study based on the severity of the orbital fracture 23 patients were surgically treated as they fell under the category of moderate to severely displaced fracture and 31 patients which were having minimally displaced or undisplaced fracture were treated conservatively.

The status of the internal orbit after reduction of ZMC was determined by Edward Ellis III<sup>[1]</sup> et al and found that volume change of the injured orbit can change either due to comminuted fractures or significantly displaced fractured segments causing change in shape of the orbit.

In our study the linear CT measurements were done according to parameters like anteroposterior, mediolateral and superoinferior dimensions pre-operatively and post-operatively that was compared with normal contralateral eye. A significant improvement in linear measurements was recorded postoperatively which improved from the seventh post op day to three months gradually. A major difference was found in orbital volume in patients with moderate to severely displaced fractures (28.36 mm<sup>3</sup>). There was no significant difference in patients with minimally displaced or undisplaced fractures. The complete restoration of the linear measurements was not seen at the end of three months follow up in patients treated either conservatively or surgically.

The patients with minimally displaced or undisplaced fracture were treated conservatively (Group B) as there was not much discrepancy (28.816 mm<sup>3</sup>) in the orbital volume pre operatively. After three months follow up mild improvement in the volume was seen (28.793 mm<sup>3</sup>) as compared to uninvolved eye (28.418 mm<sup>3</sup>). The patients with moderate to severely displaced fracture had significant change in volume pre operatively (29.504 mm<sup>3</sup>). These patients were treated surgically (Group A) and the orbital walls were anatomically reduced in position. Post operatively there is significant improvement in orbital volume towards normal (27.558 mm<sup>3</sup>) at seventh post operative day (28.604 mm<sup>3</sup>) and by the end of three months (28.360 mm<sup>3</sup>). This data suggests that surgical treatment brings about a significant improvement in the restoration of the orbital volume.

Enophthalmos is the most common complication caused by discrepancy between soft tissue volume and bony volume in the orbit. It may result from failure to anatomically restore the orbital fracture or from loss or atrophy of the orbital soft tissue. According to Edward Ellis<sup>[2]</sup> et al approximately 1cu.cm. displaced orbital soft tissue (or increase in orbital volume) produces 1mm. enophthalmos.

In our study 18 patients reported to us with enophthalmos. In all these patients enophthalmos were measured by hertel's exophthalmometer. Further these patients were divided on the basis of extent of enophthalmos ; those that had less than 2 mm enophthalmos (n=12) and rest more than 2 mm (n=6). Along with the six patients who had enophthalmos more than 2 mm another eight patients (enophthalmos less 2 mm) were subjected to surgical treatment taking into consideration all the clinical features, functional and the esthetic disabilities.

The maximum enophthalmos in our study group was found to be 4 mm. Patients with enophthalmos greater than 2mm were those with blow out fractures, entrapment of muscles and herniation of fat in maxillary sinus. These patients underwent early surgical intervention with orbital floor exploration, release of muscle entrapment, retrieval of fat tissue and reconstruction of floor with titanium mesh. There was a significant improvement up to 2 mm. in enophthalmos post operatively. one patient had complete resolution of enophthalmos after three months (0 mm.).



This data proves that surgical treatment is mandatory in patients where enophthalmos is more than 2 mm and the investigatory modalities reveals herniation of fat into maxillary sinus. In the patients who had treated conservatively had enophthalmos less than 2 mm and showed mild improvement (mean).

According to Zhiyong Zhang<sup>[3]</sup> et al the overall volume of herniated orbital contents correlated significantly with the amount of enophthalmos. The volume of herniated soft tissues posterior to the eyeball equator showed correlation with the amount of enophthalmos. In our study group 18 patients who had enophthalmos, ten patients had combined infraorbital and frontozygomatic fractures, five patients had isolated infraorbital fracture, two had combined infraorbital and medial wall fracture and one patient had isolated medial wall fracture.

Diplopia is potentially one of the serious complications. Early diplopia indicates involvement of extraocular muscle either through entrapment, edema, hemorrhage or damage to motor nerves. Man<sup>[4]</sup> et al recommended that if vertical limitation exists with large herniation of orbital contents into maxillary sinus, a 'wait and see' policy should be employed to allow resolution of the initial hemorrhage and residual edema and if eye movements improve should be delayed. Hiroki Yano<sup>[5]</sup> et al suggested that in punched out and burst type of fractures, early diplopia may result from temporal palsy after neurogenic or musculogenic injury, and its frequently diminishes within two-three days, but if it remains, the hung up contents or dislocated muscle position can be properly attended through elective surgery. Diplopia resulting from alteration of orbital form can also be reconstructed electively. In our study we encountered four patients with diplopia. In three patients the diplopia was completely resolved after three months post surgery. And in one patient there is mild improvement in diplopia post operatively as he reported to us 20 days post trauma.

Muscle incarceration is common in punched out and burst type of fractures and it requires immediate surgery. According to Hiroki Yano<sup>[5]</sup> et al it presents a more serious condition in floor fractures rather than medial wall fractures because of the structural differences of the paranasal sinuses and herniation caused by forced tension caused by the Bells phenomenon at the time of injury. In our study five patients had restricted eye movements. They all underwent immediate surgical intervention with orbital floor exploration and release of muscle entrapment and reconstruction of the orbital floor. They all presented with complete resolution of diplopia with normal eye movements after three months. This indicates that in cases of diplopia with muscle entrapment early surgical intervention should be performed to save and improve the orbital muscle recovery. The literature suggests that the correction of muscle entrapment in the patients correlates to the degree of damage and time of surgery. Therefore in all our patients immediate surgical intervention were performed with good results.

### **Conclusion:-**

Surgical management of zygomatico-orbital fractures have been the mainstay for restoring the orbital volume and improving the aesthetics of the patient. Evolution of high-tech radiographic modalities provide the clinician with stable platform to work out a holistic treatment plan and compare the results with the normal contralateral eye. Long term follow up of the patients who are managed conservatively is important to assess the healing of tissues as well as to counter and repair delayed complications.

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### RESEARCH ARTICLE

#### PHYSICO-CHEMICAL PARAMETERS APPLY TO ANALYSIS OF DRINKING WATER IN NANDED DISTRICT: MAHARASHTRA.

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#### Manuscript Info

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#### Abstract

Generally we have survey of drinking water of some selected area's in Nanded(MS). Nanded city having the population approximately 336129 and the chief sources of water supply are the Hand pumps, Bore wells, Wells, Ponds, Dam and River etc. The following parameters applied for monitoring of drinking water qualities for practical and study proposes. We are using some analytical parameter such as Temperature, pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Alkalinity, Hardness, Chlorides and Fluoride quantity in Drinking Water.

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#### Introduction:-

Water is an essential not only for survival of human being, but also for animal plants and all other living being. Water is one of the most valuable natural resources used for drinking, irrigation, navigation, propagation of wild life, fisheries etc. Ground water is the most important source of water supply for drinking, irrigation and industrial purpose. Increasing population and its necessities have led to the deterioration of surface and sub-ground water.

Water the matrix of life is exposed to pollution, unhealthy environment resulting in human affliction and diseases transmission due to rapid industrialization and population.

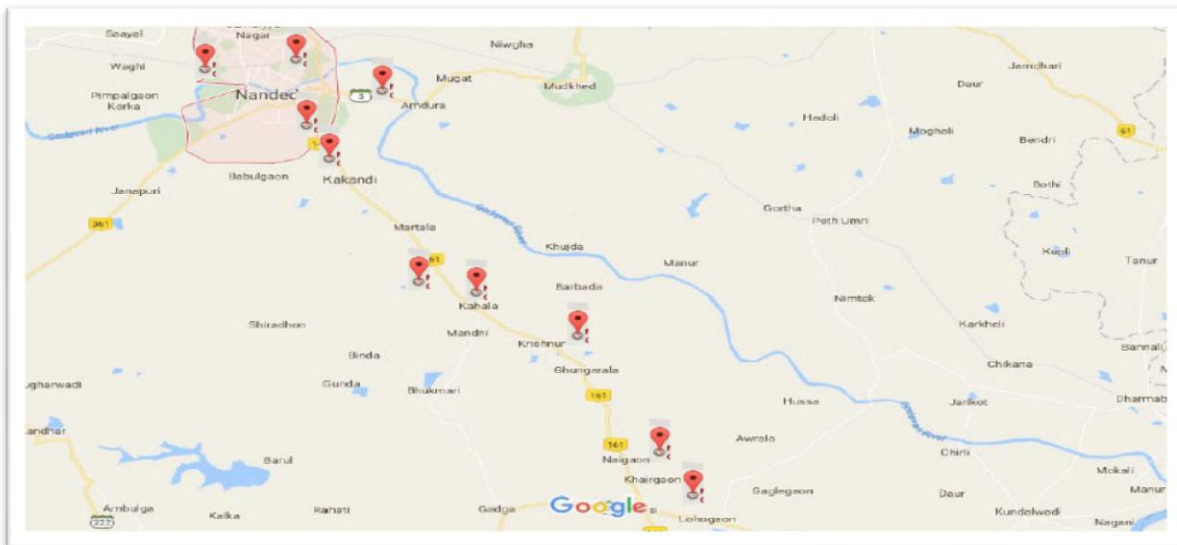
The monitoring and assessment of water quality on continual basis has become essential on part of the associated. Water quality can be defined on the basis of two criteria such as abiotic and biotic, along with the water quality standards are also formulated based on this classification of water quality through estimation of various parameters.

#### Materials And Methods:-

We have randomly selected ten area of Nanded District of Maharashtra show in table -I, collected drinking water samples in sterilized bottles from various water resources like as hand pumps, bore wells, wells, ponds, dam and river etc. We have applied some physicochemical parameter for analysis of drinking water qualities, like Temperature, Colour, Odour, pH, Electrical conductivity [EC], Total dissolved solids [TDS], Alkalinity, Hardness, Chlorides and Fluoride etc. First to know the Temperature of each samples at RT by thermometer in °C, pH by digital pH meter, electrical conductivity measured by conductivity instrument in  $\mu\text{s}/\text{cm}$ , TDS by disk filtration in mg/l. Titration Method used for Total alkalinity, total hardness and Ca concentration of drinking water known in mg/l. For chloride test,  $\text{AgNO}_3$  with  $\text{K}_2\text{CrO}_4$  indicator is used. Standard 0.02N  $\text{H}_2\text{SO}_4$  with methyl orange indicator is used for alkalinity measured in mg/l. Fluoride was estimated with standard method as prescribed by Groltman (1978), Trivedi and Geol (1984) and APHA (1998).

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Location sites

## \* Physico-Chemical Parameter Analysis of Drinking Water Samples.

Sr.No	Area of Nanded district	Resources	Temp °C	pH	TDS mg/l	Conductivity $\mu\text{s}/\text{cm}$	Alkalinity mg/l	Hardness mg/l	Ca mg/l	Cl mg/l	F mg/l
1	North Nanded	River	32	7.5	400	585	260	290	64	70	0.42
2	South Nanded	Dam	32	7.4	425	560	248	280	55	76	0.38
3	CIDCO Nanded	Hand pump	30	7.2	336	640	328	290	68	68	0.56
4	MIDC Nanded	Well	27	6.2	782	1262	140	428	180	60	0.65
5	Tupa	Hand pump	27	6.5	640	926	186	310	90	65	0.57
6	Malegaon	Tube well	25	7.7	414	802	340	280	85	72	0.06
7	Krishnur MIDC	Hand pump	30	6.4	624	1134	160	390	150	63	0.54
8	Kahala	Hand pump	28	7.4	276	432	290	234	64	70	0.24
9	Naigaon	Tube well	27	7.2	313	686	190	297	78	85	0.48
10	Narsi	Tube well	27	7.4	306	611	231	260	72	90	0.36

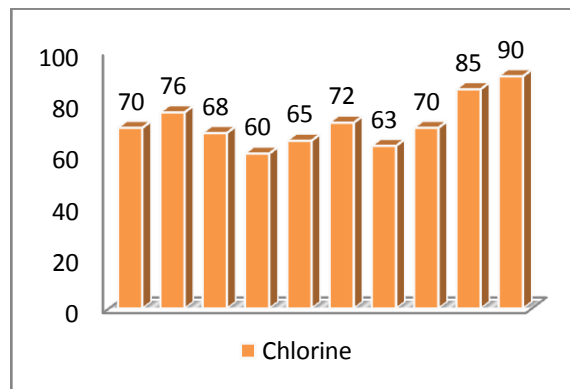
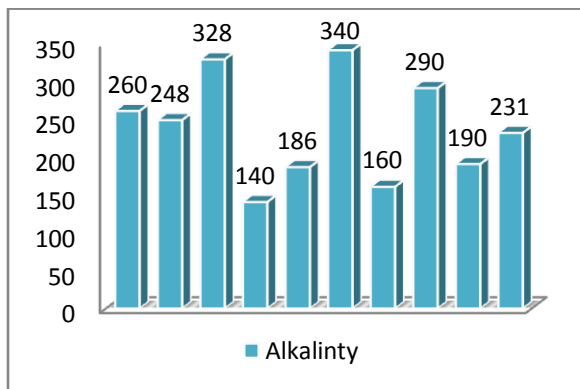
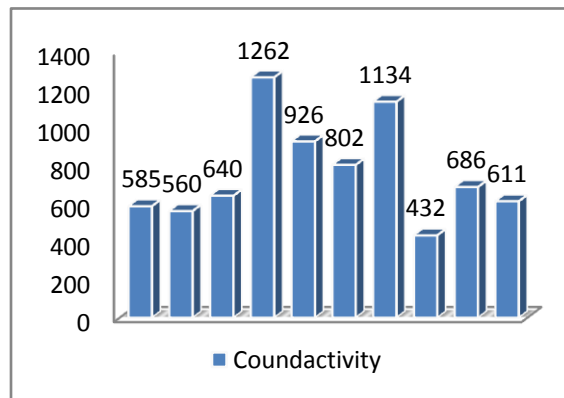
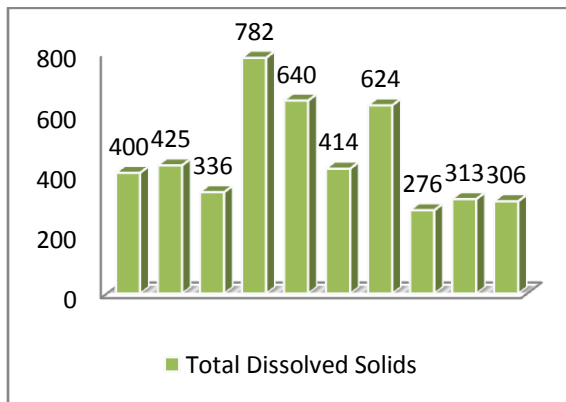
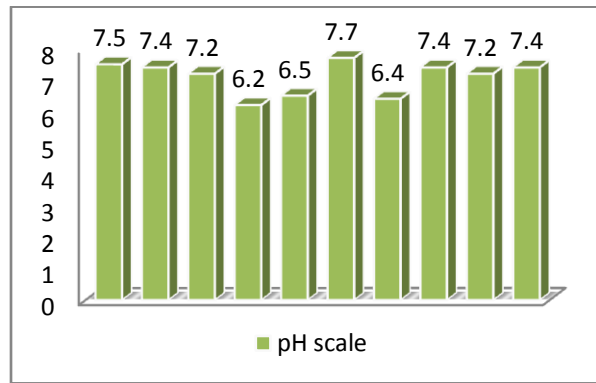
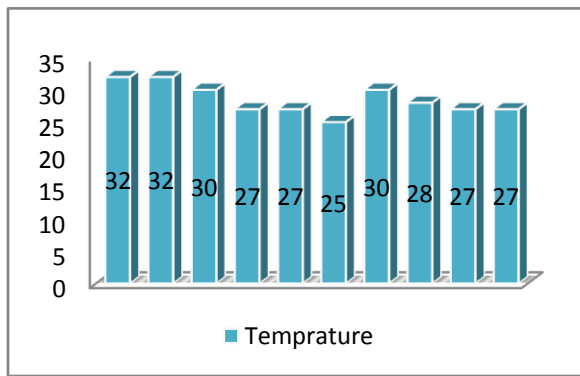
**Results and Discussions:-**

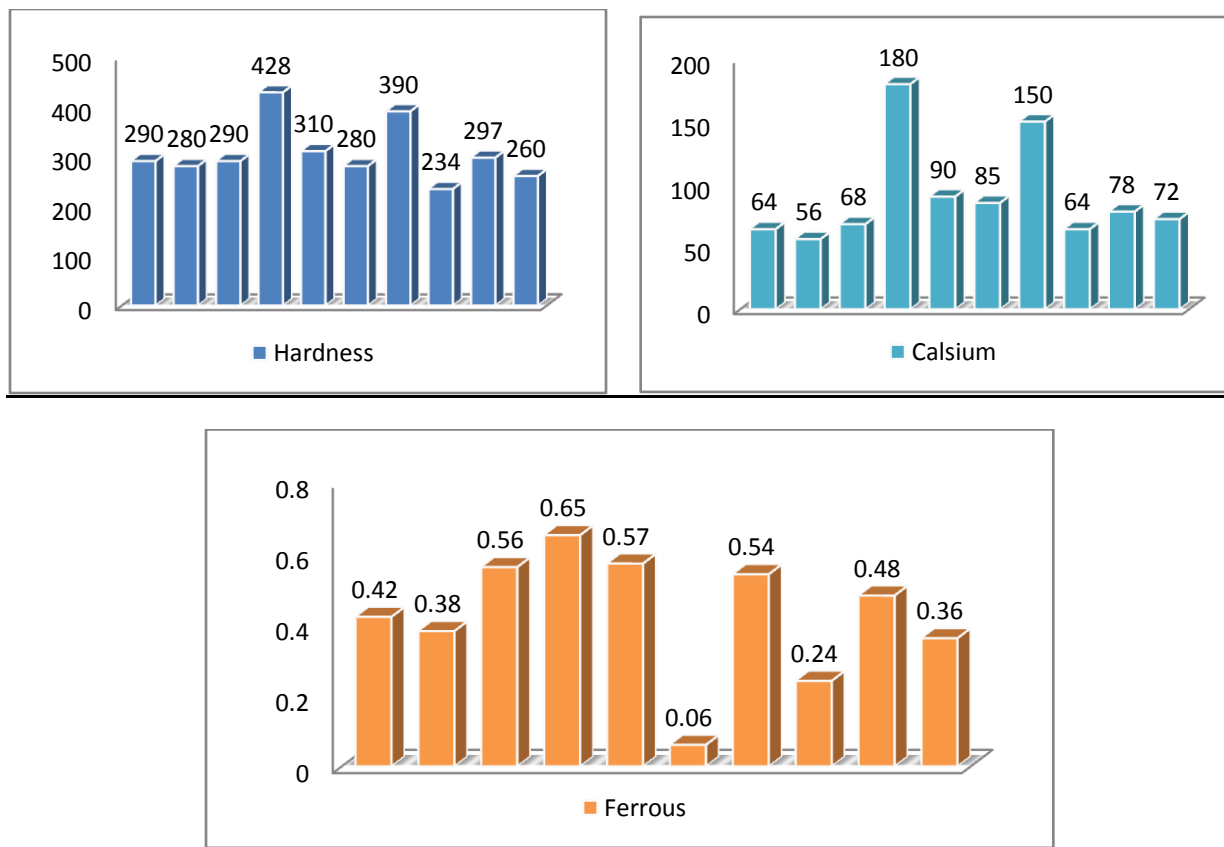
The pH values are normal drinking water ranges 6.5-8.5 on pH meter scale, most natural water is alkaline in nature due to presence of bicarbonate and carbonate. The carbonate are much stronger alkaline than bicarbonates.

we have gain pH value of water from selected area shown in table-I. The maximum pH value 7.7 Malegaon and minimum 6.2 MIDC Nanded (Maharashtra Industrial Development Corporation). The most of bio-chemical and chemical reactions changes the pH value of drinking water. The industrial area located in this area which exhaust there waste effluent without treatment. Commonly drinking water has EC range 500- 800  $\mu\text{s}/\text{cm}$  at 25°C. The EC is used to measure the concentration of dissolved solids substances in water [Navneet, *et al*, 2010]. We have our research gain results of EC highest 1262  $\mu\text{s}/\text{cm}$  at MIDC Nanded and another 1134  $\mu\text{s}/\text{cm}$  of Krishnur Nanded and lowest 132  $\mu\text{s}/\text{cm}$  Kahala as shown in fig. Alkalinity of water is due to the presence of hydroxide carbonates and bicarbonates total alkalinity for drinking water ranges 200-600mg/l we gain research. The results of the alkalinity maximum value 340 mg/l at Malegaon and minimum value 160 mg/l of MIDC Krishnur. Total hardness range 300-

600mg/l. The maximum values 428 mg/l at MIDC Nanded and lower value 234 at Kahala high value of hardness at MIDC attribute industrial west effluent discharge.

The recommended limit of Ca are 75-200 mg/l Our research experiments result are maximum concentration of Ca at MIDC site and minimum value 56 mg/l dam. Almost all natural water contain chloride ion .There concentration vary considerably according to the mineral content of the earth in any given area . In small amount it is not significant zn large concentration it present problem ,low to moderate concentration of chloride ion add palability to water. Zn fail it is for in fact this reason, excessive concentration of it ,can make water unpleasent to drink .The value of chloride in normal drinking water are range 250-1000mg/l .We have gain quantites of chloride such results the maximum value 90mg/l at Narsi and manimum value 70mg/l at Kahala. Recommended fluoride concentration in drinking water limits 1-1.5mg/l ,it is an essential constituent of drinking water mainly because of it's role in prevention of dental .We have gain experimental result ,the maximum value 0.65 at MIDC and minimum value at 0.24 at Kahala.





### Conclusions:-

The present study indicates the effect of overall development, industrialization and urbanization are felt on the quality of water has resulted few untreated wastes and impact can be easily observed by water minerals, properties changed.

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### RESEARCH ARTICLE

#### STUDIES ON PERFORMANCE OF DROUGHT TOLERANT GENOTYPES UNDER DROUGHT AND NORMAL CONDITIONS THROUGH MORPHO, PHYSIO AND BIOCHEMICAL ATTRIBUTES OF BLACKGRAM (*VIGNA MUNGO L.*) AND GREEN GRAM (*VIGNA RADIATA L.*)

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##### Key words:-

Quantitative characters, Leaf area,  
 Chlorophyll, Cell membrane stability,  
 Proline, Yields

#### Abstract

Six genotypes were studied of which each three genotypes from blackgram and greengram. Drought has been found to decline the almost all the morphological characters including leaf area in both the crops as compared to those of irrigated ones. The plant height is reduced, plants not having branches, even one or two plants having branches with shorter and unproductive, number of pods per plant, pod length and number of seeds per pod also much reduced. The hundred seed weight (g), single plant yield and dry matter production (kg/ha) were reduced compared to irrigated condition. The susceptible genotypes of Co 8 in greengram and Co 6 in blackgram were much reduced in all the biometrical characters compared to water stress tolerant genotypes VRM(Gg)1 and VMGG012-005 in greengram and VBN(Bg)4 and VBN(Bg)6 in blackgram. Among the genotypes CO 8 in greengram and CO 6 in blackgram had very low membrane stability. The reduction in photosynthesis under stress can also be attributed to a decrease in chlorophyll content in all the genotypes especially very high in Co 8 greengram and Co 6 in blackgram. The increased proline accumulation in drought tolerant genotypes of VRM(Gg)1 and VMGG 012 -005 in greengram and VBN(Bg)4 and VBN(Bg)6 in blackgram are showed tolerance to drought. The correlation between the leaf proline content and soil moisture content was found to be negatively correlated at the same time correlation between chlorophyll Stability index (CSI) and soil moisture was found to be positively significant in both greengram and blackgram.

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#### Introduction:-

Some of the existing ruling greengram and blackgram varieties have given minimum yield under water stress condition. To test verify the real fact of these varieties, the experiment was started with greengram and blackgram varieties. Water stress is abiotic factor affects plant's morphological, physiological and biochemical activities of the plant. Crop production is completely affected by periodical, regular and continuous droughts. Agriculture is the biggest consumer of water. Water is the main source involving for all activities of plant growth throughout the life of the crop plants. A complete Agriculture means which includes of seed to seed. Without soil seed will germinate

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but without water seed will not germinate. Water is essential medium for seed germination, seedling growth, vegetative period of the crops, flowering and translocate assimilate throughout the body of the plants from roots to top of the plants and leaf to bottom of the plants (Kijne., 2006) Food productivity is decreasing involved various factor such as drought, extreme temperature, cold, heavy metals, or high salinity, severely impair plant growth and productivity worldwide. But only Drought, being the most important environmental stress, severely impairs plant growth and development, limits plant production and the performance of crop plants, more than any other environmental factor (Shao *et al.*, 2008). Accumulation of proline in plants is a well known tolerance mechanism to drought stress which acts as cellular osmotic adjustor and also protects and stabilizes essential cell components like protein, photosynthetic apparatus and detoxify Reactive Oxygen Species (ROS) etc. Pulse crops green gram (*Vigna radiata L.*) and black gram (*Vigna mungo L.*) are two most important protein sources that are grown in all over India as well as in Tamil Nadu. In addition, it also plays an important role in sustaining soil fertility by fixing atmospheric nitrogen. Therefore in the present experiment we tried to evaluate the various, morphological, physiological and biochemical changes taking place in selected pulse genotypes under drought stress and normal condition.

#### **Aims and objectives:-**

1. To study the greengram and blackgram genotypes under water stress and normal condition to test verify the reality of tolerance and confirmation through morphological, physiological and biochemical parameters
2. To observe the changes in these parameters during drought.
3. To study the overall effect of drought on yield components.

#### **Materials and Methods:-**

A total of six genotypes taken for this study, four genotypes already known for tolerant to drought and high temperature under normal cultivation at field level which are again test verify the real drought tolerance of the varieties under irrigated and drought conditions. The drought tolerant genotypes namely VRM(Gg)1 and VMGG012-005 in greengram and VBN(Bg)4 and VBN(Bg)5 in blackgram were imposed to drought and irrigated situation along with check varieties of Co 8 in greengram and Co 6 in blackgram. This trials was laid out during January- March 2016 at TNAU Agricultural Research Station Virinjipuram, Vellore. The seeds was sown in 4x3 m<sup>2</sup> plot, four irrigations were given as per the schedule of 1<sup>st</sup>, 7<sup>th</sup>, 25<sup>th</sup> and 40<sup>th</sup> DAS. During growth and reproductive periods no irrigation was given in drought imposed plot of both greengram and blackgram crops. The morphological characters were recorded in both condition of normal and drought imposed plots. The biometrical characters namely plant height (cm), No. of branches / plant, Length of branches (cm), No. of pods per plant, Pod length (cm), No. of seeds per pod, Hundred seed weight (g), Seed yield / plant (g) and Dry matter production were recorded. The 10 plants from each genotypes were taken for work out the mean.

#### **Soil Analysis:-**

The collected soils were processed and analyzed for soil pH, EC using standard methods at the beginning of the experiments. Soil moisture was recorded immediately after second day of irrigation at middle of the plot in each in the irrigated plot and as same day soil moisture was also recorded in drought imposed. Soil moisture content was determined by gravimetric method at regular interval.

#### **Plant morpho-physiological analysis:-**

##### **Leaf membrane stability index:-**

Membrane stability index (MSI) was determined according to the method of Premchandra *et al.*, 1990) as modified by (Sairam, 1997). Leaf materials (0.1 g) were thoroughly washed in running tap water at 40 °C for 30 min. After the expiry of the period their electrical conductivity was recorded by conductivity bridge (C1). Subsequently the same samples were placed in boiling water bath (100 °C) for 10 min and their electrical conductivity recorded as above (C2). MSI was calculated with the following equation:  $MSI = [1 - (C1 / C2)] \times 100$

##### **Leaf area index:-**

Leaves from 10 plants in each genotype were cut and leaf area was measured in cm<sup>2</sup> by green leaf area meter (OSK-Model GA-5).

##### **Plant biochemical analysis:-**

Chlorophyll-a, chlorophyll-b and total chlorophyll were determined. The carotenoid content were also estimated as per the procedure. Chlorophyll stability index was also calculated periodically using the following formula:  $(CSI \%) = (\text{Total Chlorophyll under stress} / \text{Total Chlorophyll irrigated condition as control}) \times 100$ .

**Proline:-**

Determination of free Proline was estimated using the method of Bates et al. (1973). Samples were homogenized in 10 mL 3% (w/v) sulfosalicylic acid, and proline was assayed by the acid ninhydrin method. The absorbance was measured spectrophotometrically at 520 nm. Proline was calculated based on  $\mu\text{M. g}^{-1}$  FW. The Leaf proline content was analysed at 20<sup>th</sup> DAS and 40<sup>th</sup> DAS. The obtained data were analyzed using the statistical package PASW statistics.

**Results and Discussion:-**

In the present study which included six genotypes for the experiment and three genotypes from each crop of blackgram and greengram. During the crop period temperature and rainfall were recorded (Table 1.a). Soil moisture content was analyzed at four stages of the varietal plots and every time samples were taken for analysis at second day after irrigation (Table 1.) at both the conditions of Irrigated (Table 2) and drought (Table 3). There is no rainfall received during the entire period of the crop growth.

**Table :-** a Weather data - January 15.1.2016 – March 31.3.2016 during the crop period

Sl.No	Weekly Interval	Min Temp ( °C)	Max Temp (°C)	Rainfall (mm)
1	January -15.1.2016	13.0	30.0	No
2	22.1.2016	13.0	30.0	
3	29.1.2016	13.0	30.57	
4	5.2.2016	13.0	32.14	
5	12.2.2016	13.0	32.71	
6	19.2.2016	13.43	32.86	
7	26.2.2016	14.0	35.0	
8	4.3.2016	14.0	34.0	
9	11.3.2016	14.0	34.29	
10	18.3.2016	14.0	36.57	
11	25.3.2016	14.0	38.57	
12	March-31.3.2016	14.0	36.17	

**Table 1:-** Irrigation schedules for greengram and blackgram genotypes

Genotypes	First irrigation DAS	Second irrigation DAS	Third irrigation DAS	Fourth irrigation DAS	Fifth Irrigation DAS
<b>Normal condition</b>					
All varieties greengram and blackgram	1.0	7.0	25.0	40	0.0
<b>Drought condition</b>					
All varieties greengram and blackgram	1.0	7.0	0.0	0.0	0.0

**Table 2:-** Soil moisture content (%) under irrigated condition

<b>Greengram</b>				
	2 DAS	8 DAS	26 DAS	41 DAS
<b>VRM(Gg)1</b>	92.50	95.20	88.32	87.35
<b>VMGG 012-005</b>	92.80	95.50	87.45	86.88
<b>CO 8</b>	92.30	95.60	87.80	87.76
<b>Blackgram</b>				
<b>VBN(Bg)4</b>	93.25	97.25	86.85	85.25
<b>VBN(Bg)6</b>	94.55	92.13	87.28	86.28
<b>CO6</b>	93.50	94.16	88.20	86.52



**Table 3:-** Soil moisture content (%) under drought imposed condition

<b>Greengram</b>				
	<b>2 DAS</b>	<b>8 DAS</b>	<b>26 DAS</b>	<b>41 DAS</b>
<b>VRM(Gg)1</b>	91.20	93.10	40.12	22.20
<b>VMGG 012-005</b>	93.50	92.30	42.15	21.15
<b>CO 8</b>	92.30	95.60	47.20	20.35
<b>Blackgram</b>				
<b>VBN(Bg)4</b>	91.88	94.11	42.72	21.14
<b>VBN(Bg)6</b>	92.65	95.15	40.23	20.81
<b>CO6</b>	92.52	94.18	38.15	19.22

**Effect of drought stress on plant growth parameters:-**

In the present study, plant growth parameters in terms of height and all biometric characters including leaf area were observed and are presented in Table 4, Table 5 and Table 6. Drought stress has been found to decline the almost all the morphological characters in both the crops as compared to those of irrigated ones. The plant height is reduced, most of the plants not having branches, even one or two plants having branches with shorter and unproductive, number of pods per plant, pod length and number of seeds per pod also much reduced. The hundred seed weight, single plant yield and dry matter production were reduced compared to irrigated condition. The susceptible genotypes of Co 8 in greengram and Co 6 in blackgram were much reduced in all the biometrical characters including leaf area compared to water stress tolerant genotypes which shows susceptible to water stress. This reduction in plant growth in terms of all quantitative characters are due to the loss of cell turgor which greatly suppresses cell expansion and cell growth thereby inhibiting the linear growth of shoot observed more in drought susceptible genotypes. Stress tolerant genotypes somewhat better than the susceptible genotypes towards yield. (Tahir and Mehdi 2001) and Kamara *et al.*, 2003.

**Table 4:-** Morphological characters of greengram and blackgram genotypes under normal condition

Genotypes	Plant height (cm)	No. of branches / plant	Length of branches (cm)	No. of pods per plant	Pod length (cm)	No. of seeds per pod	Hundred seed weight (g)	Seed yield / plant (g)	Dry matter production (g)
<b>Greengram</b>									
VRM(Gg)1	35	3.2	27.5	28	9.8	10.2	3.2	8.0	28
VMGG 012-005	21.0	1.5	13.0	18.0	8.0	8.1	3.2	7.5	15
CO 8	20.0	1.2	12.0	15.0	8.0	8.0	3.2	7.5	12
<b>Blackgram</b>									
VBN4	30	3	28	45	6.0	7.3	4.2	9.0	25
VBN6	25	3	21	35	5.5	5.5	4.0	8.0	21
CO6	27	3	18	25	5.5	5.0	4.1	7.8	20

**Table 5:-** Morphological characters of greengram and blackgram genotypes under drought condition

Genotypes	Plant height (cm)	No. of branches / plant	Length of branches (cm)	No. of pods per plant	Pod length (cm)	No. of seeds per pod	Hundred seed weight (g)	Seed yield / plant (g)	Dry matter production (g)
<b>Greengram</b>									
VRM(Gg)1	22.0	1.0	15.0	12.0	7.5	6.0	2.8	3.0	15.0
VMGG 012-005	15.0	0.0	0.0	7.0	5.6	5.0	2.2	2.2	7.0
CO 8	13.0	0.0	0.0	5.0	5.0	6.0	2.2	1.5	6.0
<b>Blackgram</b>									
VBN4	20	1.0	13.0	15	5.0	5.0	4.0	5.0	13.0
VBN6	18	0.0	0.0	10	4.1	4.0	4.0	4.5	9.0
CO6	15	0.0	12.	3.0	4.5	4.0	3.8	3.5	8.0

**Table 6:-** Effect of drought stress on leaf area of greengram and blackgram genotypes

Greengram	Irrigated				Drought			
	2 DAS	8 DAS	26 DAS	41 DAS	2 DAS	8 DAS	26 DAS	41 DAS
VRM(Gg)1	-	0.70	8.5	9.5	-	0.71	6.8	5.9
VMGG 012-005	-	0.68	6.5	8.3	-	0.65	4.8	4.6
CO 8	-	0.65	6.8	8.2	-	0.64	4.1	3.3
Blackgram								
VBN(Bg)4	-	0.53	5.5	7.5	-	0.54	4.2	3.5
VBN(Bg)6	-	0.52	5.4	7.3	-	0.56	4.1	3.4
CO6	-	0.59	5.2	7.6	-	0.53	3.5	3.1

Hence it can be inferred that the slow decline in this growth parameter might be due to lack of adequate moisture decreased day by day in plant root zone which can be evidenced from the positive correlation between soil moisture and height of the plant which is in confirmatory with the findings of earlier workers (Baroowa and Gogai 2012).

The reduction of leaf area was more prominent in all the varieties that faced longest period of water deficit (55 days). Even reduction in complete drought imposed situation and the tolerant genotypes has considerable yielding capacity been observed in the all four varieties when same situation imposed in the drought and susceptible genotypes completely lower in all the characters. But these drought tolerant varieties are having capable of the osmotic adjustment to cell alive to protect for longevity and maintain the cell turgor. In susceptible genotypes show reduction in cell division resulting in reduced cell number and stop cell elongation inhibiting leaf expansion. This study agreed with many authors, cell elongation of higher plants can be inhibited by interruption of water flow from the xylem to the surrounding elongating cells (Nonami, 1998). Drought caused impaired mitosis; cell elongation and expansion resulted in reduced growth and yield traits (Hussain *et al.*, 2008). This modification in leaf anatomy is one of the basic causes which lead to reduction in average leaf size under water limiting situation (Bhaswatee Baroowa and Nirmali Gogoi 2012.). Plant height is a function of cell division, enlargement and differentiation (Hussain *et al.*, 2008) and in redgram (Nam *et al.*, 2001 and Kavar *et al.*, 2007 and Sairam *et al.*, 1997 and Saliendra et al 1995, Kaiser *et al.*, 1981).

#### **Effect of drought stress on cell membrane stability:-**

The genotypes shows a considerable decrease in the membrane stability in the plants grown under drought stress condition as compared to the irrigated plants for both the crops (Table 7). Plants kept under more than 55 days of water deficit had the lowest membrane stability value compared to the plants grown irrigated condition. Among the genotype Co 8 in greengram and Co 6 in blackgram had very low membrane stability. The decrease in cell membrane stability was found to be more in greengram. The Membrane stability index was found to be positively correlated with soil moisture content for both black gram and green gram cultivars (Baroowa and Gogai 2012). The lower MSI of Co 8 greengram and Co 6 blackgram accompanied with the greatest seed yield loss of this genotype. While other had highest value of MSI with normal seed yield may indicate the underlying physiological mechanisms that contribute in water deficit tolerance. (Yeilaghi *et al.*, 2012).

#### **Effect of drought stress on biochemical parameters:-**

In the present study, chlorophyll-a and chlorophyll-b content of both blackgram and greengram plants showed a decreasing trend with the increasing duration of drought which proved that these photosynthetic pigments are sensitive to water deficit condition Table 7. A continuous decrease in chlorophyll stability index was observed during the drought period more in CO 8 greengram and CO 6 blackgram. Chlorophyll Stability Index (CSI) is an indicator of the stress tolerance capacity of plants. A higher CSI helps plants to withstand stress through better availability of chlorophyll by maintaining more dry matter production and higher productivity. The drop down of CSI in greengram was faster than that of blackgram (Kiani *et al.*, 2008) and (Baroowa and Gogai 2012) and Chaves (2002) and Cornic G.,Massacci, (1996).

The reduction in photosynthesis under water deficit stress can also be attributed to a decrease in chlorophyll content. Water deficit reduced the chlorophyll content in water deficit susceptible genotypes and increased in water deficit tolerant genotypes. These results are in agreement with those of other oilseed crop (*Sesamum indicum*) (Abraham *et al.*, 2008). Differences in leaf chlorophyll content can be as an indicator of plant vigor and its capacity for photosynthesis, strongly dependent on chlorophyll content (Carter and Spiering, 2002). The significant variation for

Chl a, Chl b and carotenoid content has also been reported by other researchers (Jonson *et al.*, 1993). and Sharma and Hall 1991 and Nam *et al.*, 2001 and kavar *et al.*, 2007 and Long *et al.*, 1994. and Kolyorea 1958. and Rahman and Ahmad 2004 and Zhang *et al.*, 2008.

**Table 7:-** Membrane stability index (%), Chlorophyll a, Chlorophyll b, Chlorophyll a/b and carotenoid of blackgram and greengram genotypes under normal and stress condition.

Genotypes	Membrane stability index		Chlorophyll a		Chlorophyll b		Chl a+b		Chl a/b		Carotenoid	
	Irrig*	Drgt*	Irrig	Drgt	Irrig	Drgt	Irrig	Drgt	Irrig	Drgt	Irrig	Drgt
<b>Greengram</b>												
VRM(Gg)1	60.79	48.92	1.01	0.89	0.36	0.27	1.37	1.16	2.80	3.29	0.20	0.17
VMGG012-005	59.30	55.24	0.88	0.64	0.18	0.16	1.06	0.8	4.88	4.0	0.22	0.22
Co 8	61.19	50.35	0.83	0.70	0.29	0.18	1.12	0.99	2.86	3.88	0.21	0.19
<b>Blackgram</b>												
VBN(Bg)4	63.13	46.61	0.88	0.64	0.22	0.25	1.10	0.47	4.0	2.56	0.20	0.21
VBN(Bg)6	64.28	45.50	0.77	0.64	0.30	0.18	1.07	0.48	2.56	3.55	0.26	0.22
Co 6	65.28	42.91	0.87	0.76	0.29	0.23	1.16	0.52	3.0	3.30	0.24	0.13

\*Irrig: irrigated, Drgt: Drought, Chl: Chlorophyll

Proline accumulation helps in maintaining a better osmotic balance in plant cells suffering from water deficit. In the present study, more accumulation of proline was reported in leaf tissue with the increase in duration of drought stress (Table 8). Regular moisture supply through irrigation decreased the free proline content where as reverse the proline content is increased in leaf at water deficit condition. Varieties having different degree of drought resistance differ in their capacity to accumulate proline under stress. Resistant varieties like VRM(Gg)1 and VMGG012-005 in greengram and VBN(Bg)4 and VBN(Bg)6 in blackgram had accumulate higher level of proline under water stress. A similar trend was obtained by Ashraf and Ibram (2005), Ashraf and Foolad (2007) and Tawfik (2008) who found that osmoprotectants such as proline and glycine betaine (GB) were increased under drought stress. Ashraf and Foolad, 2007, Barrowa and Gogai 2012 and Bates *et al.*, 1973 and Sankar *et al.*, 2008 and Mohamadkhani and Heidari 2008 and Sundaresan and Sudhakaran, 1995.

**Table 8:-** Effect of proline content  $\mu\text{g/g}$  fresh weight at different time of gap irrigation and drought imposed

Genotypes	Free proline content ( $\mu\text{g/g}$ ) fresh weight			
	Irrigated		Drought	
<b>Greengram</b>				
	20 DAS		40 DAS	
VRM(Gg)1	60.5		60.6	
VMGG012-005	80.5		78.5	
Co8	52.1		52.4	
<b>Blackgram</b>				
VBN(Bg)4	58.0		58.5	
VBN(Bg)5	49.0		48.6	
Co6	35.2		35.0	

The correlation between the leaf proline content and soil moisture content was found to be negatively correlated (Table 9) at the same time correlation between chlorophyll Stability index (CSI) and soil moisture was found to be positively significant in both greengram and blackgram. (Premachandra *et al.*, 1992.)

**Table 9:-** Correlation co-efficient of different parameters

	TC		CSI		PRO		MSI		HT		LA	
	GG	BG	GG	BG	GG	BG	GG	BG	GG	BG	GG	BG
8 <sup>th</sup> DAS												
MC	.842*	-.417	.827*	.880**	-.857**	-.854**	.402	.714	.744	.780*	.743	.763
26 <sup>th</sup> DAS												
MC	.806*	.805*	.858**	.842*	-.858**	-.881**	.670	.728	.507	.527	.435	.5801
41 <sup>th</sup> DAS												
MC	.652	.808*	.828*	.853**	-.885**	-.872**	.488	.675	.052	.015	.251	-.030

\* Correlation significant at 0.05% probability level

\*\* Correlation significant at 0.01% probability level

(MC- Moisture Content, TC - Total Chlorophyll, HT - Plant Height, LA - Leaf Area, CSI - Chlorophyll Stability Index, MSI - Membrane Stability Index, PRO- Proline Content)

### Conclusion:-

In the present experiment, it has been observed that both the pulse varieties namely VRM(Gg)1 and VMGG012-005 in greengram and VBN(Bg)4 and VBN(Bg)6 in blackgram were significantly somewhat better yielding capacity in water deficit condition by drought tolerance mechanism when compared to greengram variety Co 8 and blackgram variety Co 6 susceptible. These varieties withstand to all such characters of membrane stability, high proline and maintain cell turgor even highest degree of drought (55 days of water deficit). The varieties namely VRM(Gg)1 and VMGG012-005 in greengram and VBN(Bg)4 and VBN(Bg)6 in blackgram has having physiological and biochemical capability for drought tolerance in water stress condition.

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### RESEARCH ARTICLE

## INTERACTOME ANALYSIS OF PROTEIN KINASES, GERMINATION-RELATED AND HORIZONTALLY TRANSFERRED GENES OF *NOSEMA BOMBYCIS* USING STRING.

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### Abstract

*Nosema bombycis* infects *Bombyx mori* upon spore germination utilizing a characteristic mechanism to invade host cell. The uptake of microsporidian spore is either by spore-host interaction or by endocytosis. The molecular mechanism leading to such interactions is not well elucidated. The expansions of *N. bombycis* genome have acquired many horizontal genes and interact with protein kinases, involved in defense mechanism and cell cycle events. Present study aimed towards understanding these interactions as spore germination being vital process in pebrine infects silkworms through spore endocytosis. Using STRING - the molecular functions of all these proteins and its functional partners in the interactome were analyzed and annotated. Further, the protein-protein interactions network was analyzed to study the functional interaction partners that could decipher the mechanism triggering uptake of spore through endocytosis. A total of 50 proteins including protein kinases, horizontal transfer and germination related genes were studied emphasizing CDC28 activation of VPS34 which inturn mediated the activation of CDC10 leading to spore wall formation. In conclusion, results highlighted the most possible mechanism triggering endocytosis of microsporidia and functional contribution of protein kinases and genes involved in horizontal gene transfer to the *N. bombycis* germination and survival strategy.

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### Introduction:-

Microsporidia have attracted much attention as they infect a variety of species ranging from protists to mammals<sup>1</sup>. Almost half of the reported genera of microsporidia use insects as primary hosts, and microsporidian infections usually have chronic and sublethal effects on their hosts. *Nosema bombycis*, the first named microsporidia species, is the causative agent of devastating pebrine disease in silkworm, *Bombyx mori*. *N. bombycis* infects silkworms both vertically (from mother to progenitor eggs) and horizontally (transovarially), damaging gut, malpighian tubules, silk glands and fat bodies causing larval inactivation and retarding the larval development and finally leading to silkworm death<sup>2</sup>. With the appropriate external stimuli trigger or direct contact with host cell, *N. bombycis* spore rapidly extrudes polar tube from the anterior end in a process called germination. Germination is the most important

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and foremost step in the infection of silkworm by *N. bombycis*<sup>3</sup>. The invasion into the host cell is by the mechanism of polar tube extrusion<sup>4</sup>.

Comparative genomics of *N. bombycis* shows that the genome is astonishingly expanded as compared to the distantly related *N. ceranae* and this large genome size is due to the proliferation of host-derived transposable elements, horizontally transferred genes (HGT) from prokaryotes, and the production of segmental and tandem duplicates<sup>5</sup>. Based on the review of literature, 55 genes were identified to be involved in horizontal gene transfer, among these, 21 HGT genes had unknown function and 34 had predicted gene functions.

Further, protein kinases that form a large group of enzymes which transfer phosphate group from ATP to a number of proteins are involved in the mechanism of signal transduction leading to the *N. bombycis* infection<sup>6</sup>. These protein kinases are generally known to be involved in cell cycle events, cell proliferation, development, metabolism, signal transduction and stimulus to external signals. Genomic kinomes of *N. bombycis* revealed that there are 41 protein-kinases belonging to serine-threonine class<sup>7</sup>. Although there are studies that focused on actions of proteins derived from HGT and also germination related transcriptomics<sup>8</sup>, there are no clear studies that depict the involvement of protein kinases in association to germination. The computational studies of physical and functional interactions prediction generates more robust interactome as the interactions integrate to provide completely annotated information. In view of this, understanding the interactome helps in understanding the biological significance of spore invasion, thereby leading to infection. The present study analyzes the functional interactions of acquired horizontal proteins and *N. bombycis* genomic protein kinases with highly expressed proteins during germination.

### Methodology:-

The present investigation involves analysis of interaction of *N. bombycis* protein kinases, germination related proteins, horizontal transfer genes and infection mechanism during germination using the STRING software. . Among the fifty proteins, thirteen show specific expression during germination of *N. bombycis* spore, eighteen proteins acquired through horizontal gene transfer and nineteen protein kinases of *N. bombycis*. STRING database<sup>9</sup> provides critical assessment and integration of protein-protein interactions, including direct (physical) as well as indirect (functional) associations. All the proteins were queried in the query multiple search box with the interactions restricted to those available for *Encephalitozoon Cuniculi* as *E. cuniculi* is the closest microsporidian to *N. bombycis* as represented by Frankenhuysen et al.,<sup>10</sup> and the sequence information is available. The prediction analysis methods including activation, inhibition, binding, co-expression and gene fusion were utilized. The confidence score >0.9 were selected to obtain interaction network representing >90% confidence in the prediction to establish an interactome network representing the *N. bombycis* infection in silkworm leading to pebrine disease.

### Results and Discussion:-

A total of fifty proteins were analyzed to predict the protein interactions involved in germination of *N. bombycis* in silkworm (Table 1). Among these, forty proteins showed interactions atleast with one protein, whereas ten proteins did not interact. Fig. 1a represents overall protein-protein interaction network obtained in the present investigation. CDC28 was found to be the most interacting protein followed by Pho85 (ECU08\_0230), which are protein kinases. CDC28 showed 19 interactions in the network forming the node 1 and 17 interactions were with other protein kinases and remaining two interactions with proteins expressed during germination. On the other hand, Pho85 showed 18 interactions, which is represented as node 2 (Table 4) and 16 such protein interactions were other protein kinases and two interactions with proteins expressed during germination. These two major nodes indicate protein kinases form crucial back bone for the interaction of horizontal proteins and *N. bombycis* protein kinases and could be implicated in eliciting there by causing the infection upon germination of *N. bombycis* spores. The functional annotation of all the proteins queried for protein-protein interactions utilized in this study is listed in table 1.

Proteins in the proposed network are highly interactive among themselves than for a random set of proteins of similar size that would be expected from the drawn genome. These strong interactions suggest that these proteins are biologically connected to elicit a response upon a specific signal, as a group. However, there was no significant pathway enrichment observed in cellular component and KEGG pathways. *N. bombycis* HGT, germination and protein kinase gene set includes genes encoding basic cellular functions such as transcription, translation, DNA replication and repair, cell cycle control, protein folding/turnover, intracellular trafficking and key enzymes for glycolysis, pentose phosphate pathway, trehalose metabolism and chitin biosynthesis (Table 1).

The mode of infection is either through polar tube intrusion or endocytosis and their protein interactors<sup>3,4,11</sup>. In the present study, the potential candidate interactor *i. e.*, VPS34 (vacuolar protein sorting 34) represented the major node of 18 protein interactors (Fig. 2) and is known to be involved in sporulation. VPS34 is known to initiate the formation of a forespore membrane at each spindle pole body and extends to form the spore envelope, which further requires binding of CDC10 through the PtdIns(3)<sup>12</sup>. VPS34 converts phospho-inositol to phosphatidylinositol 3-phosphate, the key factor for sporulation and phosphorylates phosphatidylinositol to generate PtdIns(3)P (Fig. 3). Phosphatidylinositol 3-kinase is also vital for cytoplasm to vacuole transport (Cvt) and autophagy as a part of the autophagy-specific VPS34 PI3-kinase complex I. These proteins are involved in endosome-to-golgi retrograde transport as part of the VPS34 PI3-kinase complex II.

Microsporidia invades host cells in two different ways, the first way of invasion being ejection of spore polar tube and piercing into the host cell in its close proximity. The second mode, host endocytosis of the infective spore but the spore escapes the abjection by endocytic vacuole of the host by discharging its polar tube. However, spore endocytosis mechanism remains unclear and the potential molecular players involved are yet to be elucidated. CDC10 protein or septins are GTPases involved in cytokinesis and spore wall formation<sup>2,13</sup>.

We hypothesize that major interaction of CDC28, binding and thereby activating CDC10 is crucial by which the microsporidia gets the signal for its invasive entry into the host (Fig. 1b). Endocytosis invasion is known to happen in *Encephalitozoon* species. The GO biological placement predicts that CDC10 is localised to the membrane of *N. bombycis*. Septin 7 of *O. colligata* is also known to be localised in its exospore<sup>12</sup>. Alternatively, a surface septin could also facilitate infection by simply helping to keep the parasite in close proximity to the host cell surface. Further, the present interactome also reveals the binding, catalysis and activation of CDC28 by VPS 34 mediates the activation of CDC10. The activation of VPS34 indeed might be by binding of sugars, anions or small molecules (Fig. 3).

*N. bombycis* intracellular parasitic lifestyle is designed to have highly reduced metabolism instead of energy investing pathways to synthesize basic biological building blocks (e.g. amino acids, sugars, nucleotides, lipids) and cofactors (e.g. ATP, NAD<sup>+</sup>, NADP<sup>+</sup>). The presence of one such enzyme like Mannose-1-phosphate guanyl transferase 2 is the key for carbohydrate metabolism and mannosylation of structural and functional proteins in microsporidians. In Mannosylation of polar tube (PTPs) and spore wall proteins plays very important role in the parasitic lifestyle of *E. cuniculi*, possibly as virulence factors reported for several fungal pathogens<sup>14</sup>. However, the present interactome reveals that PTP3 does not interact with Mannose-1-phosphate guanyl transferase 2, indicating its involvement in carbohydrate metabolism rather than mannosylation (Fig. 2). This is best evident (Table 2) with the maximum observed gene count correlated with the functions like phosphorylation and cell cycle processes as far as the biological function was considered. Further, another enzyme, dUTPase is involved in conversion of dUTP to dUMP and pyrophosphate thereby adding on to the ATP stealing mechanism from the host cell. Like many parasites *T. hominis* has lost the ATP-expensive pathways for the *de novo* biosynthesis of inosine 59-phosphate and for uridine mono-phosphate, the starting points for the biosynthesis of purines and pyrimidines for DNA and RNA biosynthesis<sup>15</sup>. Probably, *N. bombycis* might have acquired dUTPase through HGT from bacterium in the predicted manner.

The absence of mitochondria in *N. bombycis* indicates that they require energy for survival in the host. However, it possess several energy synthesizing pathway enzymes which could compensate for the energy synthesis, which further is achieved by stealing ATP from the host cell. Our analysis also includes such energy synthesizing pathway enzymes *viz.*, glucose-1-phosphate isomerase and transketolase based on transcriptome data of Ma et al.,<sup>1</sup>. Glucose-1-phosphate isomerases thus inter converts glucose-6-phosphate to fructose-6-phosphate in glycolysis pathway. This Glucose-6-phosphate can also be utilized by pentose phosphate pathway to synthesize ribulose-6-phosphate and NADPH, which are the key energy molecules that contribute towards the survival of spore in the host cell.

Several studies show the presence of microsporidia hexokinases involvement in glycolytic pathway; but the absence of hexokinase is evident through transcriptome data<sup>8</sup>, furthered by distinctive absence of hexokinase activity in *Nosema gryllii*, in which activity of several glycolytic enzymes was detected in isolated pathogen cells<sup>16</sup>. Hexokinase catalyzes the first step in glycolysis and the pentose phosphate pathways. Therefore, microsporidia hexokinase activity within host cells could increase host synthesis of building blocks such as nucleotides, amino acids, and lipids, necessary for the rapid growth of parasites. Hexokinases are known to be present in microsporidians like *T. hominis*, *V. culicis* and *V. corneae*<sup>14</sup>. But the absence of hexokinase in our study is



compensated by the presence of Glucose-6-phosphate isomerase and transketolase. One of the interesting feature is *N. bombycis* has acquired phosphoglycerate mutase, which is another important enzyme during glycolysis and pentose phosphate pathways through horizontal gene transfer. In this analysis, there is strong triangular interaction between three enzymes (phosphoglycerate mutase, transketolase and glucose-6-phosphate isomerase) involved in energy synthesis. .

The genes acquired through HGT include enzymes involved in nucleotide synthesis (dUTPase, cytidylate kinase, uridine kinase, thymidine kinase). Further, the pathway analysis based on molecular functions revealed more number of genes participating in nucleotide binding, transferase and kinase activities (Table 3) thus implying its significance leading to elicit the infection upon endocytosis of spore by the host cell. CTP synthetase is the only nucleotide synthesis gene retained in the highly reduced genomes of the microsporidia<sup>14</sup>. The thioredoxin reductase acquired from (bacteria) interacts with thioltransferase, also acquired from bacteria suggesting that these defense proteins are involved in maintaining spore homeostasis and viability. These defense proteins might not interact with any germination expressed proteins. Fine example of role of defense proteins in microsporidia is presence of glutathione reductases and peroxidases, thioredoxin reductases and a superoxide dismutase in *T. hominis*<sup>17</sup>. Thymidine kinase, the pyrimidine salvage pathway enzyme interacts with phosphoglycerate mutase. Thymidine kinase acquisition as HGT is also found in the apicomplexan *Cryptosporidium*, from a bacterium<sup>18</sup>.

There is an indication that calcium/calmodulin binding at the spore surface may commence a signaling cascade that causes spore activation<sup>19</sup>. Further, it is of interest to note that *E. cuniculi* genome encodes five calmodulin-dependent kinases in its minimal set of 32 protein kinases which could potentially participate in such process<sup>7</sup>. The clear concept of activation of germination through signaling pathways however has not been elucidated but, indications of calcium/calmodulin binding at the spore surface may commence signaling cascade cause spore activation. We hypothesize that calmodulin dependent protein kinase (ECU03\_0630) interacting with ECU03\_1290, ECU08\_1620, CDC28, ECU08\_0230, MRK1, ECU02\_0550, ECU01\_1320 and CDC5 (Fig. 1c) could be the stimulant for the host cell to initiate endocytosis (Fig. 3), which further requires experimental validation. The present investigation predicts and emphasizes the possible molecular mechanism of spore uptake through endocytosis and also unravels the protein interactors involved in ATP stealing mechanism and defense mechanism of *N. bombycis*.

**Table 1:-** List of proteins queried in STRING with its functional annotations and the String protein code

Query sequence name	String Protein code	Annotation
Thymidine kinase	TK	Key function in synthesis of DNA
Sugar permease	ECU11_1870	Transporter of $\beta$ -galactosides
Deoxyuridine 5'triphosphate nucleotidohydrolase	ECU05_0280	Nucleotide metabolism
Thioredoxin reductase	ECU01_0680	Catalyze reduction of thioredoxin
Mevalonate kinase	ECU10_1510	Catalyze the rate-limiting step for the production of isopentenyl pyrophosphate
Extracellular serine proteinase	SPL2	involved in the degradation of proteins
Translation initiation factor E2B gamma subunit	ECU05_1360	mRNA-binding protein involved in translation elongation
2,3-bisphosphoglycerate phosphoglycerate mutase	ECU10_1060	synthesis of 2,3-bisphosphoglycerate
Cytidylate kinase	ECU03_1270	Pyrimidine metabolism
Molybdenum cofactor synthesis protein 3	ECU03_1290	Uncharacterized
Thioltransferase	ECU09_1375	Antioxidant defense system
Microtubule-associated protein 1A	ECU02_0130	Cell cycle protein
Nucleoporin NUP170	ECU06_0470	Nuclear pore complex proteins
Transketolase 1	ECU06_0120	Catalyzes d-xylulose to erythrose-4-phosphate
Glutamate NMDA receptor-associated protein 1	ECU07_0290	Ion channel protein
glucose-6-phosphate isomerase	ECU05_0650	Interconverts glucose-6-phosphate and fructose-6-phosphate
protein phosphatase PP2-A regulatory subunit A	ECU09_1490	Uncharacterized

mannose-1-phosphate guanylyltransferase	ECU11_0690	Fructose and mannose metabolism
Nuclear transcription factor Y subunit	ECU10_0260	Uncharacterized
Alanyl-tRNA synthetase	ECU02_1490	Catalyses the attachment of an amino acid to its cognate transfer RNA molecule
Protein peanut	CDC10	Predicted septin
60S ribosomal protein L6	ECU08_1790	Ribosomal protein
MADS domain containing protein	ECU07_1730	Uncharacterized
PTP3	PTP3	Sporoblast-to-spore polar tube biogenesis.
SPL2	SPL2	Degradation of proteins
CK2	CKA1	Casein kinases
PHO85	ECU08_0230	Regulates their perception of and response to stress from the environment
CRK7	CTK1	hyperphosphorylates the C-terminal heptapeptide repeat domain (CTD)
CDC2	CDC28	Required for entry into S-phase and mitosis
GSK	MRK1	Cell cycle regulation
PLK	CDC5	Protein kinase involved in mitotic exit. 'septum-promoting factor'
AUR	IPL1	Chromosome segregation during the later part of each cell cycle.
NEK	ECU11_1500	Cell cycle regulation
WEE	ECU08_1620	Negative regulators of mitosis
CDC7	CDC7-1	Initiation of DNA synthesis
HASPIN	ECU03_0890	Mitotic spindle positioning and mitotic arrest regulation
TTK	MPS1	Involved in the regulation of the onset of mitosis.
PEK	ECU02_0550	Cell cycle regulation
GEK	ECU01_1320	Protein kinase C
NUAK	ECU08_1480	SNF1-related protein kinase
CHK1	CHK1	Serine/threonine-protein kinase
KIN1	KIN1	Serine/threonine protein kinase involved in regulation of exocytosis
MKC	ECU03_0630	Calmodulin-dependent protein kinase
CK1-A	ECU03_0910	Casein kinase 1 homolog (involved in DNA repair)
ATM	ECU03_1100	Phosphatidylinositol-4-kinase catalytic subunit
RIO2	ECU09_1260	Cell cycle regulation

**Table 2:-** List of genes involved in different aspects of biological process along with the Gene Ontology ID obtained based on the interactome of protein kinases, horizontally transferred genes and germination genes.

Pathway ID	Pathway description	observed gene count
GO.0008150	biological process	21
GO.0009987	cellular process	20
GO.0044238	primary metabolic process	19
GO.0071704	organic substance metabolic process	19
GO.0008152	metabolic process	19
GO.0016310	phosphorylation	18
GO.0006793	phosphorus metabolic process	18
GO.0006796	phosphate-containing compound metabolic process	18
GO.0044237	cellular metabolic process	18
GO.0044763	single-organism cellular process	16
GO.0044699	single-organism process	16
GO.0043170	macromolecule metabolic process	16
GO.0019538	protein metabolic process	15
GO.0044260	cellular macromolecule metabolic process	15

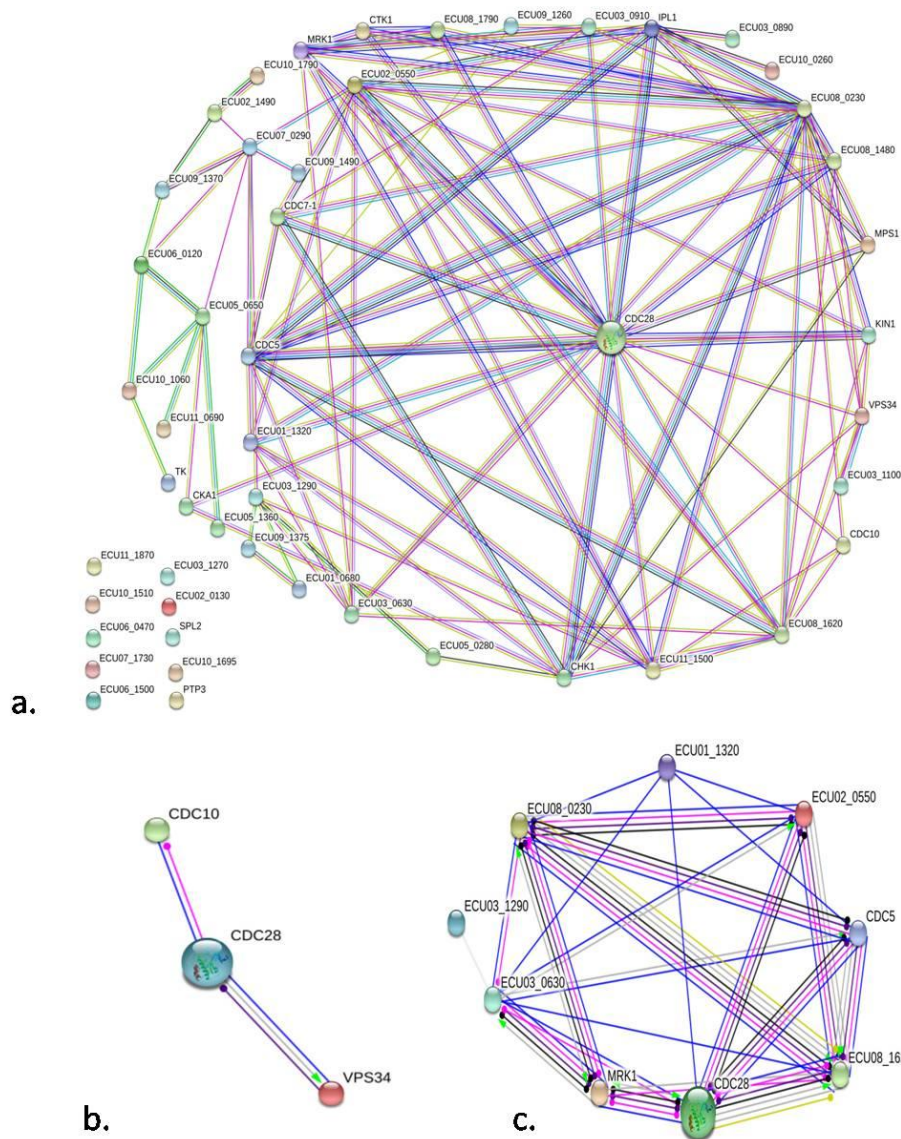
GO.0006468	protein phosphorylation	14
GO.0006464	cellular protein modification process	14
GO.0043412	macromolecule modification	14
GO.0044267	cellular protein metabolic process	14
GO.0007049	cell cycle	9
GO.0000278	mitotic cell cycle	7
GO.0022402	cell cycle process	7
GO.1903047	mitotic cell cycle process	7
GO.0051301	cell division	7
GO.0000280	nuclear division	6
GO.0007067	mitotic nuclear division	6
GO.0048285	organelle fission	6
GO.1902589	single-organism organelle organization	6
GO.0006996	organelle organization	6
GO.0016043	cellular component organization	6
GO.0071840	cellular component organization or biogenesis	6
GO.0050794	regulation of cellular process	5
GO.0051726	regulation of cell cycle	4
GO.0007059	chromosome segregation	2

**Table 3:-** List of genes involved in different aspects of molecular processes obtained based on interactome of protein kinases, horizontally transferred genes and germination genes indicating nucleotide binding activities.

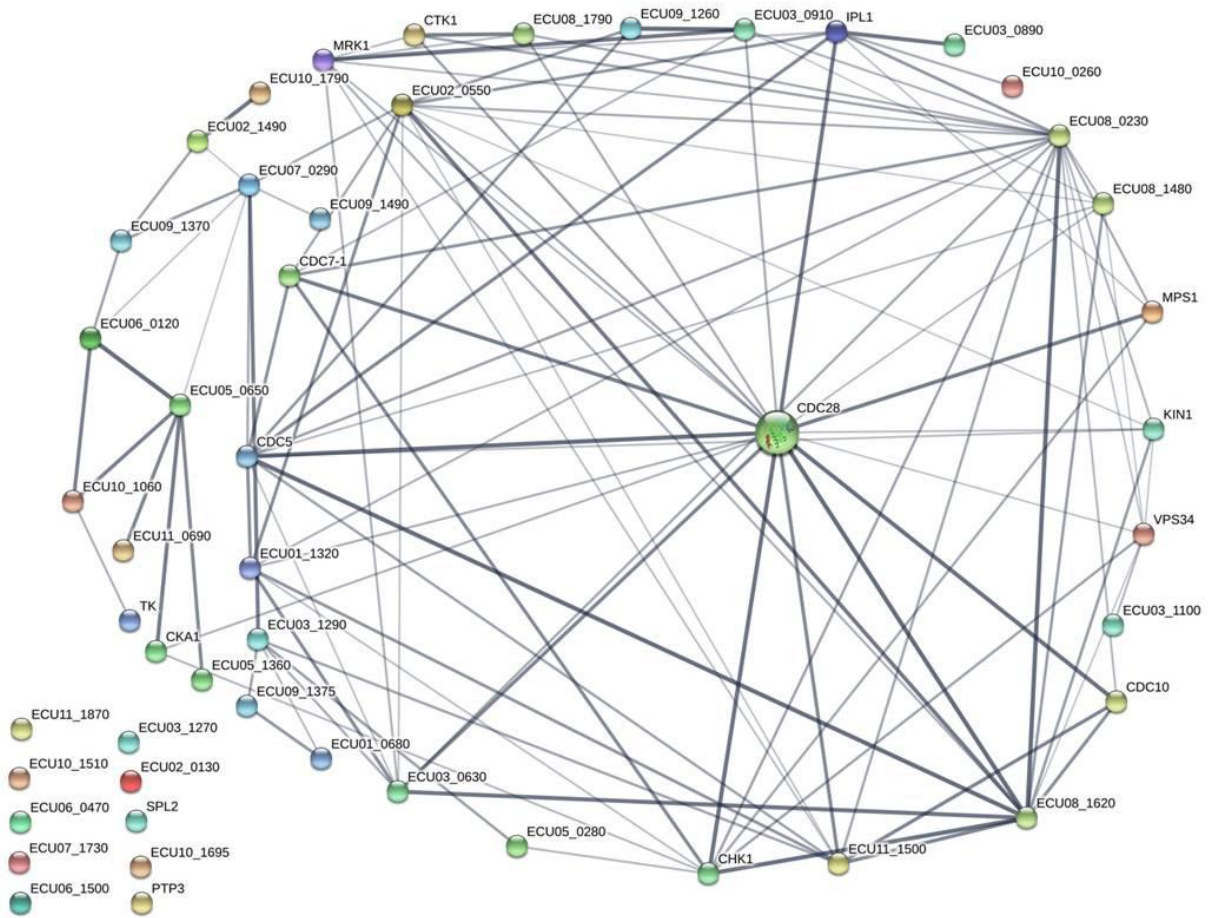
pathway ID	pathway description	observed gene count
GO.0003674	molecular_function	20
GO.0003824	catalytic activity	19
GO.0001882	nucleoside binding	18
GO.0001883	purine nucleoside binding	18
GO.0017076	purine nucleotide binding	18
GO.0032549	ribonucleoside binding	18
GO.0032550	purine ribonucleoside binding	18
GO.0032553	ribonucleotide binding	18
GO.0032555	purine ribonucleotide binding	18
GO.0035639	purine ribonucleoside triphosphate binding	18
GO.0097367	carbohydrate derivative binding	18
GO.0043168	anion binding	18
GO.0000166	nucleotide binding	18
GO.1901265	nucleoside phosphate binding	18
GO.0036094	small molecule binding	18
GO.0043167	ion binding	18
GO.0097159	organic cyclic compound binding	18
GO.1901363	heterocyclic compound binding	18
GO.0005488	binding	18
GO.0016301	kinase activity	17
GO.0016772	transferring phosphorus-containing groups	17
GO.0016740	transferase activity	17
GO.0005524	ATP binding	17
GO.0030554	adenyl nucleotide binding	17
GO.0032559	adenyl ribonucleotide binding	17
GO.0016773	phosphotransferase activity, alcohol group as acceptor	15
GO.0004672	protein kinase activity	14
GO.0004674	protein serine/threonine kinase activity	14
GO.0004693	cyclin-dependent protein serine/threonine kinase activity	3
GO.0019205	nucleobase-containing compound kinase activity	2

**Table 4:-** The genes represented in the two major nodes of the interactome

Node 1	Node 2
CDC10, CDC28, CDC5, CDC7-2, CHK1, CKA1, CTK1, ECU01_0680, ECU01_1320, ECU03_0630, ECU03_0890, ECU03_0910, ECU03_1100, ECU03_1290, ECU05_0650, ECU05_1360, ECU07_0290, ECU08_0230, ECU08_1480, ECU08_1620, ECU08_1790, ECU09_1260, ECU09_1375, ECU09_1490, ECU10_0260, ECU10_1060, ECU11_1500, IPL1, KIN1, MRK1, TK	CDC10, CDC28, CDC5, CDC7-2, CHK1, CKA1, CTK1, ECU02_0550, ECU02_1490, ECU03_0630, ECU03_0910, ECU03_1290, ECU05_0280, ECU05_0650, ECU06_0120, ECU07_0290, ECU08_0230, ECU08_1480, ECU08_1620, ECU08_1790, ECU09_1260, ECU09_1375, ECU10_1060, ECU11_0690, ECU11_1500, IPL1, KIN1, MPS1, MRK1, VPS34

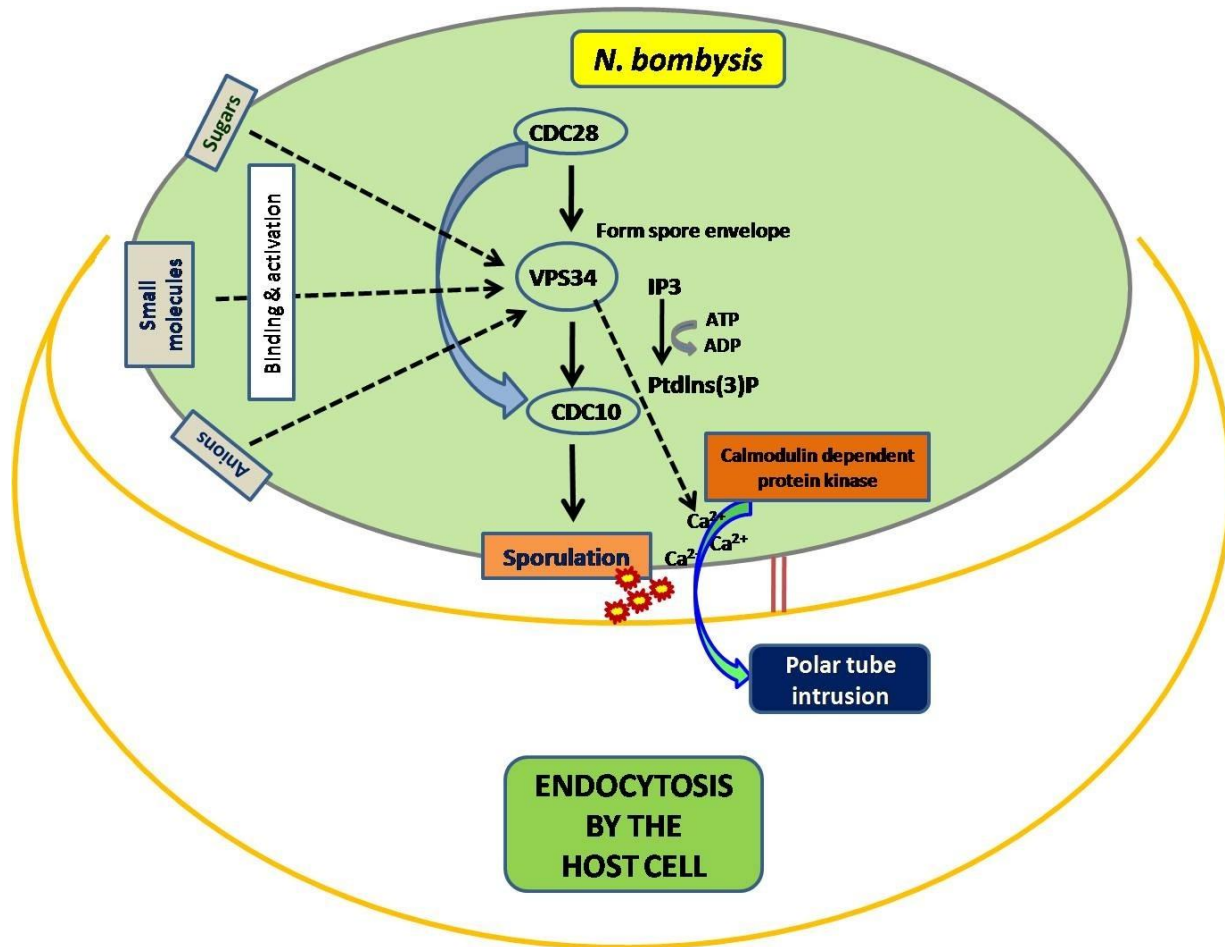


**Figure 1:-** The interactome of protein kinases, horizontally transferred genes, germination related genes of *Nosema bombycis* using STRING. a) Overall interaction b) Specific interaction of CDC28, VPS34 and CDC10; c) Interactome representing proteins interacting with calmodulin dependent protein kinases, ECU03\_0630. (Blue line indicates known interactions from curated database, magenta-known experimentally determined interaction; green-predicted interactions of gene neighborhood; red - predicted interactions of gene fusions; dark blue - predicted interactions of gene co-occurrence; light green – text mining; black –co-expression and purple –protein homology).



**Figure 2:-** Protein interactome of protein kinases, horizontally transferred genes, germination related genes of *N. bombycis* represented by the different intensity of the interactions based on data support. The circles outside the network indicated non-interacting partners.





**Figure 3:-** Pathway representing the mode of interaction leading to endocytosis of *N. bombycis* based on protein-protein interacting network.

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### RESEARCH ARTICLE

#### WOUND INFECTION IN DIABETES

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#### Manuscript Info

#### Abstract

#### Manuscript History

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#### Introduction:

Foot infections are the most common problems in persons with diabetes. These individuals are predisposed to foot infections because of a compromised vascular supply secondary to diabetes. Local trauma and/or pressure (often in association with lack of sensation because of neuropathy), in addition to microvascular disease.

The spectrum of foot infections in diabetes ranges from simple superficial cellulitis to chronic osteomyelitis. Infections in patients with diabetes are difficult to treat because these patients have impaired microvascular circulation, which limits the access of phagocytic cells to the infected area and results in a poor concentration of antibiotics in the infected tissues. For this reason, cellulitis is the most easily treatable and reversible form of foot infections in patients with diabetes. Deep skin and soft tissue infections are also usually curable, but they can be life threatening and result in substantial long-term morbidity.

In terms of the infecting microorganisms and the likelihood of successful treatment with antimicrobial therapy, acute osteomyelitis in people with diabetes is essentially the same as in those without diabetes. Chronic osteomyelitis in patients with diabetes mellitus is the most difficult infection to cure. Adequate surgical debridement, in addition to antimicrobial therapy, is necessary to cure chronic osteomyelitis.

Patients with diabetes also can have a combined infection involving bone and soft tissue called fetid foot. This extensive, chronic soft tissue and bone infection causes a foul exudate and usually requires extensive surgical debridement and/or amputation.

Individuals with diabetes may also have peripheral vascular disease that involves the large vessels, in addition to microvascular and capillary disease that results in peripheral vascular disease with gangrene. Dry gangrene is usually managed with expectant care, and gross infection is usually not present. Wet gangrene usually has an infectious component and requires surgical debridement and/or antimicrobial therapy to control the infection.

Except for chronic osteomyelitis, infections in patients with diabetes are caused by the same microorganisms that can infect the extremities of those without diabetes. Gas gangrene is conspicuous because of its low incidence in

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patients with diabetes, but deep skin and soft tissue infections, which are due to gas-producing organisms, frequently occur in patients with diabetes. In general, people with diabetes have infections that are more severe and take longer to cure than equivalent infections in other people.

### Epidemiology:

-Here are recent estimates of the disease burden due to diabetes and projections for the future\*:

	2003		2025	
	Europe	Africa	Europe	Africa
Population				
-Total	872 million	667 million	863 million	1107 million
-Adult (20-79 years)	621 million	295 million	646 million	541 million
Diabetes				
-No. of people (20-79 years)	48.4 million	7.1 million	65 million	19million
-Prevalence (20-79 years)	7.8 %	2.4 %	7.8 %	4.3 %

\*Source:International Diabetes Federation and The International Working Group on Diabetes joint publication 2006

-People with foot ulcers\*:

- Developed countries: **15%** of people with diabetes get ulcers at least once in their lifetime.
- Developing countries: the prevalence is even higher at **20%**.

\*Source:International Diabetes Federation and The International Working Group on Diabetes joint publication 2005

-The diabetic foot affect individuals and society:

- Diabetic foot ulcers and their complications (explained later) are often painful. Patients often become dependent on others for mobility, suffer a loss of autonomy, reduced social function, and making depression common.
- The cost of diabetic foot management is **12-15%** of the total health care budget for diabetes in developed countries. This figure may as high as **40%** in developing countries\*.

\*IDF/IWG joint publication on diabetic foot.

### Pathophysiology:

Diabetic foot ulcers may have multiple causes, the prominent ones being;

- A. Peripheral neuropathy (nerve damage)
- B. Peripheral vascular disease (poor pedal blood supply)
- C. Trauma:
  1. Acute: any injury to the foot such as burns or cuts.
  2. Chronic: due to foot deformities(changes of foot shape that lead to ill-fitting shoes and, thereby, ulceration frequency)

### International:

Diabetic foot infections range from cellulitis to chronic osteomyelitis, and, globally, they are the most common skeletal and soft tissue infections in patients with diabetes.

### Mortality/Morbidity:

Mortality is not common, except in unusual circumstances. The mortality risk is highest in patients with chronic osteomyelitis and in those with acute necrotizing soft tissue infections.

### Race:

The incidence of diabetic foot infections is similar to that of diabetes in various ethnic groups.

### Sex:

No important sex differences exist.

### Age:

Diabetic foot infections most frequently affect elderly patients.

## Materials and Methods:

We have collected 10 D.M. Foot samples from inpatient of King Fahad Hospital Hofuf (KFHH) through swab touch and then had been planting in MacConkey's agar and Blood agar. Identified the bacteria was by VITEK 2 Systems (version:04.02), and then test the sensitivity of antibiotics was done.

## Results:

- All samples collected from D.M. foot.
- 4 samples were growing:

No.	Sex	Age	Collection Date	Organism	Bionumber
3	F	67	23/12/10	<i>Staphylococcus hominis</i>	040000004220231
3/2	F	67	23/12/10	<i>Pasteurella pneumotopica</i>	0401200210000210
4	F	42	25/12/10	Unidentified organism	0001200210300210
6	F		25/12/10	<i>Pseudomonas aeruginosa</i>	0043051243500252

- Sensitivity test: Resistant (R), Sensitive (S)

	<i>Staphylococcus hominis</i>	<i>Pasteurella pneumotopica</i>	Unidentified organism	<i>Pseudomonas aeruginosa</i>
VA 30	11 mm (S)	S	12 mm (S)	R
AMP 10	7 mm (S)	S	10 mm (S)	R
E 15	R	S	R	R
TE 30	5 mm (S)	S	R	5 mm (S)
AK 30	14 mm (S)	S	15 mm (S)	14 mm (S)
IPM 10	10 mm (S)	S	10 mm (S)	15 mm (S)
KF 30		S		R
SXT 25	R	6 mm (S)	R	R
BCDD	R	R	R	R
Fox 30	14 mm (S)	S	R	R
MET 5	10 mm (S)	S	R	R
CN 10	S	S	R	12 mm (S)
C 30	9 mm (S)	S	S	R
CAZ 30	10 mm (S)	S	S	14 mm (S)
AMC 30	S	S	S	R
P 10	10 mm (S)		10 mm (S)	R

## Discussion and Conclusion:

### In sample No. 3:

*Staphylococcus hominis* (Bionumber:040000004220231) is harmless in human.

### In sample No. 3/2:

*Pasteurella pneumotopica* (Bionumber:0401200210000210) is an opportunistic organism prevalent in many commercial and research colonies of rodents. The incidence of clinical disease associated with this organism is low. In the presence of primary pathogens, this organism, like other opportunistic organism, potentiates the severity of disease.

*P. pneumotopica* belongs to the family of *Pasteurellaceae*, which also includes the genera *Haemophilus* and *Actinobacillus*. *P. pneumotopica* is a gram-negative short rod or coccobacillus. On primary culture the organism grows well on blood agar.

All efforts to detect *P. pneumotopica* must discriminate between *P. pneumotopica* infection and *P. pneumotopica* induced disease. Since rodents in many colonies are asymptotically infected with this agent (in their respiratory tract, conjunctivae or other sites) without demonstrable disease, its diagnosis as a primary pathogenic agent must necessarily be one of exclusion. Important to characterize the bacteriologic, mycoplasma and viral status of animals in which this diagnosis is considered to rule out other possible causative agents and disease processes.

**In sample No. 6:**

*Pseudomonas aeruginosa* (Bionumber:0043051243500252) remains one of the most important pathogens in nosocomial infections, with high associated morbidity and mortality.

In intensive care units, *Pseudomonas aeruginosa* (PA) ranks among the top five organisms causing pulmonary, bloodstream, urinary tract, surgical site, and soft tissue infections. Current treatments, primarily antibiotics that kill or inhibit the growth of this bacterium, have been associated with unacceptably high rates of morbidity and mortality. The development of agents that antagonize virulence factors represents a novel and potentially fruitful approach to the treatment of severe infections caused by PA.

Any attempt to therapeutically target virulence determinants must build upon a thorough understanding of host-pathogen interactions in PA infections. Interactions between PA virulence factors and the host immune response dictate the severity and type of infection. Depending on the environmental conditions and the immune status of the host, PA can be a quiescent colonizer, a cause of chronic infection, or a highly virulent invader during acute infections. For example, in the respiratory tract PA may cause fulminant and acute ventilator-associated pneumonia (VAP), be a colonizer in chronic obstructive pulmonary disease, or cause a chronic infection in cystic fibrosis (CF) patients, causing slowly progressive deterioration of pulmonary function. Bacterial surface factors such as flagella, pili and lipopolysaccharide as well as active processes such as the secretion of toxins, biofilm formation, and quorum sensing are virulence determinants that impact the outcome of PA infections. Interaction with the host immune system via soluble and cell surface receptors (e.g. toll-like receptors) controls signalling molecules (e.g. cytokines), modulates the host response, which impacts disease severity both by influencing the rate of bacterial clearance and by causing collateral damage to host tissues.

Given the growing problem of antimicrobial resistance in PA, improving therapy has been designated a priority by the Antimicrobial Availability Task Force of the Infectious Diseases Society of America.

Because of its resistance attributes, PA is the most common antibiotic-resistant pathogen isolated from VAP, with a significant attributable mortality, even with early and optimal therapy. Unfortunately, the multi-faceted resistance mechanisms possessed by PA have made the development of new antipseudomonal antibiotics challenging. Thus, there is a need for novel approaches for controlling these infections in the future.

Recent technological advances in areas such as genomics, proteomics and microscopy have led to rapid progress in our understanding of PA pathogenicity. Scientists are now pushing these discoveries through the translational pipeline in the hope of developing new therapeutic agents useful in the treatment of PA infections. While many PA virulence determinants are being actively targeted (Table 1), here we will focus on four: type III secretion, quorum sensing, biofilm formation, and flagella. We will highlight recent advances in our understanding of basic mechanisms underlying each of these virulence determinants and cite examples of how each is being targeted for therapeutic intervention.

**Table 1**

Virulence determinants of PA that have been targeted for therapeutic intervention.

Virulence Determinant	Type	References demonstrating role in pathogenicity*	Examples of therapeutic interventions	References demonstrating potential utility*	Furthest progress in translational efforts
type IV pili	Surface appendage	Tang et al (130) Chi et al (131)	active immunization	Kao et al (132) Ohama et al (133)	Preclinical
Flagella	Surface appendage	Feldman et al (134) Balloy et al (135)	active and passive immunization	Doring et al (129) Doring et al (136)	phase III trial
Lipopolysaccharide	Outer membrane component	Danner et al (137) Moskowitz et al(138) Pier et al (139)	active and passive immunization	Zuercher et al (140) Lang et al (141) Lai et al (142)	phase III trial
Alginate	cell surface exopolysaccharide	Simpson et al (143) Cabral et al (144)	active and passive immunization	Kashef et al (145) Theilacker et al(146) Pier et al (147)	phase I trial
type III secretion	Secretion system	Shaver et al (20) Lee et al (148) Vance et al (149)	active and passive immunization, small molecule inhibitors	Sawa et al (59) Neely et al (60)	Preclinical
Elastase	Protease	Park et al (150) Azghani et al (151)	active immunization	Matsumoto et al (152) Sokol et al (153)	Preclinical
Alkaline protease	Protease	Nicas et al (154) Guzzo et al (155)	active immunization	Matsumoto et al (152)	Preclinical
exotoxin A	Toxin	Nicas et al (154) Miyazaki et al (156)	active and passive immunization	Denis-Mize et al (157) Hertle et al (158) El-Zaim et al (159)	Preclinical
Quorum-sensing	cell-to-cell Communication	Pearson et al (160) Rumbaugh et al (161)	natural and synthetic inhibitors	See <a href="#">Table 2</a>	preclinical
Biofilms	Bacterial Aggregates	Jesaitis et al (162) Cochran et al (163)	antimicrobial coatings, small molecule inhibitors	see <a href="#">Table 3</a>	phase III trial

Like people, PA bacteria behave differently depending on whether they are alone or in a crowd. They accomplish this by using an intercellular signalling process called quorum sensing (QS). In QS, small compounds called autoinducers are released by bacteria into the environment. Autoinducer concentrations are then sensed by neighboring bacteria to infer the density of the local bacterial population and to regulate gene expression accordingly. PA QS systems regulate about 350 genes (6% of the PA genome) and play a role in the regulation of a wide variety of processes including biofilm formation and production of numerous toxins. Given this regulatory breadth, it is not surprising that QS plays an essential role in virulence. Two primary QS systems were initially identified in PA, the *las* and the *rhl* systems. More recently a third QS system was identified in PA, referred to as the *Pseudomonas* Quinolone Signal (PQS). PQS is controlled by *las* system and itself regulates the *rhl* system, suggesting that it acts as link between the two systems.

Just as many environmental organisms synthesize antibiotics to gain an advantage over microbial competitors, some also produce enzymes that degrade the QS autoinducer signals of other species of bacteria. Recent evidence suggests that mammalian cells too have developed such capabilities. Paraoxonases (PONs) are mammalian enzymes that are capable of degrading PA autoinducer molecules and thereby have the potential to disrupt QS. Treatment of PA with PON-containing serum inhibited biofilm formation, which requires functional QS. Thus, these enzymes may play an important role in host defense against PA.

Numerous approaches have been successfully used to inhibit QS in culture and in vivo model systems (Table 2). For example, triclosan, an antimicrobial substance used in soaps, toothpaste, cleansers, and deodorants, has been shown to inhibit the synthesis of autoinducer. The anti-QS strategies of bacteria themselves have been exploited. Expression of bacterial enzymes that degrade autoinducers resulted in decreased production of QS-regulated toxins by PA. In another approach, natural and synthetic compounds have been screened for their utility in preventing the

interaction between the autoinducer and its receptor. Much effort has been directed towards furanones, compounds produced by marine macroalga with anti-fouling properties. Although naturally occurring furanones lacked substantial activity, modified furanone compounds inhibited QS and increased bacterial clearance in a mouse model of infection. Further investigations are necessary to determine whether these approaches will prove efficacious in inhibiting QS in human infections.

**Table 2**

Inhibitors of PA quorum sensing.

Class	Examples	Mechanism	References
autoinducer analogs	cyclopentanol, cyclopentylamide, and cyclohexanone compounds, tetrazole derivatives	block autoinducer receptor	(168–172, 104)
structurally unrelated autoinducer antagonists	4-nitro-pyridine- <i>N</i> -oxide, triphenyl compound	block autoinducer receptor	(173,174)
natural compounds	products from fungi (penicillic acid), marine macroalga (furanone derivatives), garlic, medicinal plants	decrease concentration of autoinducer receptor, unknown	(88–91, 101, 102 173, 175–178)
enzymes	AHL-lactonase, AHL-acylase	degrade autoinducers	(86,87)
antibiotics, metabolic compounds	azithromycin, triclosan, <i>S</i> -adenosylhomocysteine, <i>S</i> -adenosylcysteine, sinefungin	inhibit synthesis of autoinducer	(85, 179–180)

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4. <http://emedicine.medscape.com/article/237378-overview>
5. A Review of *Pasteurella pneumotopica*, (spring 1991), Charles River Laboratories
6. *Pseudomonas aeruginosa* Virulence and Therapy: Evolving Translational Strategies (PMCID: PMC2749241 - NIHMSID: NIHMS144849)



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### RESEARCH ARTICLE

#### ANEURYSMAL SUBARACHNOID HEMORRHAGE AND ITS PRACTICAL IMPLICATIONS IN A PERIPHERAL SET-UP.

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#### Abstract

**Background:** Aneurysmal subarachnoid hemorrhage is the most common cause of non-traumatic SAH. It's a challenging condition to treat. It involves methodical assessment and timely management of multiple factors which will have prognostic significance on the patients.

**Methods:** A brief overview of different types of aneurysms, risk factors, clinical signs and symptoms of SAH, the diagnostic and management protocol in a peripheral set up has been presented.

**Conclusion:** Sub arachnoid hemorrhage due to ruptured aneurysm is a neurosurgical emergency requiring prompt detection and timely referral to a Centre of neurosurgical expertise. Basic knowledge about the presentation of SAH is critical in the management of this condition at a peripheral set up.

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#### Introduction:-

Sub arachnoid space lies between the arachnoid and pia mater of brain. All the major blood vessels supplying the brain lie in this space. Any bleeding in this area is defined as sub arachnoid haemorrhage. Worldwide trauma is the most common cause of SAH. Among the non-traumatic (spontaneous) causes of SAH, ruptured aneurysms are the most important cause of this condition, with high mortality rates. Awareness regarding the presentation and management is critical for quick diagnosis and management of SAH secondary to ruptured aneurysm in order to have good outcomes.

#### Causes of SAH:-

Causes of sub arachnoid haemorrhage
Trauma
Aneurysms
Arterio-venous malformation
Brain tumours
Cortical venous thrombosis
Coagulopathy
Vasculitis syndromes including Moya-Moya disease
Drug abuse : cocaine

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### Cerebral aneurysms:-

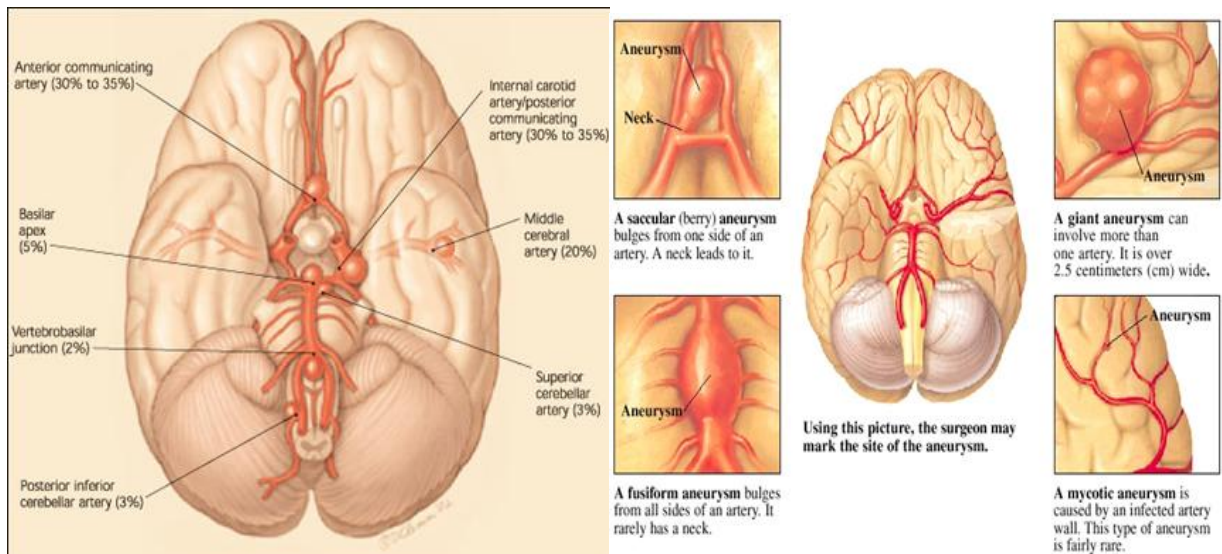
An aneurysm is an abnormal localized dilation of any vessel. Intracranial aneurysms are classified as saccular, fusiform, or dissecting. Approximately 90 percent are saccular (berry aneurysms). Saccular aneurysms are responsible for most of the morbidity and mortality caused by subarachnoid hemorrhage.

**Saccular aneurysms** develop from defects in the internal elastic lamina of cerebral arteries, rendering them less resistant to changes in intraluminal pressure. These changes most frequently develop at sites of vessel bifurcation, where blood flow is most turbulent and shear forces against the arterial wall are greatest. Saccular aneurysms most frequently form in the first- and second-order arteries originating from the cerebral arterial circle (Circle of Willis) at the base of the brain. Multiple aneurysms develop in 30 percent of affected patients.

**Fusiform aneurysms** develop from ectatic, tortuous cerebral arteries, most often in the vertebral-basilar system, and can reach several centimeters in diameter. Patients with fusiform aneurysms characteristically present with symptoms of cranial-nerve or brain-stem compression, but the symptoms are not commonly associated with subarachnoid hemorrhage.

**Dissecting aneurysms** are the result of cystic medial necrosis or a traumatic tear of an artery. Like dissecting aneurysms elsewhere in the body (e.g., dissecting aortic aneurysms), they form as blood courses through a false lumen while the true lumen is collapsed upon itself.

**Mycotic aneurysms**, also known as infective or microbial aneurysms, are rare inflammatory neurovascular lesions that account for 0.7–6.5% of all intracranial aneurysms. The term mycotic is a misnomer since most of these aneurysms are caused secondary to bacterial infection. These aneurysms are unique in their natural history and frequently develop at terminal arterial branches. They usually develop in patients with endocarditis and other infective conditions.



**Figure 1:-**showing common location of aneurysms and morphology

### Risk Factors:-

The most important risk factors for aneurysmal SAH are **hypertension** and **cigarette smoking**. Other risk factors include heavy alcohol use, and personal or family history of aneurysm, autosomal dominant polycystic kidney disease and other connective tissue disorders.

SAH can occur at any age, but it tends to happen at a younger age than other types of stroke. It has a peak incidence among persons 40 to 60 years of age, with a mean age of about 53 years. Women are affected about 70% of the time.

**Clinical Signs and Symptoms of Subarachnoid Hemorrhage:-**

Subarachnoid hemorrhage can be easily diagnosed in patients who present with classical symptoms of thunderclap headache, vomiting and loss of consciousness than in patients who present in good condition.

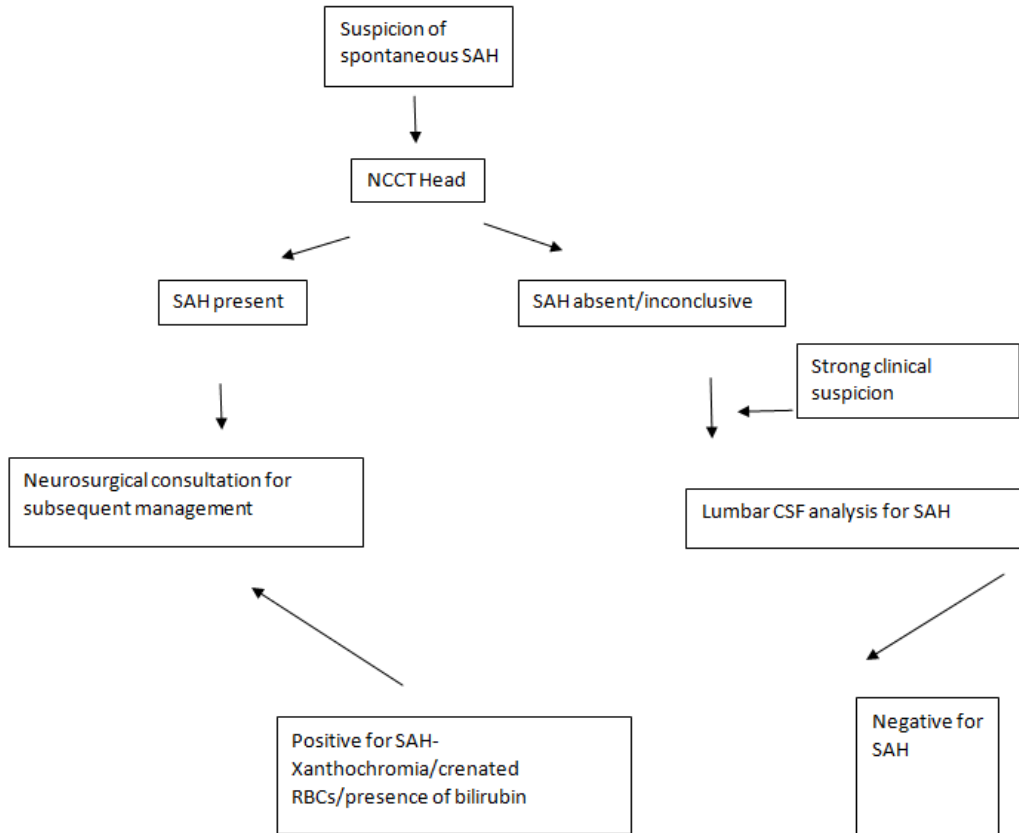
**Symptomatology of Sub arachnoid hemorrhage:-**

Patient experiences the <b>worst headache of his or her life</b>
<b>Recent warning or atypical headaches</b> (often severe, feel different to the patient, and may have lasted for days at a time; may occur days to weeks before the event)
Meningismus
Focal neurological deficits(III cranial nerve palsy in case ruptured posterior comm. artery aneurysm)
Syncope, change in consciousness, or altered mental status
Vomiting
Neck pain/stiffness

- Among patients who presented to the emergency department with sudden, severe headache, which the patients often called the worst headache of their lives, 15% had SAH
- Among patients with sudden, severe headache and a neurologic deficit, 25% were found to have SAH.
- Among patients with acute severe headache as the only symptom, 12% had SAH

Despite considerable advances in diagnostic, surgical and perioperative management, the overall outcome after SAH remains poor. Thirty-five percent of patients die within 3 months of the bleed (12% before receiving medical attention) regardless of medical and surgical therapy. In addition, approximately 40% of survivors will have residual neurological deficits including cognitive disturbances

**Diagnosis of sub arachnoid hemorrhage:-**





**CT Head:-**

It is investigation of choice in the diagnosis of SAH. SAH appears as hyperdensity(bleed) usually in the basal cisterns. It also helps in predicting the location of aneurysm.

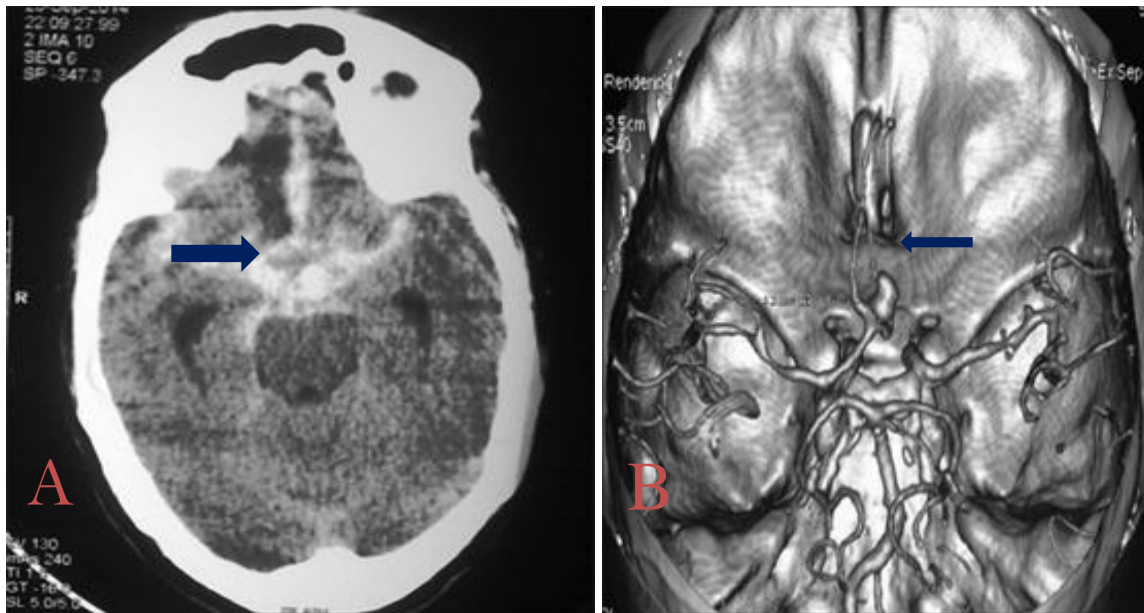
**Lumbar CSF Analysis:-**

Ideally done at-least 6 hours after the ictus so that the RBC are lysed . Presence of xanthochromia and crenated RBCs are suggestive of SAH.

**MRI Brain:-** Few sequences like FLAIR help in the detection of blood. However MRI is not widely available.

**Cerebral Angiography:-**

CT Angiography or catheter angiography helps in knowing the location and morphology of the aneurysm which helps in the treatment of it.

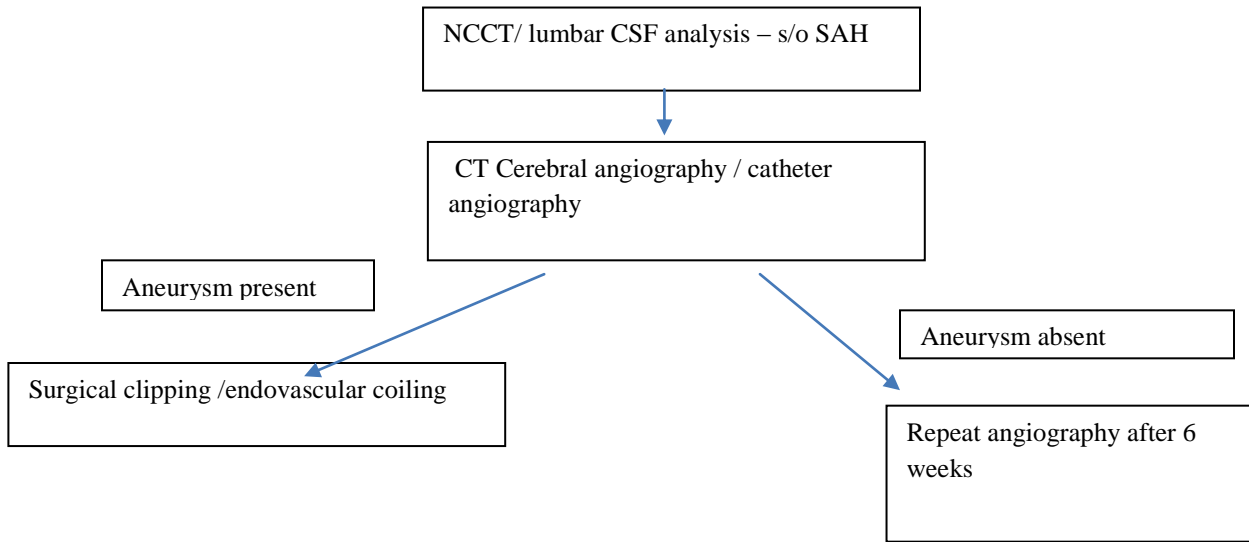


**Figure 2 (A):-** NCCT Head showing blood in the basal sub arachnoid cisterns(arrow) ; 2 (B) – CT Angiography showing rupture anterior communicating artery aneurysm(arrow)

**Management of SAH:-****Basic medical management**

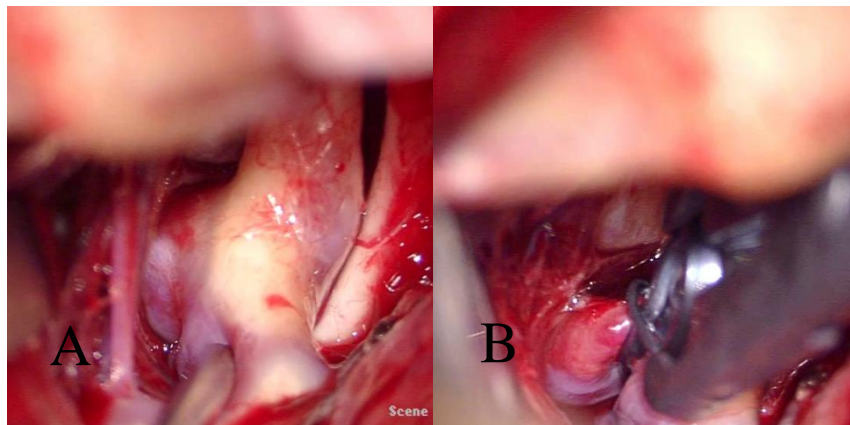
- Monitor Vital signs, neurological assessment , fluid intake and output
- Bed rest until the aneurysm is obliterated
- Elevation of the head of the bed by 30 degrees
- Avoidance of unnecessary stimulation
- Graduated compression stockings or intermittent pneumatic compression devices on the lower extremities
- Adequate Analgesia
- Anticonvulsants for the treatment of seizures
- Anti-hypertensives to reduce blood pressure predominantly within the first 4 days after subarachnoidhemorrhage when the aneurysm is not obliterated
- External Ventricular drain in case of acute hydrocephalus
- Timely referral to a center of neurosurgical excellence

**Management of SAH at a neurosurgical center:-**

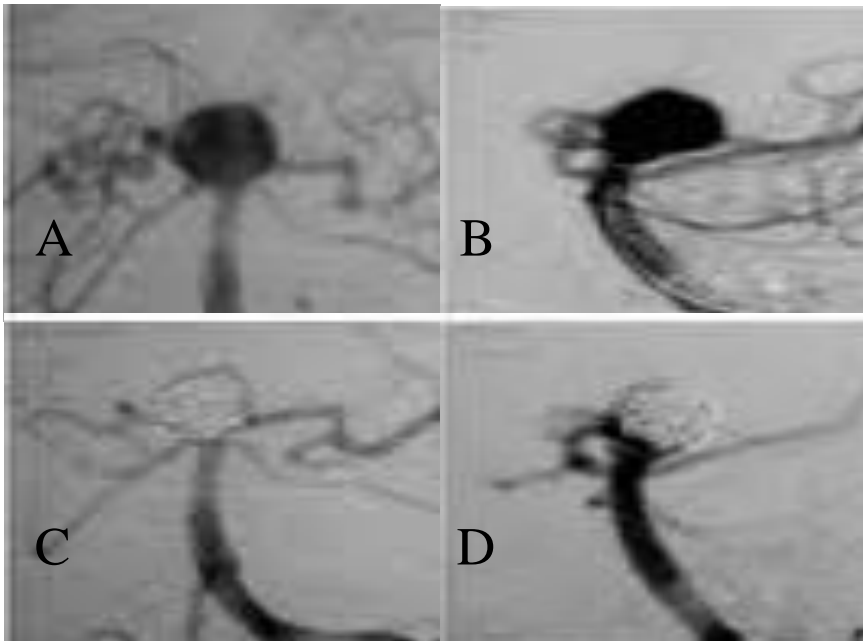


**Surgical management of Aneurysms:-**

Intracranial aneurysms can be managed by open cranial surgery (**Clipping of aneurysm**) or through endovascular route(**Coiling of aneurysm**). The selection of appropriate approach depends on various factors like morphology of aneurysm, location of aneurysm, ease of access and other factors.



**Figure 3:-**Intra operative picture showing (A)right ICA aneurysm and (B) clip being applied across the neck of aneurysm



**Figure 4:-** digital subtraction angiography(DSA) images showing a large aneurysm arising from the Basilar artery(A & B). Images C & D show the endovascular management with coils.

#### **Complications of SAH:-**

**Re-bleeding:**It is one of the dreaded complications following SAH due to ruptured aneurysm, carrying high mortality rates. The risk of re-bleed is highest in the first 24 hours of rupture and gradually decreases.

**Hydrocephalus:-**It is the dilatation of ventricles due to obstruction of flow of CSF either across the ventricle or in the sub arachnoid space. It may be acute in onset (usually due to intra-ventricular hemorrhage) requiring urgent ventricular diversion or chronic.\

**Vasospasm/DINDs :** It is one of the major complications following SAH occurring due to the spasm of vessels at the base of brain. It usually develops 5 days following rupture of aneurysm. it may lead to variety of focal neurological deficits depending in the vessel affected. It is traditionally managed by HHH (hypertension, hypervolemia, hemo-dilution) therapy.

**Focal Neurological Deficits:-** It is usually secondary to intra cerebral hemorrhage or due to vasospasm.

#### **Dyselectrolytemia**

#### **Conclusion:-**

Sub arachnoid hemorrhage due to ruptured aneurysm is a neurosurgical emergency requiring prompt detection and timely referral to a Centre of neurosurgical expertise. Basic knowledge about the presentation of SAH is critical in the management of this condition at a peripheral set up.



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### RESEARCH ARTICLE

#### PHYTOCHEMISTRY OF THREE INDIAN VARIETIES OF *PUNICAGRANATUM* AND VITAMIN-C STUDY BY HPLC TECHNIQUE

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##### Key words:-

Pomegranate, Ascorbic acid, HPLC, Exocarp, Mesocarp, *Punicagranatum*

#### Abstract

Three Indian pomegranate varieties with different physiological properties have been studied for their phytochemistry and ascorbic acid content. Local varieties of *Punicagranatum* L. namely *Bhagwa*, *Ganesh* and *Mridula* were selected for analysis. The three parts of pomegranate viz. exocarp, mesocarp and seeds were separately processed as methanol extractions for various phytochemicals and HPLC analysis for Vitamin-C content. Flavonoids were found absent in the seeds of three varieties, whereas they were present in the exocarp and mesocarp of the same. On other hand, tannins were present in the seeds and absent in the exocarp and mesocarp of all varieties. Phycobilins were absent in all parts of *Ganesh* and mesocarp of *Mridula*. Out of all varieties, the mesocarp of *Ganesh* has high content of ascorbic acid with an area of 90.14% with a TP content of 4784.9µg/mg and TF content of 1.6364µg/mg. Out of three varieties, exocarp, mesocarp and seeds of *Ganesh* resulted with more ascorbic acid content.

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#### Introduction:-

A multitude of organic molecules or phytochemicals, generally referred as secondary metabolites are synthesized by vascular plants. These phenolic compounds are synthesized during plant development and are plays vital roles in the plant life cycle (Stalikas, 2007). Based on metabolic utilization, the plant produces primary constituents which include sugars, proteins and chlorophyll, whereas secondary constituents include alkaloids, steroids, terpenoids, etc. (Dhawale, 2013). Various fruits and vegetables have been confirmed for their phytochemical properties which include oranges and green fruits and vegetables (carotenoids); Apples, citrus fruits, onions, soybeans and products (flavonoids); Green tea, wine, grapes, berries, whole grains and peanuts (Polyphenols); Cherries, citrus fruits (Terpenes). *Punicagranatum* is a fruit, highly grows in Mediterranean regions under drought conditions (Chakraborty Manodeepet *et al.* 2012). Pomegranates also showed many medicinal properties ranging from reduced oxidative stress, platelet aggregation (Aviram *et al.* 2000), antioxidant and antibacterial (Negi and Jayaprakasha, 2003) and antiviral (Zhang *et al.* 1995) activities.

Pomegranate can be separated into three major parts: peel, which includes exocarp, mesocarp and the edible portion, Seeds. The peel of pomegranates contains good levels of phenolic compounds including tannins and flavonoids

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(Zhao *et al.* 2014). The edible plant parts are juice, pulp and seeds, which constitute around 65-75% of total fruit weight (Tehrani *et al.*, 2010). The taste of the juice and seeds vary among different varieties of pomegranate. The taste may be sweet, sour or sweet-sour. However, these portions are rich in sugars, minerals and various phenolic constituents (Mansour *et al.* 2014).

The present study aimed to study various phytochemical compounds present in the exocarp, mesocarp and seeds of three varieties of pomegranates: *Bhagwa*, *Ganesh* and *Mridula*. The main objectives of the study include to identify the phytochemical constituents present in all the parts of the three varieties and to analyze ascorbic acid content from the same.

### Materials & Methods:-

Twenty individual fruits from each variety were collected randomly from the local markets of Loni, Maharashtra separately to study the phytochemistry. *Bhagwa* is a fruit with orange-red fruit having peach-red colored seeds with sweet taste. *Ganesh* is a yellowish fruit with soft and pink colored seeds having sour-sweet taste. *Mridula* is a red fruit with red seeds and sour-sweet taste (Fig. 1).

The fruits were collected separately in wooden boxes and stored at the Laboratory of Biotechnology, P.V.P. College, Loni. The exocarp, mesocarp and seeds were isolated manually and they were dried in hot air oven at 50°C until they dried completely. The dried plant materials were grinded by using a house-hold mixer grinder. The Soxhlet procedure for methanol extraction is performed (Akkiraju *et al.* 2016) and collected the extracted powder separately from each part of three varieties of pomegranates (Fig. 1). These powders are then subjected to various studies of primary Phytochemical compounds viz. test for saponins, proteins, carbohydrates, amino acids, glycosides and secondary Phytochemical compounds viz. test for alkaloids, flavonoids, vitamin-C, anthraquinones, phycobilins and tannins. The presence or absence of the mentioned compounds and HPLC analysis for ascorbic acid were performed according to Akkiraju *et al.* (2016).

### Results:-

The triplicates of tests performed for the identification of different phytochemicals was tabulated (Table 1). The saponins, alkaloid, carbohydrates and ascorbic acid were found present in all the parts of *Bhagwa*, *Ganesh* and *Mridula*. Glycosides, proteins, amino acids and anthraquinones are absent in all the parts of all three varieties. The flavonoids were present in exocarp and mesocarp of three varieties, but found absent in the seeds. The tannins were absent in the exocarp and mesocarp of all three varieties and resulted positive in seeds. Phycobilins were positive in all the parts of *Bhagwa* and negative in all parts of *Ganesh*. In *Mridula*, exocarp and seeds have phycobilins, but mesocarp does not possess them.

Ascorbic acid analysis by HPLC was performed and the results were obtained (Fig. 2a, b, c; Table 2). The same has revealed ascorbic acid peaks and compared with the standard. The chromatogram for the exocarp, mesocarp and seeds showed peaks confirming the quantity of Vitamin-C. The mesocarp of *Ganesh* has showed the peak within a retention time of 3.9167 min, whereas the exocarp of *Mridula* showed the highest RT (4.3833 min.). The maximum peak area was identified for the exocarp of *Mridula* with an area of 84335.227 mV\*s with an area% of 81.79%, where it showed a significant TP value of 456.1 and TF value of 0.5469. The least area peak area was observed for the seeds of *Ganesh* with an area of 1144.852 mV\*s with an area% of 40.72%. In respect to area%, Mesocarp has a maximum area% of 90.14% and minimum was for the seeds of *Mridula* with 30.17%. The maximum number of Theoretical Plates (TP) was observed for the mesocarp of *Ganesh* with 4784.9 and the minimum was found in the exocarp of *Mridula* with a TP of 456.1. The exocarp of *Ganesh* has a maximum TF value (1.75) and the same of *Mridula* has a minimum TF value (0.5469).

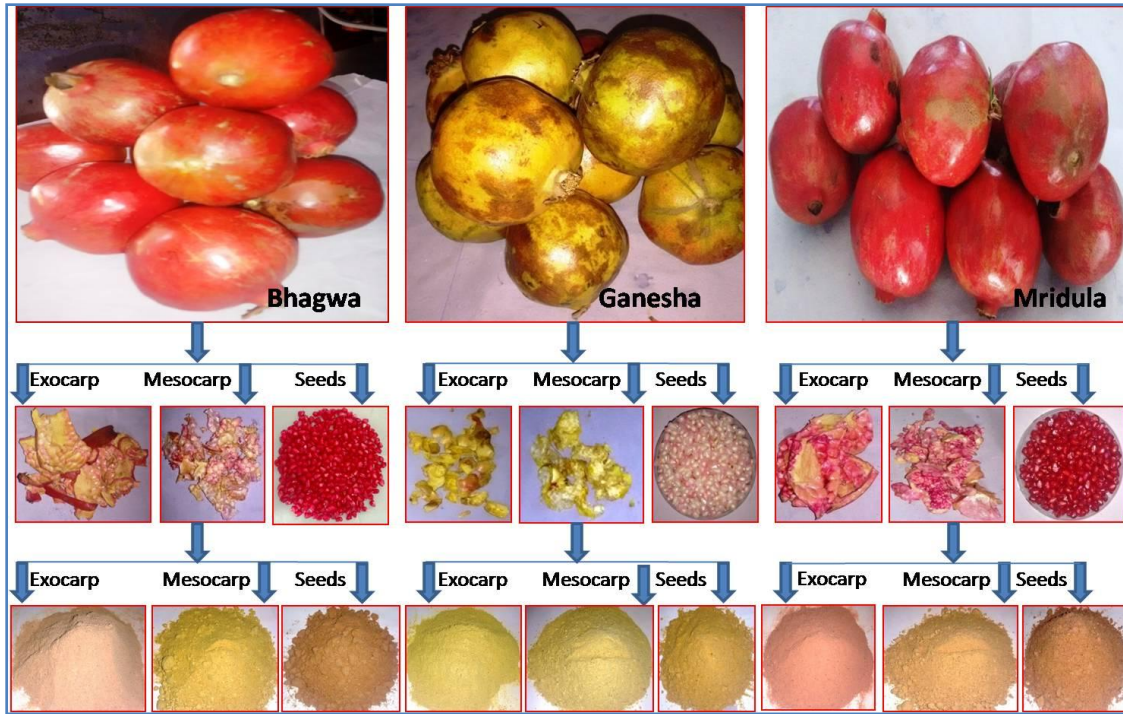


Figure 1:- Preparation of powders from exocarp, mesocarp and seeds of *Bhagwa*, *Ganesha* and *Mridula*.

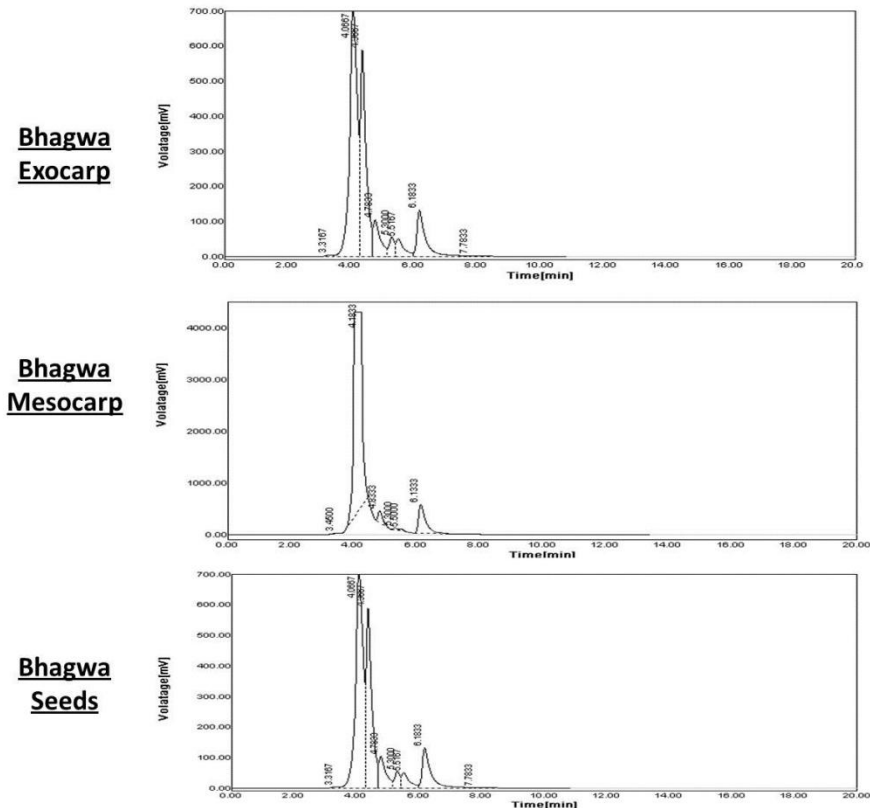
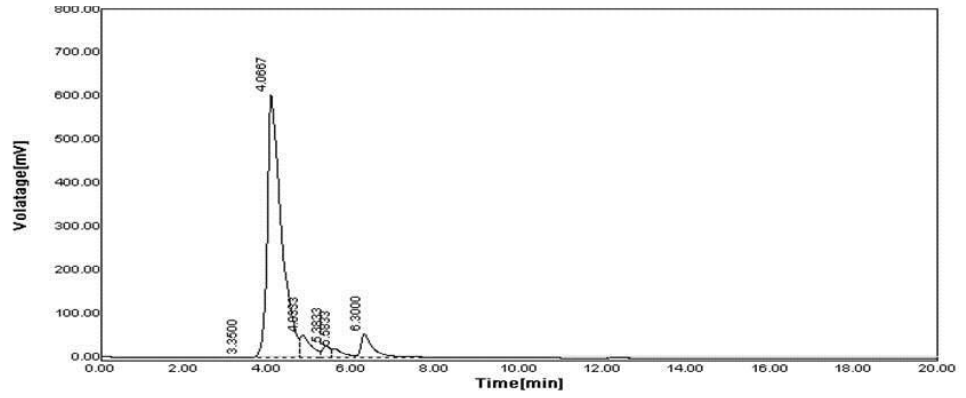


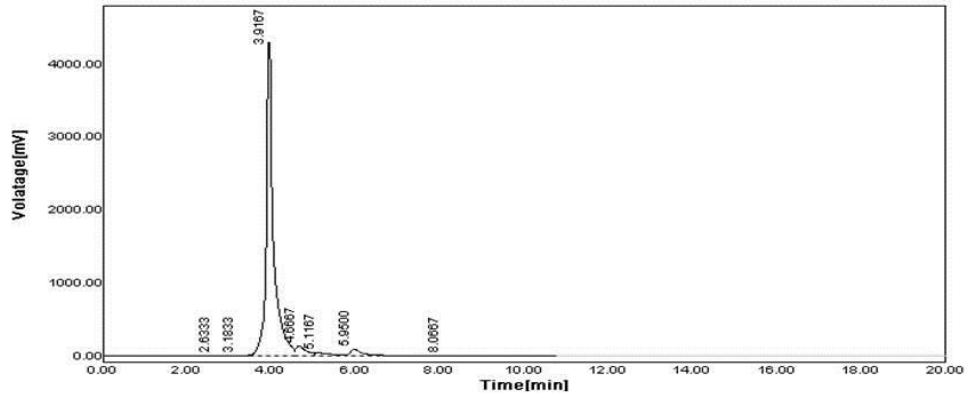
Figure 2 (a):-Ascorbic acid analysis by using HPLC in *Bhagwa* exocarp, mesocarp and seeds.



**Ganesha**  
**Exocarp**



**Ganesha**  
**Mesocarp**



**Ganesha**  
**Seeds**

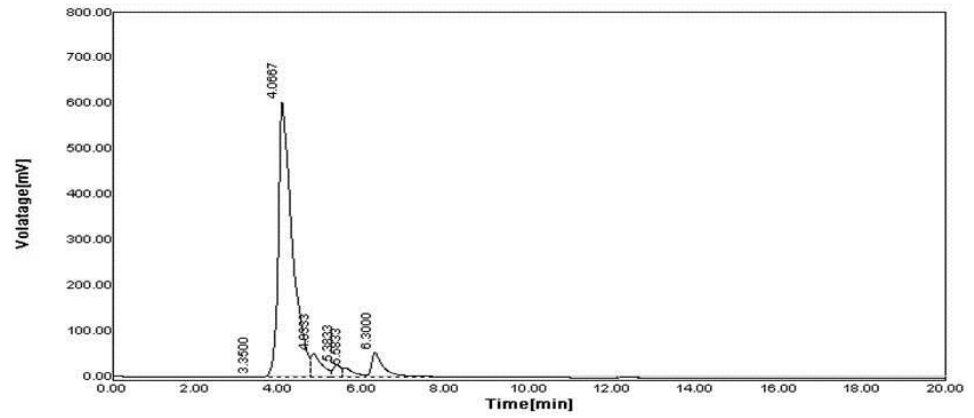


Figure 2 (b):- Ascorbic acid analysis by using HPLC in *Ganesha* exocarp, mesocarp and seeds.

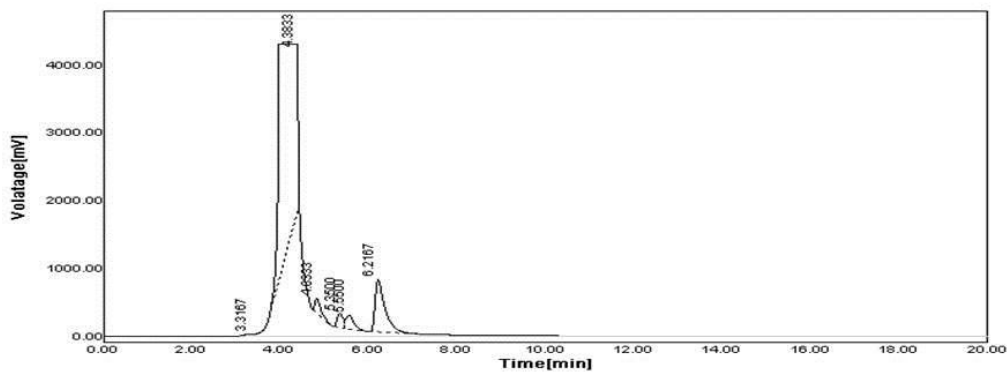
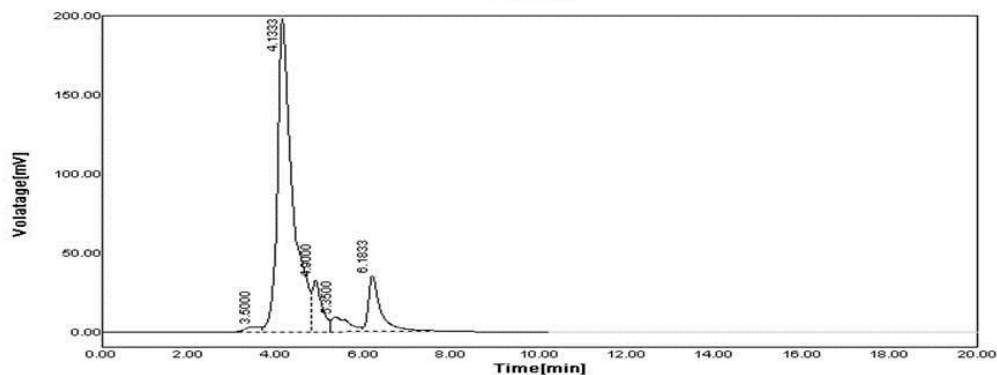
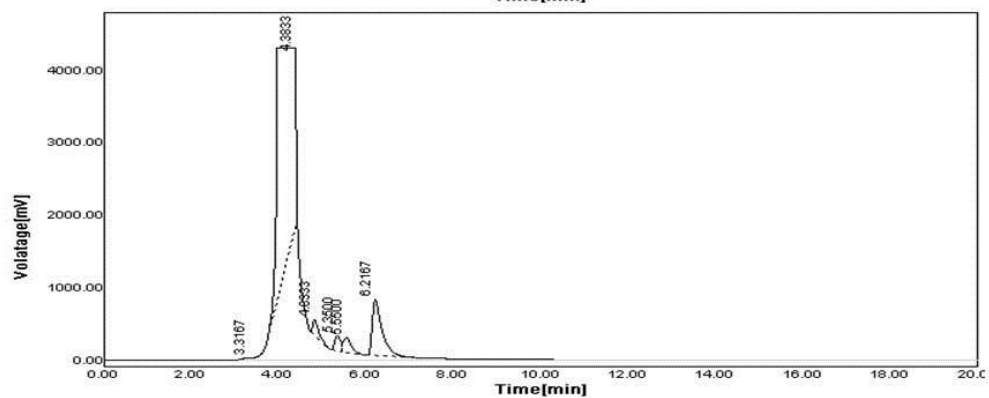
**Mridula**  
**Exocarp****Mridula**  
**Mesocarp****Mridula**  
**Seeds**

Figure 2 (c):-Ascorbic acid analysis by using HPLC in *Mridula* exocarp, mesocarp and seeds.

Table 1:-List of Phytochemicals tested and their presence or absence in different parts of pomegranates.

S. No.	Test Compound	Bhagwa			Ganesha			Mridula		
		Exo Carp	Meso Carp	Seeds	Exo carp	Meso carp	Seeds	Exo carp	Meso carp	Seeds
1	Saponins	+	+	+	+	+	+	+	+	+
2	Flavonoids	+	+	-	+	+	-	+	+	-
3	Glycosides	-	-	-	-	-	-	-	-	-
4	Proteins	-	-	-	-	-	-	-	-	-
5	Carbohydrates	+	+	+	+	+	+	+	+	+
6	Alkaloids	+	+	+	+	+	+	+	+	+
7	Amino acids	-	-	-	-	-	-	-	-	-
8	Tannins	-	-	+	-	-	+	-	-	+
9	Anthraquinones	-	-	-	-	-	-	-	-	-
10	Phycobilins	+	+	+	-	-	-	+	-	+
11	Ascorbic acid	+	+	+	+	+	+	+	+	+



**Table 2:-**Ascorbic acid analysis: RT- Retention time; TP- Theoretical Plates; TF- Tailing Factor

	Name	RT[min]	Area[mV*s]	Area%	TP	TF
Exocarp	Bhagwa	4.0667	12075.139	47.28	1018.9	1.2500
	Ganesha	4.0667	14123.877	82.83	825.3	1.7500
	Mridula	4.3833	84335.227	81.79	456.1	0.5469
Mesocarp	Bhagwa	4.1833	75550.063	86.17	967.7	0.8947
	Ganesha	3.9167	52225.969	90.14	4784.9	1.6364
	Mridula	4.1333	4745.440	75.52	944.7	1.5000
Seeds	Bhagwa	4.1667	2462.467	33.71	475.4	1.0000
	Ganesha	4.1500	1144.852	40.72	596.9	1.0000
	Mridula	4.1833	3911.646	30.17	479.2	1.0909

**Discussion:-**

Evaluation of total phenolic contents, antioxidant activities and presence of vitamins in pomegranate were previously reported and discussed. Elfalleh *et al.* (2012) showed that the methanolic extracts to study alkaloids, flavonoids and tannins were suitable for phytochemical screening, which is supported by this current study. However, we found the difference among three varieties of pomegranates in respect to flavonoids and tannins. Alkaloids were present in all the varieties and studied through methanol extractions. We found that flavonoids and tannins were oppositely present among the varieties. In all the varieties, exocarp and mesocarp contained flavonoids, but seeds contained only tannins. Bhandari *et al.* (2012), while performing the phytochemical screening with peel and seeds, revealed the presence of glycosides in peel (Chloroform) and seeds (Ethanol). However, in the current study, we found no glycoside content in any part of any variety. This may be due to methanol extraction. The same authors reported the absence of flavonoids in seeds, which is supported by our study. In respect to saponins and alkaloids, we observed them in all varieties and their parts, where as, these authors were not able to find the same in peels. These authors reported tannins in peels, where as we found tannins only in seeds. Chebaibiet *al.* (2013) showed the absence of alkaloids in peel extracts, where as our results showed alkaloids presence in the peel extracts. They found tannins and glycosides in peels, where as we found absence of the both in peels.

Anahita *et al.* (2015) evaluated antioxidant vitamin i.e. ascorbic acid from pomegranate juice and seed and concluded that a combination of both seed-juice have high phenolic compounds and vitamin-C. In the current study, the mesocarp of *Ganesha* showed high content of ascorbic acid (90.14%). It indicates that, mesocarp can be a complementary source for vitamin-c supplement.

**Conclusion:-**

The presence of various phytochemicals in pomegranate can promote the essential constituents in alimentary purposes. We found variation in phytochemical constituents among different varieties of pomegranates available in India. We found that the seeds of these varieties does not contain flavonoids, but are rich of tannins. These varieties showed absence of glycosides. Neither a single variety nor any part of these varieties showed glycoside's presence. We also found alkaloids in seeds. In respect to ascorbic acid, out of all the parts and varieties, the mesocarp of *Ganesha* showed high content of ascorbic acid.

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### RESEARCH ARTICLE

#### MODELING AND FORECASTING GDP AT CURRENT MARKET PRICE IN BANGLADESH: AN APPLICATION OF ARIMA MODEL.

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#### Abstract

An autoregressive integrated moving average (ARIMA) model is useful to analyze time series data either for better understanding or for forecasting future points in the series. The ARIMA model is useful even when the data show evidence of non-stationarity, where an initial differencing step is applied to remove the non-stationarity. In this study, it is tried to find out the trend in GDP at current market price of Bangladesh using Box-Jenkins approach for ARIMA model based on the GDP at current market price data of Bangladesh from 1989-90 to 2014-15. Initially, evidence of non-stationarity was found in the data using the Dickey-Fuller test and the non-stationarity was removed by taking first differences. Then using the model selection criteria, AIC, ARIMA (0, 2, 1) model has been selected and it has been used to forecast GDP at current market price of Bangladesh up to 2026-27. It is hoped that the forecasts would be useful for researcher and policy makers.

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#### Introduction:-

Most of the expert and economists favor high and efficient government planning because they think that it ensures and contributes to enlarging GDP. Planning is one of the main components of public budget. Investment is one of the main components of aggregate demand. Its plays an important role of economic growth (Ahmed, *et.al.* 2010). Public investment is fully conducted by the government. By development plan, the government can improve economic situation of the country. Currently, we observed that government budget and private investment simultaneously plays great role to rapid economic growth. Both the public and private investments are required to boost up real GDP at current market price (main part of public investment) has a big share compared to private investment (Mahi, *et.al.* 2015). Bangladesh is small country but over populated. Its economy is rapidly improving based on market price. Most of the indicators of development show their positive reaction since 1971. According to Wikipedia, Bangladesh has made significant strides in its economic sector performance since independence in 1971 (Wikipedia). The economy has improved vastly after 1990s. Most of the characteristics of public investment are present in GDP at current market price. So we can consider the maintenance current market price as the public investment. Though public investment is organized in different ways but the aim and objects are same for all countries. Finally, we can infer that GDP at current market price is the public investment in our country [Wikipedia]. Gross domestic product (GDP) is a monetary measure of the market value of all final goods and services produced in a period (quarterly or yearly). Nominal GDP estimates are commonly used to determine the economic performance of a whole country or region, and to make international comparisons. Nominal GDP per capita does not, however, reflect differences in the cost of living and the inflation rates of the countries. Therefore, using a GDP

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PPP per capita basis is arguably more useful when comparing differences in living standards between nations (<http://en.wikipedia>). In 1993 India adopted an exchange rate system in which the exchange rate is determined by the supply and demand in the inter-bank foreign exchange market. The adoption of this floating flexible regime had not freed the Reserve Bank of India, the central bank of India, from intervening in the foreign exchange market (Branson, 2002). As the thinness of the Indian foreign exchange market as well as large transactions can cause excessive volatility, Reserve Bank of India pursues an explicit policy of intervention in the spot market and also undertakes both forward and swaps transactions in support of its exchange rate objectives (World Bank, 2001).<sup>72</sup> ASA University Review, Vol. 3 No. 2, July–December, 2009 (Delurgio, 1998). In 2000 Pakistan has abandoned her 'exchange rate band regime' and adopted a sort of floating exchange rate system. Though Pakistan experienced with her exchange rate band regime in 1998 and 1999 high exchange rate volatility and was bound adopted fixed peg for a brief period, however, with the adoption of the floating system the volatility increased. The State Bank of Pakistan was forced to intervene in foreign exchange market, which takes the form of outright sales of foreign exchange, swap transactions and supply of foreign exchange to banks to cover certain bulky imports (World Bank, 2001) (Krugman, 2000). In 2001 Sri Lanka adopted the free floating exchange rate regime. Immediately after the float, the exchange rate volatility arose sharply and caused massive depreciation of the Lanka rupee in spite of putting precautionary foreign exchange regulations in combination with the introduction of the float. Sri Lanka has with the free float a set of guidelines for dealing in the foreign exchange market and intervention by the central bank (World Bank, 2001) (Bukhari, et.al. 2007). In the backdrop of the discussion so far, it is intended to look at the performance of the exchange rate policy of Bangladesh and its impact on inflation and growth rate of GDP. In Bangladesh perspective, importance of GDP at current market price is relatively high compared to other developing country. Due to low infrastructure, the returns of GDP are not satisfactory and still not clear (Mahi, 2015). It is very important to know whether GDP and economic growth are related to each other especially in Bangladesh perspective or not. For any economy like Bangladesh, GDP is the vital factor of the development. From the above discussion, it is clear to us many study was conducted to forecast some economy variables by using time series model in respect of Bangladesh but now it is needed to study about GDP. The vital objective of the study is to select the better model and forecasting GDP on overall economy of Bangladesh.

#### **Source of data and Methods:-**

The data is collected from different editions of Statistical Yearbook published by Bangladesh Bureau of Statistics (BBS). The editions are: (i) Statistical Yearbook of Bangladesh-1975 (ii) Statistical Yearbook of Bangladesh-1990 (iii) Statistical Yearbook of Bangladesh-2000 (iv) Statistical Yearbook of Bangladesh-2010. There are a lot of sectors that impact our GDP; Current market price is one of them. In order to, find out the probable relationship between economic growth and Current market price by using auto-regressive and moving average models and other statistical method. This study analyzes the Modeling and forecasting GDP at current market price of Bangladesh. We know that, the general purpose of ARIMA method is to know more about the proper relationship between some explanatory variable. We use annual data for the period from the fiscal year 1989/90 to 2014/2015. We will use secondary data that are collected from different sources. All data are time series data. All variables are measured in millions of us dollar in core in taka. Bangladesh is also not different from like other developing countries. Some data are clearly vague such as same data but from different sources are inconsistent. That's why, careful attention was implied during self-complied period. Here, data are to be used in this analysis will be standard and reliable because of all sources of data are well known, recognized, widely used and accepted by government and others. So, data, which will be used in this study, must be reliable.

#### **Autoregressive Integrated Moving Average (ARIMA) model:-**

To develop the Box and Jenkins (1972) method for analyzing stationary univariate time series data. The Box-Jenkins methodology for ARIMA models differences the series to stationary and then combines the moving average with autoregressive parameters to yield a comprehensive model useful for forecasting. The underlying goal is to find an appropriate formula so that the residuals are as small as possible and exhibit no pattern. Box-Jenkins forecasting models are based on statistical concepts and principles and are able to model a wide spectrum of time series behavior.

#### **Augmented Dickey-Fuller Test (ADF Test):-**

The Augmented Dickey-Fuller Test (ADF Test) is used to determine the stationarity of the data. The ADF test is used to test for unit root [9]. The null-hypothesis for an ADF test:  $H_0: \gamma = 0$  vs  $H_1: \gamma < 0$ , Where  $H_0$ : is the null hypothesis (has unit root) and  $H_1$ : Does not have unit root,  $\gamma$  is the estimated coefficient. The testing procedure for

the ADF test is the same as for the Dickey–Fuller test but it is applied to the model. A random walk with drift and trend is represented as;

$$\Delta y_t = \alpha + \beta_t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + \dots + \delta_{p-1} \Delta y_{t-p+1} + \varepsilon_t \quad (1)$$

Where,  $\alpha$  is a constant,  $\beta$  the coefficient on a time trend and  $p$  –the lag order of the autoregressive process. Imposing the constraints  $\alpha = 0$  and  $\beta = 0$  corresponds to modeling a random walk and using the constraint  $\beta = 0$  corresponds to modeling a random walk with a drift. The test statistics,  $\tau = \frac{\gamma}{\sigma_\gamma}$ , Where:  $\gamma$  is the estimated coefficient and  $\sigma_\gamma$  is the standard error in the coefficient estimate. The test statistics value  $\tau$  is compared to the relevant critical value for the Dickey Fuller Test. If the test statistic is less than the critical value, we reject the null hypothesis and conclude that no unit-root is present. The ADF Test does not directly test for stationarity, but indirectly through the existence (or absence) of a unit-root. Decision rule: If  $t^* >$  ADF critical value,  $\implies$  not reject null hypothesis, i.e., unit root exists. If  $t^* <$  ADF critical value,  $\implies$  reject null hypothesis, i.e., unit root does not exist. Using the usual 5% threshold, differencing is required if the p value is greater than 0.05.

#### Formulation of ARIMA Model:-

ARIMA( $p, d, q$ ) Completely ignores independent variables and assumes that past values of the series plus previous error terms contain information for the purposes of forecasting. The integers refer to the Auto regressive (AR), Integrated (I) and Moving Average (MA) parts of the data set respectively. The ARIMA models are applicable only to a stationary data series, where the mean, the variance, and the autocorrelation function remain constant through time [8]. Autoregressive process AR presses a dependent variable as a function of past values of the dependent variable. An  $p$ th order process is of the form:

$$y_t = \alpha + \phi_1 y_{t-1} + \phi_2 y_{t-2} + \dots + \phi_p y_{t-p} + \varepsilon_t \quad (2)$$

Where;  $Y_t$  is the stationary depended variable being forecasted at time  $t$ .  $y_{t-1}, y_{t-2}, \dots, y_{t-p}$  is the response variable at time lags  $t-1, t-2, \dots, t-p$  respectively,  $\alpha = \mu(1 - \phi_1 - \dots - \phi_p)$ .  $\phi_1, \phi_2, \dots, \phi_p$  are the coefficients to be estimated.  $\varepsilon_t$  the error term at time  $t$  with mean zero and a constant variance. Using the backshift operator, we can write the AR( $p$ ) model as;

$$(1 - \phi_1 B - \phi_2 B^2 - \dots - \phi_p B^p) y_t = \phi(B) y_t = \varepsilon_t \quad (3)$$

The moving average model of order MA( $q$ ) is defined as;

$$y_t = \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \dots + \theta_q \varepsilon_{t-q} \quad (4)$$

Where;  $q$  is the number of lags in the moving average and  $\theta_1, \theta_2, \dots, \theta_q$  are parameters to be estimated the moving average operator is given by;  $\theta(B) = \theta_1 B + \theta_2 B^2 + \dots + \theta_q B^q$ . To create an ARMA model, we begin with an econometric equation with no independent variables  $Y_t = \beta_0 + \varepsilon_t$  and add to it both the AR process and the MA process.

$$y_t = \beta_0 + \phi_1 y_{t-1} + \phi_2 y_{t-2} + \dots + \phi_p y_{t-p} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \dots + \theta_q \varepsilon_{t-q} \quad (5)$$

$\beta_0 + \phi_1 y_{t-1} + \phi_2 y_{t-2} + \dots + \phi_p y_{t-p}$  is the AR( $p$ ) and  $\varepsilon_t + \theta_1 \varepsilon_{t-1} + \dots + \theta_q \varepsilon_{t-q}$  is the MA( $q$ ) process. Where,  $\phi_s$  and  $\theta_s$  are the coefficients of the autoregressive and moving average processes respectively. The integrated ARMA or ARIMA model is a broadening class of ARMA model which includes a differencing term. A process is said to be ARIMA( $p, d, q$ ) if

$$\nabla^d y_t = (1 - B)^d y_t \quad (6)$$

Is an ARMA( $p, q$ ). This is generally written as;  $\phi(B)(1 - B)^d y_t = \theta(1 - B) \varepsilon_t$ . A first- differenced GDP at current market price series is of the form:  $GDP_t = (\nabla GDP_t) = GDP_t - GDP_{t-1} = \Delta GDP_t - \Delta GDP_{t-1}$ . Thus ARIMA( $p, d, q$ ) model may be specified as:

$$GDP_t = \beta_0 + \phi_1 GDP_{t-1} + \phi_2 GDP_{t-2} + \dots + \phi_p GDP_{t-p} + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \dots + \theta_q \varepsilon_{t-q} \quad (7)$$

Where,  $GDP_t$  is the differenced GDP at current market price series of order  $d$ , and  $\phi, \beta$ , and  $\theta$  are the parameters to be estimated. Shumnay & Stoffer (2011). The equation must assume stationarity before applying to a time series. In case of non-stationarity successive differences are taken until the series is stationary. In practice the differences are rarely more than two. The aim of this methodology is to find the most appropriate ARIMA( $p, d, q$ ) model and to use it for forecasting. It uses an iterative six-stage scheme: (1) A priori identification of the differentiation order  $d$  (or choice of another transformation) (2) A priori identification of the orders  $p$  and  $q$  (3) Estimation of the parameters, ( $\phi, \beta$  and  $\theta, \delta^2 = Var \varepsilon_t$ ) (4) Validation (5) Choice of a model (6) Prediction.

**Selection of best model:-**

When a model is identified, the work is to estimate the AR and MA parameters to fit the time series that is being modeled. For ARIMA model, the method of least squares and the method of maximum likelihood can be used. The method of maximum likelihood finds the values of the parameters, which maximizes the likelihood. To find a tentative model, the pattern in the ACF and PACF are considered which are summarized by Markridakis et al (1998). Spikes at lag 1 *top*, and cuts off to zero in PACF indicates  $AR(p)$  model. Again, Spikes at lag 1 *toq*, and cuts off to zero in ACF indicates  $MA(q)$  model. To select the best model among the plausible model, the Akaikeinformationcriterion (AIC) can be used, which is given by

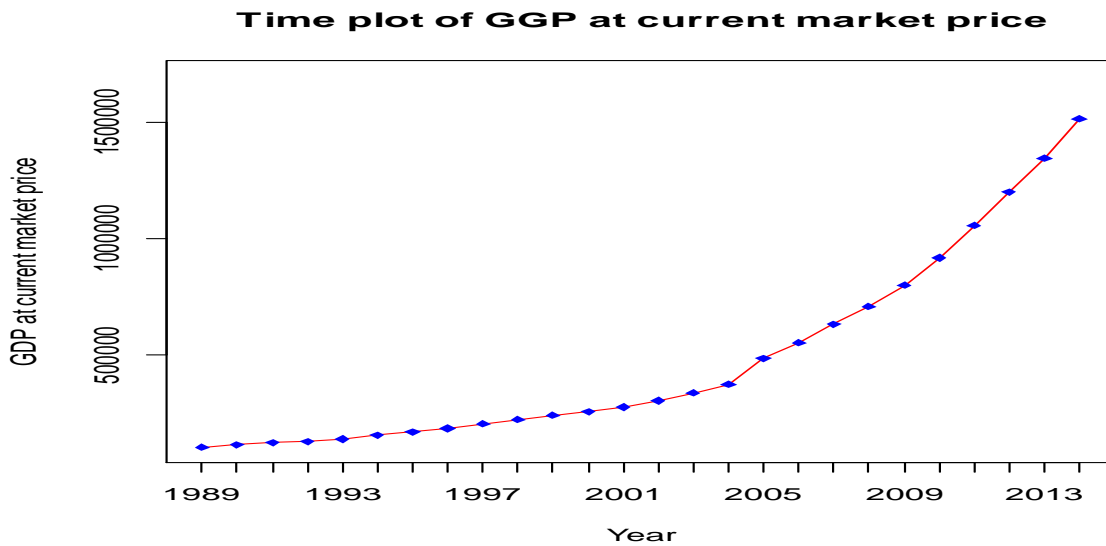
$$AIC = -2\log L + 2m \tag{8}$$

Where,  $L$  is the maximum likelihood,  $m$  is the number of parameters estimated in the model. The model with the minimum AIC is to be chosen.

**Analysis and results:-**

**Time series plot:-**

At first the data are plotted, where the variable is the GDP at current market price of Bangladesh. The following figure 3.1 shows the time plot of the variable.

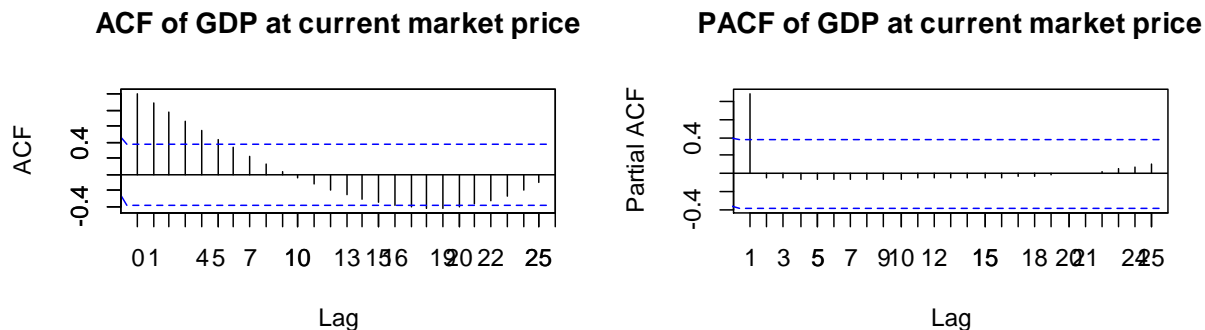


**Figure: 3.1:-** Time plot of GDP at current market price of Bangladesh

From the figure 3.1, it is seen that the data are showing an upward trend that is the data is non-stationary. As a result, to achieve stationarity differencing is needed.

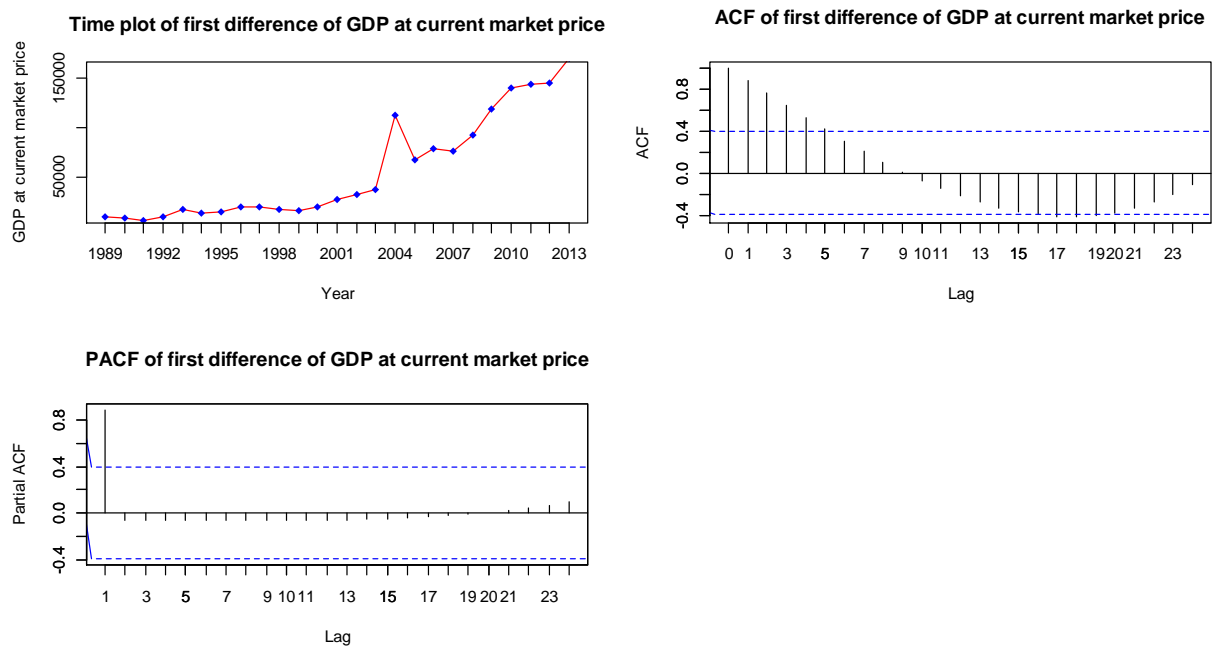
**Checking and obtaining stationarity:-**

Before taking any difference, it is convenient to examine stationarity by using auto-correlation function (ACF) and partial auto-correlation function (PACF) graphs or by using different tests like augmented Dickey-Fuller test or L-Jung-Box test. The following figure shows the ACF and PACF plots of GDP at current market price of Bangladesh.



**Figure: 3.2:-** ACF and PACF of GDP at current market price of Bangladesh.

Here we see that, the ACF plot shows a slowly decreasing and for several lags. Thus the result shown by ACF and PACF are that the data is non-stationary. Stationarity can also be checked by several statistical tests. **Augmented Dickey-Fuller (ADF) test about unit root or stationarity:** A statistical test to check stationarity of a time series dataset is ADF test. Here, the null and alternative hypothesis is given by  $H_0$ : Data is non – stationary versus  $H_1$ : Data is stationary. For lag order 3, the calculated Dickey-Fuller test statistics is -1.3251 and the p-value is 0.6489. As a result, the null hypothesis cannot be rejected at 5 percent level of significance. Thus the test concludes the series is non-stationary. **White noise test for checking independence (L-Jung-Box test):** If the data are correlated or not, then we can use the L-Jung-Box test. Here, the null and alternative hypothesis is as:  $H_0$ : Data points are independent of one-another Vs  $H_1$ : Data points are correlated. For 52 degrees of freedom, the test shows the calculated Chi-squared statistic is 18.4972 and the p-value is 1.702e-05 which is less than .01. So, at 5 percent level of significance, the conclusion is, dataset is not independent. Since the GDP at current market price of Bangladesh is non-stationary, here differencing is used to achieve stationarity. At first, the first difference has been taken and the data is again checked whether it is stationary or not. The following plot shows the time plot of after taking first difference of the GDP at current market price data of Bangladesh.



**Figure: 3.3:-** Time plot, ACF and PACF of first difference of GDP at current market price

From the above time plot, it is seen that non-stationarity in mean is achieved. Where the ACF plot shows only five spikes fall outside the confidence limits. Again in the PACF plot only one spike falls outside the confidence limits, which are the indications of stationarity. But, to become assured, the statistical tests are applied.

**White noise test for checking independence (L-Jung-Box test):** Hypothesis:  $H_0$ : Data points are independent of one-another Versus  $H_1$ : Data points are correlated. For 52 degrees of freedom, the test shows the calculated Chi-squared statistic is 16.6605 and the p-value is 4.47e-05. So, at 5 percent level of insignificance, the conclusion is, dataset is not independent, because the null hypothesis can be rejected. Since the first difference of GDP at current market price of Bangladesh is non-stationary, here second differencing is used to achieve stationarity. Then, the second difference has been taken and the data is again checked whether it is stationary or not. The following plot shows the time plot of after taking second difference of the GDP at current market price data of Bangladesh.

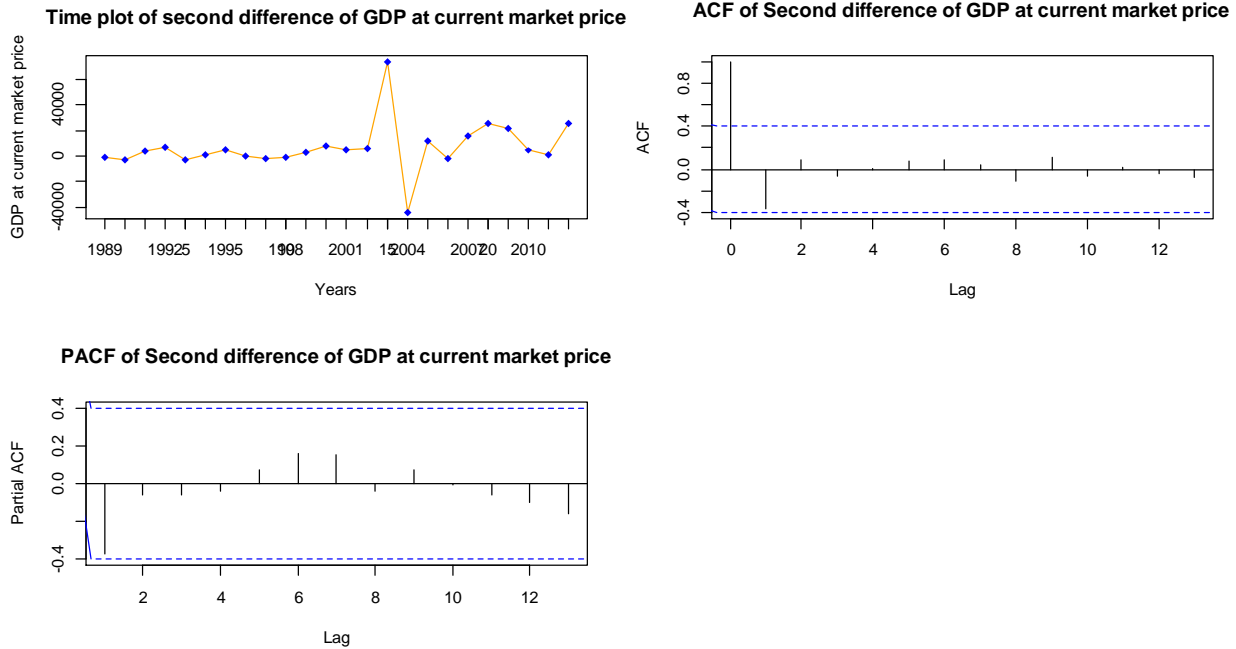


Figure: 3.4:- Time plot, ACF and PACF of second difference of GDP at current market price

From the above time plot, it is seen that stationary in mean is achieved. The ACF plot shows that only one spikes fall outside the confidence limits. Again in the PACF plot have no any spike falls outside the confidence limits, which are the indications of stationarity. But, to become assured, the statistical tests are applied. **White noise test for checking independence (L-Jung-Box test):** Hypothesis:  $H_0$ : Data points are independent of one-another Versus  $H_1$ : Data points are correlated. For 52 degrees of freedom, the test shows the calculated Chi-squared statistic is 3.2491 and the p-value is 0.07146 which is less than .01. So, at 5 percent level of significance, the conclusion is, dataset is independent, because the null hypothesis cannot be rejected.

**Determining an appropriate ARIMA model:-**

Among the different plausible models, the best model can be selected by using the Akaike Information Criterion (AIC). Here, the model with the minimum AIC will be selected as the appropriate model. Table 3.1 shows the AIC values for different combinations of p and q, that is, for different ARIMA (p; d; q) models.

Table 1:- AIC values for different ARIMA (p; d; q) models

ARIMA (p, d, q)	Values of AIC
ARIMA (0, 0, 1)	722.86
ARIMA (0, 1, 1)	615.79
ARIMA (0, 2, 1)	547.01
ARIMA (0, 2, 2)	548.12
ARIMA (0, 2, 3)	550.11

From the above table, we can find that ARIMA (0, 2, 1) model is appropriate for the GDP at current market price data of Bangladesh, since it has the minimum AIC (547.01).

**Estimation and diagnostic checking:-**

We can find that, ARIMA (0, 2, 1) is the best model for the data. Here, the ARIMA model includes no autoregressive and one moving average coefficients with two differences. Thus, we can write the ARIMA model is as  $(1 - B)^2 y_t = (1 + \theta_1 B) e_t$ . That is,  $\nabla^2 y_t = e_t + \theta_1 e_{t-1}$ , Where,  $\phi$ 's be the autoregressive coefficient and  $\theta$ 's be the coefficient for moving average. Now, the parameters have to be estimated using the maximum likelihood method. Following table gives the maximum likelihood estimates of the parameters and significance of the parameters.



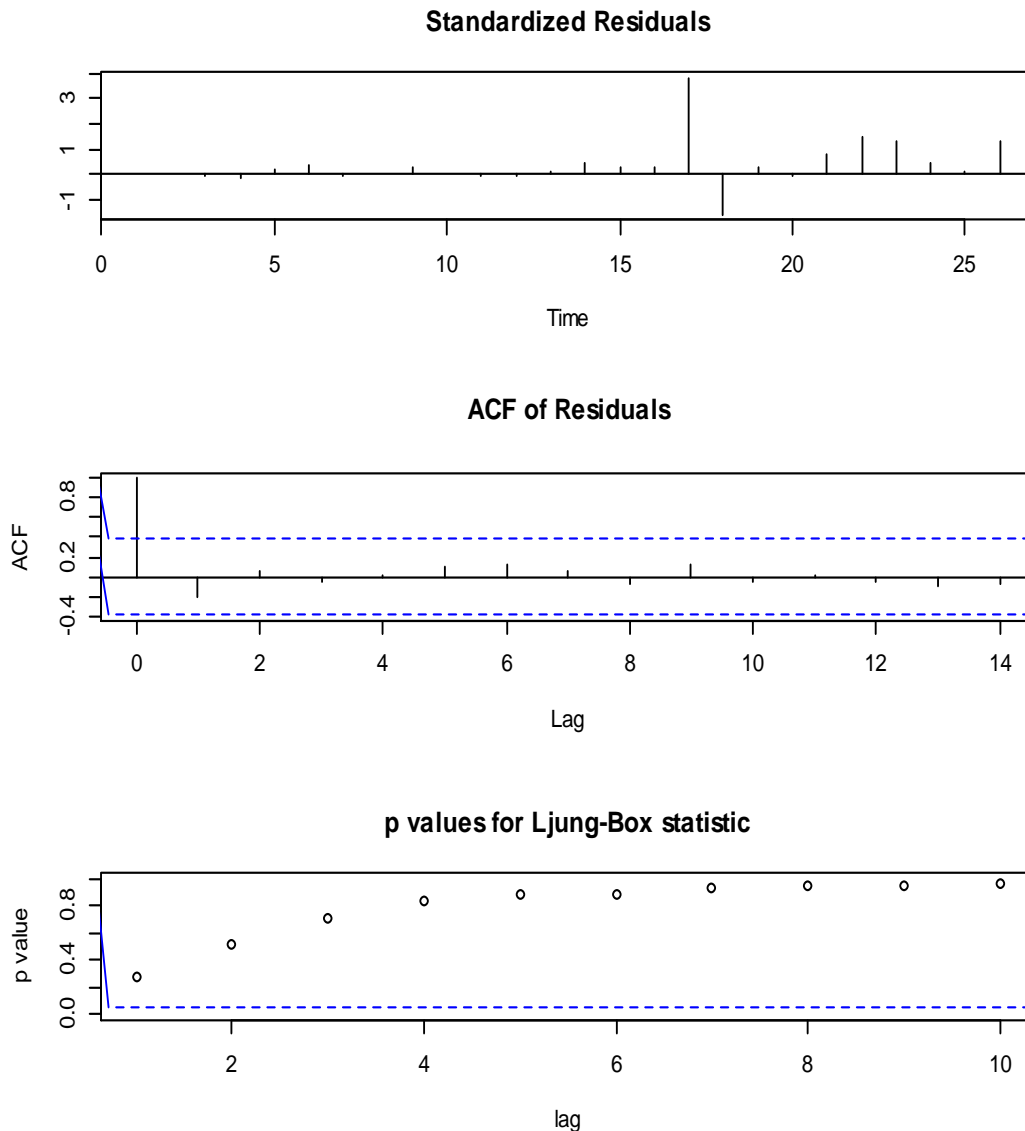
**Table 2:** The estimate and significance levels of the parameters of *ARIMA (0, 2, 1)* model

Parameter	Estimate	Standard error	p-value	Decision
$\theta_1$	-1.0000	0.1121	0.001	Significant

Here, the diagnostic checking can be started by checking whether the errors are white noise or not. The assumption of independence of residuals can be checked by L-Jung-Box test.

**L-Jung-Box test for checking independence of residuals:-**

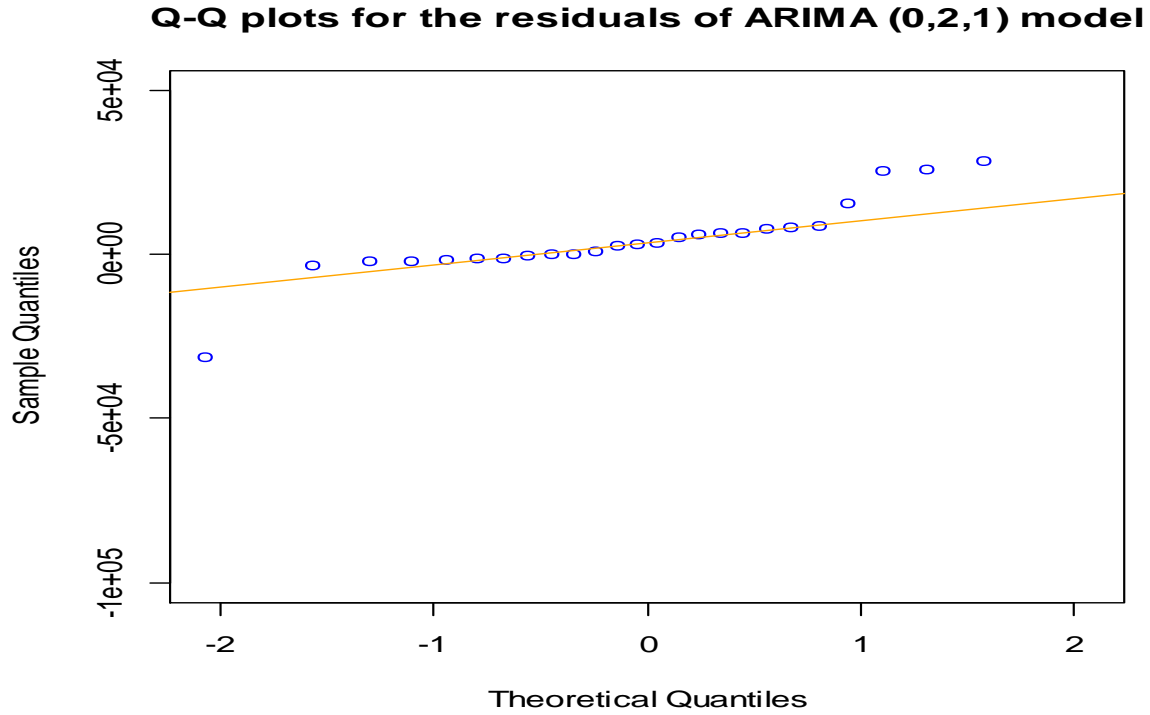
Hypothesis: $H_0$ : The residuals are independent of one-another Versus  $H_1$ : The residuals are correlated. For 1 degree of freedom, the test shows the calculated Chi-squared statistic is 4.8824 and the p-value is 0.02713. So, at 5 percent level of significance, the null hypothesis cannot be rejected. Hence, it can be said that the residuals are independent of each other. Following plot shows the standardized residuals, ACF of residuals and p-values for L-Jung-Box statistics taking different lag values that is the diagnostic plot for the model.



**Figure 3.5:-** Diagnostic plot for *ARIMA (0, 2, 1)* model

From this plot, the independence assumptions of residuals are also satisfied since none of the ACF values of lag 1 or more is significant. The plot also shows the large p-values for L-Jung-Box statistics for different lag values which is also the evidence of independent residuals.

The normal q-q plot is the following:



**Figure: 3.7:-** Q-Q plots for the residuals of ARIMA (0, 2, 1) model

Finally, the q-q plot shows that the residuals are almost normal.

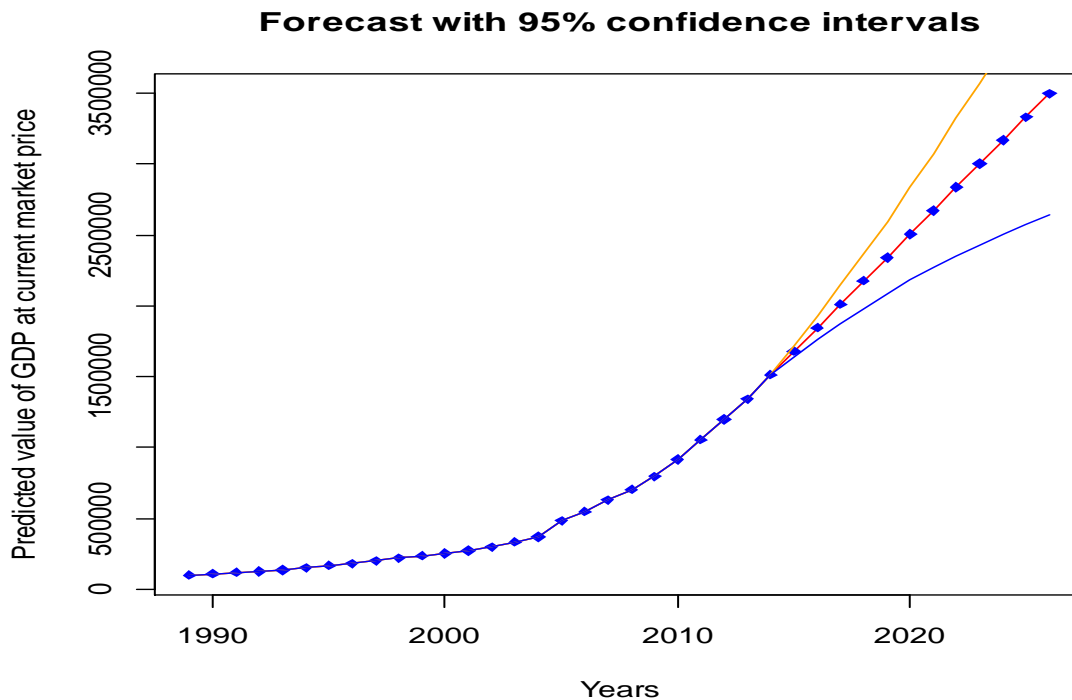
**Forecasting:-**

At the starting of the forecast, we have found the forecasted values which were included in our data by using our fitted ARIMA model. Then the initial forecasts obtained from the ARIMA model was for differencing series of the GDP at current market price data. To obtain the forecasts valid for the original series second differencing has been taken. The point forecast with 95% confidence interval of yearly total GDP of Bangladesh for the years 2015-2016 to 2026-2027 (next twelve years) using selected model is given in table 3.

**Table 3:**Forecast of total GDP for next twelve years

Time periods	Point forecasts	95% Confidence intervals
2015-16	1679054	(1639464, 1718644)
2016-17	1844508	(1762103, 1926912)
2017-18	2009961	(1876525, 2143398)
2018-19	2175415	(1983717, 2367113)
2019-20	2340869	(2084442, 2597296)
2020-21	2506323	(2179273, 2833373)
2021-22	2671777	(2268659, 3074895)
2022-23	2837231	(2352959, 3321502)
2023-24	3002684	(2432472, 3572897)
2024-25	3168138	(2507449, 3828827)
2025-26	3333592	(2578107, 4089077)
2026-27	3499046	(2644632, 4353460)

The plot of the forecast values with the 95% confidence intervals is shown in figure 3.8



**Figure:-**Forecasts with 95% confidence intervals

Here, the red line indicates the forecast values for next twelve years and the two orange and blue lines indicate the 95% confidence intervals for those forecasts.

### Discussion and Conclusions:-

The objectives of this study were to model the GDP at current market price data of Bangladesh and to forecast it for next twelve years using that model. To achieve the objectives, Box-Jenkins approach to ARIMA model has been used. The data was the GDP at current market price of Bangladesh for the years 1989-90 to 2014-15, Taka in core was used.

Initially, non-stationarity and dependency was found in the data by augmented Dickey-Fuller and the L-Jung-Box tests. This non-stationarity was removed first by taking first differencing and then second differencing. Using the model selection criterion AIC, ARIMA (0, 2, 1) model was selected. The parameter of this model has been estimated using the maximum likelihood method and all the parameters were found to be significant assuming normal distributions of the estimators. The assumptions made on normality and independence of the residuals was checked using different plots and tests and all the results were satisfactory. The plot comparing the actual values of the data and the fitted values using the model shows very much close fit. Then the model was used for forecasting purposes.

The forecast for the original series has been obtained by taking second differencing of the initial forecasts which were obtained for the first difference data. At last the forecasts for GDP at current market price of Bangladesh with the 95% confidence interval for twelve years along with the data has been shown in a plot and it is found that the upward trend in GDP at current market price will still continue for this period and our study conclude that Bangladesh will promote his position from developing countries to high income country with appropriate time or our forecasted time.

### Limitations:-

In this study, the model has been established by using ARIMA approach only. Other types of time series models such as ARCH, GARCH and SV models were not considered. The study has been done based on the secondary data. So, the limitations of secondary data remain in the study.

**Acknowledgement:-**

This study is conducted based on secondary data of Gross Domestic Product (GDP) of Bangladesh. We have taken data from different editions of Statistical Yearbook published by Bangladesh Bureau of Statistics (BBS). So, we have to give a special thanks to the authority of BBS for providing the data.

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### **RESEARCH ARTICLE**

## **THE IMPACT OF COLLABORATIVE LEARNING TO THE ORAL PROFICIENCY AND SELF EFFICACY OF THE KOREANS LEARNING ENGLISH AS A FOREIGN LANGUAGE IN LSPU, PHILIPPINES.**

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#### **Abstract**

Motivation is a powerful and effective variable in the second language acquisition (Liu M. 2007). Hence, in the learning of the second language, motivation is affected by numerous language related factors like culture, community; learner factors such as self-efficacy, causal attribution, goal orientation and the learning situation; and the learning situation about the teacher, the teaching method, the syllabus, among others.

Every year, Changwon Moonsung University, the partner of Laguna State Polytechnic University in Korea, send students to participate in a one-month Intensive English Language Proficiency Course in LSPU, as part of the international academic collaboration of two universities.

As expected, upon arrival in LSPU, these Korean students could scarcely use the English language orally due to lack of ability to carry out the task, and inadequate confidence to cope with the challenges associated with language learning.

But after a few days of rigid English language exposure, observable changes take place. Hence, during the learning process, it is necessary for learners to have strong sense of confidence within them as they make efforts to learn a foreign language in a short period of time.

After one month, this study revealed the significant impact or effect of collaborative learning to the oral proficiency and self-efficacy level of the Koreans learning English as a foreign language in Laguna State Polytechnic University.

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#### **Introduction:-**

Korean people's difficulty in learning English as a means of communication could be attributed to a number of factors. One, is the fact that in many developing countries like Korea, the system of education utilizes mother tongue based education model in which initial instruction begins in children's mother tongue. Another is the dialectal differences which exist for each language which makes it difficult for Koreans to pronounce various phonemic sounds. These are some of the major considerations why the Korean nationals have difficulty in learning English which is now one of the widely used means of communication in the world's businesses, economics, science, and education to name a few.

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Another consideration as pointed out by Yap (1981), is the fright of an individual and his defect in pronunciation of words clearly and correctly, which are the primary reasons why in front of people, Korean English learners appear to have shaky voice, inferiority and other manifestations of anxiety.

However, to become abreast with the advancement of the world of technology, to become competent members of the world community, and to be “in” in the world of professionals, learning English has become not only a must but a passion among majority of the Korean people.

These are the reasons why many students from Changwon Moonsung University participate in the Intensive English Language Proficiency Course offered by Laguna State Polytechnic University. It is because they believe that one-month in LSPU may profoundly contribute to the improvement of their English proficiency, and may enhance their self-efficacy. They would like to take advantage of the environment of people who do not only understand English but are confident of using English as a means of communication. Also, learning collaboration with the Filipino learners contribute greatly in the advancement of their communication skill.

This study on collaborative learning is heavily rooted in Vygotsky’s views that there exists an inherent social nature of learning which is shown through his theory of zone of proximal development. Often, collaborative learning is used as an umbrella term for a variety of approaches in education that involve joint intellectual effort by students or students and teachers. Thus, collaborative learning is commonly illustrated when groups of students work together to search for understanding, meaning, or solutions or to create an artifact or product of their learning. Collaborative learning activities can include collaborative writing, group projects, joint problem solving, debates, study teams, and other activities. The approach is closely related to cooperative learning methodology.

### **Methodology:-**

This study is experimental in design. The independent variable is the method of instruction in terms of collaborative learning in different learning areas in English such as reading, speaking, listening, writing, and vocabulary development. The dependent variable comprised of the pre-evaluation and post-evaluation of the Korean students’ self-efficacy level. The evaluation is an individual proficiency assessment and a questionnaire to assess the students’ self-efficacy level.

The population consisted of 19 Korean exchange students from Changwon Moonsung University. They were pre-selected in Korea and were part of the Student Exchange Program between Laguna State Polytechnic University and Changwon Moonsung University, Korea.

Pre-evaluation language proficiency examination was undertaken to the foreign students prior to the collaborative learning experiences.

There were lectures and activities in various learning areas in English such as reading, speaking, listening, writing, and vocabulary development. 19 Koreans were involved in class which grouped with Filipino students (college level) during the execution of lessons from the discussion part, to clarification of ideas and evaluation.

Post-evaluation language proficiency examination was undergone after four weeks of classroom collaborative interactions.

The self-efficacy level of the Korean students was measured utilizing a questionnaire.

When implementing collaborative learning, the concept and the learning structure were explained to the students emphasizing on the key elements of the collaborative process. The students were instructed to cooperate and listen carefully to teacher’s instruction/comments/suggestions. Every student was given opportunity to contribute his/her ideas/opinions.

Groups were formed using self-selection, hence, each Korean student had a Filipino partner. As cited by Fui Fong Ho and Hong Kwen Boo (2007) from Johnson & Johnson (1993) cooperative learning is structuring smaller groups (two or three) so that students work together to maximize their own and each other’s learning. In this study, there were 19 Korean students and 19 Filipino students that make up a class of 38 students.

The instruments used in this study was developed by the writer patterned on the English Proficiency Test (Fulcher-Hasselgren Data-Based Fluency Scale). The Language Proficiency Assessment was designed to measure the students' fluency, listening comprehension, grammar, pronunciation and vocabulary among others. To measure the self-efficacy, a set of self-efficacy questionnaire mainly focused in rating their confidence level weredistributed and answered by the Korean students.

#### Analysis and Interpretation of Data:-

**Table 1:-**presents the Mean Scores and Standard Deviation, including the Remarks in the Pre-test and Post-test to measure the Koreans' Proficiency Level.

**Table 1.** The Mean Scores of the 19 Korean Students in the Oral Proficiency Test

No. Of Respondents	Pre-Test Mean Scores	Standard Deviation	Post-test Mean Scores	Standard Deviation	Remarks Pre-Test	Remarks Post-test
1.	3.50	0.84	5.0	0.00	HL	VHL
2.	5.0	0.00	5.0	0.00	VHL	VHL
3.	4.83	0.41	4.83	0.41	VHL	HL
4.	4.33	0.52	5.0	0.00	VHL	HL
5.	3.0	0.41	5.0	0.00	ML	VHL
6.	3.83	0.75	4.67	0.52	HL	VHL
7.	2.50	0.55	4.50	0.55	ML	HL
8.	3.17	0.75	4.17	0.75	ML	VHL
9.	2.33	1.03	4.50	0.55	LL	ML
10.	4.33	0.82	4.33	0.82	HL	ML
11.	2.67	0.52	3.0	0.00	ML	HL
12.	2.50	0.55	3.0	0.00	ML	ML
13.	3.83	0.41	3.50	1.05	ML	ML
14.	1.83	0.75	1.83	0.75	LL	ML
15.	4.67	0.52	5.0	0.00	VHL	HL
16.	2.50	0.55	3.67	0.82	ML	ML
17.	4.17	0.75	4.33	0.82	HL	VHL
18.	4.33	0.52	4.50	0.55	HL	HL
19.	2.83	0.41	4.67	0.82	ML	HL
<b>Over All</b>	<b>3.43</b>	<b>1.10</b>	<b>4.24</b>	<b>1.0</b>	<b>Moderate Level</b>	<b>High Level</b>

The table reflects that in the pre-test mean scores for the English proficiency level among the 19 Korean students, an average mean score of 3.43 was obtained with a standard deviation of 1.10 and a remark of Moderate Level; for the post-test mean scores, there was an obtained overall average mean of 4.24, a standard deviation of 1.0 and a remark of High Level. The results show an increase in the English proficiency level of the foreign students after the one-month Intensive English Language Proficiency Course from moderate level to high level.

The data reflects further a minimum increase in the proficiency level which could be attributed to the short period of time studying the English language through collaborative learning approach with the Filipino students.

**Table 2:-**presents the Pre-test Mean Scores of the 19 Korean Students per Item in the Oral Proficiency Test

Item	Pre-test Mean Score	Pre-test Standard Deviation	Verbal Interpretation
1. Fluency	3.47	0.81	High Level
2. Listening	3.47	1.10	High Level
3. Comprehension	3.02	0.92	Moderate Level
4. Grammar	3.58	0.96	High Level
5. Pronunciation	3.58	0.96	High Level
6. Vocabulary	3.05	1.25	High Level
<b>Over All</b>	<b>3.43</b>	<b>0.97</b>	<b>High Level</b>

Table 2 reflects the Pre-test Oral Proficiency Result per area of competency. It is depicted from the table that fluency, listening, grammar, pronunciation, and vocabulary obtained mean scores of 3.47, 3.47, 3.58, 3.58 and 3.05

respectively, with a verbal interpretation of high level while comprehension obtained a mean score of 3.02 with a standard deviation of 0.97 and verbal interpretation of moderate level.

According to Nunan (2009), the language proficiency of individuals including the structure, and measurement continue to be controversial in language testing. Normally, a speaking proficiency test is given to assess three important elements of the English such as pronunciation, grammatical structure and vocabulary, hence, Fulcher Hasselgen Data-Based Fluency Scale intends to evaluate nine(9) areas of speaking such as accent, pronoun confusion, fluency, initiation and sustaining of conversation, listening comprehension, grammar, vocabulary, question formation, and prepositions. The test aims to determine at a highest level, the speakers ability to demonstrate confidence, expand and support utterances and respond quickly to a given subject.

**Table 3 presents the Post – test Mean Scores of the 19 Korean Students per Item in the Oral Proficiency Test**  
**Table 3.** Post-test Mean Scores of the 19 Korean Students per Item in the Oral Proficiency Test

Item	Pre-test Mean Score	Post-test Standard Deviation	Verbal Interpretation
1. Fluency	4.26	0.81	High Level
2. Listening	4.11	1.10	High Level
3. Comprehension	4.21	0.92	High Level
4. Grammar	4.42	0.96	High Level
5. Pronunciation	4.42	0.96	High Level
6. Vocabulary	4.0	1.25	High Level
<b>Over All</b>	<b>3.78</b>	<b>0.97</b>	<b>High Level</b>

The table reflects that in the post-test mean scores of the 19 Korean students per item in the oral proficiency test, an overall mean score of 3.78 was obtained with a verbal interpretation of high level in all items.

**Table 4 presents the Self-Efficacy Level of the 19 Korean Students**

**Table 4.** Mean Scores of the 19 Korean Students in Self-Efficacy Level

Korean Students	Self-Efficacy Mean Score	Self-Efficacy Standard Deviation	Verbal Interpretation
1	4.67	1.03	VHL
2	3.93	0.83	HL
3	3.80	0.45	HL
4	3.60	0.50	HL
5	4.60	1.09	VHL
6	4.60	1.14	VHL
7	4.00	1.05	HL
8	4.60	1.05	VHL
9	2.87	2.87	ML
10	3.33	1.77	ML
11	3.73	1.97	HL
12	2.80	2.58	ML
13	3.13	2.57	ML
14	2.87	2.87	ML
15	3.47	2.97	HL
16	3.40	3.25	ML
17	4.64	3.23	VHL
18	3.93	3.70	HL
19	3.79	3.95	HL
<b>Over All</b>	<b>3.87</b>	<b>0.97</b>	<b>High Level</b>

The table explains that with respect to self-efficacy in terms of self-confidence, the 19 Korean students obtained an overall mean score of 3.87 and a standard deviation of 0.97 which is verbally interpreted as high level. This means that the Korean students possess ability to complete tasks and reach goals, hence those with high self – efficacy can successfully engage and complete course-specific academic tasks and can show better academic performance than those with low self-efficacy.



Self-efficacy has something to do with the learner's opinion, about his ability to carry out the task, and the degree to which the learner thinks he has the ability to cope with the training challenges according to Arnold (2000). Learner's self-efficacy influences his choices of the language learning activities and the amount of effort exerted. Those with low sense of self efficacy in second language acquisition regard difficult learning tasks as a threat to dignity; they dwell on their deficiencies and the barriers that they encounter rather than concentrate on how to finish the tasks successfully. Consequently, they are inclined to lose faith in their abilities and are likely to give up the learning tasks. In contrast, learners with strong sense of self-efficacy encounter tough tasks with confidence and will sustain efforts in the face of failures. Therefore, those with high self-efficacy are generally high achievers.

**Table 5:-Presents the Correlation Results with T-tests**

Correlations r	
	Self-Efficacy
Pre-test	0.5483
Post-test	0.3484
Correlated T-test	
Pre-test	2.6225
Post-test	1.4868

It can be gleaned from the table that the oral proficiency tests (both pre-test and post-test) exhibit different relationships with the self-efficacy of the Korean students. The post-test resulted in an r-value of 0.5483 denoting a high positive correlation, while the pre-test resulted in an r-value of 0.3484 denoting a moderately small positive correlation. Based on the critical r value obtained at  $18 - 2 = 16$  degrees of freedom at 5% confidence level which is 4683, the post-test has a significant relationship while the pre-test has no significant relationship at 95% significance level.

These results may mean that after the one-month of collaborative learning, the Korean students acquired more self-efficacy with respect to confidence, hence they become more confident in using the English language for classroom interactions and for conversational or social interactions as well.

### Conclusion:

Based on the findings, the one month collaborative learning has significant relationship to the oral proficiency and self-efficacy of the Korean students, therefore the hypothesis stating that the one month Intensive English Language Proficiency Course focused on collaborative learning has no significant relationship with the oral proficiency and self-efficacy of the Koreans is rejected.

### Recommendations:-

1. Since the one month collaborative learning has significant relationship with the oral proficiency of the students, it is recommended that more innovative and creative collaborative activities be utilized not only in the teaching of the foreign students but also in the teaching of English to Filipino students.
2. The duration of the program can also be extended and more studies can be conducted utilizing other variables that are not yet investigated.
3. Teachers should provide more instructional materials that are fresh and effective to further enhance the teaching of Intensive English Language Proficiency Course.

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### RESEARCH ARTICLE

#### EFFECTIVENESS OF EDUCATIONAL INTERVENTION ON IMPROVING AWARENESS ABOUT OSTEOPOROSIS AMONG UNIVERSITY FEMALE EMPLOYEES.

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Osteoporosis, Saudi Arabia, female, education

#### Abstract

**Background of the problem:-** Osteoporosis affects around 200 million female in the world and 34% of Saudi female suffer from it. Measuring the extent of the community's awareness especially in target groups is the beneficial way to reduce the prevalence.

**Objectives:** Assess the baseline knowledge about osteoporosis among female employees, to implement health education program and to evaluate the effectiveness of health education program.

**Method:** An educational intervention study carried out in three phases' assessment, education, and evaluation. To measure the change in the knowledge by comparing the change between the pre and posttest group. Questionnaire was collected from 112 female employees in the college of Administration and Business at Princess Nourah bint Abdulrahman University.

**Result:** There was a significant improvement in the level of knowledge in the posttest in all what is related to the planned educational program about osteoporosis was ( $p \leq .001$ ) except for diagnosis ( $p = .116$ ). The mean total knowledge score has significantly increased in the posttest ( $41.6 \pm 3.83$ ).

**Conclusion:** The educational intervention program about osteoporosis was effective. The knowledge improved and the aim was successfully achieved.

**Recommendations:** In this intervention study the majority of the participants were educated and employees aged between 21-30 years old. However, the most beneficial way to reach the effectiveness of the educational program is through the most affected group in women at menopausal stage, unemployment house wives with different background.

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#### Introduction:-

Osteoporosis is one of the important health problems due to the global spread, there are around 200 million women in the world suffer from it.<sup>[1]</sup> Osteoporosis is known as silent disease, most affected individuals are not diagnosed or treated and remain asymptomatic, bones become weaker and more likely to break, from a minor fall or even from simple actions, like sneezing or bumping into furniture.<sup>[2,3]</sup> Osteoporosis affects both men and women at any age, but

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older women (postmenopausal) are more susceptible to the higher risk.<sup>[4]</sup> It has major socioeconomic burden, causing loss of work days and income among adults who are still active in the work place. Moreover, huge direct costs for medical, hospital and surgical care. Therefore, rising indirect costs that result when patients lose their independence and require nursing care either at home or in institutions.<sup>[5]</sup>

Regarding previous study conducting in Saudi Arabia which revealed that femoral fractures yearly cost \$1.14 billion,<sup>[6]</sup> but this has not necessarily been translated into more effective management of osteoporosis health education campaign, which needed to fill the gap between the high prevalence and the drain of health care resources. If there are lacking in knowledge and good application subsequently, the preventive health education is needed to ameliorate knowledge and motivating healthy behaviors. Without doubt the Ministry of Health efforts on improving health awareness of osteoporosis is significantly obvious and taking its course over the past years. However, there's still significantly high prevalence percentage that we cannot marginalized it, according to study conducted among Saudi female, the prevalence of Osteoporosis is 34%. Although the treatments and prevention methods are safe, available, affordable and it effectiveness to reduce the risk of fractures, there is still need to find the loophole in order to detect if there is need for further efforts or further health campaigns that targeting specific population to reduce this percentage. Based on barzanji et al "There is a limitation regarding some studies that indicate women knowledge irrespective of age about osteoporosis risk factors".<sup>[7]</sup> Therefore, measuring the extent of the community's awareness, especially in target groups is the beneficial way to reduce the prevalence. Also, it is important and necessary to measure the progress and possibility efforts that will provided through the whole society.<sup>[8]</sup>

**Research question:-**

Is the health education program effective in improves awareness of osteoporosis among Princess NourahBintAbdulrahman University employees?

**Hypothesis:-** Health education will improve awareness of osteoporosis among Princess NourahBintAbdulrahman University employees.

**The Objectives of the study are to:-**

- Assess the baseline knowledge about osteoporosis among female employees at Princess NourahBintAbdulrahman University.
- To implement health education program for female employees at Princess NourahBintAbdulrahman University.
- To evaluate the effectiveness of health education program

**Methodology:-****Study Design, sitting and duration:-**

An educational intervention study. At Princess Nourahbint Abdulrahman University, from April- September to December 2016

**Study population:-**

The study was on female employees at princess NourahbintAbdulrahman University.

**Inclusion and exclusion criteria:-**

This study only included Saudi (teaching and administrative staff) after excluding those who refuse to participate as their participation was voluntary.

**Sampling technique:-**

A Multi-stage cluster sampling technique was used. Different stages were conducted to select the sample, in the first stage one college was selected randomly by simple random sampling. At the 1<sup>st</sup> stage, the Sciences colleges were randomly selected out of the three main categories (humanities collages, health colleges, and sciences colleges) at Princess Nourah Bint Abdulrahman University. Then in the 2<sup>nd</sup> stage, the college of business and administration was randomly selected out of the four Sciences colleges (college of sciences, college of computer and information science, college of business and administration, college of art and design) included in the sciences colleges as illustrated in figure 1

**Sample Size:-**

A total sample size of 120 teaching and administrative female employees calculated in this study by using an open epi calculator.<sup>[9]</sup> The following parameters were used to calculate the required sample: 95% confidence level, 80.0% power of the test assuming that the change of knowledge can reach up to 25%, according to the findings from the pilot study. Then the sample was doubled to be  $51 \times 2 = 102$ , in addition to 15% expected non response from the participants so the final sample = 120. They were from the college of Administration and Business at Princess Nourah Bint Abdulrahman University. After removing the incomplete filled questionnaire, the remaining sample number became 112

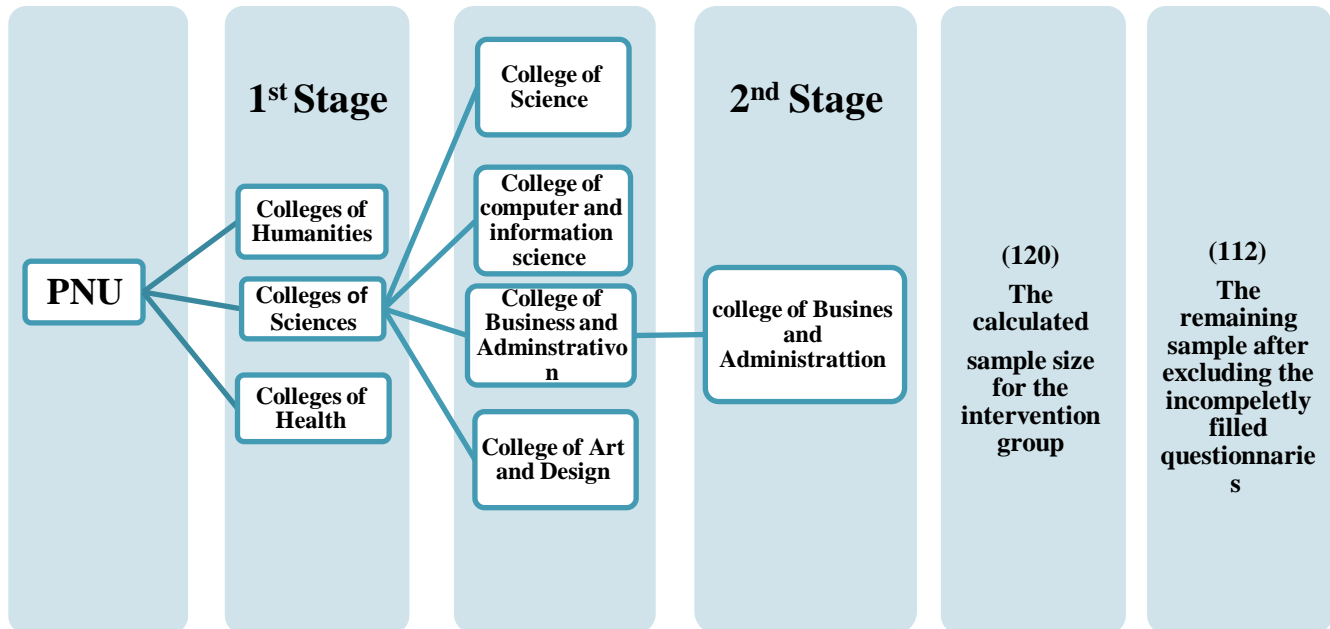


Figure 1:- Sampling technique

**Study Tools:-** A different tools used to achieve the objectives, which are:

**Questionnaire:-**

A self-administrated anonymous Arabic questionnaire, designed using a standard questionnaire, then modified to suit Saudi culture (The Impact of Osteoporosis Continuing Education on Nurses' Knowledge and Attitudes.)<sup>[10]</sup> Pilot testing of the questionnaire was carried out on 20 females not included in the study. It was performed as an initial step for the study to check the easiness of the questionnaire and the time needed to complete it. Some modifications in some questions were done after the pilot study. The final version covers the following items **Personal information** included Nine questions, **Knowledge:** Assess their current knowledge about osteoporosis, with four questions includes (background, sources of information, magnitude problem estimation...etc.). **Risk factors** (Smoking, family history, early menopausal ...etc.). **Manifestations:** Two questions about **Complications and Diagnosis.** **Dietary Requirements:** Three questions about (Recommended daily calcium, source of daily calcium...). Questions about **Sun Exposure** (produce vitamin D, exposing to sunlight, recommended time ...etc.). Three questions includes assessing **Physical activity:** (type of exercise, duration and frequency). For all the previously mentioned items the responses were either (Yes/No/I don't know).

**Intervention tools:-**

The tools used displays the main item that was covered in health education message, knowing that it was carried out in Arabic and it was guided by the items asked in the questionnaire which were:

1. **Poster (roll up panel):** covered the main outlines of the questionnaire in brief through pictures and small sentences.
2. **Booklet:** also covered the main outlines of the questionnaire in more details with pictures and verity of tables that shows detailed daily requirement of calcium, vitamin D, sun exposure and physical activity. To motivate

the participants and to increase their cooperation, motivations rich in calcium and vitamin D was attached with the booklets.

- Lecture:** covered the overall idea of the questionnaire which contained seventeen slides that took around fifteen minutes with the opportunity for the participants to ask oral questions. The lecture conducted into different days and different times to take the most advantages of involving more participants.

#### Data Collection phases:-

The data collection strategy performed in the form of three phases in three weeks, one week for each phase. The first phase was the assessment phase took place in the first week was the pretest phase via the questionnaire and took about 7 to 9 min to be completed after obtaining the informed consent from the females. Followed by the next phase in the second week, which was the intervention program by conducting the health education sessions aided by booklet, poster and lecture. Finally, post-test used in the evaluation phase to compare the effectiveness of the educational intervention through the same questionnaire that carried out in the first phase.

#### Statistical Analysis:-

The data was presented and analyzed by SPSS 23<sup>[11]</sup> using descriptive and analytical statistics. McNemar test was used to assess the significant difference between post and pretest results. The main outcome was to measure the change in the knowledge by comparing the change between pre and posttest by using paired T test. Level of significance assessed at  $p < .05$ .

#### Ethical Approval:-

Ethical approval was taken from the ethical committee at health and rehabilitation sciences collage. As well as, from the dean of business and administration college. Informed consent was attached with the questionnaires to explain the objective and importance of the study, in addition to explaining the phases of the research confirming that their participation or drop out is voluntary. Knowing that the confidentiality of their information is secure by using anonymous coding of the questionnaires.

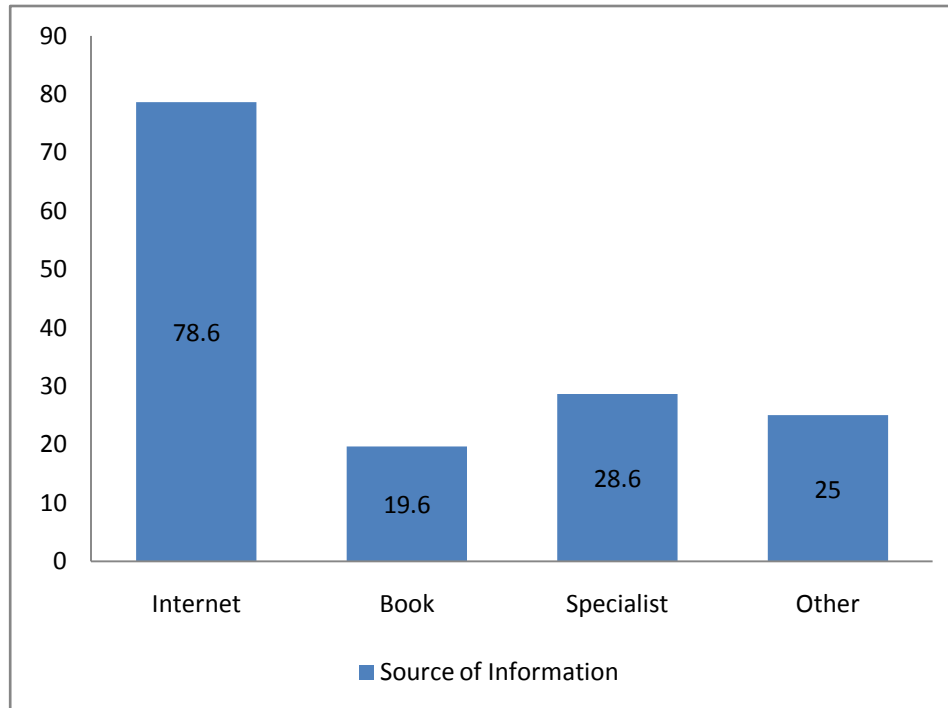
#### Results:-

**Table 1:-** Frequencies and Percentage for Personal Information of Saudi Female Employees at Princess NourahBintAbdulrahman University

After excluding incompletely filled questionnaires(8), a total of 112 Saudi female employees took a part in the study. The participants were from the college of Administration and Business. Forty percent of the participants were aged between 21- 30 and they were the highest percent group. More than half (53.6%) of the respondents were from

3. Variable	4. No	5. %
6. Age	7.	8.
9. 21-30	10. 45	11. 40.2
12. 31-39	13. 38	14. 33.9
15. 40-49	16. 26	17. 23.2
18. 50-59	19. 3	20. 2.7
21. Employment state	22.	23.
24. Full Time	25. 85	26. 75.9
27. Part Time	28. 27	29. 24.1
30. Level of education	31.	32.
33. High school	34. 29	35. 25.9
36. Bachelor degree	37. 53	38. 47.3
39. Master	40. 22	41. 19.6
42. PhD	43. 8	44. 7.1
45. Occupation	46.	47.
48. Administrative	49. 60	50. 53.6
51. Educational	52. 52	53. 46.4
54. Marital status	55.	56.
57. Single	58. 35	59. 31.3
60. Married	61. 66	62. 58.9
63. Divorced	64. 9	65. 8.0
66. Widow	67. 2	68. 1.8
69. Total	70. 112	71. 100.0

administrative staff and (75.9%) had a full time job, (47.3%) had a bachelor degree. Also, more than half (58.9%) of the participants were married as shown in [Table 1].



**Figure2:-**Participant source of information about osteoporosis

After assessing the source of information about osteoporosis, the Internet was the most frequently reported source (78.6%) followed by specialist (28.6%), other (25%) which falls below television, relatives and patient, then books (19.6%). Knowing that the participants were allowed to choose more than one source. Figure 2

**Table 2:-**Association between pre- and post-test in Knowledge Changing Score among the Participants.

	Level Of Knowledge				pValue
	Pre		Post		
	M±SD		M±SD		
General knowledge	0.90±	0.73	2.29±	0.75	.000*
Non Modifiable Risk Factors	2.32±	1.35	5.24±	0.85	.000*
Modifiable Risk Factors	4.19±	1.44	6.21±	1.09	.000*
Manifestation	3.04±	1.84	6.17±	1.05	.000*
Complication	1.99±	0.95	2.91±	0.78	.000*
Prevention	1.74±	0.74	1.97±	0.49	.003*
Dietary Awareness	4.54±	2.07	6.77±	1.45	.000*
Sun Exposure	2.25±	0.88	1.94±	0.81	.001*
Physical Activates	0.54±	0.66	2.32±	0.85	.000*
Diagnosis	1.59±	0.90	1.70±	0.86	.116
DEXA Indication	3.06±	1.23	4.13±	0.83	.000*
Total	26.16±	4.21	41.64±	3.83	.000*

Table 2 presents the mean and standard deviation about the level of knowledge in pretest and posttest. The mean knowledge was found to be positively correlated ( $p \leq 0.001$ ) between their knowledge and in general knowledge category as well as in non-modifiable risk factors, modifiable risk factors was, manifestations, complication, dietary awareness, sun exposure, physical activity and DEXA indication where it was. The mean and standard deviation in the pretest was  $0.90 \pm 0.73$ ,  $2.32 \pm 1.35$ ,  $4.19 \pm 1.44$ ,  $3.04 \pm 1.84$ ,  $1.99 \pm 0.95$ ,  $4.54 \pm 2.07$ ,  $2.25 \pm 0.88$ ,  $0.54 \pm 0.66$  and  $3.06 \pm 1.23$ . While it becomes  $2.29 \pm 0.75$ ,  $5.24 \pm 0.85$ ,  $6.21 \pm 1.09$ ,  $6.17 \pm 1.05$ ,  $2.91 \pm 0.78$ ,  $6.77 \pm 1.45$ ,  $1.94$

$\pm 0.81$ ,  $2.32 \pm 0.85$  and  $4.13 \pm 0.83$  respectively in the posttest. In the same hand the mean and standard deviation of the prevention found to be moderate with ( $p = .003$ ) and it was  $1.74 \pm 0.74$  in the pretest and became  $1.97 \pm 0.49$  in the posttest. However, a negative correlation was found between their level of knowledge in the pretest and posttest and the diagnosis category ( $p = .116$ ) it was  $1.59 \pm 0.90$  in the pretest and became  $1.70 \pm 0.86$  in the posttest.

### Discussion:-

The aim of this research was to reduce the osteoporosis rate due to lack of awareness among Saudi females. An intervention study was carried out where a designed self-administered questionnaire was used in order to collect data. The current study included a total number of 112 female employees. As regards the main source of information about osteoporosis, it was revealed that the internet was the main source of information among the majority (78.6%) of the studied women, while specialists were ranked as the second source of information was less than one third (28%). This was in agreement with what was reported in many studies carried out among (Egyptian, Turkish, American, Bruneian, Indian and Singaporean women) the mass media was rated as the main source of information in (54.2%, 53%, 55%, 70%, 74% and 76.4%) of the studied women respectively.<sup>[12-19]</sup> This result ought to raise consideration toward the content of the health messages incorporated into broad communications in media programs, articles and advertisements.<sup>[19, 20]</sup>

According to a study conducted in Texas that analyzed the data by using one-tailed t-test shows that there was a significant increase in the general knowledge of osteoporosis from the pre to the post ( $p = .000$ ). Additionally, the mean and standard deviation of the pretest was  $6.89 \pm 3.30$  while it became  $9.96 \pm 2.65$  in the posttest when compared<sup>[21]</sup> a paired-test was calculated in a study conducted in the United States of America and the results revealed that there was a statistically significant increase in knowledge scores in both groups. For women with a family history of osteoporosis the pretest mean was 12.66 (SD = 1.57), while it became 25.83 (SD = 5.19) in the posttest. The women without a family history of osteoporosis had a highly significant difference in posttest scores with the mean of 26.11 (SD = 2.67), while it was 12.11 (SD = 2.02) in the pretest.<sup>[22]</sup> According to a study carried out in California State discussing the knowledge of osteoporosis risk factors, among 49 older adults, included 41 females and 8 males with ages ranging from 78-98 years. The osteoporosis knowledge mean number of correct responses was 8 (SD = 4) out of 20 possible questions.<sup>[23]</sup> However, in this study the data was analyzed by using paired t-test and revealed that there was a similar significantly increasing as in the previous one in the mean of the knowledge level ( $P < .0001$ ). The pretest mean and standard deviation was  $26.16 \pm 4.21$  and changed to be  $41.64 \pm 3.83$  in the posttest.

There is a negative correlation between the study conducted in the Unaided States of America that discuss the benefits-exercise among the participant without family history of osteoporosis and the current study. The revealed results in the previous study was  $26.0000 \pm 2.74874$  in the pretest and become  $26.7368 \pm 5.50598$  in the posttest ( $p = .630$ ).<sup>[22]</sup> While the physical activity mean and standard deviation in this study was  $0.54 \pm 0.66$  in the pretest and change to be  $2.32 \pm 0.85$  ( $P < .0001$ ).

There is a positive correlation between the previous study and the current study in relation to the dietary awareness were it was  $4.54 \pm 2.07$  in the pretest and became  $6.77 \pm 1.45$  in the posttest. Compared to the previous study that indicates calcium benefits were it was  $23.6842 \pm 2.05623$  in the pretest and became  $26.0000 \pm 2.66667$  in the posttest.<sup>[22]</sup> On the other hand, a study carried out among 42 women who participated in an 8-week educational intervention. There was statistically significant regression equations were found for all pre intervention intentions related to calcium. Posttest intervention calcium intake significantly increased to  $821 \pm 372$  mg/day ( $P < .0001$ ).<sup>[24]</sup>

There was a dramatically increased in the mean at the non-modifiable risk factors where it was  $2.32 \pm 1.35$  in the pretest and increased to be  $5.24 \pm 0.85$  in the posttest. As well as among the modifiable risk factors where it was  $4.19 \pm 1.44$  in the pretest and increased to be  $6.21 \pm 1.09$  in the posttest. However, comparing to a study conducted in Lublin Voivodeship reveals that varied scores between the pretest and the posttest. The level of knowledge about osteoporosis risk factors estimated as an average were it was ( $M = 59.78$ )<sup>[25]</sup>

There is a negative correlation regarding the disease complication where it was  $1.99 \pm 0.95$  in the pretest and increased to be  $2.91 \pm 0.78$  in the posttest ( $P < .0001$ ). Compared to the seriousness of the disease among the participants without family history of osteoporosis where it was  $16.2105 \pm 3.32631$  in pretest and became  $15.8421 \pm 5.06911$  in the posttest ( $p = .702$ )<sup>[22]</sup>

**Conclusion:-**

The educational intervention program about osteoporosis was effective. The knowledge improved and the aim were successfully achieved. Preventing osteoporosis and its consequences considered as an important argument in the drive to encourage people to follow a healthy lifestyle. Knowledge of disease process, risk factors, and what can be done specifically for prevention and management may better prepare participants to make behavioral change required for successful participatory disease management. Commonly based providing osteoporosis educational programs and screening by knowledgeable health care team should be personalized and comprehensive in order to determine bone health decision. Preventing osteoporosis in women should be a useful strategy in preventing later health and socioeconomic consequences. This should aid in building and directing further modalities for the prevention and treatment of osteoporosis in Saudi Arabia.

**Recommendations:-**

1. Further research should focus on osteoporosis methods of diagnosis, to increase their awareness about it
2. In this intervention study the majority of the participants were educated and employees aged between 21-30 years old. However, the most beneficial way to reach the effectiveness of the educational program is through the most affected group in women at menopausal stage, unemployment or housewives with different backgrounds.
3. Controlling the quality of health information provided through the mass media is a must, as it is the main source for health information for the public as revealed by the current study results. Moreover, nutritional education should also emphasize on the importance of preventing osteoporosis should also motivate women to adopt a healthier lifestyle.
4. Health care providers' role in providing information regarding osteoporosis should give special care to women of osteopenia or premenopausal in order to increase awareness and protection methods as well as enhancing different communication channels should be provided in order to reach the biggest sector of the population.

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**RESEARCH ARTICLE**

**THE GENETICS OF SYSTEMIC LUPUS ERYTHEMATOSUS IN SAUDI ARABIA**

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**Abstract**

Systemic Lupus Erythematosus (SLE) is a complex multisystem autoimmune disorder. It is characterized by the production of autoantibodies that react against its own tissues, which may lead to immune-complex mediated end organ involvement. There are more than 30 genetic loci in different ethnic backgrounds that have been associated with the risk of developing this disease. The high level of consanguinity in the Saudi population is a risk factor for developing the disease. On the other hand, it provides an opportunity to identify the genetic variations that are associated with the disease. Applying Genome Wide Association Studies (GWAS) and exome sequencing would help to identify these variations. This review provides an opportunity to outline the genetics of Systemic Lupus Erythematosus in the Saudi population.

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**Introduction:-**

Systemic Lupus Erythematosus (SLE) is a complex multisystem autoimmune disorder. It is characterized by the production of autoantibodies that react against its own tissues, which may lead to immune-complex mediated end organ involvement. SLE can affect almost any part of the body and it can range from mild to severe. The most common clinical features are kidney diseases, thrombotic problems and skin diseases. SLE is associated with wide range of autoantibodies, which could help in the diagnosis and monitoring the progress of the disease. The complexity of this autoimmune disease with the diverse clinical manifestations makes the progress of understanding the pathogenesis of SLE quite challenging. Despite these challenges, it has been reported that there are several factors that have roles in the development of SLE such as genetic susceptibility, gender, age, hormonal and environmental factors. (Hersh et al., 2016; O'Neill & Cervera, 2010; Smith & Gordon, 2010)

Based on many epidemiological studies, there are marked differences in the incidence of SLE, which mainly based on the features of the studied populations. (Pons-Estel, Alarcon, Scofield, Reinlib, & Cooper, 2010) In Europe, it is estimated to be 2.2 cases per 100,000 per year while in the US it is estimated to be 7.6 per 100,000 cases per year. (Lopez, Mozo, Gutierrez, & Suarez, 2003) The worldwide prevalence ranges from 10 to 150 per 100,000 per year. (Cervera et al., 1999; Fessel, 1974) These variations are due to the difference in the ethnic groups, as it appears to be higher and more severe in the non-European ancestry. (Borchers, Naguwa, Shoenfeld, & Gershwin, 2010; Sanchez et al., 2012) These differences among ethnic groups are due to the variation in the genetic components that is related to the ethnicity, which leads to the variation in the phenotypic expression of SLE among the individuals who have different genetic background.

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For the past few years, significant progress has been done to understand the role of genetics in the pathogenesis of the disease. These studies investigated the mechanism of the disease, the occurrence, the inflammatory process and the reversible organ damage. Despite these studies, there are still significant gaps to understand the pathogenesis of the disease. (Pons-Estel et al., 2010) One of the best methods to understand the genetic roles in the development of the disease is using familial aggregation, which has been reported in many studies in SLE patients.

In Saudi Arabia, many studies emphasize the prevalence of SLE in the Saudi population. The largest study included 624 patients, 551 of these patients have Saudi genetic background. The overall of the clinical and the laboratory investigations were similar to the other populations such as the European population. However, the average age of onset was relatively lower comparing to the age of onset in different groups, which is often associated with a high risk of genetic role in the development of the disease. (Al Arfaj & Khalil, 2009; Heller, Ahmed, Siddiqi, Wallrauch, & Bahlas, 2007; Qari, 2002)

The aim of this review is to outline the predisposing factors of SLE in the Saudi population, and to highlight the relationship between the high level of consanguinity and its role in increasing the risk of the development of SLE. In addition, it will provide an overview of the genetic diagnostic methods applied to increase the efficacy of determining the high-risk variations.

#### **Genetic Pathogenesis of Systemic Lupus Erythematosus:-**

The autoantibodies in SLE are directed against the nucleic antigens. It occurs due to abnormalities in the innate immune system, which includes the toll-like receptors beside the malfunctioning of the T-helper, IgG autoantibodies and the gene expression pattern of type-1 interferon. All these elements would have a critical role in developing the production of the autoimmune response. Another studies emphasized the apoptosis process in the pathogenesis of the current disease. (Moulton, Lo, & Tsokos, 2012; Shin, Lee, & Kang, 2011; Tsokos, 2011)

Based on the findings of many studies, there is strong evidence that Lupus is a non-Mendelian complex inheritance and that there is a main role of the polygenic contribution to its pathogenesis. For the past few years, over 30 genetic loci have been identified in different ethnic backgrounds that have been associated with the risk of developing the disease. (Gateva et al., 2009; Guerra, Vyse, & Cunnigham Graham, 2012; Harley et al., 2008; Hom et al., 2008; Moser, Kelly, Lessard, & Harley, 2009; Ramos et al., 2011; Yang et al., 2010) Some of these genes have important roles in the immune system including T-cell regulations, B-cell differentiation and production of antibodies and dendritic cells in the antigen presentation process. Some of these genes are identified by certain Single Nucleotide Polymorphisms, SNP's that are located in certain genes. For example; the *IRF5* gene, which is mainly, involved in the expression of type 1 interferon. (Graham et al., 2006; Guthridge et al., 2012) The *STAT4* gene, which is an important transcription factor that has a role in the TH<sub>1</sub>, or TH<sub>17</sub>, which are associated with the autoimmunity. (Remmers et al., 2007; Shin et al., 2011) Although, some of these genes are common with autoimmunity disorders, they appear to be more specific with the Lupus especially with certain genetic variations located in these determined genes. (Ramos et al., 2011)

Also, many recent studies have shown that the high frequencies in certain genetic variations that are specific in genetic populations are associated with lupus phenotype. For example; certain genetic variations in the *ETS1* and *WDFY4* genes were found to be specific in the East Asian populations but not in the European populations. (Alarcon et al., 1999; Alarcon et al., 2002; Chung et al., 2009; Richman et al., 2010; Richman et al., 2012; Yang et al., 2010)

#### **Consanguinity and the development of lupus:-**

Generally, it appears that populations with high rate of consanguinity are more susceptible to genetic diseases. Consanguinity increases the overall frequency of inherited diseases including many complex phenotypic diseases such as SLE. The decrease in the heterozygosity due to the impact of the consanguineous marriages leads to increase in the uncommon genetic variations relatively to the other populations groups. (Bittles & Black, 2010; Rudan et al., 2003) In Saudi Arabia, it has been estimated that the prevalence of consanguinity is 52 % with 39.3 % are in first cousin marriages. (al-Abdulkareem & Ballal, 1998; El-Mouzan, Al-Salloum, Al-Herbish, Qurachi, & Al-Omar, 2007) Another important factor is high inbreeding coefficient due to polygamy, which is common in the Saudi population. In one of my published studies, using data from the Human Genome Diversity Panel (HGDP), the inbreeding coefficient was very high ( $F_{is} = 0.038$ ) comparing to the other population groups. (al-Abdulkareem & Ballal, 1998; Tian et al., 2009) Also, there are two different studies in Kuwait and Qatar that investigated the genetic substructure of the population of the Arabian Peninsula. The results of these two studies support our findings that the

Saudi population has a very small west-African contribution similar to the HGDP.(Hunter-Zinck et al., 2010; Mohammad, Xue, Evison, & Tyler-Smith, 2009; Nassir et al., 2009) For the reasons stated above, especially the findings in Qatar, it is extremely important to consider the genetic variation in the subgroups as it play a critical role in the development of the genetic diseases such as SLE.

#### Genetics and Molecular Diagnosis:-

Genome Wide Association Studies (GWAS) method has successfully identified many of the risk alleles for many complex genetic diseases. Basically, this method assesses the association between the genetic variations and the phenotype of interest such as lupus. The challenge for this method requires a large well-characterized sample for the disease, advanced genotyping technology and advanced data managing system.(Guerra et al., 2012; Iwamoto & Niewold, 2016)

For the past few years, the success of exome-sequencing technology has achieved an important advancement. Exome sequencing is highly effective in the process of the high-throughput genetic analysis. This is accomplished by using a set of “exome capture” techniques that specifically target all the exons in the genome. This is due to the nature of the DNA and the coding regions in the human genome, which represents about 1% of the whole genome. This would allow us to approach and determine the genetic variations very easily in a cost effective approach comparing to the whole genome sequencing. (Do, Kathiresan, & Abecasis, 2012; Manolio et al., 2009)

In complex genetic disease such as SLE, determining the genetic susceptibility is quite challenging due to the rare variants with the large genotyping effects. GWAS has successfully identified multiple susceptible genes. However, these genes do not provide any valuable insights to the pathogenesis of the disease other than the additive proportion of the hereditary risk. Therefore, it is important to consider other methods in determining the rare variant that have a significant association with the complex genetic diseases. (Fernandez et al., 2007; Iwamoto & Niewold, 2016; Mohan & Putterman, 2015; Williams et al., 2016)

In SLE, it is extremely important to consider rare variants for the genetic studies for many reasons. First, there are several family studies that have determined that there are certain deficiencies in the complement system (C1q, C2 and C4) that are linked to the SLE phenotype. Another study reported a mutation in the FAS ligand gene that is associated with the SLE. Also, there is another study that has reported a rare mutation in the *TREX1* gene that is highly associated with the SLE development. Lately, a recent study in the Saudi population reported that there is a rare loss-of-function mutation in the *DNASE1L3* gene that is associated with the recessive familial form of SLE. The later mutation was identified in several families using an autozygome analysis. (Al-Mayouf et al., 2011; Hannema et al., 1984; Lee-Kirsch et al., 2007; Meyer, Hauptmann, Tappeiner, Ochs, & Mascart-Lemone, 1985; Rynes, 1982; Wu et al., 1996)

Therefore, it is extremely important to consider each genetic variation in a population especially for complex genetic diseases such as SLE. Also, it is crucial to consider the social behavior that has an effect in the genetic modifications such as the high rate of consanguinity in the Saudi population. Such information would help to understand the pathogenesis of the disease overall and in the Saudi population in particular. It would help to provide new methods for therapies in addition to stratifying the populations based on the genetic variations for more effective therapeutic interventions.

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### RESEARCH ARTICLE

#### CELIAC DISEASE, A CAUSE FOR CAPSULE ENDOSCOPE RETENTION

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Capsule endoscope, celiac disease, retention

#### Abstract

The capsule endoscope was introduced to the market over a decade ago. It is considered an addition to the diagnostic armamentarium for many gastrointestinal (GI) diseases including GI bleeds, Crohn's disease, celiac disease, and surveillance of familial polyposis syndromes. The procedure is safe but retention is the most common complication. Here in this report a case of celiac disease and capsule endoscope retention which caused complete small bowel obstruction requiring emergent surgical intervention. The patient made full recovery.

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#### Introduction:-

Investigations for GI diseases have been developed over the years with better accuracy and less invasiveness. Capsule endoscopy (CE) was introduced in 2001 (1). The indications for its use have broadened over the years. CE carries some potential complications. The most common is retention which usually is asymptomatic. The retention duration varies as demonstrated in several reports. Interventions to retrieve the retained capsule depend on the degree of symptomatology of the patient and the underlying disease.

#### Case Report:-

We present a case of a 16-year-old male with a known case of celiac disease (CD). He presented to our emergency room with abdominal pain and distention for 2 days duration. Upon questioning it was revealed that he was admitted several weeks earlier in another hospital for investigation of his weight loss and abdominal pain. The results of his investigations were not conclusive at that time. Therefore, he was scheduled for capsule endoscopy. The procedure took place 3 weeks before his current presentation. The patient had the impression and misconception that the capsule endoscope could stay for long time without a problem. He was demonstrating a picture of a complete intestinal obstruction, abdominal pain, abdominal distension, and obstipation. Results from a systemic exam were unremarkable. An abdominal exam revealed a scar from a diagnostic laparoscopy done 2 years earlier to treat his CD. On physical examination, a diffusely distended abdomen with hyperactive bowel sounds were elicited. The patient showed no evidence of hernia. The results from his laboratory investigations were within normal ranges apart from iron deficiency anemia. An abdominal x-ray showed a retained capsule endoscope in the small bowel (Figure 1). A computed tomography (CT) scan of the abdomen with double contrast confirmed this finding (Figure 2). Due to his previous surgery with the expectation of extensive adhesion, we elected to go for an exploratory laparotomy which revealed a dilated small bowel with a grossly diseased ileal segment around 60 cm proximal to the ileocecal junction. The bowel wall was thick and erythematous with areas of multiple strictures (Figure 3a). The capsule endoscope was impacted between 2 stricture points. Enterotomy and complete extraction was achieved (Figure 3b).

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The patient tolerated the procedure well and had an uneventful post-operative course. He was referred to his original hospital to complete the investigations and further management.

### Discussion:-

The capsule endoscope was introduced to the market over a decade ago. Currently three companies manufacture it: PillCam SB, Given Imaging Ltd., Yokneam, Isreal;

Olympus EndoCapsule from Olympus, Tokyo, Japan and OMOM capsule endoscope from Jinshan Science and Technology Group, Chongqing, China. The capsule size is a 26 by 11 mm containing a battery-powered, complementary metal oxide silicon imager (CMOS), a transmitter antenna and four light emitting diodes. It takes 2 images per second through a transparent plastic dome of the capsule (2,3). Once swallowed, it is propelled through the intestine by peristalsis. The spectrum of capsule endoscopy indication has increased over the last few years. The main indication so far is for obscure gastrointestinal bleeding accounting for 70-80% of the cases. The diagnostic yield approaches 80%. Crohn's disease involves small and large bowel in 45% of the cases, 25% and it is usually confined to small bowel primarily the ileum (4). Damage from non-steroidal anti-inflammatory drugs (NSAID) can also be diagnosed by the capsule endoscope which reveals the mucosal damage. It has to be emphasized that this lesion, mainly ulcerations, can present in 10% of healthy individuals. Small bowel tumors are rare comprising only 1-3% of all GI malignancies can be as well diagnosed by the endoscopic capsule (5). Increased reporting has increased the incidence to 6-9% of all GI malignancies. Surveillance became an established indication especially in familial polyposis coli (FAP) & PeutzJegher syndrome (3). Other indications in rare clinical syndromes include: undetermined colitis, small bowel transplant graft versus host disease, protein losing enteropathies, primitive lymphangiectasia (in pediatric population), Whipple's disease, and irritable bowel syndrome. Capsule endoscope has been indicated in celiac disease as adjunct to the gold standard gastroscopy with duodenal biopsy (4). However, it can be a suitable procedure in patients with high suspension who may be unable or unwilling to undergo the traditional endoscopy. The procedure is indicated to rule out malignant neoplasms associated with celiac disease namely, primary enteropathy-associated t-cell lymphoma (EATL). It is also indicated to rule out other known complication such as ulcerative jejunitis. The time frame for capsule endoscope evacuation varies among patients but 2 weeks is generally accepted (6). The longest retention in the literature was 2 years (2). Thereafter, intervention by medical or invasive means such endoscopy, laparoscopy or laparotomy as in our case can take place especially if the patient is symptomatic. Retention is reported in 2% of cases and usually asymptomatic but perforations have been reported as well (7). The highest risk of retention is reported in patients with chronic NSAID use, extensive Crohn's enteritis, abdominal radiation injury, prior abdominal surgery, prior small bowel resection, and in our case celiac disease (8). This case address 2 issues: 1st the emphasis on patient education and complete understanding of the process of diagnosis with the expected time frame as well as the patient's full awareness of potential red flags and complications; 2nd, the relative contraindication for capsule endoscope use in stricture-forming diseases such as CD. Some groups, however, used this relative contraindication as a guide to stricture causing chronic obstruction to resect the narrowed segment.



**Figure 1:-** Plain abdominal x-ray showing the endoscopic capsule in the small bowel.



**Figure 2:-** CT scan of the abdomen with IV & oral contrast confirming the location of the endoscopic capsule



**Figure 3a:-** Intra-operative picture showing the grossly diseased segment of the ileum with points of strictures.



**Figure 3b:-** The extraction of the endoscopic capsule

### **Conclusion:-**

Capsule endoscopy is considered an investigative modality for many GI diseases. The risk of retention has to be considered on an individual basis. Patient education cannot be overemphasized to prevent delayed type of retention and bowel obstruction consequently.

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### **RESEARCH ARTICLE**

#### **DESIGN OF HYBRID CONCENTRATED SOLAR AND WIND POWER PLANT FOR THE AUTONOMY OF ISLANDS.**

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#### **Abstract**

Renewable energy sources can offer isolated communities the chance for employment to regulate their energy use in a manner that best suits their needs. This paper presents the simulation and thermodynamic evaluation of a stand-alone hybrid power plant using renewable energy sources and storage technologies exclusively. Here, the proposed system includes Vienna rectifier for the wind system in order to reduce voltage stress on semi conductor devices and switching losses. The analysis shows that the evaluated hybrid concentrating solar-wind power plant is a reliable alternative for satisfying the fluctuating electricity demand. The output stable and controlled autonomous performance using the complementary character of solar and wind energy, combined with energy storage is verified by simulating using MATLAB Simulink.

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#### **Introduction:-**

Generally islands have the most carbon-intensive primary energy supply, because of its strong dependency on oil and lignite. 55% of the domestic energy demand is met with oil, approximately 99% of which is imported. For the oil energy needs of the islands alone, the country spends more than 500 million Euro a year, in order to generate electricity at local power plants. The relatively high cost of electricity of isolated areas and non interconnected islands increased the competitiveness and encourages the wider incorporation of renewable energy technologies that may, in other cases, seem economically subaltern to business-as usual energy solutions. With this in mind and accounting for the high potential of the country in renewable sources, it is expected that appropriate energy policies could contribute significantly to the economic recovery of islands.

Today, producing electrical power by renewable sources such as wind, solar and wave are becoming very important since the demand of electrical energy is increasing promptly and the fossil fuel sources are restricted. Among these renewable sources, wind is highly preferred and wind conversion systems technology already plays an important role in power production. Since power is proportional to the cube of wind speed, the location of wind turbine becomes important. Therefore, building offshore wind farm is a good alternative to extract maximum power due to high average wind speed. With this wind speed we have added Concentrated Solar Power (CSP) plant to form the hybrid system. The addition of the CSP system would create a hybrid project that maintains or improves the power output.

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In this paper Vienna rectifier is used in the wind system for Power Factor Correction and to reduce power quality problems. The switching losses, number of MOSFET's are reduced by using Vienna rectifier. The efficiency of the system is improved. The output efficiency and the accuracy of the system is analyzed and verified by simulating the proposed system using MATLAB Simulink.

### **Related Works:-**

Kolar, J.W.; Ertl, H.; Zach, Franz C., The development of guidelines for the practical application of a new power module (IXYS VUM25-E) realizing a bridge leg of a three-phase/switch/level PWM (VIENNA) rectifier system with low effects on the mains was discussed. The inner circuit structure of the power module was formed by a bidirectional bipolar switch and of two free-wheeling diodes. In the first stage, the switching losses of the power MOSFET and of the free-wheeling diodes are determined by measurement in dependency on the switched current for characteristic values of the junction temperature. The isolated driving stage of the MOSFET was designed for minimum switching losses considering the occurring switching over voltages and the ringing between the parasitic components. The conduction losses of the semiconductor elements are calculated directly via simple analytical approximations of the mean and rms values of the device currents. Based on the proficiency of the dependency of the main loss contributions of the semiconductors of the power module, the operating parameters such as mains voltage, output voltage, heat sink temperature and switching frequency and the maximum allowable mains current amplitude was calculated [1].

R Rajesh, M.; Singh, B., presented the power quality improvement in the midpoint converter based switched reluctance motor (SRM) drive using a Vienna rectifier. A conventional bridge rectifier with midpoint converter based SRM drive yields very high level of harmonics content and low power factor at ac mains. They proposed Vienna rectifier with midpoint converter fed SRM drive that improves the power factor at ac mains with low current harmonics. It also provides constant dc link voltage and balanced capacitor voltages [2].

A. Rajaei, M. Mohamadian, and A. Y. Varjani, presented the improved factors, such as higher efficiency and improved total harmonic distortion by the use of Vienna rectifier as generator-side converter of wind energy conversion system (WECS) consisting a permanent-magnet synchronous generator (PMSG) compared to the traditional back-to-back inverter. The direct torque control (DTC) of the generator in WECS includes fast torque response, insensitivity to PMSG model and associated parameters, elimination of rotor position sensor, and reduced computations. The effects of Vienna rectifier voltage vectors on PMSG torque and stator flux are derived, and DTC of PMSG by the Vienna rectifier is implemented, considering the constraints imposed by the Vienna rectifier [3].

H. Chen and D. C. Aliprantis, discussed about the topology consisting of a squirrel-cage induction machine combined with a Vienna rectifier for a wind energy conversion system. It is energy efficient compared to a traditional six-switch two-level converter. This topology can have higher reliability, due to reduced blocking voltage stress across the semiconductors [4].

C. Qiao and K. M. Smedley, presented about unified constant-frequency integration controller for a three-phase star-connected switch three-level rectifier. It is based on one-cycle control and is simple and reliable. It does not require multipliers to scale the current reference according to the output power level and the input voltage sensor is eliminated. It employs constant switching frequency modulation that is desirable for industrial applications. This controller can be operated on sensing either the inductor currents or the switching currents., The cost is further reduced, if the switching currents are sensed because switching currents are easier to sense comparing with inductor currents [5].

M.A. Barik and H.R. Pota, presented the effects of integration of renewable energy sources (RES) in a microgrid in grid connected and islanded operation. To analyze the complementary feature of renewable energy penetration into microgrid, a fixed speed wind turbine equipped with squirrel cage induction generator (SCIG) and a grid connected solar system with maximum power point tracker (MPPT) are used. They also compared the effect of wind and solar penetration separately as well as jointly [6].

S.H. Madaeni, R. Sioshansi and P. Denholm, estimated the capacity value of concentrating solar power (CSP) plants with thermal energy storage (TES) in the southwestern U.S. Our results show that incorporating TES in CSP plants deliberately increases their capacity value. While CSP plants without TES have capacity values ranging between

60% and 86% of maximum capacity, plants with TES can have capacity values between 79% and 92%. They demonstrated the effect of location and configuration on the operation and capacity value of CSP plants [7].

R. Sioshansi and P. Denholm analyzed the potential benefits of locating wind and concentrating solar power (CSP) plants in the southwestern U.S. Using a location in western Texas as a case study, it is manifest that such a deployment strategy can improve the capacity factor of the combined power plant and the associated transmission investment. This was because of two synergies between wind and CSP: 1) the negative interaction between real-time wind and solar resource availability and 2) the need of low-cost high-efficiency thermal energy storage in CSP. The economic tradeoff between transmission and system performance is eminently sensitive to CSP and transmission costs [8].

J. Usaola, discussed about the CSP technology, which will most likely develop in some parts of the world in the near future which has been already exploited in certain countries, such as the USA and Spain, where subsidy policies are granted to support its development. The possibility of storing the received thermal energy and usage of the energy later is an effective constraint. This storage allows CSP plants to smooth the power generation and to schedule it independently of the instantaneous solar resource. These plants may be considered as dispatchable, and can be easily and efficiently integrated to the grid [9].

Keith E. Holbert, presented about the electricity generation using renewable energy, particularly solar power which has been increased considerably in recent years. Solar energy resources in the southwestern U.S. are the best in the world. A significant number of solar thermal generating stations using parabolic concentrators or central receivers are commonly preferred. Concentrating solar power (CSP) plants require condenser cooling, which is provided using water resources. To ensure sustainability of solar-electric facilities in the Southwest, requirements for CSP units to utilize dry cooling may be prudent [10].

Maria Dicorato, Giuseppe Forte, Maria Giovanna Pisani, Enrico De Tuglie, discussed the available technologies for energy production from solar source. Concentrating Solar Power could give a significant contribution to develop a more sustainable energy system. The work is about to investigate a Concentrating Solar-Trough plant, having nominal power equal to 100 KW. And exploiting linear parabolic collectors, to produce electric energy by means of Organic Rankine Cycle Turbine. In particular, a model to estimate solar radiation on a sun-tracking surface is preferred, in order to minimize the angle of incidence and thus maximize the incident beam radiation [11].

S. Alekhya, D. Aarti, Raghavender Kulkarni., attempts a heat energy storage for power generation in which a Molten Salt is preferred for Thermal Energy Storage for Concentrating Solar Power systems. In this method numerous large, flat, sun-tracking mirrors, known as heliostats are used which focuses sunlight onto a receiver at the top of a tall tower. A heat-transfer fluid heated in the receiver is used to produce steam, which in turn, is used in a conventional turbine generator to produce electricity. Some power towers use water/steam as the heat-transfer fluid. Solar power tower convert sunshine into clean electricity. The gained thermal energy can be used for molten salt, which saves the energy [12].

### Hybrid Generation System:-

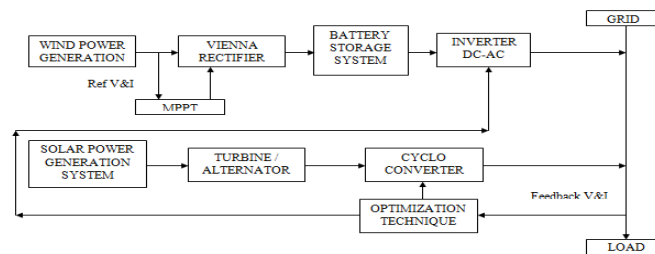


Fig. 1. Block diagram of proposed system

The proposed system block diagram is shown in the Figure 1. Hybrid renewable energy system is used as the input source. In the wind system Vienna rectifier is preferred in order to reduce losses and ripples to improve the Power Factor. Then the battery storage system is to store the energy. By optimization technique the power is injected to the grid on high demand time and for fluctuation compensation.

### A. Concentrating Solar Power plant

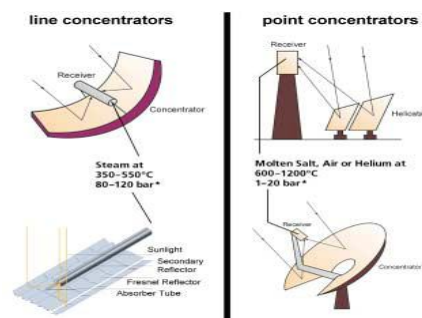
In Concentrating Solar Power (CSP) technique sun's Direct Normal Irradiation (DNI) is concentrated to produce heat of temperature about 400°C to 1,000°C. This heat is then used to generate electricity by the traditional process of steam cycle, or combined cycle, or Stirling engine. Based on the process of collecting and concentrating solar radiation, the CSP can be identified into four major technologies:-

1) **Parabolic Trough:** Long, curved mirrors pivot is preferred concentrate sunlight onto the tubes filled with a heat transfer fluid, commonly oil or water, whose steam rotates a power- generating turbine. These systems are the mostly used CSP technology and have operated in the United States since the 1980s. Optimal capacity size is 150- 250 MW that is enough to power 44,000 homes, although 80 MW is the largest plant size nowadays. In alternate, one U.S. Company, Sopoty Inc., has created a "Micro CSP" system that uses a scaled- down parabolic system for generation on rooftops.

2) **Linear Fresnel Reflectors (LFR):** Still in the demonstration stage, LFR systems operates like parabolic trough systems but uses flat mirror strips instead of curved mirrors. Although less efficient than other CSP systems, has cheaper cost of flat mirrors lowers with initial investment cost.

3) **Dish/Engine:** Mirrored dishes track the sun and concentrates the heat onto a for power generation unit that has a heat- responsive fluid powered engine. Stirling engines, the most common type of engine for this system, do not require the vast water cooling system needed for steam engines because its engine is powered by the expansion- contraction of hydrogen gas as it is heated and cooled. The newest systems have 31.5 percent sun- to- grid energy conversion efficiency, the highest among CSP plants. However, they have a smaller production capacity of 0.003- 0.025 MW. The first commercial deployment of a dish/Stirling system array is planned for 2010.

4) **Power tower:** Fields of flat mirrors concentrates sunlight onto a central receiver which is filled with a heat- transfer fluid, most often molten salt, which can trap thermal energy for long periods. These systems focus heat at higher temperatures than other conventional CSP systems, improving its conversion efficiency. A 20 MW power tower system came online in April 2009 outside Seville, Spain, and the early Solar Two demonstration plant, a 10 MW facility that operated from 1996- 1999 in Barstow, California, had a storage tank which provided three hours of electricity when the sun was not shining.



**Fig. 2.** Technologies for concentrating solar radiation: left side parabolic and linear Fresnel troughs, right side central solar tower receiver and parabolic dish

### B. Wind Power Plant:-

A wind energy conversion system or wind energy harvester is a machine that, powered by the energy of the wind, produces mechanical energy that can be used to directly power machinery to power an electrical generator for making electricity.

#### 1) Schemes for Wind Power Generation:

Based on the speed and frequency, generally following schemes are identified:

1. Variable Speed Constant Frequency Scheme (VSCF)
2. Variable Speed Constant Frequency with Dual Output(VSCF with DO)
3. Variable Speed Variable Frequency Scheme(VSVF)



#### 4. Dual Speed Constant Frequency Scheme (DSCF)

Among all these schemes the preferred scheme for the proposed system is Variable Speed Variable Frequency Scheme.

##### 2) Variable Speed Variable Frequency Scheme:

This scheme is suitable for loads that are frequency insensitive such as heating load.

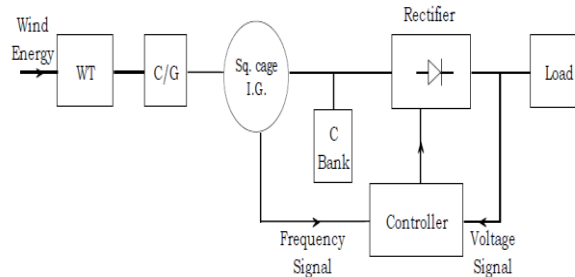


Fig. 3. VSVF Scheme

Depending upon the wind speed, squirrel cage Induction Generator produces power at variable frequency. Such generators are charged by Capacitor-bank. The magnitude and frequency of the generated emf relies on the wind turbine speed, excitation capacitance and load impedance.

If the load demands constant dc voltage, output of generators is converted into D.C using chopper controlled rectifiers. Feedback system can be used to monitor and control to get desired performance.

**a) Lower Power Demand on Start:** If power is proportional to current-times-voltage, then power needed to excite an AC motor across the line is extremely higher than with an Adjustable Speed AC Drive. This is possible only at start, since the power to run the motor at load would be equal if it were fixed speed or variable speed. The issue is that some distribution systems are at their limit, and demand factors are fixed on industrial customers, which charges them for surges in power that could strip other customers or tax the distribution system during peak periods. These demand factors would not be a typical issue with an Adjustable Speed AC Drive.

**b) Controlled Acceleration:** An Adjustable Speed AC Drive starts at zero speed and accelerates competently on a customer-adjustable ramp. On the other hand, an AC motor started across the line is a dreadful mechanical shock both for the motor and connected load. This shock will increase the wear and tear on the connected load, and also the AC motor. Some applications, such as bottling lines, cannot be started with motors, but must be started empty to avoid breakage.

**c) Reduced Power Line Disturbances:** Starting an AC drive across the line, and the consequent demand for seven-to-eight times the motor full-load current, places an excessive drain on the distribution system which is connected to the motor. Typically, the supply voltage sags, with the amplitude of the sag and dependent on the size of the motor and the capacity of the distribution system. These voltage distortions can motive sensitive equipment connected on the same distribution system to trip offline due to the low voltage. Items such as computers, sensors, proximity switches, and contactors are voltage sensitive. Adjustable Speed AC Drive reduces this voltage sag, since the motor is started at zero voltage and ramped up.

**d) Adjustable Torque Limit:** Use of an Adjustable Speed AC Drive can preserve machinery from damage, and protect the process or product An example would be a machine jam. With an AC motor connected, the motor will continue to rotate until the motor's overload device opens An Adjustable Speed AC Drive, can be set to restrict the amount of torque so the AC motor never exceeds this limit.

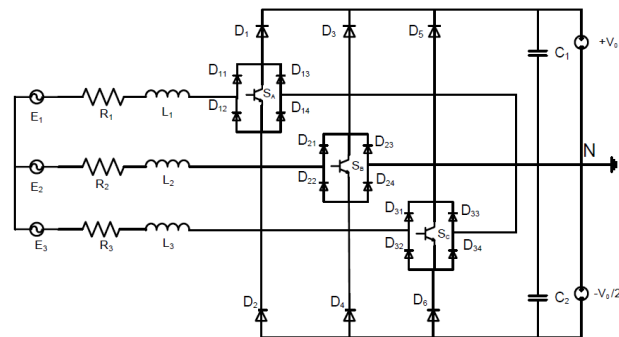
**e) Energy Savings:** Centrifugal fan and pump loads operated with an Adjustable Speed AC Drive minimizes energy consumption. Centrifugal fans and pumps follow a variable torque load profile, which has horsepower proportional to the cube of speed and torque varies with proportional to the square of speed. As such, if the speed of the fan is cut in half, the horsepower needed to run the fan at load should be cut by a factor of eight  $(1/2)^3 = 1/8$ . Using a fixed

speed motor would need some type of mechanical throttling device, such as a vane or damper; but the fact remains that the motor would still be operating full load and full speed (full power). Energy savings can be sufficient to pay back the capitalized cost in a matter of a couple of years (or less), depending on the size of the motor.

**f) Elimination of Mechanical Drive Components:** Using an Adjustable Speed AC Drive can avoid the need for expensive mechanical drive components such as gearboxes. Because the AC Drive can function with an infinite variable speed, it can distribute the low- or high-speed required by the load, without a speed-increasing or reduction devices between the motor and load. This eliminates maintenance costs, as well as reducing floor-space requirements.

### C. Vienna Rectifier:-

The Vienna rectifier was introduced in 1993 by Prof. Johann W. Kolar. It is a three phase, three levels and three switch rectifier; it is kind of PWM (Pulse Width Modulation) rectifier with controlled output voltage. The topology of the Vienna Rectifier comprising of a boost DC\DC converter with a three-phase diode bridge rectifier. Fig.3 illustrates this rectifier circuit.



**Fig. 4.** Vienna rectifier

As Fig. 4, shows the output capacitor is split in two parts with two equal values ( $C_1$  and  $C_2$ ). Across each capacitor, two voltage sources  $+V_0/2$  and  $-V_0/2$  exists. Therefore three different voltages ( $+V_0/2$ ,  $0$ ,  $-V_0/2$ ) available here. The DC bus voltage is assumed to be a constant dc voltage and can be connected to a conventional six switch inverter.

The input current for each phase will be defined by the voltage applied across the corresponding inductor  $L_N$ . The input voltage of the rectifier is by the switching state and also the input current direction. The input inductors ( $L_N$ ) charge when the switch is on and there is an increase in current in the inductor, and when the switch is off the inductors discharge through the positive or negative diode which depends on the current flow direction. The existence of an input inductor creates a current source at the input while the capacitors create output voltages.

### D. Energy Storage:-

Wind power turbines have operational constraints over very high and very low speeds. When the power generated exceeds the demand, excess energy can be stored to be used at other times.

- Excess energy can be efficiently stored in storage batteries in the form of chemical energy.
- Excess energy can also be stored in water power storage as mechanical energy. Wind power plant (WPP) along with Hydroelectric power plant (HPP), when the power generated ( $P_g$ ) exceeds the power demand ( $P_d$ ), helps to partly switch hydro power plant output to Pumping motor (PM) to pump water from an reservoir at the bottom of the dam to main reservoir.



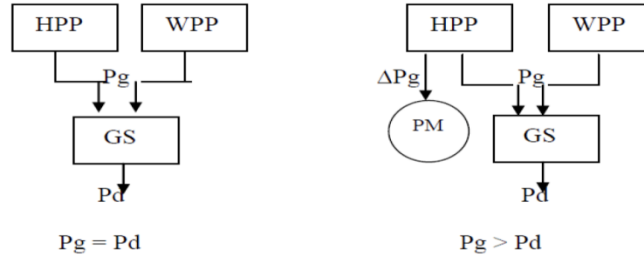


Fig. 5. Energy Storage

**Simulation Module:-**

The hybrid power plant proposed in this paper includes a concentrating solar power (CSP) plant including thermal storage with wind energy coupled with electricity storage.

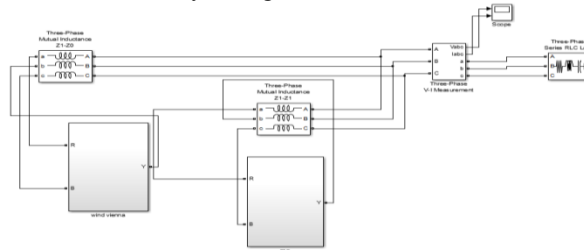


Fig. 6. Simulation Module of the Hybrid System

The simulation module of the proposed system is shown in Fig. 5. Here Wind system and Concentrated Solar Power (CSP) plant is used as the input source for the system. The sub systems are shown below with simulation results.

**A. Wind System Simulation Module:-**

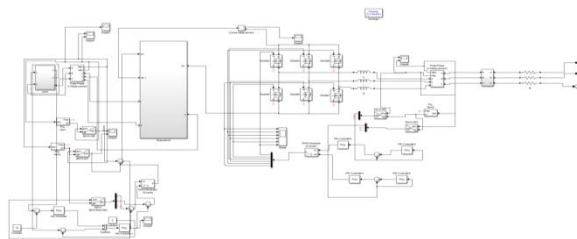


Fig. 7. Simulation Module of Wind System

Fig. 6. shows the Wind system, where the Vienna rectifier is added to the wind system for reduce the switching losses and voltage stress on power semiconductor devices.

Here the maximum power from the wind system is tracked using MPPT tracking. And accordingly the Vienna rectifier is operated. Fig. 7 shows the simulation module of the Vienna rectifier.

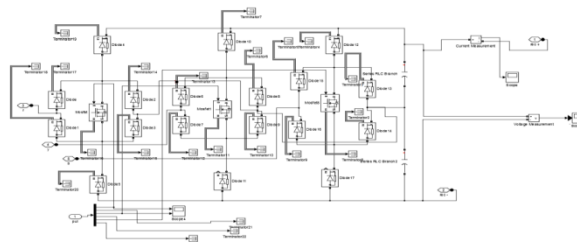
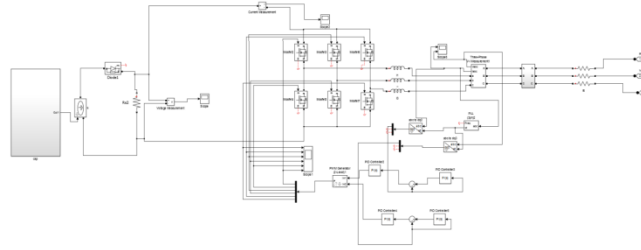


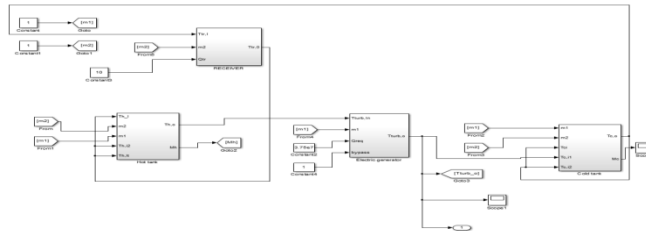
Fig. 8. Simulation Module of Vienna Rectifier

**B. CSP simulation module:-**



**Fig. 9.** Simulation Module of Solar Power System

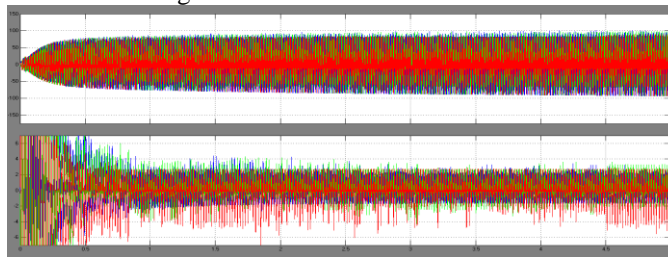
As discussed above this plant works on solar heat power. The heat is transferred to electricity by some processes as mentioned above. The simulation module of the CSP system is shown in Fig. 9.



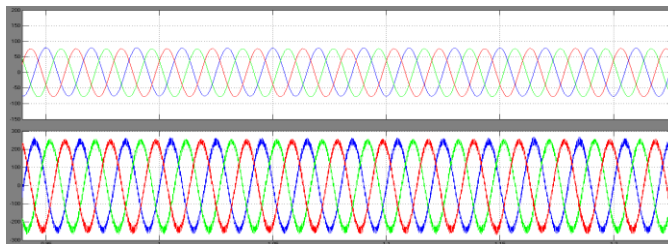
**Fig. 10.** Simulation Module of CSP

**Simulation Results:-**

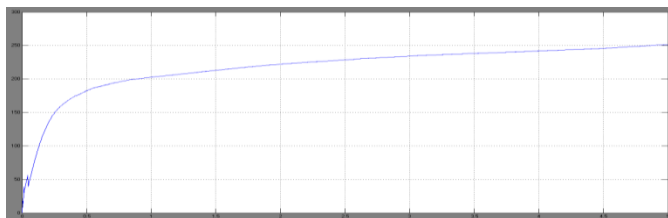
The simulation module is designed using MATLAB Simulink and the output results are verified. The simulation result waveforms are shown in the below figures.



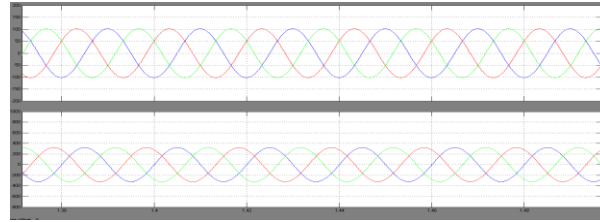
**Fig. 11.** Wind system output voltage and current waveform



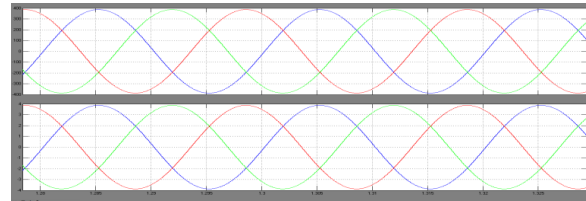
**Fig. 12.** Output Voltage and current waveform with Vienna rectifier



**Fig. 13.** Output DC voltage waveform



**Fig. 14.** CSP output voltage and current waveform



**Fig. 15.** Output waveform of the proposed system

### Conclusion:-

In this paper the efficiency of the conventional system is improved by including Vienna rectifier in wind system. Here, maximum losses are reduced and power factor is improved. This system is a promising alternative in locations where the extension of the electrical grid is difficult or not economical, where the cost of electricity is high, or where the electricity generation is associated with significant harmful emissions. The efficiency and the stability of the system are verified by simulating the proposed system by using MATLAB Simulink.

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### RESEARCH ARTICLE

#### ASSESSMENT OF ORAL HYGIENE HABITS AND KNOWLEDGE OF CARIES AMONG UNIVERSITY STUDENTS IN TAIF CITY.

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##### Key words:-

Oral hygiene habits, oral hygiene behaviors, knowledge of caries, tooth brushing, caries.

#### Abstract

**Background:** Obtaining a baseline information of the oral hygiene habits and knowledge of caries is essential and it will help in establishment of adequate preventive programs and proper allocation of available dental services. Therefore, the aim of the present study was to examine self-reported oral hygiene habits and caries knowledge of Saudi students in Taif University.

**Methods:** A cross-sectional study was conducted in Taif University. A self-reported, anonymous and structured questionnaire was distributed to a random sample of 600 students (n=600; Male (M) =300, Female (F) =300) from different colleges. The questionnaire included two sections, one section for assessing the oral hygiene behavior (Q1-Q11) and another to assess the knowledge of caries (Q12-Q20). The students were requested to remain in the classroom after the lecture to answer the questions. The participation was voluntary and the answers were anonymous. The data was collected and then analyzed using Statistical Package for Social Sciences (SPSS, v.21) software to calculate the frequency distribution and percentage.

**Results:** The male and female responses are presented in tables to show the distribution frequency of each question. In addition, the overall percentages of total students' responses are presented in figures. Results of the first part of the questionnaire show that 47.5% (41.21% of males, 53.94% of females) practice good oral hygiene behavior. Conversely, 52.5% of students (58.79% of males and 46.06% of females) practice incorrect behavior. The results of the second part show that 45.04% of the students (47.11% of males, 42.96% of females) have correct knowledge about caries. In contrast, 54.96% of students (52.89% of males, 57.04% of females) lack that knowledge about caries.

##### Conclusion:

The findings of this study indicate that more than half of the students practice incorrect oral hygiene behaviors and lack the basic knowledge about caries and its related information, so this direct us to the importance of conducting oral health promotion programs to raise the

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awareness and motivate students to practice the ideal and correct oral hygiene behavior for the prevention from oral diseases.

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### **Introduction:-**

Oral health is an important component of general health and overall quality of life <sup>[1]</sup>. The two most common oral diseases; caries and periodontal disease, continue to be highly prevalent in most regions of the world <sup>[2]</sup>. Behavior plays a major role in the prevention of both diseases in adequate oral hygiene habits and compliance with regular preventive dental visits essential for their control <sup>[3]</sup>. Self-preventive measures for the removal of bacterial dental plaque through adequate use of the toothbrush and dental floss have been demonstrated to reduce the prevalence of caries <sup>[4, 5]</sup> and periodontal diseases <sup>[6, 7]</sup>. Similarly, compliance with regular preventive dental examination and prophylaxis visits have been documented as essential for the prevention and early diagnosis of oral diseases <sup>[8-9]</sup>. Self-preventive oral health behavior and oral hygiene habits are influenced by several factors including patient motivation, attitude, and value system <sup>[10-11]</sup>. Consequently, differences in oral hygiene habits have been shown to be related to culture and geographic region <sup>[12-13]</sup>. For instance, while 73–83% of school children in Norway, Germany, Sweden, Denmark, and Austria brushed their teeth twice daily <sup>[12]</sup>, such tooth brushing frequency was reported by only 19–46% of patients in Lithuania, Saudi Arabia (Riyadh), and Japan <sup>[13-14]</sup>.

Until today, limited information is available on the oral hygiene habits of Saudi adults, so obtaining a baseline information of the oral hygiene habits and knowledge of caries is essential and it will help in establishment of adequate preventive programs and proper allocation of available dental services. Therefore, the aim of this study was to examine self-reported oral hygiene habits and caries knowledge of Saudi students in Taif University.

### **Materials and Methods:-**

A cross sectional study was conducted in Taif University. A self-reported, anonymous and structured questionnaire was distributed to a random sample of 600 students (300 males and 300 females) from different colleges. The students were requested to remain in the classroom after the lecture to answer the questions. The participation was voluntary and the answers were anonymous. The study protocol was approved by the review committee of the Faculty of Dentistry in Taif University. The questionnaire used in this study covered two aspects as follow:

The first part of the questionnaire (Q1-Q11) covered oral hygiene behavior: (Tooth brushing frequency, time spent for brushing, replacement of toothbrush, cleaning of tongue, use of dental floss, use of mouthwash, purpose of visiting dentist, frequency of eating candies, frequency of having soft drinks, frequency of smoking, use of sugar with tea and coffee).

The second part (Q12 – Q20) covered oral health knowledge: (Role of sugar bacteria, saliva, soft drinks and fresh juices in getting decay, role of fluoride in toothpastes, importance of preserving the teeth from extraction, ability of teeth to regenerate, role of milk bottles to develop decay in children).

The data were collected and then analyzed using Statistical Package for Social Sciences (SPSS, v.21) software to calculate the frequency distribution and percentage.

### **Results:-**

The questionnaire included two sections, one section for assessing the oral hygiene behavior and another to assess the knowledge of caries. The self-reported oral hygiene behavior of male and female are presented in table (1). In addition, the overall percentages of total students' responses are presented in figure (1):

Q1: 53.3% of males (n=160) and 15% of females (n=45) brush their teeth once a day, 28.7% of males (n=86) and 60% of females (n=180) brush their teeth twice a day, 10% of males (n=32) and 23.3% of females (n=70) brush more than two times a day and 7.3% of males (n=22) and 1.7% of females (n=5) never brush their teeth.

Q2: 43.3% of males (n=130) and 23.3% of females (n=70) spend only around 30 seconds for brushing, 51.3% of males (n=154) and 65% of females (n=195) spend 2-3 minutes for brushing, 5.3% of males (n=16) and 11.7% of females (n=35) spend more than 3 minutes for brushing their teeth.

Q3: 20% of males (n=60) and 21.7% of females (n=65) replace their tooth brush every month , 43.3% of males (n=130) and 60% of females replace their toothbrush every 3 – 4 months , 17.3 % of males (n=52) and 15% of females (n=45) replace their toothbrush every 6-8 months and 19.3% of males (n=58 ) and 3.3% of females replace their toothbrush every year or never replace it .

Q4: 57.7% of males (n=170) and 58.3% of females (n=175) clean their tongue every day , 13.3% of males (n=40) and 23.3% of females (n=70) clean it once a week , 7.3% of males (n=22) and 0% of female (n=0) clean it once a month and 23% of males (n=68 ) and 18% of females (n=55) don't clean it .

Q5: 10% of males (n=30) and 25% of females (n=75) use the dental floss once a day , 6% of males (n=18) and 6.7% of females use it twice a day ,4% of males (n=12) and 1.7% of females (n=5) use it more than two times a day and 80% of males (n=240) and 66.7% of females (n=200) don't use the dental floss .

Q6: 16.7% of males (n=50) and 41.7% of females (n=125) use the mouthwash once a day, 11.3% of males (n=34) and 11.7% of females (n=35) use it , 2% of males (n=6) ) and 0% of female (n=0) use it more than two times a day and 70% of males (n=210) and 46.7% of females (n=140) don't use it.

Q7 : 50% of males (n=150) and 41.7% of females (n=125) visits the dentist when severe pain presents , 25.3% of males (n=76) and 41.7% of females (n=125) visit the dentist when the pain start , 8.7 % of males (n=26) and 8.3 % of females (n=25) visit the dentist for periodic examination and 16% of males (n=48) and 8.3 % of females (n=25) don't visit the dentist at all .

Q8: 36.7% of males (n=110) and 53.3% of females (n=160) have candies and biscuits multiple times during the day , 33.3 % of males (n=100) and 31.7% of females (n=95) have candies and biscuits once a day , 15.3 % of males (n=46) and 6.7 % of females (n=20) have candies and biscuits once a week and 14.7 % of males (n=44) and 8.3% of females (n=25) rarely have biscuits and candies .

Q9: 36.7% of males (n=110) and 26.7 % of females (n=80) have soft drinks multiple times during the day , 28.7% of males (n=86) and 26.7% of females (n=80) have soft drinks once a day , 23.3% of males (n=70) and 26.7% (n=80) have soft drinks once a week and 11.3% of males (n=34) and 20% of females (n=60) rarely have soft drinks .

Q10: 18% of males (n=54) and 3.3% of females (n=10) smoke multiple times during the day, 1.3% of males (n=4) and 3.3% of females (n=10) smoke once a day, 0.67% of males (n=2) and 0% of female (n=0) and 80% of males (n=240) and 93.3 % of females (n=280) rarely or never smoke.

Q11: 24.7% of males (n=74) and 35% of females (n=105) use one spoon with tea or coffee , 50% of males (n=150) and 40% of females (n=12) use two spoons of sugar with tea or coffee , 20% of males (n=60) and 15% of females (n=45) use three spoons or more with tea or coffee and 5.3% of males (n=16) and 10% of females (n=30) don't use sugar with tea or coffee .

The second section of the questionnaire assessed the knowledge about caries among males and females as presented in table (2). In addition, the overall percentages of total students' responses are presented in figure (2):

Q12: 65.3% of males (n=196) and 86.7% of females (n=260) consider sugar as the main factor for decay, 15.3% of males (n=46) and 5% of females (n=15) think the opposite and 19.3% of males (n=58) and 8.3% of females (n=25) don't know if sugar is responsible or not.

Q13: 20% of males (n=60) and 31.7% of females (n=95) think that fluoride is added to toothpastes to give it a good taste, 40% of males (n=120) and 33.3% of females (n=100) know that fluoride isn't added for enhancing taste and 40% of males (n=120) and 35% of females (n=105) don't know what is the purpose of adding fluoride.

Q14: 86.7% of males (n=260) and 88.3% of females (n=265) know that bacteria has a role in developing decay and 5.3% of males (n=16) and 3.3% of females (n=10) think that bacteria has no role in developing decay and 8% of males (n=24) and 8.3% of females (n=25) don't know if bacteria is involved in the process or not.

Q15: 59.3% of males (n=178) and 41.7% of females (n=125) know that saliva has a protecting action against decay, 17.3% of males (n=52) and 13.3 % of females (n=40) think that saliva has no role against decay and 23.3% of males (n=70) and 45% of females (n=135) don't know if saliva has a protecting action or not.

Q16: 20% of males (n=60) and 41.7% of females (n=125) think that extraction of the tooth is the best way to treat it, 64% of males (n=192) and 45% of females (n=135) know that isn't right and 16% of males (n=48) and 13.3% of females (n=40) don't know if extraction is the best solution or not.

Q17: 32% of males (n=96) and 53.3% of females (n=160) think that teeth can regenerate again if care is taken, 46.7% of males (n=140) and 30% of females (n=90) know that's not true and 21.3% of males (n=64) and 16.7% of females (n=50) don't know if teeth has the ability to regenerate or not.

Q18: 46.7% of males (n=140) and 68.3% of females (n=205) think that soft drinks cause decay because they contain gases, 25.3% of males (n=76) and 16.7% of females (n=50) know that's not right and 28% of males (n=84) and 15% of females (n=45) don't know if soft drink is causing decay because of gases or not.

Q19: 22.7% of males (n=68) and 33.3% of females (n=100) know that children are at risk of developing decay from milk bottles, 43.3% of males (n=130) and 36.7% of females (n=110) think not and 34% of males (n=102) and 30% of females (n=90) don't know if milk bottles increasing the risk or not.

Q20: 14% of males (n=42) and 11.7% of females (n=35) know that fresh juices can harm our teeth, 67.3% of males (n=202) and 71.7% of females think that fresh juices will not harm our teeth and 18.7% of males (n=56) and 16.7% of females (n=50) don't know if fresh juices will harm our teeth or not.

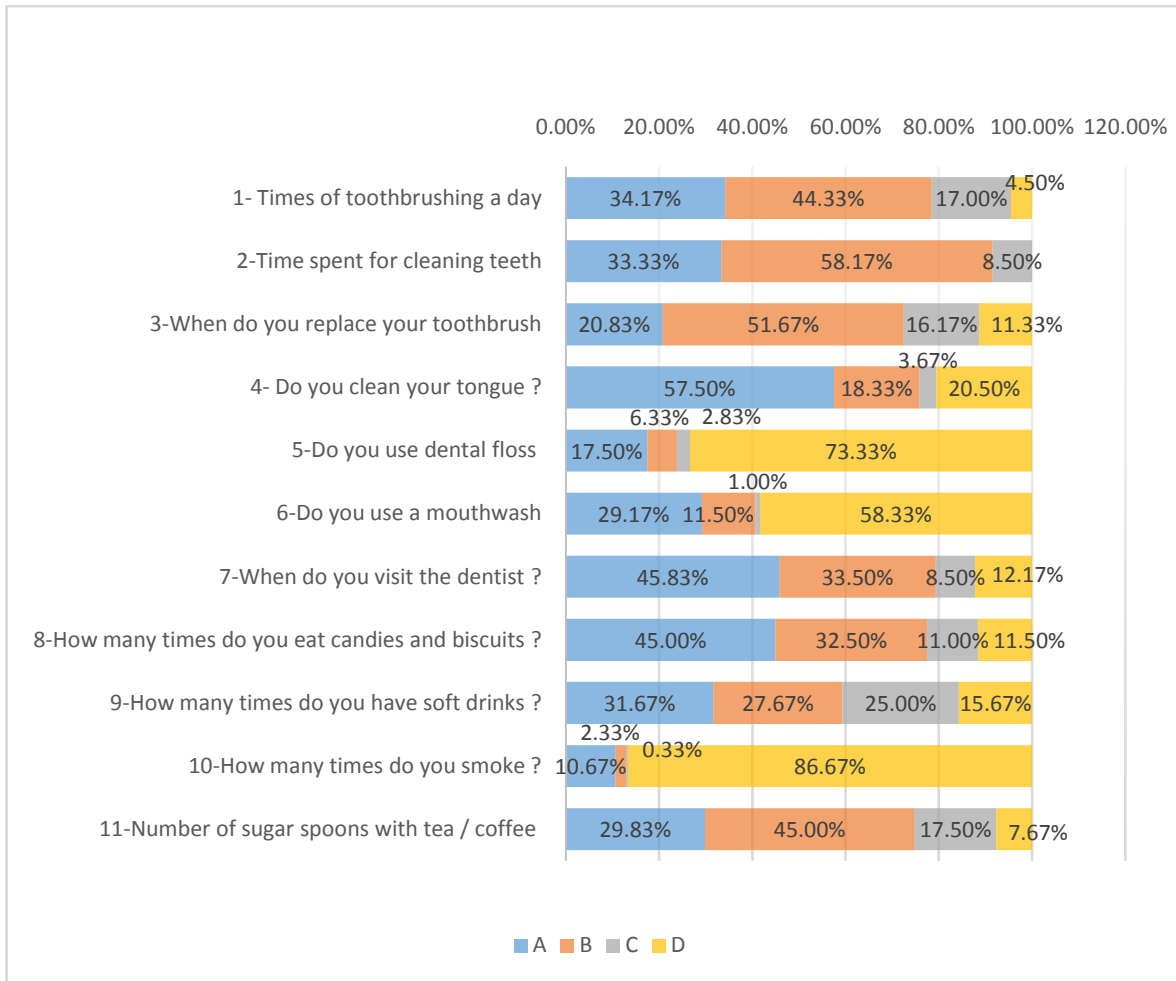
**Table 1:-** Frequency distribution and percentage of students' responses regarding oral hygiene behavior

		A	B	C	D	Total
<b>1- Times of tooth brushing a day</b>		Once a day	Twice	>2	None	
		160	86	32	22	300
	M	<b>53.33%</b>	<b>28.67%</b>	<b>10.67%</b>	<b>7.33%</b>	<b>100%</b>
	F	45	180	70	5	300
		<b>15.00%</b>	<b>60.00%</b>	<b>23.33%</b>	<b>1.67%</b>	<b>100%</b>
<b>2-Time spent for cleaning teeth</b>		30 seconds	2-3 min	>3 min		
	M	130	154	16		300
		<b>43.33%</b>	<b>51.33%</b>	<b>5.33%</b>		<b>100%</b>
	F	70	195	35		300
		<b>23.33%</b>	<b>65.00%</b>	<b>11.67%</b>		<b>100%</b>
<b>3-When do you replace your toothbrush</b>		Every month	Every 3 - 4 months	Every 6 - 8 months	Every year / never	
	M	60	130	52	58	300
		<b>20.00%</b>	<b>43.33%</b>	<b>17.33%</b>	<b>19.33%</b>	<b>100%</b>
	F	65	180	45	10	300
		<b>21.67%</b>	<b>60.00%</b>	<b>15.00%</b>	<b>3.33%</b>	<b>100%</b>
<b>4- Do you clean your tongue ?</b>		Yes ,Every day	Yes, Once a week	Yes,Once a month	No	
	M	170	40	22	68	300
		<b>56.67%</b>	<b>13.33%</b>	<b>7.33%</b>	<b>22.67%</b>	<b>100%</b>
	F	175	70	0	55	300
		<b>58.33%</b>	<b>23.33%</b>	<b>0.00%</b>	<b>18.33%</b>	<b>100%</b>
<b>5-Do you use dental floss</b>		Yes, once a day	Yes,twice a day	Yes, more than 2 times a day	No	
	M	30	18	12	240	300
		<b>10.00%</b>	<b>6.00%</b>	<b>4.00%</b>	<b>80.00%</b>	<b>100%</b>
	F	75	20	5	200	300
		<b>25.00%</b>	<b>6.67%</b>	<b>1.67%</b>	<b>66.67%</b>	<b>100%</b>
<b>6-Do you use a</b>		Yes, once a day	Yes, twice a	Yes, more than	No	

<b>mouthwash</b>			day	2 times a day		
	M	50	34	6	210	300
		<b>16.67%</b>	<b>11.33%</b>	<b>2.00%</b>	<b>70.00%</b>	<b>100%</b>
	F	125	35		140	300
		<b>41.67%</b>	<b>11.67%</b>	<b>0.00%</b>	<b>46.67%</b>	<b>100%</b>
<b>7- When do you visit the dentist?</b>		When sever pain presents	When the pain starts	For periodic examination	Never	
	M	150	76	26	48	300
		<b>50.00%</b>	<b>25.33%</b>	<b>8.67%</b>	<b>16.00%</b>	<b>100%</b>
	F	125	125	25	25	300
		<b>41.67%</b>	<b>41.67%</b>	<b>8.33%</b>	<b>8.33%</b>	<b>100%</b>
<b>8-How many times do you eat candies and biscuits?</b>		Multiple times during a day	Once a day	Once a week	Rarely	
	M	110	100	46	44	300
		<b>36.67%</b>	<b>33.33%</b>	<b>15.33%</b>	<b>14.67%</b>	<b>100%</b>
	F	160	95	20	25	300
		<b>53.33%</b>	<b>31.67%</b>	<b>6.67%</b>	<b>8.33%</b>	<b>100%</b>
<b>9-How many times do you have soft drinks?</b>		Multiple times during a day	Once a day	Once a week	Rarely	
	M	110	86	70	34	300
		<b>36.67%</b>	<b>28.67%</b>	<b>23.33%</b>	<b>11.33%</b>	<b>100%</b>
	F	80	80	80	60	300
		<b>26.67%</b>	<b>26.67%</b>	<b>26.67%</b>	<b>20.00%</b>	<b>100%</b>
<b>10-How many times do you smoke?</b>		Multiple times during a day	Once a day	Once a week	Rarely / Never	
	M	54	4	2	240	300
		<b>18.00%</b>	<b>1.33%</b>	<b>0.67%</b>	<b>80.00%</b>	<b>100%</b>
	F	10	10	0	280	300
		<b>3.33%</b>	<b>3.33%</b>	<b>0.00%</b>	<b>93.33%</b>	<b>100%</b>
<b>11-Number of sugar spoons with tea / coffee</b>		<b>One spoon</b>	<b>Two spoons</b>	<b>Three or more</b>	<b>Non</b>	
	M	74	150	60	16	300
		<b>24.67%</b>	<b>50.00%</b>	<b>20.00%</b>	<b>5.33%</b>	<b>100%</b>
	F	105	120	45	30	300
		<b>35.00%</b>	<b>40.00%</b>	<b>15.00%</b>	<b>10.00%</b>	<b>100%</b>

M= Male &amp; F= Female.





**Figure 1:-** Percentage of total students' responses regarding oral hygiene behavior (refer to table 1 for A,B ,C and D for each question) :

**Table 2:-** Frequency distribution and percentage of students' responses regarding knowledge about caries

12- Sugar is considered as the main factor for decay		Yes	No	I don't know	
M		196	46	58	300
		<b>65.33%</b>	<b>15.33%</b>	<b>19.33%</b>	<b>100%</b>
F		260	15	25	300
		<b>86.67%</b>	<b>5.00%</b>	<b>8.33%</b>	<b>100%</b>
13-Fluraide is added to the toothpaste for giving it a good taste		Yes	No	I don't know	
M		60	120	120	300
		<b>20.00%</b>	<b>40.00%</b>	<b>40.00%</b>	<b>100%</b>
F		95	100	105	300
		<b>31.67%</b>	<b>33.33%</b>	<b>35.00%</b>	<b>100%</b>
14-Bacteria has a role in decay		Yes	No	I don't know	
M		260	16	24	300
		<b>86.67%</b>	<b>5.33%</b>	<b>8.00%</b>	<b>100%</b>
F		265	10	25	300
		<b>88.33%</b>	<b>3.33%</b>	<b>8.33%</b>	<b>100%</b>
15- Saliva protect the teeth from getting decayed :		Yes	No	I don't know	
M		178	52	70	300
		<b>59.33%</b>	<b>17.33%</b>	<b>23.33%</b>	<b>100%</b>

	F	125 41.67%	40 13.33%	135 45.00%	300 100%
16-Extraction of the tooth with pain is the best way for treating it		<b>Yes</b>	<b>No</b>	<b>I don't know</b>	
	M	60 20.00%	192 64.00%	48 16.00%	300 100%
	F	125 41.67%	135 45.00%	40 13.33%	300 100%
17-Teeth can regenerate if care is taken		<b>Yes</b>	<b>No</b>	<b>I don't know</b>	
	M	96 32.00%	140 46.67%	64 21.33%	300 100%
	F	160 53.33%	90 30.00%	50 16.67%	300 100%
18-Soft drinks lead to decay because they contain gases		<b>Yes</b>	<b>No</b>	<b>I don't know</b>	
	M	140 46.67%	76 25.33%	84 28.00%	300 100%
	F	205 68.33%	50 16.67%	45 15.00%	300 100%
19-Children are prone to decay from the milk bottles		<b>Yes</b>	<b>No</b>	<b>I don't know</b>	
	M	68 22.67%	130 43.33%	102 34.00%	300 100%
	F	100 33.33%	110 36.67%	90 30.00%	300 100%
20-Fresh juices can harm the teeth and contribute in destroying them		<b>Yes</b>	<b>No</b>	<b>I don't know</b>	
	M	42 14.00%	202 67.33%	56 18.67%	300 100%
	F	35 11.67%	215 71.67%	50 16.67%	300 100%

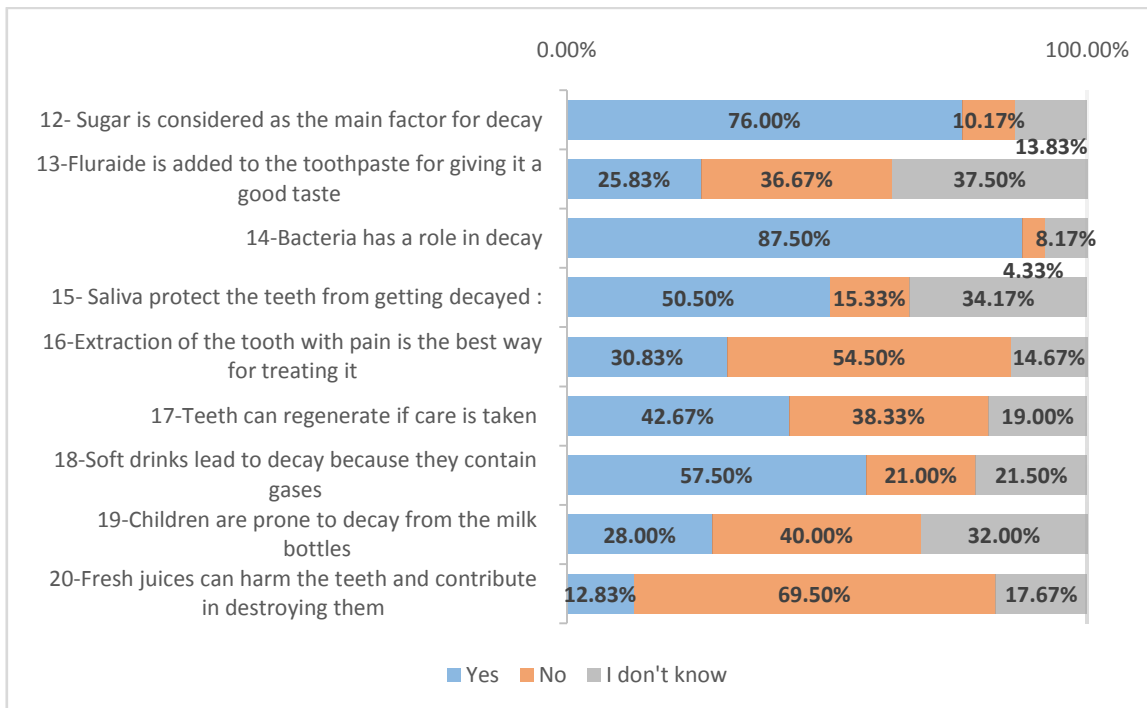


Figure 2:- Percentage of total students' responses regarding knowledge about caries

The data in figure 3 shows the percentage of good behavior and incorrect behavior among Taif university students. The good behavior included : (brushing twice or more daily , spending 2 -3 minutes while cleaning the teeth , replacing the toothbrush every 3-4 months , cleaning the tongue once or more daily ,using dental floss once or more daily , using mouthwash , visiting the dentist for periodic examination , reduced frequency of eating candies and biscuits and drinking soft drinks , non-smoking , using not more than one spoon of sugar with tea or coffee ).

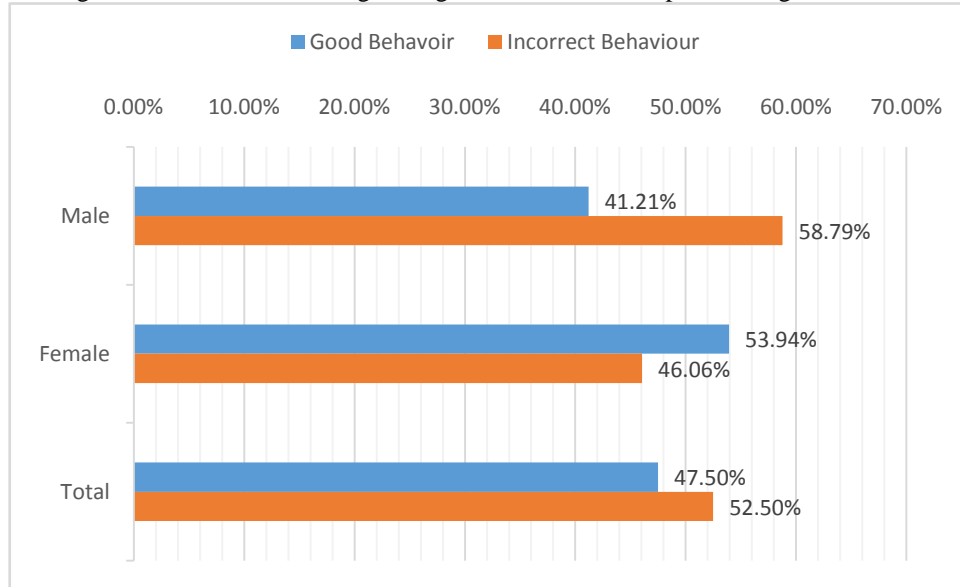


Figure 3:- The oral hygiene behavior among Taif university students

The data in figure 4 shows the percentage of Taif University students who have the correct knowledge about caries compared with people who lack that knowledge. The knowledge assessed include: ( The role of sugar and bacteria in developing caries , the protective role of saliva and fluoride , the importance of preserving teeth from extraction , ability of teeth to regenerate , role of milk bottles to develop decay in children )

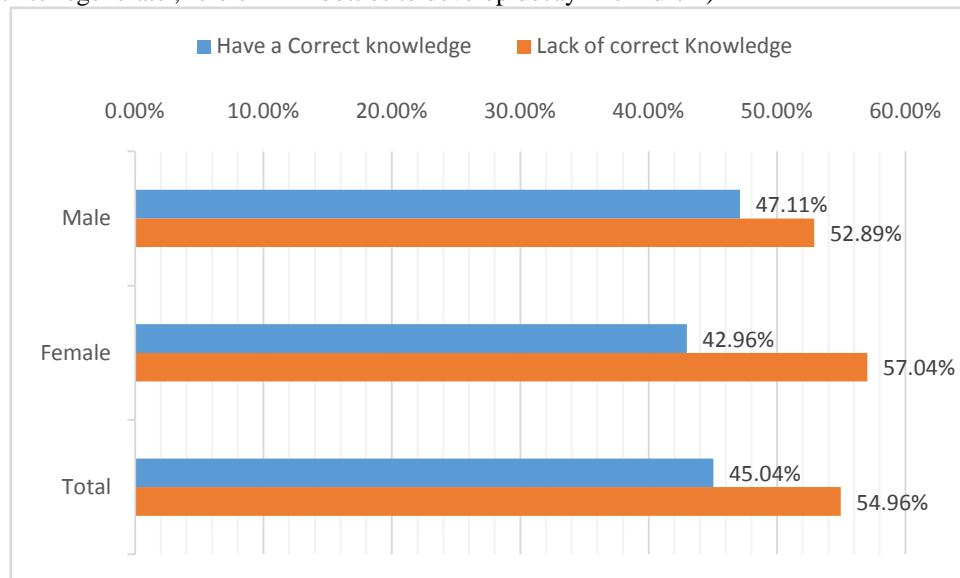


Figure 4:- The knowledge about caries among Taif university students

**Discussion:-**

This research presents; to the best of our knowledge, new data as no researcher has investigated the oral hygiene behavior or the knowledge of caries among students in Taif University or even among population in Taif. The first part of the questionnaire revealed a huge negligence on the using of mouthwashes and dental floss as 73.33% of the

sampled student (the males more than the females) don't include the use of dental floss in their oral hygiene routine, but it's still better compared to a study reported 89% who don't use the dental floss in Denmark<sup>[15]</sup> and 83.2% in Iran [16]. Also about 58.33% of the sampled student (the males are more than the females) don't use a mouthwash. Regarding tooth brushing about 44.33% of the sampled students follow the international guidelines that indicate brushing at least twice a day, and our result is in the range of other studies which reported such tooth brushing frequency by 19–46% of patients in Lithuania, Saudi Arabia(Riyadh), and Japan<sup>[13-14]</sup>. It's also noticed that women had higher odds of brushing teeth twice a day than men and that is parallel with other findings<sup>[17-18]</sup>; 34.17% brush their teeth once a day and 17% brush more than two times a day. A minor percent (approximately 9%) of sampled students do not use the toothbrush on a daily basis and we should consider them without hesitation. The behavior of visiting the dentist for periodic examination is minimum as most of the samples students (more than half) only visit the dentist when severe pain presents or when the pain starts, this finding is similar to another literatures which found that about 60% of the subjects paid no attention to signs of caries if there was no pain<sup>[19]</sup>. The consumption of candies and biscuits is more in female) than in males (about half of females consume them multiple times during the day). However, the males drink soft drinks and soda more than the females (about one third of males). In total, this study indicates high consumption of sugar which disagrees with results of Zhu *et al*<sup>[19]</sup>. Our findings also show that smoking in males is more than in females obviously with only about one fifth of males practicing this unhealthy habit. The use of extra sugar with tea or coffee is unhealthy and it is considered as a factor for developing caries and other health problems; however, more than the half of sampled students use extra sugar which also contrast the results of Zhu *et al*<sup>[19]</sup> and that should be taken into consideration. Lastly, figure 3 shows that more than half of the samples students practice incorrect oral hygiene methods (with the females practice less incorrect behavior than males). This noticed good oral hygiene behavior among women has been reported in various studies<sup>[15,20,21]</sup>. This may be because women have flexible daily routine<sup>[22]</sup> which is suggested to promote higher teeth cleaning behavior. Also, women are more motivated to follow oral hygiene behavior that might be due to the esthetic value which they care about.

The second part of the questionnaire revealed that majority of sample students know that sugar and bacteria are responsible for caries which is a positive aspect. Although half of the sample student think that saliva has no role in protection against decay or do not know if it has a role or not. Also the majority of sampled students think fluoride is added for taste or do not know if it is for taste or not. There is also lack of knowledge about the cause soft drink causing decay, the harmful effect of fresh juices on the teeth and the importance preservation of teeth in the majority of sampled students (more than half). Also, majority of sampled students (about two thirds) think that teeth can regenerate or do not know if it can or not. Finally, figure 2 shows that more than the half of sampled students lack the correct knowledge (females lack knowledge more than males) which does not coincide with a research that suggest females were having relatively more oral health-related knowledge<sup>[23]</sup>.

The results of the present study emphasize the need of oral health promotion programs to be conducted to increase the awareness and motivate the people to practice the correct and last current oral hygiene behavior by explaining the importance of preserving the teeth and illustrating the oral diseases that could develop if the recommendations are not followed.

#### **Limitation of the study:-**

This study is giving baseline information about oral hygiene behavior and knowledge among males and females but it does not take into consideration the effect of other variables such as the socio-demographic factor and the economic status of each subject. Another limitation is that this study just gives information regarding University students only and that necessitate the need for conducting more comprehensive study including large population samples.

#### **Conclusion:-**

The findings of the present study indicate that more than the half of students practice incorrect oral hygiene behaviors and they lack basic knowledge about caries and its related information, hence, this directs us to the importance of conducting oral health promotion programs to raise the awareness and motivate students to practice the ideal and correct oral hygiene behavior for the prevention from oral diseases.

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### RESEARCH ARTICLE

## SKIN CARE IN SPINAL CORD INJURY PATIENTS: A PRACTICAL AND SCIENTIFIC APPROACH TO THE DEVASTATING PROBLEM.

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### Abstract

**Background:** Spinal cord injury subjects the patients to multitude of complex problems which have bearing on physical, mental, psychological and social aspects of the individual. It leaves the patients crippled for various aspects and mobilization being the important one which is severely impaired. Among all the problems, skin care constitutes an important aspect.

**Methods:** Various comprehensive aspects of skin care like Grading of decubitus ulcers, preventive methodologies and management is reviewed.

**Conclusion:** Skin care in Spinal cord injury patients is an important aspect of the rehabilitation process. It plays a pivotal role in maintaining the well-being of spinal cord injury patients. It involves simple common sense steps which the patients or the care givers can adapt and make it a daily routine to ensure the integrity of the neurologically impaired skin. Timely observation and action are the keys to the approach.

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### Introduction:-

A pressure sore (or bed sore) is an injury to the skin and tissue under it. Sitting or lying in the same position will begin to cut off the flow of blood to that area, blocking oxygen and vital nutrients from maintaining healthy tissue<sup>1,9</sup>.

**Definition of decubitus ulcer:** Pressure sores will also be referred to as pressure ulcers or decubitus ulcers. Breach in the continuity of epithelium and underlying tissue due to prolonged pressure on the skin. Prolonged pressure reduces blood supply and essential nutrients and oxygen supply to underlying tissues eventually resulting in skin breakdown<sup>9,12</sup>.

### Susceptibility<sup>1,4,14</sup>:-

1. Decubitus ulcers are common in patients with spinal cord injury with paraplegics and quadriplegics.
2. Reason: loss of sensation, loss of muscle function, reduced blood supply, poor nutrition, abnormal postures resulting from spasticity, pressure from external devices like prosthesis or wheel chair.
3. Spinal cord injury patients have reduced capacity to reposition or shift their body postures in bed or on wheelchair resulting in pressure sores. Hence they need periodic daily assessment of vulnerable areas to look for any skin changes.

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Skin care is an integral part of management of patients with spinal cord injury patients. People with spinal cord injury living life in a wheelchair are at greater risk of skin damage like pressure sore areas due to loss of feeling and reduced sensation to parts of their body. Combined with loss of muscle function, poor circulation and often poor nutrition people with spinal cord injury often develop pressure sores. Left unattended these can quickly become life threatening<sup>2,8,11</sup>.

While both vulnerable, people with quadriplegia and tetraplegia are more susceptible than those with paraplegia due to the reduced capacity and strength in upper limbs to reposition or shift their body weight in a wheelchair or bed. It's important to check skin on a daily basis in order to reduce the risk of developing problems such as pressure sores<sup>3,7</sup>.

#### **Characteristics of Neurologically impaired skin<sup>4,6,10</sup>:-**

1. Reduced elasticity and tensile strength
2. Reduced resistance to ischemia, physical insult ( friction,heat, rub etc..)
3. Muscle atrophy
4. Reduced sensation
5. Altered maintenance of constant body temperature
6. Impaired reflex vascular changes below the level of lesion

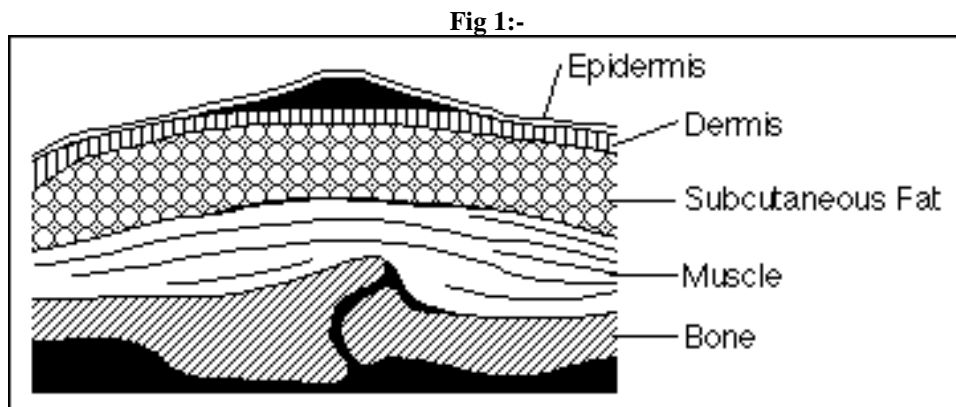
#### **Signs of impending bedsores<sup>13,15,19</sup>:-**

- Reddened areas
- Damp soft white areas
- Rashes, pimples, blisters, bumps
- Cuts, bruises, scrapes, scratches, insect bites
- Hard lumps beneath the skin surface
- Marks from seams or elastic binding
- Dry flaky skin

#### **Stages<sup>12,16,18</sup>:-**

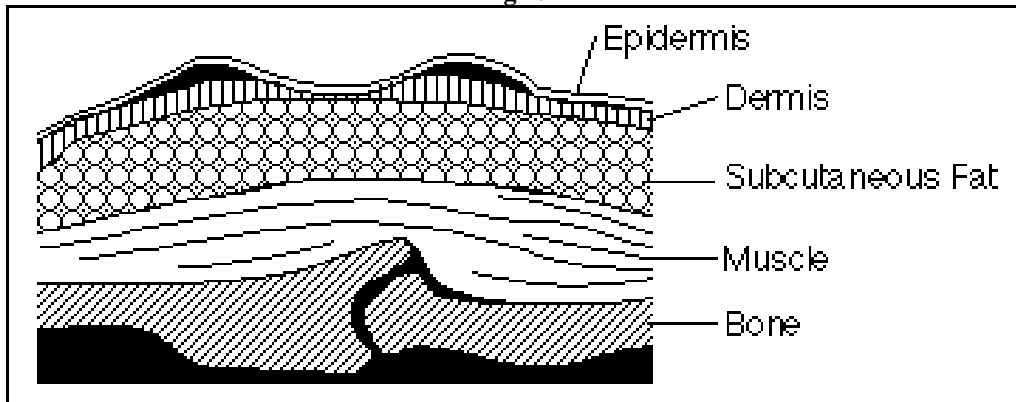
Damage from a pressure sore will range from slight discoloration of the skin (stage 1) to open sores that go all the way to the bone (severe).

**Stage 1:-** Skin is not broken but is red or discolored. The redness or change in color does not fade within 30 minutes after pressure is removed.



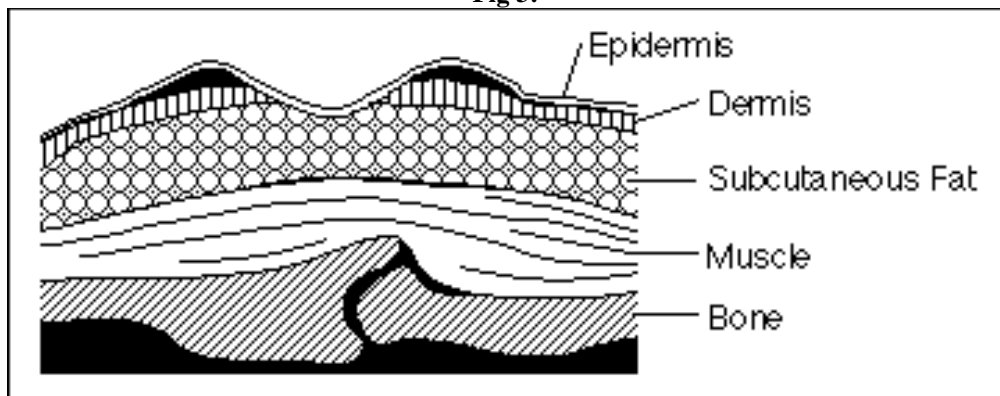
**Stage 2:-** The epidermis or topmost layer of the skin is broken, creating a shallow open sore. Drainage may or may not be present.

Fig 2:-



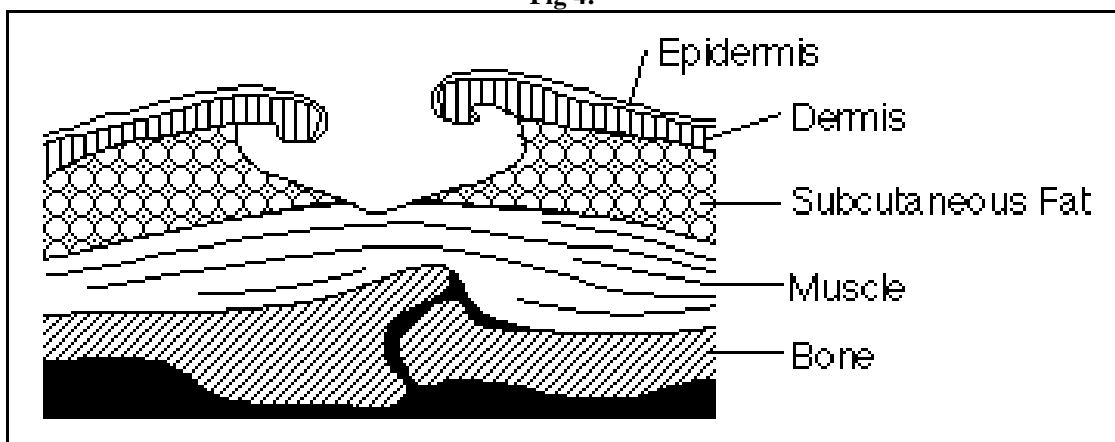
**Stage 3:-** The break in the skin extends through the dermis (second skin layer) into the subcutaneous and fat tissue. The wound is deeper than in Stage Two.

Fig 3:-



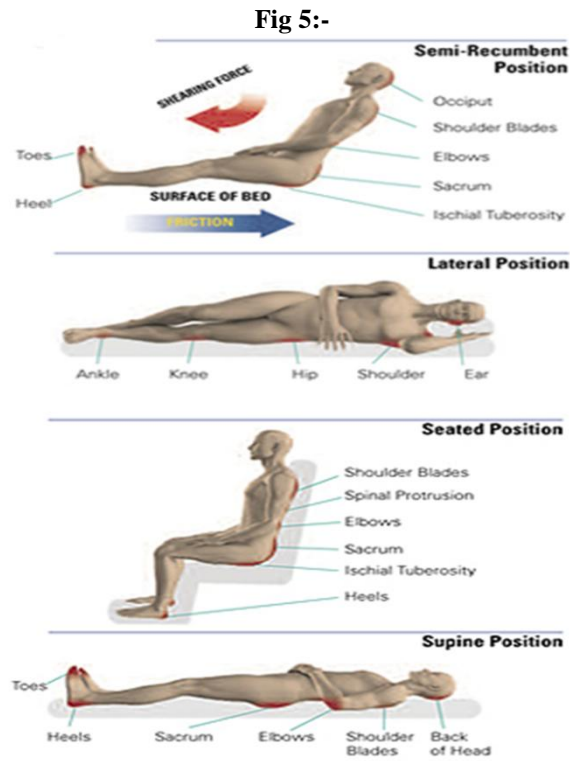
**Stage 4:** The breakdown extends into the muscle and can extend as far down as the bone. Usually lots of dead tissue and drainage are present.

Fig 4:-

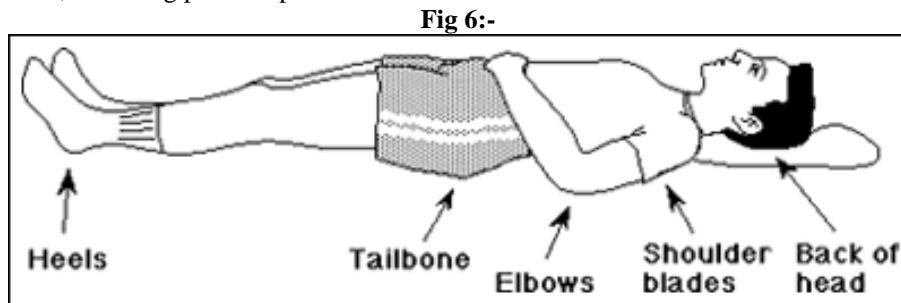




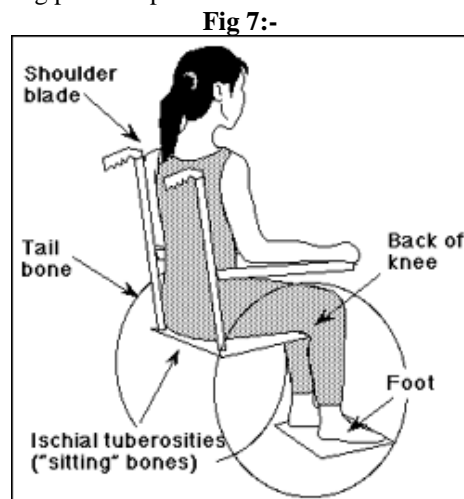
Susceptibility zones<sup>20</sup>:-



In recumbent posture, following pressure points are vulnerable:



In wheel chair bound patients, following pressure points are vulnerable:



**Principles of decubitus ulcer prevention<sup>11,26,30</sup> :-**

1. Risk assessment
2. Skin inspection
3. Pressure relief
4. Continence management
5. Skin care hygiene
6. Nutrition
7. Environmental evaluation
8. Equipment prescription
9. Exercise regimen
10. Education
11. Seeking advice

**Risk assessment tools<sup>23, 27</sup> :-**

1. Waterlow index
2. Braden index
3. Norton index
4. NSW pressure sore prediction score
5. Waterlow index has highest predictive value in SCI patients. (Wellard and Lo, 200).

Of all these indices, Waterlow pressure ulcer preventive policy is most practical and hence generally followed.

**Fig 8:-**

**WATERLOW PRESSURE ULCER PREVENTION/TREATMENT POLICY**  
RING SCORES IN TABLE, ADD TOTAL. MORE THAN 1 SCORE/CATEGORY CAN BE USED

BUILD/WEIGHT FOR HEIGHT	◆	SKIN TYPE VISUAL RISK AREAS	◆	SEX AGE	◆	MALNUTRITION SCREENING TOOL (MST) (Nutrition Vol.15, No.6 1999 - Australia)	
AVERAGE BMI = 20-24.9	0	HEALTHY TISSUE PAPER	0 1	MALE FEMALE	1 2	A- HAS PATIENT LOST WEIGHT RECENTLY YES - GO TO B NO - GO TO C UNSURE - GO TO C AND SCORE 2	B- WEIGHT LOSS SCORE 0.5 - 5kg = 1 5 - 10kg = 2 10 - 15kg = 3 > 15kg = 4 unsure = 2
ABOVE AVERAGE BMI = 25-29.9	1	OEDEMATOUS	1	14 - 49	1	C - PATIENT EATING POORLY OR LACK OF APPETITE "NO" = 0; "YES" SCORE = 1	NUTRITION SCORE If > 2 refer for nutrition assessment / intervention
OBESSE BMI > 30	2	CLAMMY, PYREXIA	1	50 - 64	2		
BELOW AVERAGE BMI < 20	3	DISCOLOURED GRADE 1	2	65 - 74	3		
BMI < 20 BMI = W(kg) / Ht (m) <sup>2</sup>	3	BROKEN/SPOTS GRADE 2-4	3	75 - 80	4		
				81 +	5		
<b>CONTINENCE</b> ◆		<b>MOBILITY</b> ◆		<b>SPECIAL RISKS</b>			
COMPLETE/ CATHETERISED	0	FULLY	0	<b>TISSUE MALNUTRITION</b> ◆		<b>NEUROLOGICAL DEFICIT</b> ◆	
URINE INCONT.	1	RESTLESS/FIDGETY	1	TERMINAL CACHEXIA	8	DIABETES, MS, CVA 4-6	
FAECAL INCONT.	2	APATHETIC	2	MULTIPLE ORGAN FAILURE	8	MOTOR/SENSORY 4-6	
URINARY + FAECAL INCONTINENCE	3	RESTRICTED BEDBOUND e.g. TRACTION CHAIRBOUND e.g. WHEELCHAIR	3 4 5	SINGLE ORGAN FAILURE (RESP, RENAL, CARDIAC,)	5	PARAPLEGIA (MAX OF 6) 4-6	
				PERIPHERAL VASCULAR DISEASE	5	<b>MAJOR SURGERY or TRAUMA</b>	
				ANAEMIA (Hb < 8)	2	ORTHOPAEDIC/SPINAL 5	
				SMOKING	1	ON TABLE > 2 HR# 5 ON TABLE > 6 HR# 8	
				MEDICATION - CYTOTOXICS, LONG TERM/HIGH DOSE STEROIDS, ANTI-INFLAMMATORY MAX OF 4			

**SCORE**

**10+ AT RISK**

**15+ HIGH RISK**

**20+ VERY HIGH RISK**

# Scores can be discounted after 48 hours provided patient is recovering normally

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\* The 2005 revision incorporates the research undertaken by Queensland Health. www.judy-waterlow.co.uk

**Methods of taking care of skin in spinal cord injury patients<sup>25,28,30</sup>:-****Nutrition:-**

The diet should consist of plenty of protein foods, fresh fruits, vegetables and liquids. In cases with existing pressure sores, the diet should be rich in proteins: lean meats, dairy foods and legumes; carbohydrates: breads, cereals; vitamins: A,B6,C,E and minerals: Zinc and iron.

**Circulation:-**

With a lack of air circulation, feeling and movement daily skin care is very important in order to avoid infections, sores, and irritations. The skin is served by a large number of blood vessels, and adequate circulation is needed to maintain skin health. Following measures are needed to ensure healthy blood supply to the skin:

- **To avoid Smoking** - Nicotine in cigarettes causes blood vessel constriction and prevents blood, oxygen and nutrients from flowing to the body tissues.
- **Edema, or swelling** caused by fluid collecting in the tissues, usually occurs in a part of the body that is not moved frequently and is below the level of the heart (i.e., the feet, legs and hands). Skin over areas of edema becomes thin and pale and injures easily because of poor circulation. Edema can be prevented by elevating the limbs frequently, performing regular Range of Motion (ROM) exercises and wearing compressive stockings.
- **A massage technique** similar to squeezing a tube of toothpaste can be used to work the fluids out of the fingers and feet. After a couple of minutes massage the swelling should begin to subside.
- **Anemia:** Oxygen is essential for skin health, and is carried by red blood cells. A decrease in their number means less oxygen gets to the skin, which means that skin cells may become unhealthy or even die. Anemia should be evaluated and treated.
- **Vascular Disease**, or a narrowing of the blood vessels, can be caused by diabetes, smoking, high blood pressure or elevated cholesterol. The result is decreased blood flow to the skin. Work closely with your health care provider to manage conditions that can lead to vascular disease and cause skin problems.
- **Diabetes:** Diabetes damages the blood vessels and nerves. Wounds and sores can become infected easier and heal at a much slower rate. Its mandatory to perform the skin inspections more closely, paying special attention to any reddening of the skin as they can become dangerous faster than those who do not have diabetes.
- Avoiding using soaps labeled "antibacterial" or "antimicrobial." These tend to reduce the skin's acidity, which acts as a protection from infection.
- Keeping the skin clean and dry. Washing with soap and water daily is recommended.
- **Skin folds or creases** (as in the groin area and underarms) need washing more frequently -- twice a day, morning and bedtime. Rashes can easily form in these areas because of increased moisture and warmth. Increasing the air circulation to these areas to help prevent rashes can be accomplished by positioning the arms and legs so the skin surfaces are separated. For example, using the "frog" position to air the groin area.
- **Rashes** can be caused by tapes, soaps, fabrics or other irritants. Total body rashes may result from food or drug allergies. Early treatment is necessary to avoid skin excoriations.
- Avoiding using items that may dry the skin -- for example, harsh soaps or alcohol based products such as lotions. (A good non-drying lotion to use is Alpha Keri.)
- **Lubricating** dry skin with moisturizing creams or ointments (such as Eucerin or Aquaphor). Using care in applying creams over bony areas is necessary since they may soften the skin and promote skin breakdown.
- **Soiled skin** can break down easily. Urine and stool have irritants in them and should be cleaned up immediately to prevent weakening and breakdown of the skin surface.
- Avoiding using **talccum powders**, as they may support yeast growth. They can also "cake up" and keep moisture in, causing skin breakdown.
- **Calluses** may form on feet and hands. These can be removed by soaking frequently in warm water and towelling briskly to remove dead skin. Using moisturizing creams to help soften calluses.
- **Finger and toe nails** require special care. Soaking them and rubbing them gently with a towel to remove dead skin decreases the chance of hangnails forming. Nails are easier to cut after soaking; it is necessary to cut them straight across to avoid ingrown nails, and keep them short for safety.
- Preventing skin injuries and positional padding.
- **Skin inspection<sup>32,36</sup>:**

Inspecting the skin daily is extremely important as pressure sores and infections could occur very quickly. Skin should be inspected at least once a day. Areas that need special attention are the groin area, behind knees, the areas around the ankles and elbows, and posteriorly hips and tailbone areas should be checked carefully.

The only way to know if skin is healthy and intact is to look at it regularly. In areas where sensation (feeling) is decreased, skin inspection is essential and should become a habit. Planning it as a part of regular routine -- like after a shower, before dressing in the morning or after undressing in the evening.

If patients are unable to see some parts of your body, using a mirror or teach another person to check the skin is recommended. Long handled mirrors and other specially designed mirrors are available. Checking all bony prominences or areas where the bones protrude slightly below the skin.

**Fig 9:-**



Following things to be looked for: Any reddened areas, rashes, cuts, bruises, scrapes, or indentations from seams or elastic binding. Check also for blisters, bumps, insect bites, dry flaky skin or pimples. Checking toenails for any redness or pus formation around the end of the nail.

#### **Pressure releases<sup>33,37</sup>:-**

1. Appropriate body postures is a relatively simple and effective way
2. Use of draw sheets to reposition the patients should be avoided. Material slide sheets made of slippery material should be used to turn the patients
3. Prompt change of soiled linen
4. Repositioning every 2 hours . Intervals are reduced in cases with early signs of damage.
5. Alternating air mattresses during sleeping hours

In both bed and wheelchair, changing position according to skin tolerance is beneficial. Pressure releases in a wheelchair can be done by pushing straight up, leaning side to side, bending forward over knees, reclining the seat of electric wheelchair or having someone tilt the back in manual chair.

It is always better to use wheelchair cushion. In bed, body parts can be padded with pillows to keep bony prominences free of pressure.

#### **Pressure relief surfaces<sup>2,15,26</sup>:-**

- Special equipment like wheelchair, mattresses, cushions, commode, shower chair, toilet seating, sling, slide board, car seat, lounge chairs etc require periodic review and maintenance at regular intervals.
- These special equipment should be used on expert prescription and after trial to suit the need.
- Manufacturer recommendations should be followed strictly to avoid damage to the skin by using harsh and domiciliary materials.

#### **Check list for wheel-chair management<sup>38,40</sup>:-**

1. Proper placing of cushions as per instructions.
2. Proper inflation of air cushions
3. Appropriate recommended cushion cover.
4. Correct placement of vulnerable areas with added paddings
5. The height of footrests should be appropriate. Raising the height increases chances of seating pressures.

6. Periodic expert seating reviews .

**Pressure management cushions<sup>1,6,10</sup>:-**

1. Appropriate material recommended by the manufacturer should be used.
2. The material should be 4 way stretch which is loose but neatly fitted over the cushion
3. Not to use: towels, sheepskin, pillow cases, sheets as they do not stretch and increase the chances of pressure sores.

**Repositioning technique<sup>4,8,9</sup>:-**

**Rule of 30:-**

- Head end of bed should be elevated no more than 30 degrees
- Laterally inclined position of 30 degrees
- Hips and shoulders 30 degrees inclined from supine
- Support with pillows and wedges to maintain 30 degrees

**Fig 10:-**



**Return to seating protocol<sup>22,24</sup>:-**

- Returning to seating protocol should begin as early as possible to avoid posture related vascular changes.
- Seating protocol promotes to increase skin tolerance and psychological benefits.

**Continence management<sup>29</sup>:-**

1. Urinary/ fecal incontinence have implication on integrity of skin due to maceration, excoriation caused by the presence of moisture and pH of the soilage.
2. Use of absorbent briefs and gentle cleansing of skin in case of soiling
3. Avoiding use of plastic and draw sheets as they interfere with pressure redistributing surfaces.(Mac Donald 2001) (O'Connor 2006).

**Skin care hygiene (Thomas et al 2001 protocol)<sup>30,34</sup>:-**

1. Controlling humidity
2. Avoiding extreme temperatures
3. Applying moisturizers to dry skin
4. Avoiding massage to reddened areas and bony prominences.
5. Controlling moistures.
6. Regular shower
7. Avoid excessive hot water and harsh cleansing agents, excessive force and friction while cleaning.
8. Monitor skin between toes for splits and fungal infections
9. Nail care and inspection for ingrowing toe nails.
10. Correct shoe size: one size larger to compensate gravitational edema
11. Perianal care : cleaning with normal saline and avoiding harsh solutions, effective cleaning and thorough drying.

**Environmental evaluation<sup>36,40</sup>:-**

- Poikilothermic: unable to regulate their own body temperature thereby taking environment temperatures.
- Both spasm and excessive sweating resulting from excess cold and hot environment respectively can increase ulcer development
- Home, work and vehicle environment should be controlled to protect the skin

**Temperature<sup>27,32</sup>:-****Extremes of temperature call for extra caution in protecting the skin:-**

Heat -- Avoiding sunburn by covering up or using sun-block. Its wise to avoid heating pads or electric blankets and close proximity to fireplaces or heaters .

Cold – its necessary to dress warmly to prevent frostbite if patients are out in cold weather for long periods of time. Dressing in layers of clothing will provide extra warmth.

Fever -- Skin tolerances can change due to the increased body temperature that occurs with a fever.

**Equipment prescription<sup>34</sup>:-**

Extreme weather conditions and high altitudes will alter the consistency of cushions and mattresses. This must be considered while selecting the cushions and mattresses.

Expert prescription on equipment : wheel chair cushions, mattresses, commodes, slings etc. it is necessary to trial each piece to suit the needs of each individual.

**Exercise Regimen<sup>32</sup>:-**

- Regular exercises should be tailored to the individual and prescribed.
- Patients as well as care givers' participation is vital in promoting the exercise regimen.

**Advantages of exercises:-**

1. Maintenance of skin integrity
2. Increase strength of muscles
3. Improve cardio-vascular endurance
4. Prevents fatigue and deconditioning
5. Psychological benefits

**Body weight<sup>12</sup>:-**

Too much -- Being overweight can cause increased pressure on bony prominences. Delayed healing may occur because there are fewer blood vessels in fat tissue.

Too little -- Excess pressure over bony prominences may occur because there is less padding (muscle and fat) over these surfaces. In addition, underweight persons may lack the proper nutrition to maintain healthy skin.

**Clothing<sup>16</sup>:-**

Proper fit is important. Avoiding sitting on seams and back pockets and always checking the skin carefully after wearing new shoes or clothing.

Too loose -- Lose clothing can form wrinkles that put pressure on the skin.

Too tight -- Overly tight clothing can hinder circulation.

**Alcohol<sup>18</sup>:-**

Over-indulgence in alcohol -- or any other drug -- may interfere with attention to the personal care needs. For example, while under the influence patient might forget to turn himself or be too weak to transfer himself properly.

**Stress & Depression<sup>22</sup>:-**

Stress and depression can have a similar effect by causing patients to lose interest in their personal care and pay less attention to their skin and general health.

**Spasticity<sup>26</sup>**

Spasticity may cause the arms and/or legs to bump against an object, or to fall off from armrest or footrest, and get injured. Spasms may cause skin to rub against something (for example, the sheets on the bed), which could produce an open sore.

**Education<sup>1,2</sup>**

Education to nursing staff, patient, care takers and family is of pivotal importance to recognize the importance of skin care and their responsibility for the overall success of pressure sore preventive initiative.

A range of social support, financial support, psychological distress, cognitive impairment and substance abuse have all been found to compromise preventive measures.

**Immediate actions for pressure sores<sup>2,8,10</sup>**

1. All pressure areas should be freed for 24 hours depending on site of pressure
2. Assess wound
3. Equipment review
4. Commence appropriate wound management by consulting health care professionals.
5. Antibiotic therapy if indicated
6. Relevant investigations
7. Surgical treatment: Debridement and dressings.

**Conclusion**

Skin care in Spinal cord injury patients is an important aspect of the rehabilitation process. It plays a pivotal role in maintaining the well-being of spinal cord injury patients. It involves simple common sense steps which the patients or the care givers can adapt and make it a daily routine to ensure the integrity of the neurologically impaired skin. Timely observation and action are the keys to the approach.

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### RESEARCH ARTICLE

#### LEGAL CERTAINTY OF OWNERSHIP RIGHT FOR UNIT FLATS:A REVIEW ON THE SALE AND PURCHASE AGREEMENT

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#### Abstract

The concept of home-ownership with a system of co-ownership (*condominium*) in Indonesia known as the flats. This research aims to analyze the legal force of Sale and Purchase Agreement and to review the legal protection of buyer for the unit flats. The type of study was juridical-empirical, a study based on library research, as well as field research. The outcomes of the research indicate that the Sale and Purchase Agreement as a basis of unit flats ownership is not evidence that can provide legal certainty for buyers/consumers, because in practice, not carried out in accordance with the Act on Unit Flats. The responsibility of development actors to give legal certainty to buyers of unit flats is the fulfillment of obligation of the development actors with the delivering of freehold title for unit flats. The lack of regulation of concerning the sale and purchase agreement leads to the weak of legal protection for unit flats buyer in obtaining legal certainty for unit flats ownership.

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#### Introduction:-

The 1945 Constitution of the Republic of Indonesia (hereinafter referred to as "The 1945 Constitution") has provided guarantees to every person to live in prosperity inner and outer, residing and get a good and health living environment and as a basic human need.<sup>1</sup> The fulfillment of these basic needs become an obligation for the government to provide facilities in the provision of adequate housing for every citizen of Indonesia.

The development of population is increasing overtime it certainly related to the need for the availability of adequate housing. While, available land for housing need never grow. Anticipating the need for the availability of such housing, the government then makes the concept of home ownership with a system of co-ownership (*condominium*), known as flats. The system of home ownership with the concept of condominium is a solution in the provision of housing, especially in urban areas whose population continues to increase with an effective land use.

The concept of housing, in Indonesia later obtained a legal basis for the establishment of Act No. 16 of 1985 on the Flats was later amendment by Act No. 20 of 2011 on the Flats (hereinafter abbreviated UURS). In the considering of letter "b" UURS stated that the State is responsible for protecting all Indonesian citizens in the implementation of housing through flats eligible for life that is healthy, safe, harmonious and sustainable throughout Indonesia.

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Government's liabilities emphasizes in UURS is certainly not only to ensure the availability of flats eligible, but must be accompanied by the provision of legal certainty over the ownership of the units flats by the owner of the unit flats.

In the context of contract law, the agreement that occurs in the relation of sale and purchase legal creates rights for achievement and obligations for fulfill the accomplishment. According to Christine Jolls<sup>2</sup>, contracts have traditionally been regarded as means by which individuals may commit themselves to specified courses of conduct. However, a contract is not a means by which the parties collectively may achieve such commitment. Contract law permits parties to modify contractual terms by mutual agreement.<sup>3</sup> Contracts are individual commitments, but nothing more; both parties' commitments are only as strong as their contracting partners' desire to hold them to their original promises.

Legal certainty in the ownership of flats, especially on unit flats by the owner must be a hope for every owner the flats, so that they can obtain legal protection of ownership, so it can utilize the ownership of flats well. For example, flat owners can ensure their flats to raise capital in business activities. Legal certainty of unit flats ownership can be realized with the issues of flat certificate as proof of ownership legality. Based on Article 1234 of the Indonesian Civil Code, this achievement may be giving something, do something and not do anything. What is something here depends on the parties to a legal relationship, what will be given, what will be done or should not be done. Words "something" can be in the form of material (tangible) and can be in the form of immaterial (intangible).<sup>4</sup>

In the pre-research by the author, the circumstances occurring in at least one flats in Jakarta,<sup>5</sup> namely Flats "W". Based on preliminary research through interviews<sup>6</sup> with some buyers/consumers of flats explained that they complained of the legal uncertainty for the ownership of unit flats earned solely on the Sale and Purchase Agreement (hereinafter abbreviated as SPA). Based on their explanation, that since buying unit flats based SPA the flats in 6 (six) years ago, the development actor do not provide certainty of time on the SPA is conducted in the presence Land Deed Official (hereinafter abbreviated as PPAT) as a basis for rights transfer over the unit flats for them can be done the delivery of Freehold Title on unit flats as the basis for a strong proof of ownership to the buyer/consumer. Though the construction of flats in the tower has been completed, even many of the buyers/consumers are making payments of unit flats in cash or by credit, until the installment is completed but never performed Sale and Purchase Certificate or giving Freehold Title of unit flats had bought.

This situation will conflict with one of the purpose of unit flats ownership as stated in Flats Act, which is about to provide legal certainty in the ownership of flats.<sup>7</sup> The legal certainty<sup>8</sup> for flat ownership at least can be used as the basis to be able to take legal actions against unit flats them, as it can easily be resold or can be used as loan collateral in the Bank.

### Method of the Research:-

The type of study was juridical-empirical, a study based on library research, as well as field research. This research was conducted in Jakarta on Flats Development Actors "W", "X", "Y", the Regional Office of the National Land Agency of Jakarta, Jakarta Provincial Governors' Office and the Office of Notary.

The population in this research is the Development Actors/Business Performers on the Flats in Jakarta, Buyer/Consumer of Unit Flats, Head of the Regional Office of the National Land Agency of Jakarta, Jakarta

2 Jolls, Christine. (1997). "Contracts as Bilateral Commitments: A New Perspective on Contract Modification." *The Journal of Legal Studies*, 26(1): 203-237.

3 Schwartz, Alan, and Robert E. Scott. (2003). "Contract theory and the limits of contract law." *Yale Law Journal*, 113(2): 541-619.

4 Riduan Syahrani. 1992. *Seluk Beluk dan Asas-asas Hukum Perdata, Third edition*. Alumni. Bandung. page. 205.

5 Jakarta, the Capital of Indonesia. A research site the author.

6 Interview on 27 February 2016 in Flats "W", Cempaka Putih, Jakarta.

7 Adrian Sutedi. 2012. *Hukum Rumah Susunan Apartemen*. Sinar Grafika. Jakarta. page. 198.

8 Kelsen H. (2007). *General Theory of Law and State*, (Translated by Somardi. *Teori Umum Hukum dan Negara*). BEE Media Indonesia, Jakarta, page. 16

Provincial Government and Notary. The technique of sampling was purposive sampling,<sup>9</sup> by considering that only meets the specific criteria in accordance with the purpose of the research is used as a sample.

The data obtained in this research were primary and secondary data, it will be analyzed qualitatively and presented descriptively, by elaborating, explaining and describing the legal protection is reflected through the legal certainty provided to buyer/consumers of unit flats for unit flats purchases through Sale and Purchase Engagement Agreement.

## Results and Discussion:-

### A Review of Sale and Purchase Agreement as Basis for of Unit Flats Ownership:-

The definition and scope of the Sale and Purchase Agreement (SPA) normatively is not found in the Flats Act. Flats Act is not specifically regulate the characteristics of the SPA, and in fact there is no further explanation of what is meant by the SPA in Flats Act in Indonesia. SPA is only referred to in Article 42 and 43 of Flats Act, as a legal instrument against the sale and purchase of unit flats to the development actors who have not completed all the facilities and the building of flats to be sold it. SPA in Article 42 of Flats Act set conditions on the procedure of sale and purchase of unit flats that unfinished construction namely the seller as development actors can do marketing before construction of flats. Furthermore, in Article 42 paragraph (2) stipulated that in terms of marketing is done before the construction of flats as described in paragraph (1), development actors must have at least 5 (five) things:

- certainty of space allocation;
- certainly rights to land;
- certainty of tenure status of flats;
- permitting the construction of flats; and
- guarantee for construction of flats from insurance corporation.

Then in Article 42 paragraph (3) determined that in terms of marketing is done before the construction of flats completed as referred to in paragraph (2), then everything that is agreed by development actor and/or binding marketing agent as the Sale and Purchase Engagement Agreement (SPA) for the parties.

Based on the analysis of author on the provision of Article 42 paragraph (1), (2) and (3) of Flats Act above, the instrument of SPA in sale and purchase of unit flats cannot just be done, if it does not meet all the requirements specified in the Flats Act. The provisions of Article 42 paragraph (2) of Flats Act are requirements that must be met by development actors before marketing. According to author, the requirement must be met cumulatively; so that the SPA may have binding force is strong.

Apart from the two article in Flats Act, orders for further guidance on the SPA was not found in Flats Act, so what and how SPA referred to in new Flats Act, do not have special characters. SPA arrangements prior to the enactment of new Flat Act found in the Decree of the Minister of People Housing No: 11/KPTS/1994 on Guidelines for the Sale and Purchase Engagement of Unit Flats. Decree of the Minister is declared valid because not been revoked or amendment by new regulations under the provisions of Flats Unit.

In the annex to the Decree of Ministerial provides that the SPA is a sale and purchase agreement by message or preliminary purchase agreement which then will be set forth in the Sale and Purchase Certificate of Unit Flats. Thus, the SPA as a form of agreement on matters agreed between development actors as the seller and the buyer of unit flats that binding formal-juridical on both parties, although the character of SPA theoretically still at the stage of *pre-contractual* or pre-selling contract, because SPA has contained rights and obligations between the purchaser or consumer with development actors/business actor.

However, based on the analysis of literature data, the binding force of SPA is largely determined by the character of SPA provided by Flats Act. This means, the legally binding force of SPA is determined by the fulfillment of the requirements set out in a limited manner in Article 43 paragraph (1) and (2) of Flats Act. Thus, according to the author, although SPA has met the requirements for the validity of an agreement, but if SPA was created not qualify under Article 43 paragraph (1) and (2) of Flats Act, the SPA does not have strong binding legal force.

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9 Bambang Sunggono. (2006). *Metodologi Penelitian Hukum*, PT. Raja Grafindo Persada, Jakarta, pages. 44-45

Theoretically, an agreement on a particular issue that made consciously by those who made it, whether made orally or in writing, that they meet the provisions of Article 1320 of the Civil Code on the validity of the terms of the agreement, then the agreement is binding on the parties. Terms of validity of agreement in question are:

- agreed to those who bound themselves;
- skills of the parties to make an engagement;
- a certain thing;
- lawful cause

The first and second requirement (a and b) referred to as the subjective condition because both of those conditions must be met by the subject of the law, while the third and fourth is referred to as objective conditions for these two conditions to be met by the object of the agreement. Differences both requirements associated with *nieteg or null and ab initio* and *vernietigbaar = voidable* of an agreement. If the objective requirement in this agreement is not fulfilled, the agreement is null and void or agreement from the beginning has been canceled, the law presumes the agreement never existed. If the subjective requirement is not met then the agreement can be canceled or the whole of the agreement have not been canceled or not the court, the agreement in question was still valid.<sup>10</sup>

In relation to the SPE made between development actors/businesses actor with buyers/consumers, can be analyzed based on the provisions of Article 1320 of the Civil Code, then the signing of the SPA by the parties as set forth in the SPA between Development Actors in this case Development Actors "W" and "X" with the buyers/consumers,<sup>11</sup> indicating that it has fulfilled the elements agreed for those that bind himself.

Someone said give consent or agreement (*toestemming*) if he did want what was agreed. Based on the analysis of data from interviews with respondents were 20 (twenty) peoples, all respondents stated that they wanted the signing of SPA. Badruzaman<sup>12</sup> explains the definition of agreed as a condition of the will of approved (*overeenstemmendewilsverklaring*) between the parties. The statement of parties offering called bid (*offerte*), whereas the statement of parties accepting offering called acceptances (*acceptatie*).

Based on the provision, in relation to the results of interviews by the author<sup>13</sup> found the conclusion that they consciously have the intention to buy the unit flats which is then signing the deed of SPA, as shown in Table 1.

**Table 1:-** Data on statement of intent of respondents in SPA on Development Actors "W" and "X" of Flats

Development Actor	Statement of Intent		Amount	Percentage
	Read and Signed	Not read and Signed		
W	0	10	10	50%
X	10	0	10	50 %
Total			20	100%

Source: Primary data, 2016 (Edited)

Data on Table 1 shows that all the respondents on Development Actors "W" claimed that the SPA was signed not read beforehand. Although not read, but the SPA was signed, then in formal judicial, statement of intent of the parties have stipulated in the SPA, it meaning that the parties have agreed to bind himself in agreement with the intended object of unit flats, although 10 (ten) respondents of flats "W" recognizes that the contents of SPA were not read, and only informed that the SPA is evidence that the respondent has bought the flats.

Such conditions corresponding to the recognition of the Head of PPPSRS Mr. Be,<sup>14</sup> that based on complaints from buyers of unit flats on Development Actors "W", they are only required to sign without reading the contents of the

10 Subekti and Tjitrosudibio. (2003). *Kitab Undang-Undang Hukum Perdata*. Pradnya Paramita. Jakarta. page. 330

11 Data document of SPA between Development Actor/Business Actor "W" with Buyer/Consumer No. 00445 (made under hand) signed on 23 April 2013 in Jakarta (title under hand), and data document of SPA between Development Actor "X" with Buyer/Consumer No. 08, dated 11 July 2013 made in the notary of Fauzah Askar, SH (Notarial deed)

12 Ridwan Khairandy. (2004). *Hukum Alih Teknologi*. Modul II. Faculty of Law, Islamic University of Indonesia. Yogyakarta. page. 11.

13 Analysis of questionnaire for 10 (ten) respondent of development actor "W" and 10 (ten) respondent of development actor "X", that distributed on October 2016 in Jakarta.

SPA in advance, as well as SPA previously should not be taken home to be studied prior to signature, but development actors "W" only provides an opportunity for buyers/consumers see SPA shortly before signed on the same day.

In such conditions, must all respondents do not understand the contents of the SPA, as well as recognition of the respondents listed in Table 2. However, the development actor "X" of all respondents (100%) admitted that the SPA was read in advance by the Notary before they are asked to sign it. However, when asked if they understood the contents of the SPA, it turns out there are 2 (two) of 10 (ten) of respondents or 20% did not understand the details of the SPA, as shown in Table 2.

**Table 2:-** Data on respondent's knowledge on SPA of flats of development actors "W" and "X"

Development actor	Understand the content of SPA	Do not understand the content of SPA	Amount	Percentage
W	0	10	10	100%
X	8	2	10	100%
Total			20	100%

Source: Primary data, 2016 (edited)

The data in Table 2 shows that 100% of respondents in Development Actors "W" do not understand the contents of SPA because it does not read out in advance or no explanation is given by the Development Actors and respondents were only asked to sign it. All respondents (100%) on the Development Actors "W" just know that with the signing of the SPA, they have obtained flats that would be his/her and understood as his/her own. SPA for them has been considered as proof of ownership of the flats.

Based on a review of the requirement related to the validity of the binding force agreement SPA as the basis for the acquisition of flats, then all requirements referred to in Article 1320 of the Civil Code are nominally fulfilled. However, when reviewed based on the contents of the SPA, the Development Actors "W" made under hand, tend to weaken the position of the buyer/consumer. Because the deed of SPA had been prepared in advance or prepared in a standard contract model, so buyers/consumers only sign to the contents of deed. It is recognized by all respondents on Development Actors "W" 10 peoples (100%) that they are only required to sign the deed of SPA (See Table 1).

It can happen, because in practice, the SPA is an agreement made unilaterally by development actors/businesses actor in the form of raw agreement contain standard clauses, which can certainly allegedly contained clauses that may favor or favor the perpetrators of such development. Clauses in raw agreements can only be made in such a way and can even be made is not clear and firm with the aim to protect the interests of development players from certain obligations, or instead they refrain from clauses that can bind to and guarantee the rights of the buyer or consumers that could potentially harm the buyer or consumer.

In fact, from the principle of the law of treaties (agreement), agreements must be made in good faith. The principle of good faith is a principle known in the law of agreement, more details on the provisions on good faith is governed by Article 1338 paragraph (3) of the Civil Code, that the agreement must be made in good faith. Good faith is also not only refers to the good faith of the parties, but should also refer to the values that developed in the community, because the assessment of a will can be good or bad derived from *living law* or law in the community. With such meanings are made in good faith as a universal social force that govern social relations between them.<sup>15</sup>

The limited arrangement to the SPA in Flats Act and implemented by Development Actors are not based on the fulfillment of the principles in the agreement and consumer protection, can lead to legal uncertainty and tend to harm the buyer/consumer. While in reality, the SPA is a way of buying and selling of flats which must be carried out by development actors/businesses actor, for giving a great business opportunity and a way of marketing that is more easily attract buyers.

14 Interview on 12 October 2016 in Jakarta.

15 Ridwan Khairandy. (2015). *Kebebasan Berkontrak & Pacta Sunt Servanda Versus Itikad Baik: Sikap Yang Harus Diambil Pengadilan*. FH UII Press. Yogyakarta. Page 52.

### Legal Protection against Flats Buyer Based on Sale and Purchase Agreement:-

In theoretical, legal protection implies a meaning protection derived from the legal provision and/or any laws made by a State or on the basis of the peoples' agreement to regulate the relationship between the individual and the government that is considered to represent the peoples' interests. Relating to the legal protection of buyer/consumer of flats on the basis of SPA may refer to Salim H.S<sup>16</sup> that the legal protection as an effort or form of service provided by the law to the subject of law and matters became a protected object. In this case, the form of services provided by Flats Act in providing protection for the interests of buyers in the acquisition of flats by using SPA instrument, so that the buyers of flats can enjoy the rights granted by the law, namely the ownership of flats.

SPA as legal instruments in the process of sale and purchase of flats that regulated in Flats Act expected to be a strong legal instrument as basis for the acquisition of flats, so it can provide legal protection to the buyer/consumer, but it turned out to be based on research results state the expected does not materialize, because SPA apparently not be grounds for them to raise it to the Sale and Purchase Agreements for further obtained the Freehold Title as proof of ownership rights to the flats.

Based on data analysis of questionnaire to 20 (two) twenty respondents from 2 (two) development actor, it turns out all respondents (100%) argued that SPA is proof of ownership of flats. On the contrary, they admit that SPA they have not yet as basis for demanding their rights to obtain legal certainty in the form of Freehold Title that has been bought in cash. That is, until now SPA they have not been able to be increased to the Certificate of Sale and Purchase henceforth as basis for the issuance of Freehold Title of flats. Such conditions corresponding to the results of an interview<sup>17</sup> with Mr. A as *Legal Staff* on Development Actors "W", that SPA of flats from buyers who have paid cannot be processed the Certificate of Sale and Purchase because main certificate on behalf development actor have not been published to date. In addition, the requirements that have been agreed in the SPA that the signing of Certificate of Sale and Purchase will be made if the flats have been fully developed.

In relation to the reasons given by Mr. A as *Legal Staff*, by comparing the statement of the Head of Land and Land Registration of BPN Jakarta Andi Tenrisau that Development Actors "W" has not entered a registration application of Freehold Title of flats, so what has been agreed in the SPA that the Certificate of Sale and Purchase will be made if the main Freehold Title of flats has been issued on behalf development actors, not enabling to be realized and it will only be a reason for development actors to evade responsibility. Data from the questionnaire on knowledge about the SPA can be seen in Table 3.

**Table 3:-** Data on respondents' knowledge on the Position of SPA as proof of ownership of flats

Development actor	Understand the Position of SPA	Do not Understand the Position of SPA	Amount	Percentage
W	0	10	10	100
X	0	10	10	100
Total		20	20	100

Source: Primary data, 2016 (edited)

The data in table 3 shows that the respondents do not understand the position of SPA in Flats Act, because in their understanding, when it had signed the SPA then they already feel they are receiving legal protection of his/her rights as a buyer of flats. The form of legal protection that they expect is to obtain legal certainty of ownership in the form of Freehold Title of flats. In Flats Act, legal certainty of flats ownership by the issuance of freehold title of flats as proof of ownership of flats. Freehold Title of flats will be strong evidence for the flats owner and can be used as collateral.

Based on the analysis of author, especially against the legal norms that regulate the SPA in Flats Act, it can be concluded that the arrangements of SPA that are limited in Flats Act cannot provide legal protection to the buyer/consumer, for the arrangement of SPA in Flats Act is only as administrative requirements. While, the position of SPA as proof of buying and selling on flats are not confirmed.

16 Salim HS. (2014). *Penerapan Teori Hukum pada Penelitian Tesis dan Disertasi*. PT. Raja Grafindo Persada. Jakarta. page. 262

17 Interview on 11 October 2016.

Based on the results of study found that not all development actors do marketing has completed the administrative requirements set out in Flats Act, as in Development Actors "W". Based on interview with Andi Tenrisau<sup>18</sup> as Head of Right to Land and Land Registry of National Land Agency Jakarta that the ownership of land for construction of flats by Development Actors "W" is unclear because until now the Development Actors "W" are not yet signed the petition right, Though the requirement of land ownership status for the construction of flats should be clearly defined in Article 43 paragraph (2) of Flats Act.

Buyer/consumer is protected by UUPK particularly concerning the rights of consumers, among others, set forth in Article 4 of the right to obtain compensation and/or reimbursement, if the goods and/or services received are not in accordance with the agreement or not as it should be. In addition, development actors/businesses actor burdened with the obligation under Article 7 UUPK to be good faith in conducting its business activities, as well as provide the correct information, clear and honest about the condition and guarantee of the goods and/or services and explain the use, repair and maintenance.

Clearly, UUPK stipulates the purpose of the enactment of UUPK among others set forth in Article 3 letter (d), to create a consumer protection system contains elements of legal certainty and transparency of information and access to information. However, the provision of Article 3 of UUK does not materialize in the research by the author. Because the data is based on questionnaires to 20 respondents, it turns out all (100%) of the respondents had paid in cash their flats, but development actors not provide time certainty for the issuance of Freehold Title. In this condition, according to Lili Rasjidi and WyasaPutra,<sup>19</sup> the legal protection is not able to provided by the law, but legal protection is actually output from the workings of the law believe the theory of interest of fairness, expediency and legal certainty in an effort to provide public services. That is, when the SPAis set as a legal instrument in sale and purchase of flats, then it should have the legal character of the SPAwere made should be more concrete, in order to provide legal certainty.

In theoretical, the form of legal protection is divided into two forms, namely:<sup>20</sup>*First*, the protection is preventive.*Second*, the protection is repressive. Preventive protection is legal protections that are precautionary. Protection provides the opportunity for people to submit his/her complaint before a decision the government receives in definitive. So that legal protection is intended to prevent disputes and it great significance for the acts of government that is based on freedom of action.<sup>21</sup> While the legal protections that are repressive function to complete the event of a dispute.

The government in legislation or policies made should provide solutions in order to provide protection to the buyers/consumers who buy flats and has fulfilled all its obligations as a buyer. Moreover, the nomenclature of SPAare accommodated into new Flats Act is not accompanied by any further settings, according to the authors provide arrangements vagueness that result in the absence of the protection afforded by the State Government in this regard to the buyer of flats. Ideally, sale and purchase based on the SPA can only be done when it has to meet the requirements of Article 42 and Article 43 Flats Act, but the practice many development actors/ businesses actor that conduct development and marketing and selling of flats though not meet all the administrative requirements specified in Flats Act.

In relation to the legal protection provided by the government, the authors argues that arrangements or regulation granted by the government to the buyer/consumer of flats that purchased by sale and purchase agreement do not reflect the absence of legal protection, both preventive and repressive. This is evident from the absence of further regulation of Flats Act that governing specifically the time limit should be observed by development actors/business actors to improve the status of SPAfor subsequent Freehold Title issued on flats.

### Conclusions:-

Sale and Purchase Agreement (SPA) as a basis of flats ownership is not evidence that can provide legal certainty for buyers/consumers, because in practice, not carried out in accordance with the Flats Act. The responsibility of development actors to give legal certainty to buyers of flats is in the fulfillment of obligation of the development

18 Interview on 14 October 2016 at Regional Office of National Land Agency of DKI Jakarta

19 Lili Rasjidiand IB Wyasa Putra. (1993). *HukumSebagaiSuatuSistem*. RemajaRusdakarya. Bandung. page. 118

20 Philipus M. Hadjon. (1987). *PerlindunganHukumBagi Rakyat Indonesia*. Bina Ilmu. Bandung. Page 2

21 Salim HS. (2014). *Op.Cit*. Page 264

actors with the delivery of Freehold Title of flats after the buyer completes the entire payment and other costs that have been agreed in the SPA. The lack of regulation of the SPA in Flats Act causing the weak of legal protection to the buyer in obtains legal certainty for flats ownership. In relation to the provision of legal protection to the buyer of flats, then the instrument of SPA needs to be revisited in its existence in Flats Act in order not to become a tool for development actors to ease marketing but ignore the rights of buyer/ consumer to obtain legal certainty.

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### RESEARCH ARTICLE

#### RADIO FREQUENCY IDENTIFICATION TECHNOLOGY APPLICATION FOR DISASTER AND RESCUE: A REVIEW.

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#### Abstract

Radio frequency identification (RFID) always has a significant area of academic research over the last few years. The current paper presents a literature review of academic journal articles that were published on the subject after year 2000. Several case examples have been analyzed with the particular focus on RFID applications, its potential and future opportunities, particularly during disaster and rescue applications. It is hoped that the review will be a useful resource for researchers interested in RFID research.

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#### Introduction:-

The primary focus of emergency management is the avoidance, control, management, and elimination of inherent losses when disasters occur. With the high number of natural and manmade disasters, researchers have emphasized on all aspect of disaster including preparedness, mitigation rescue, and recovery. Disasters can be very different in their distinctiveness on severity, the impact of homes, businesses, public structures, and human life or any combination of the above [1].

Tracking human beings and objects have been considered as a primary component for researchers and scientists, especially during the disaster and rescue operations. Different Automatic Identification(Auto-ID), Technologies such as Sensors, Barcodes, Smart Cards, Optical character recognition (OCR), Biometric procedures-BP, Pattern analysis, Radio frequency identification (RFID) and Geographical information systems (GIS), have been used for tracking procedures. Detailed study of these technologies shows that they are often more resource demanding and their performance become questionable during the unfavorable conditions such as in emergencies. For instance, to implement GIS in disaster management, each site has to be identified, added to the suitable database and sited on the map. This takes more time and workforce during the development phase, as well as for maintenance phase [2]. The limitation of OCR systems is that they have failed to become globally popular because of their high price and complicated readers they require, in comparison with other ID procedures [3].

RFID can work well for tracking as well as authentication, automation and information management [4-6]. It is a contact-less, cost-effective and reliable technology. Therefore it can be used successfully where contact-less tracking and identification is required. RFID constitutes of a tag made up of a microchip at one end and a reader on the other, whereas both are connected with antennas. A reader sends out electromagnetic waves such that they are received by a tag antenna [7-9].

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**Methodology:-**

This study was an unsystematic review in which the literature search was carried with the help of available literature, journals, books and proceedings and also searches engines available at Google, Google Scholar. We searched and analyzed the keywords such as Radio frequency identification, RFID application, disaster victim identification, disaster rescue and recovery. It was aimed to review the current research and development in the field of RFID application in disaster rescue operations. A taxonomic framework is also compiled to classify literature for quick content analysis and identify future direction of research.

**Finding and analysis of review:-**

RFID technology has exploited in the healthcare and hospitality [10], power facilities [11-12], urban planning and construction [13-14], parking and traffic control system [15-19], transportation [20] sectors. This facilitates early identification of potential problems and thus helping in preventing them from escalating into bigger problems. However, the need of planning during a disaster and emergency response has been flagged by various researchers [21-23]. Effective disaster management depends on the information systems and technologies which could play a significant role in making appropriate decisions at any stage of natural disasters and improving information dissemination and communication among of all stakeholders during response and recovery operations [24]. Various information communication technology (ICT) tools, such as geographical information system (GIS), remote sensing, RFID, GPS, building black box, radio communication media, and social media are available for use in disaster recovery [25-28].

**Various facets of RFID technologies in disaster and its applications in rescue operations:-**

The difficulties in identifying Disaster victim identification (DVI) during tsunami catastrophe was discussed by Meyer et. al., 2006 [29]. They suggested that placement of radio frequency identification device (RFID) microchips inside victim bodies provided a practical solution to problems of body tagging and attribution in the DVI setting encountered by the Austrian DVI team in Thailand in early 2005.

Pate [30] in his state of art technology review in Identifying and Tracking Disaster Victims identified the failure of the country to enough track casualties of Hurricane Katrina had been recognized as a noteworthy shortcoming of social and nearby calamity readiness arranges. This gap has urged government and private enterprises to acknowledge that current work-based tracking frameworks are unequipped for overseeing data amid a large-scale catastrophe. In light of this need, endeavors are under the approach to growing new advances including RFID technologies that permit moment access to personality and area data amid crisis circumstances.

The challenges in finding the causalities in seismic tremor in Japan's Niigata Prefecture were noted by M. Daito and N. Tanida [31]. The quake brought about a wired system detachment. The frameworks' breakdown was because of the huge number of clients who were stressed over the security of their relatives. The same circumstance happened amid Hurricane Katrina in the USA. This work gives careful consideration to a fundamental and guaranteed calculation for finding casualties utilizing RFIDs. To begin with, it discloses strategy to affirm the area of casualties. Second, it clarifies a strategy for pinpointing the position of casualties using trilateration. At last, it introduces simulation results.

The urban disaster response and recuperation were discussed by Peña-Mora *et al.*, 2008 [26] through a comprehensive cutting edge survey of different technological advances. This survey was a part of the CP2R venture (Collaboration Framework for Preparedness against, Respond to and Recovery from eXtreme Events (XEs) including necessary physical base) which has concentrated on enhancing the coordinated effort between the major performing artists that ought to be required in various strides of readiness against (i.e., before disaster), reaction (i.e. amid calamity) and recuperation (i.e., after disaster). The work presumed that developing Information and Communication Technologies using RFID can assume an essential part in a disaster readiness, reaction, and recuperation forms. Nam, 2009 [32] presented building up an expert system as a GUI project to decode radio frequency identification codes for modeling and simulation of natural disasters using virtual environment of disasters.

Badpa et al. 2013 [33] emphasized the effect and importance of Knowledge Management System in Disaster Management through RFID Technology Realization. They studied the various disasters, especially quakes in Iran. This work recommended Radio Frequency Identification System can be utilized in disaster victim identification and

framing disaster management strategies in coordination with Oracle as Data Base Management System with a devoted system framework.

The exploration work of Beruvides, 2014 [1] emphasized on potential uses for the RFID innovation in emergency management. The paper was focused on crisis administration (man-made or natural) and found that emergency management includes the avoidance, services, control, and disposal of intrinsic misfortunes when disasters happen. Vijtech et. al. 2016 [34] studied on Ultra High-Frequency Radio Frequency Identification device tag design for disaster management. The Ultra High Frequency (UHF) Radio Frequency Identification device (RFID) label plan as a piece of RFID confinement framework principally assigned for mass disasters. The configuration of RFID label considers numerous setbacks in a range of hundreds square meters, human body impedance, battery lifetime, maximal yield power, safe epitome and so forth. Results demonstrate the composed RFID label model is reasonable for application in a disaster management.

Healthcare and disaster supply chain have becoming a more critical and popular research issues recently. The current issues both healthcare and disaster supply chain, especially in natural disaster case, was studied by Syahrir, I., and Vanany, I. (2015) [35]. Research that integrates both healthcare and disaster supply chain is a relevant issue to develop a model framework in order to have the capability in handling humanitarian relief operations during natural disasters including focused on inventory management and controls for medical needs in the event of a natural disaster (eg earthquakes, floods, epidemic disease outbreaks, landslides, etc.). Use information technology such as RFID was highlighted more widely in the healthcare and disaster supply chain system in responding to the problem of interference supply chain at the time of the disaster.

Daito, M., and Tanida, N. (2008) [31] in their study on Agent-based simulation approach for disaster rescue using active RFID found that after the 2004 earthquake in Japan's *Niigata* Prefecture, there were many difficulties finding the victims. The earthquake caused a wired network disconnection. Also, fixed-phone and cell-phone service systems crashed due to the rapid increase in the volume of communications. The systems' collapse was due to a large number of users who were worried about the safety of their relatives. The same situation happened during Hurricane Katrina in the USA. Reflecting on these situations, the Japanese Ministry of Internal Affairs and Communications is trying to adopt several methods to correct these communications problems. Authors recommended that a predominant goal of one of the methods is most likely to find victims using RFIDs (Radio Frequency Identification) with computer sensors. They suggested that the RFID process would have to be incorporated in the following ways: 1) by scattering sensor devices from helicopters when a large-scale disaster such as an earthquake occurs, 2) by making RFIDs self-organized into a network, and 3) by making the self-organized network pinpoint the position of victims. The researchers pay specific attention to a simple and assured algorithm for discovering victims using RFIDs by the method to confirm the location of victims then pinpointing the position of victims using trilateration and simulation results.

The paper on emerging technologies to support urban resilience and disaster recovery by Peña-Mora *et al.*, 2008 [26] presented a comprehensive state-of-the-art review of various emerging technologies to support urban disaster response and retrieval. The review was undertaken as a part of the CP2R project (Collaboration Framework for Preparedness against, Respond to and Recovery from eXtreme Events (XEs) involving critical physical infrastructure) which has focused on improving the collaboration between the main actors that should be involved in different steps of preparedness against (i.e., before disaster), response (i.e. during disaster) and recovery (i.e., after disasters). Technologies reviewed include the application of Radio Frequency Identification (RFID) based techniques for formative assessment, field responders mobility and disaster site data collection, Geospatial Information System (GIS) for optimal resource optimization from disaster site were discussed. The paper concluded that emerging ICTs (Information and Communication Technologies) can play a pivotal role in disaster preparedness, response and recovery processes. The need for further exploitation of convergence and synergy between various technologies and their application to support existing disaster response processes is also discussed.

Dorasamy *et al.*, 2013 [36] in their review of Knowledge management systems in support of disasters management highlighted that the successful management of emergency situations requires proper planning, guided response, and well-coordinated efforts across the emergency management life cycle. It was suggested that emergency management efforts benefit from well-integrated knowledge-based emergency management information systems (EMIS). It was found that only limited work has been done in three EMIS-knowledge management system (KMS) subdomains: (i)

definition, (ii) use, and (iii) methods. Second, only limited research has been done in embedding roles in KM systems.

Ganz *et al.*, 2015 [37] introduced the DIORAMA based system that provides situational awareness for urban search and rescue operations in both indoor and outdoor settings, significantly improving the operations' efficiency. Using a Smartphone, DIORAMA enables the responders to triage patients with active RFID tags and to mark the locations of trapped patients and points of interest (e.g. fire, chemical spill, collapse buildings). Also, the tagged patients' location will be automatically tracked and updated on the interface. The incident commander can also interact with the responders on-site using the DIORAMA interface either on a Smartphone or a tablet. The DIORAMA system uses active RFID technology as well as visual analytics tools.

Hasanzadeh, S., and Sarkari, M. (2014) [38] argued that RFID can be useful technology that can be used in emergency situations. In the model offered by Badpa and his colleagues this technology had a major role in coordination, which can be done in an emergency situation. Dorasamy and his colleagues' research showed that if some recommendations offered by them is considered in KMS designing, it can be more useful in support of emergency situations. And finally, Li and his colleagues' research show that establishing broad connection between different parts of a community including various organizations and peoples can make a useful database that its' knowledge and resources can be used when a disaster occurs.

Nam, 2009 [39] in his paper presented an expert system as a user interface program to decode radio frequency identification codes for simulation and modeling of natural disasters. The entire developed environment for the expert system is intended to integrate all subtasks as a standard user interface program to simulate and report the damages due to the catastrophic disasters. To perform the simulation as a part of the entire system, the expert system reads in RFID codes to provide the desired information about the damages due to the catastrophic disasters based upon the available fields.

Ingrassia *et al.*, 2012 [40] demonstrated the applicability and the reliability of a radio frequency identification (RFID) system to collect data during a live exercise. In their study, a rooftop collapse of a crowded building was simulated. Fifty-three volunteers were trained to perform as smart victims, simulating clinical conditions, using dynamic data cards, and capturing delay times and triage codes. Every victim was also equipped with a RFID tag. RFID antenna was placed at the entrance of the advanced medical post (AMP) and emergency department (ED) and recorded casualties entering the hospital. Results showed 100% accuracy in tag reading or data transfers.

Ahmed, A., and Sugianto, L. (2012) [41] in their papers addresses the impacts of RFID (radio frequency identification) adoption on the performance of emergency management organizations. They studied that what are the effects of RFID adoption on the performance of emergency management operations? They found that the impacts of using RFID technologies reduced response time, efficient tagging and tracking, compatibility, reduced labor cost, and robustness. The empirical findings in these studies indicated that five key factors influencing the decision to adopt privacy, compatibility, standardization, implementation, and locatability.

The role of the RFID technology in an earthquake to rescue victims was studied by Akbari, B., and Ajami (2015) [42]. They found in their review that organizational resources and technical structures such as hardware and software are essential requirements in the redesign of electronic projects, especially in disaster response. The RFID makes the prevention of the human error of Medicine, easy, and fast access to medical staff, equipment, medicine. It is cost effectiveness. All of these factors cause to increase the quality and quantity of care in the healthcare sector. The study also helps define the concept of "Tracking victims via RFID" (regarding both advantages and barriers) as the new technology in the present age.

Chatfield *et al.*, 2010 [43] studied the E-Government Challenge in Disaster Evacuation Response and emphasized on the role of RFID Technology in Building Safe and Secure Local Communities. The potential high impact and strategic value of integrating RFID into e-government development and government's comprehensive natural disaster management policy for improved preparedness, response, recovery, and mitigation, very little has been written in the e-government literature regarding the adoption, use, and impact of RFID in building safe and secure local communities for citizens and businesses.

The role of the RFID technology in an earthquake to rescue victims was studied by Akbari, B., and Ajami, S. (2015) [42]. They found that organizational resources and technical structures such as hardware and software are essential requirements in the redesign of electronic projects. The RFID makes the prevention about the human error of Medicine, easy, and fast access to medical staff, equipment, medicine. The advantages of RFID cited by researchers includes reduce time; cost, error, facilitate medical and supportive data recording by using RFID in the process of victims tracking. The significant barriers highlighted in this study by Akbari, B., and Ajami[42] was the inability to read wet Tags; Tags and reader interaction, safety and security concern, the high initial cost for tag and hardware, ethical and moral dimension to tagging human.

Daito, M., and Tanida, N. (2008) [31] revealed that RFID could play a predominant role to find victims with computer sensors. They suggested that the RFID method would have to be incorporated in the following ways: 1) by scattering sensor devices from helicopters when a large-scale disaster such as an earthquake occurs, 2) by making RFIDs self-organized into a network, and 3) by making the self-organized network pinpoint the position of victims. They also highlighted the importance of field-testing as a necessity to confirm the effects. The summary of the review is presented in table 1.

**Table:-** Summary of RFID review.

<b>Particulars related to RFID</b>	<b>Major area of RFID application</b>	<b>Abstract</b>	<b>Reference</b>
The adoption of RFID technology in the retail supply chain	Recent improvements with respect to selection of RFID innovation in retail inventory network.	This innovation to retailers are plot as opposed to Bar Coding	[44]
Implantation of radio frequency identification device (RFID) microchip in disaster victim identification (DVI)	Practical solution to problem of body tagging.	The position of RFID microchips inside casualty bodies gave a down to earth answer for issues of body labeling and attribution in the DVI	[45]
VIRE: Active RFID-based localization using virtual reference elimination	RFID for indoor area detection.	The proposed methodology can defeat the above downsides without extra cost	[46]
A framework for disaster management system and WSN protocol for rescue operation	Information collection framework for disaster mitigation and rescue operation.	This proposed structure and contrast the execution of the convention and that of SENDROM framework convention.	[47]
Identifying and Tracking Disaster Victims: State-of-the-Art Technology Review	Identification and tracking of disaster victims.	Proposed approach to grow new advances that permit moment access to personality and area data amid crisis circumstances.	[30]
Agent-based simulation approach for disaster rescue using active RFID	Strategy to affirm the area of causalities.	This work gives careful consideration to a basic and guaranteed calculation for finding utilizing RFIDs	[36]
Review of Emerging Technologies to Support Urban Resilience and Disaster Recovery	Radio communication and social media for use in disaster recovery.	The work presumes that developing ICTs can assume a urgent part in a disaster readiness, reaction and recuperation forms.	[26]
Lightweight cryptography in radio frequency identification (RFID) systems	Lightweight cryptographic arrangements in RFID	Study investigates of the best in class distinguishes the requirement for lightweight cryptographic arrangements reasonable for these extremely obliged gadgets	[48]
Development of an Expert	Expert system as a user	Proposed master framework	[40]

System as a User Interface for an RFID Application	interface program.	peruses in RFID codes considering the end goal to give the sought data about the harms.	
Implementable Privacy for RFID Systems	RFID innovation to track development of items.	A configuration strategy for building private frameworks from these building blocks	[49]
What benefits can be brought forward by adopting RFID in emergency management	Impacts of RFID adoption on the performance of emergency management.	This work will help the crisis administration associations to better manage the crisis operations	[41]
E-government challenge in disaster evacuation response: the role of RFID technology in building safe and secure local communities	Role of RFID in building safe and secure local communities.	This work presents an audit of the review and a field contextual investigation	[43]
A relationship investigation was performed between the two techniques plotting the matched RFID and manual times	Data collection in a live mass casualty through RFID and manual system.	Data collection in a live mass casualty incident simulation: automated RFID technology versus manually recorded system	[50]
Findings show that 5 key variables affecting the choice to receive are security, standardization, compatibility, implementation and locatability.	Significance of RFID in Emergency management.	Potential of RFID in Emergency Management: Task-Technology Fit Perspective	[41]
This study proposes an structure for the improvement of a philanthropic crisis stock administration	Inventory management framework for emergency relief operations.	An RFID-based inventory management framework for efficient emergency relief operations	[51]
The proposed model means to concentrate on learning, human and innovation related issues of Emergency Coordination Center	Effect and importance of Knowledge Management System in Disaster management through RFID.	Effects of knowledge management system in disaster management through RFID technology realization	[33]
This study had performed examination of Flood Prediction procedures taking into account GIS utilizing Ad hoc remote Sensor Network Architecture	Flood prediction and disaster risk analysis.	Flood Prediction and Disaster Risk Analysis using GIS based Wireless Sensor Networks, A Review	[52]
This study exhibits two decade's audit of works relating to the use of learning driven frameworks in backing of crisis administration	Knowledge management system in support of disasters management.	Knowledge management systems in support of disasters management: A two decade review	[37]
It show a novel separation hopping convention in	Innovative separation hopping.	Privacy in RFID and mobile object	[53]

light of diagrams that is amazingly low-asset expending			
This work, subsequent to calamity administration, asses learn about the calculated application model of the KMS application in a disaster administration.	KMS application in disaster management.	Evaluation of Knowledge Management Systems application in Disaster Management	[39]
This work presents past examination and applications that show new potential uses for the RFID innovation in emergency management	Primary focus of emergency management.	An Analysis of the Potential and Actual Utilization of the RFID Technology in Emergency Management	[1]
Proposed work is to counteract cloning and falsifying of tags in view of RF Fingerprinting	RFID based signal acquisition.	RFID Signal Acquisition and Identification	[54]
The composed RFID label model is reasonable for application in a disaster management	Disaster management centric RFID tag designs.	UHF RFID tag design for disaster management	[35]
This work is a preparatory report of an examination on medicinal services and calamity store network	Healthcare and disaster supply chain.	Healthcare and Disaster Supply Chain: Literature Review and Future Research	[36]
The labeled patients' area will be naturally followed and overhauled on the interface	Smartphone and RFID tag based rescue.	Urban Search and Rescue Situational Awareness using DIORAMA Disaster Management System	[38]
This literature survey characterizes the idea of "tracking casualties by means of RFID" as the new innovation in the present age	Role of RFID in earthquake to rescue victims	Radio frequency identification and rescue victims in earthquake	[42]

### Conclusion:-

The adoption of RFID technology hailed as one of twenty-first century's greatest contributions in the retail supply chain, healthcare and hospitality, power facilities, urban planning and construction, parking and traffic control system, transportation sectors is significant. Recently Radio frequency identification (RFID) gains an important area of academic research with focus on disaster preparedness and rescue operations. However, from the above literature review, it can be concluded that standardization of hardware, software, network protocols and reading devices of RFID can play vital role during disaster and rescue applications including disaster victim identification.

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### RESEARCH ARTICLE

**Assessment of oral health knowledge, attitude and practice behaviour among Obstetricians- a questionnaire study.**

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#### Abstract

The objective of this study was to assess oral health knowledge, attitude and practice behaviour among obstetricians in Mangalore city, Karnataka. A total of 135 participants responded to a self constructed questionnaire consisting of open and closed ended questions. The data was analyzed by applying descriptive & inferential statistical analysis. Level of significance was kept at 5% ( $p=0.05$ ). Results have shown that the obstetricians with the lack of knowledge and time (8.1%, 11.0%) regarding outcomes of poor oral health respectively were less likely to refer for comprehensive oral care services for pregnant patients (25.7%  $p=0.991$ ). Obstetricians working in private hospitals showed significantly higher mean attitude score (59.1%,  $p=0.014$ ) towards the referral of expectant mothers to dentists or periodontists regularly as compared to academicians (38.1%) and post graduates (30.0%). 87.0% ( $p=0.068$ ) of obstetricians strongly recommend the need for dental treatment prior to conception. Majority of the obstetricians considered in the present study showed adequate knowledge, attitude and practice behaviour but there is a gap between knowledge and practice ( $r=0.432$ ,  $p=0.000$ ).

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#### Introduction:-

Oral health is an integral component of general health [Shah et al.2013]. Pregnancy is a delicate condition involving complex physical and physiological changes [Balla et al.2013]. Oral tissues are known to be affected by pregnancy with the most frequent and greatest changes occurring in the gingival tissues. Studies have shown that there is a relationship between pregnancy and periodontal status with a variability in the frequency of periodontitis among pregnant women, ranging from 35% to 100%. [Patil.S et al.2011, Ifesanya JU et al.2010, Wandera M et al.2009, Piscoya MD et al 2012, Vogt M et al.2012, Wu YM et al.2013, Dhaliwal et al 2013]. Pregnant women may be more susceptible to periodontal disease, since higher concentration of estrogen and progesterone can induce hyperaemia, edema, bleeding in periodontal tissues and increased risk of bacterial infection [Russell et al.2008].

Obstetrician due to frequent contacts with family are in an ideal position to provide guidelines for improving oral health.

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earlier than dentist [Balla et al.2013]. Thus it is essential for these specialists to be aware of the infectious nature of oral diseases and its associated risk factors to make appropriate decisions regarding timely and effectively. Increasing the involvement of obstetrician during pregnancy care visits can actually play an important role in improving the oral health of their patients and thereby reducing adverse pregnancy outcome. Therefore, the present study was designed to assess the knowledge, attitude and oral health practices among Obstetricians. It is assumed that results obtained from this study will open new frontiers in the management of oral diseases during pregnancy.

### **Materials and Methods:-**

There is no universally accepted or recommended index/ inventory to measure dental health attitude and behavior. The data was collected on the attitude and behavioral aspects which was derived from a series of open and closed end questionnaires. The Hiroshima University- Dental Behavioral Inventory (HU-DBI) questionnaire developed by Kawamura has been regarded as useful for assessing patient's perceptions and oral health behavior and is widely used all around [Dagli et al.2005].

This is a cross sectional study with a sample consisting of 145 Obstetrician from Mangalore city, Karnataka with a population of approximately 600,000 and is a reputed center for education with five medical colleges, four dental colleges and twenty five private hospital centers. Questionnaire consisted of self constructed open and close ended questions. Participation in the survey was voluntary. Besides, confidentiality was also maintained about the personal record. Obstetricians who were not willing to participate in the study and who did not respond/gave back the questionnaire during the stipulated time period were excluded from the study. Prior to data collection ethical approval was obtained from Institutional ethical committee, Yenepoya University, Mangalore, Karnataka.

### **Questionnaire design:-**

- The questionnaire was prepared by the principal investigator in consultation with other authors. Reliability of the questionnaire was assessed using cronbach's alpha internal consistency coefficient.
- A study specific questionnaire consisted of 27 questions which were divided into four parts.
- Personal data, their personal dental care histories, details relevant to professional practice.
- Knowledge about changes in oral health during pregnancy and their effect on pregnancy outcomes (1-9 scale).
- Attitude towards the oral health and pregnancy outcomes (10-18 scale).
- Their own practice behaviour to implement their knowledge (19-27 scale).

The question scale numbers 11,12 and 23 are open ended questions. [Personal oral care questions such as reason for visiting the dentist by the Obstetrician, how often they used to visit dentist and reason for not checking the oral cavity of expectant mothers respectively]. The questionnaires were handed to the subjects either in the clinics, colleges or the hospitals where they worked. The questionnaire was either collected the same day or next day. The filled responses were then transferred to the microsoft excel sheet for appropriate statistical analysis.

### **Statistical analysis**

Sample size of 97 subjects was obtained based on the formula by assuming 50% of the obstetricians aware with 95% confidence interval and 10% allowable error. However in the present study we could able to collect data from 135 subjects. The data was analyzed by applying descriptive & inferential statistical analysis. The cronbach's alpha value for closed end question was 0.93 and for open ended questions was 0.6345.

Analysis was carried out using SPSS package version 23. Pearson's Chi Square test was used to check the difference in knowledge, attitude and practice among Obstetricians. A Karl Pearson's correlation co-efficient is used to assess the hypotheses that there is a positive linear relationship between the variables, a negative linear relationship between the variables, or no linear relationship between the variables. Kruskal Wallis test was used to compare the variables between the groups. But the difference was not significant, So Posthoc analysis was not performed. Level of significance was kept at 5% ( $p= 0.05$ ).

### **Results:-**

#### **A. Basic characteristics:-**

Table I shows the distribution of Obstetrician and their demographic characteristics. A total of 135 responses were collected from 145 Obstetricians (93.10% response rate) which included private practitioners (32.4%), academicians (30.9%) and post graduates (36.8%). Their average number of years of experience as an obstetricians was 9.23 years.

**Table I-Basic characteristics of the participants**

Age	Percent (%)
24-30	33.1
31-40	34.6
41-50	20.6
51-60	11.8
Total	100
<b>Gender</b>	
Male	32
Female	104
Total	100.0
<b>Years in practice</b>	
5 yrs and below	52.2
6-10yrs	24.3
11-20yrs	15.4
Above 20yrs	8.1
Total	100.0
<b>Work sector</b>	
Academicians	30.9
Post graduates	36.8
Private	32.4

**Knowledge:-**

Table (II) shows their responses to the various questions regarding their knowledge about oral health. We found that Obstetricians with the lack of knowledge and time (8.1%, 11.0%) regarding outcomes of poor oral health respectively were less likely to refer to comprehensive oral care services for pregnant patients (25.7%,  $p=0.528$ ). 11 respondents in the study stated that gum disease does not affect the health of expectant mothers. Obstetricians who underwent regular dental examination themselves were slightly more attentive to report that they referred pregnant patients to dentists.

There was no co-relation between Obstetrician's experience and knowledge ( $P= 0.69$ ). There was significant co-relation between Obstetrician's self reported knowledge and routine referral to a dentists ( $P= 0.00001$ ).

**Table II-frequency distribution of knowledge regarding oral health**

Questions	Academicians(%)	Pg(%)	Private(%)	Total(%)	P value
1. Are you aware of a speciality in dentistry called periodontology?	No	7.1%	8.0%	11.4%	0.762
	Yes	92.9%	92.0%	88.6%	
2. Do any changes in dental health occur during pregnancy?	No	2.4%	2.0%	.0%	0.608
	Yes	97.6%	98.0%	100.0%	
3. Do you think gum disease can affect health of expectant mothers?	No	11.9%	10.0%	2.3%	0.528
	Yes	88.1%	90.0%	97.7%	
4. Do you think dental referral is important for expectant mothers?	No	11.9%	14.0%	6.8%	0.991
	Yes	88.1%	86.0%	93.2%	
5. Do you advice expectant mothers to undergo routine dental check up?	No	26.2%	26.0%	25.0%	0.941
	Yes	73.8%	74.0%	75.0%	
6. Can dental treatment be delivered at anytime during	No	81.0%	78.0%	79.5%	0.195
	Yes	19.0%	22.0%	20.5%	

pregnancy?						
7. Do you think periodic scaling causes harmful effects to teeth and gums in expectant mothers?	No	50.0%	46.0%	31.8%	42.6%	0.326
	Yes	50.0%	54.0%	68.2%	57.4%	
8. Does the pregnancy increases the tendency for gums to bleed or swell?	No	7.1%	8.0%	15.9%	10.3%	0.973
	Yes	92.9%	92.0%	84.1%	89.7%	
9. Can poor oral health be one of the causes for preterm labor and low birth weight in expectant mothers?	No	16.7%	18.0%	16.3%	17.0%	0.195
	Yes	83.3%	82.0%	83.7%	83.0%	

**Attitude:-**

The frequency distribution of dental attitude among study participants are shown in table (III). Obstetricians working in private hospitals showed significantly higher mean attitude score (59.1%,  $p=0.014$ ) towards the referral of expectant mothers to dentists or periodontists regularly as compared to academicians (38.1%) and post graduates (30.0%).

**Table III- frequency distribution of dental attitude regarding oral health**

Questions	Academicians(%)		Pg(%)	Private(%)	Total(%)	P value
	No	Yes				
10. Have you been to a dentist?	No	21.4%	16.0%	13.6%	16.9%	0.614
	Yes	78.6%	84.0%	86.4%	83.1%	
13. Do you feel expectant mothers should maintain good oral hygiene?	No	7.1%	4.0%	4.5%	5.1%	0.7751
	Yes	92.9%	96.0%	95.5%	94.9%	
14. Do you insist the expectant mothers should maintain good oral hygiene?	No	16.7%	14.0%	11.4%	14.0%	0.778
	Yes	83.3%	86.0%	88.6%	86.0%	
15. Do you refer expectant mothers to dentists/periodontists regularly?	No	61.9%	70.0%	40.9%	58.1%	0.014
	Yes	38.1%	30.0%	59.1%	41.9%	
16. Would you consult or take advice from dentists/periodontists if you notice gum disease in expectant mothers?	No	26.2%	22.0%	18.2%	22.1%	0.670
	Yes	73.8%	78.0%	81.8%	77.9%	
17. Do you think expectant mothers require oral health supervision by dentists/periodontist in all the trimesters?	No	21.4%	18.0%	29.5%	22.8%	0.399
	Yes	78.6%	82.0%	70.5%	77.2%	
1118. Do you feel dentists/periodontist should be included in prenatal care team?	No	19.0%	18.0%	20.5%	19.1%	0.955
	Yes	81.0%	82.0%	79.5%	80.9%	

**Practice behavior:-**

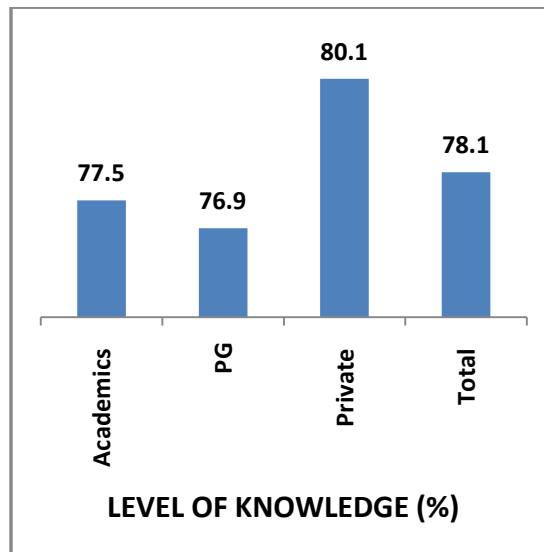
The frequency distribution of practice behaviour regarding oral health in Obstetricians are summarised in table(IV). 69.6% ( $p=0.073$ ) of the respondents think that the examination of oral cavity should be integral part of prenatal care while 30.4% think it is not necessary. Lack of time is the major factor which made 69.6% of Obstetricians refrain from checking oral cavity of expectant mothers. Comparison of mean knowledge, attitude and practice scores among gender and age group of Obstetricians did not show any statistical significance ( $p>0.05$ ).

However, Obstetricians with 20-25 years of experience showed higher mean attitude score towards prevention of oral diseases as compared to the others and the difference was statistically significant ( $p < 0.05$ ).

**Table IV-frequency distribution of practice behaviour regarding oral health**

Questions	Academicians(%)		Pg(%)	Private(%)	Total(%)	P value
19. Do you ask expectant mothers whether they use toothbrush and toothpaste regularly?	No	55.6%	62.5%	66.7%	60.9%	0.905
	Yes	44.4%	37.5%	33.3%	39.1%	
20. Do you examine whether the expectant mothers visited dentists/periodontist on your advice?	No	66.7%	50.0%	83.3%	65.2%	0.429
	Yes	33.3%	50.0%	16.7%	34.8%	
21. Do you feel examination of oral cavity should be integral part of prenatal care?	No	22.2%	12.5%	66.7%	30.4%	0.073
	Yes	77.8%	87.5%	33.3%	69.6%	
22. Do you check oral cavity of all expectant mothers?	No	55.6%	75.0%	83.3%	69.6%	0.476
	Yes	44.4%	25.0%	16.7%	30.4%	
24. Do you think education of expectant mothers regarding maintenance of oral health is important?	No	11.1%	12.5%	0%	8.7%	0.676
	Yes	88.9%	87.5%	100.0%	91.3%	
25. Do you advice professional cleaning for expectant mothers as a part of prenatal care?	No	33.3%	25.0%	33.3%	30.4%	0.918
	Yes	66.7%	75.0%	66.7%	69.6%	
26. Have you used any of the available dental education aids to educate expectant mothers on oral health?	No	66.7%	75.0%	66.7%	69.6%	0.918
	Yes	33.3%	25.0%	33.3%	30.4%	
27. Do you think it is necessary to get dental problems treated prior to conception?	No	33.3%	.0%	.0%	13.0%	0.068
	Yes	66.7%	100.0%	100.0%	87.0%	

Level of knowledge, attitude and practice score regarding oral health care among Obstetricians have been shown in Figure 1, Figure 2 and Figure 3.



Figure(1) illustrates level of knowledge among obstetricians

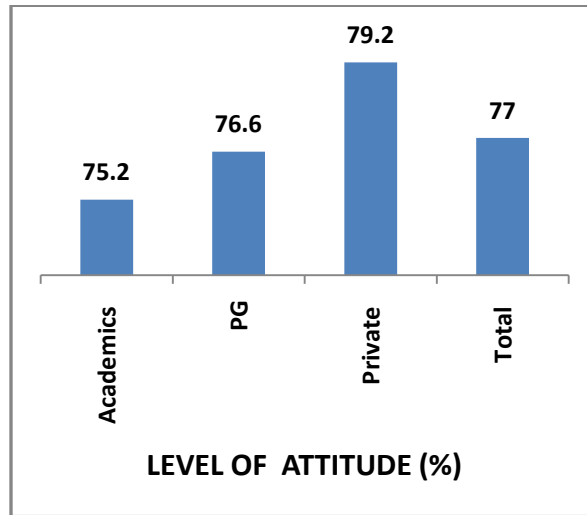


Fig (2) illustrates level of attitude among obstetricians

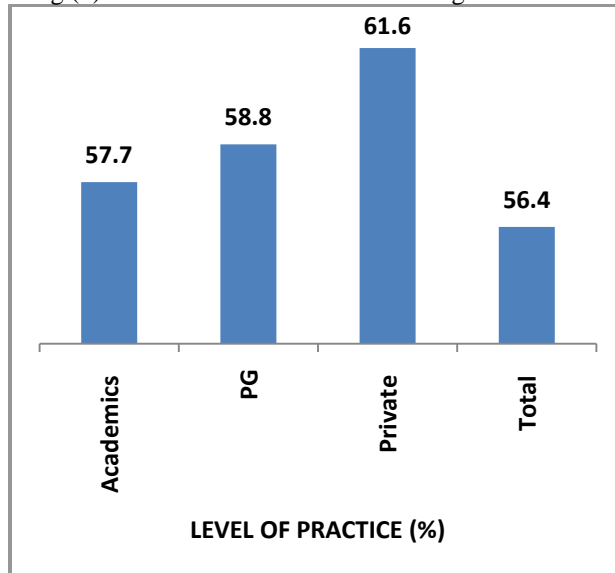


Fig (2) illustrates level of practice among obstetricians

Co-efficient correlation between knowledge, attitude and practice behaviour is illustrated in table (V). A linear positive co-efficient correlation between knowledge and attitude ( $r=0.55$ ,  $p=0.01$ ), attitude and practice ( $r=0.34$ ,  $p=0.027$ ) was observed in academicians, post graduates and private practitioners but a negative co-relation was observed between knowledge and practicing academicians ( $r=0.27$ ,  $p=0.039$ ) and private practitioners ( $r=0.35$ ,  $p=0.019$ ).

Table v- co-efficient correlation between knowledge, attitude and practice behaviour

WORK SECTOR			Karl pearson correlation coefficient r value	p-value	
ACADEMICS	KNOWLEDGE SCORE	ATTITUDE SCORE	0.545	0.000	Sig
		PRACTICE SCORE	0.269	0.039	Sig
	ATTITUDE SCORE	PRACTICE SCORE	0.340	0.00	Sig
PG	KNOWLEDGE SCORE	ATTITUDE SCORE	0.657	0.000	Sig
		PRACTICE SCORE	0.616	0.000	Sig



	ATTITUDE SCORE		0.640	0.000	Sig
PRIVATE	KNOWLEDGE SCORE	ATTITUDE SCORE	0.487	0.001	Sig
		PRACTICE SCORE	0.351	0.019	Sig
	ATTITUDE SCORE		0.223	0.041	Sig

### Discussion:-

This study was undertaken to assess knowledge, attitude and practices among Obstetricians regarding oral health of expectant mothers which reveals an adequate knowledge and attitude among Obstetricians but a considerable amount of difference between knowledge and practice behaviour was observed. The advantage of a questionnaire study is that, it allows information to be collected and analyzed easily and it also allows the concerned specialist to express freely their perception on oral health care.

In the present study it was observed that most of the Obstetricians had good knowledge, attitude and practice behaviour regarding oral health in expectant mothers however, there still exist minor misconceptions amongst Obstetricians regarding provision of dental treatments during pregnancy. This is of importance to the dentists as it acts as a barrier for them in providing the most appropriate treatment to their pregnant patients. Such misconceptions should be clarified in order to stop compromising on the quality of dental care due to unnecessary fears developed among patients. This conclusion is similar to the study done by Shah et al (2013). In our study about 59.1% of private practitioners were very particular about referring expectant mothers to dentists or periodontists when compared to academicians(38.1%) and post graduates(30.1%). This may be due to the fact that they remained in continuous contact with the recent advances and new facts coming to light on the topic. Continuing education programs may also have had some role to play in the difference in knowledge levels. Studies conducted by Shenoy et al(2009) reveals that about 62% of the post graduates referred their patients to dentists and 38.3% referred to periodontists which was much higher referral than our study. Another study by Rocha et al(2011) presented a situation in which the highest percentage of Obstetricians refer their patients to other professionals is when they are concerned with their oral health status(88.2%). 55% of the Obstetricians in the study conducted by Shenoy et al agreed that periodontal disease in expectant mothers may lead to preterm low birth weight babies whereas, in the present study 83.0% of the Obstetricians were aware of the fact because most of the studies revealed a direct relationship between periodontal disease and adverse pregnancy such as preterm birth, preterm prelabor rupture of membranes, pre-eclampsia and post-cesarean endometritis (Crowther CA et al. 2005]

Obstetricians with 20-25 years of experience had better knowledge than the other group. This can be due to combination of experience and knowledge by continued learning process towards oral health during Obstetrician care. No difference of knowledge among female and male gynaecologists was noted. Obstetricians with more than 40 years of age were having good attitude, this may be because they face number of cases in their routine practices and updated knowledge.

During pregnancy hormonal changes can cause exacerbation of periodontal or gingival clinical characteristics especially swelling and bleeding [Rocha et al.2011]. In our present study 89.7% of respondents said that pregnancy increases the tendency for swelling and bleeding from gingival but it is a well known fact that most of the physicians do not look into the mouth of the pregnant women due to lack of training [Wender EH et al.1992,Cunningham G et al. 2000] and because busy Obstetricians have no time to look into patients mouth unless patients have complained about this change [Singh S et al .2011,Varun S et al. 2014] . Rocha et al (2011) surveyed and found out that more than 90% of Obstetricians expected these changes during pregnancy.

Obstetricians who are undergoing regular dental visits more recently showed greater interest in recommending the same for their patients ( $p < 0.001$ ). It can be suggested that such an attitude shows that the health care of patients is a reflection of the attitudes of Obstetricians toward their personal oral health. In this sense, it is also relevant to stress the importance of self-care to each member of the healthcare team, since they are the disseminators of knowledge to those under their care.

Regarding pregnancy guidelines, it was strongly suggested to include dental visits as an integral part of antenatal check ups [Patil et al.2013]. The introduction of mandatory dental examinations for women in early stage of pregnancy should motivate dentists to introduce a new approach of preventive services which result in closer cooperation with Obstetricians in order to reduce the prevalence of delivery of pre-term low birth weight babies

[Stupak A et al. 2013]. Professionals involved in prenatal care should discuss the importance of oral health with pregnant women and refer patients to dental treatment when necessary [Al-Habasneh et al.2008]. In our study 69.6% of Obstetricians carried out oral health examination of their patients. This is in accordance with the study done by Patil et al and Shah et al who observed that about 39% of Obstetricians performed oral examination of expectant mothers during the first trimester and 65% recommended every 6 months interval.

Limitation for the oral examination during antenatal visits is due to lack of time and lack of demand for the service. In our study about 31% of practitioners refrained from oral examination due to lack of time and higher percentage (44.5%) was seen in academicians compared to private practitioners(25.7%) and post graduates(16.7%).

Preconception and antenatal knowledge and habits reduces the oral diseases in expectant mothers [offenbacher et al.1996,Lyndon-Rochelle et al. 2004]. To best of our knowledge no reported literature added the necessity of dental treatment prior to conception but in our study 87.0% of respondents were aware of the importance of dental problems treated prior to conception and an 100% agreement by post graduates and private practitioners. It can be due to the fact that hormonal changes taking place during pregnancy render the women more susceptible to plaque accumulation and gingival inflammation [Singla N et al.2013] and it has been observed that phase I therapy in pregnancy patients with chronic periodontitis reduced adverse periodontal outcome such as preterm low birth weight, still births etc [Tarannum F et al 2007, Schwendicke F et al.2015,Reddy BV et al.2014 ]

It has been found out that dental treatment can be rendered at any time during pregnancy (Wasylo et al.1998,American dental association.1999, Lee et al.1999) but due to the morning sickness experienced by most pregnant women during the first trimester and great deal of risk of postural hypotension during the third trimester, second trimester of pregnancy is the ideal period of delivering efficient dental care [Kumar J et al .2009]. In our study only 20.6% opined that dental treatment can be delivered at any time during pregnancy.

Obstetricians exhibited relatively lower practice score of 59.38% towards prevention of oral diseases. However, Obstetricians working in private sector showed significantly higher mean practice score indicating that they practiced prevention of oral diseases relatively better than post graduates and academicians. This could be due to the time constraints, as large number of patients seeking care in hospitals make it difficult for the Obstetricians to focus on the issues related to the oral health. Other possible barrier may be lack of understanding of oral health care during pregnancy[Bassey et al.2010].

In our study there is a negative correlation between knowledge and practice among academicians(  $r=0.269$ ,  $p=0.039$ ) which shows that they have adequate knowledge about oral disease prevention in expectant but certain factors are refraining them to implement it.

The highlights of the study were the participation of the majority of the Obstetricians in the Mangalore city and the categorisation of the study groups into academicians, private practitioners and post graduates aided in assessing their practice behaviour. The major shortcoming of the study is the restriction of the study population to a specific area hence the results of the study should be generalised with caution. Therefore further randomised controlled clinical trials has to be carried out. Some of the Obstetricians refrained from the study due to lack of time, interest or conflict with their busy schedule.

### **Conclusion:-**

Majority of the Obstetricians considered in the present study showed adequate knowledge, attitude and practice behaviour but there is a gap between knowledge and practice. Since our study shows moderate practice behaviour, it should be emphasized that knowledge and attitude cannot make it certain that it will be implemented effectively. And it is necessary that specialists should keep their knowledge updated. They should be encouraged to refer the patients for oral health examination. A multidisciplinary team that includes the Family Physician, Obstetricians and Dental practitioner should assume an active role in providing health education to pregnant women which can significantly decrease the possibility of oral diseases. Oral health education can be included in the medical curriculum to emphasize a positive attitude towards oral health.

All authors have no conflicts of interests to declare.

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**RESEARCH ARTICLE**

**FACTORS OF QUALITY STANDARDS IN THE TEACHING PROCESS IN HIGHER EDUCATION INSTITUTIONS AND ITS IMPACT ON THE STUDENTS SATISFACTION: A CASE STUDY OF A PRIVATE UNIVERSITY IN DUBAI**

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Higher Educational institutes, service quality standards, student satisfaction, United Arab Emirates.

**Abstract**

The United Arab Emirates is becoming a hub for quality in teaching in the higher education institutions. There are two types of these institutions, such as those which are under the private programs and the ones which are under the government programs. A private university in Dubai is going to be taken as a case study for its reputation as one of the centres of excellence in higher education in the region. This study examines the quality standards in the teaching process in higher education institutions and its impact on the student satisfaction in private institution of Dubai. The questionnaires used to collect quantitative information. The questionnaires were distributed to 50 male and female students of Private Universities in Dubai aged between 20 to 40 years and the Statistical Package for Social Sciences was used for data analysis. The study found that students at Private Universities in Dubai have high satisfaction levels because the institution offers courses that impact on the students with right skills and knowledge. However, the university's IT infrastructure underdeveloped hence the need to invest more resources in upgrading the system. By doing so, the institution will attract students from the region and other parts of the world.

The study recommends policy to enhance high quality standards in the Teaching Process in Higher Education Institutions such that managers and administrative executives should consider enhancing the academic and institutional status the University with regard to the highlighted determinants of teaching quality education as well as the different student dimensions of quality.

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**Introduction:-**

The growth of the United Arab Emirates higher education sector has improved in the last two decades and became one of the highest international institutions of higher education in the world. Since the 1960s, the United Arab Emirates is rated among the world's rapidly developing and wealthiest countries in the world.

As the establishment of the first university in the region in 1977, education in these institutions was in English (Witte, 2015). For that reason, students in these education institutions study both English and classical Arabic languages which leads to many challenges for teachers to teach complex content. Moreover, many students graduate from public high schools do not advance their education. To motivate such students, most institutions offer

foundation programs for students entering these institutions to enhance their competencies in core subjects such as math, English, Arabic, and IT before starting their academic studies (Witte, 2015).

Recent studies believe that the quality of education in higher education institutions in the United Arab Emirates has improved in the past few years following the federal Ministry of Higher Education involvement through improving the education quality standards. And today, there are more than 70 private institutions of higher education in the United Arab Emirates licensed by related government agencies such as the Ministry of Higher Education and hence an increase in the numbers of enrolled learners from 52,926 students to 128,279 (Witte, 2015). This research tries to establish the efforts of a private university in Dubai towards providing quality in teaching and its impact on the students' satisfaction.

### **Literature Review:-**

Higher education in the Arab world has experienced a number of major developments such as the expansion of previously established universities, increased numbers of students, public and private sector enthusiasm for investing in higher education, and the emergence of new disciplines and styles of learning. By noting these developments, sector leaders have recognized a need to support the application of quality standards in higher education to ensure the quality and final outputs of universities (Bashour, 2005). The sustainability of these countries owned private institution in Dubai against the public owner universities is as results of their service qualities which meet up with expectation of the residences in Dubai. Rendering the expected value in competitive business environment in concentration of quality of service is an important element for business success, and experts concur that the most powerful competitive tool currently reshaping marketing and business strategy is service quality (Eraghi&Atharnejad, 2012).

### **Student satisfaction:-**

Owston, York & Murtha (2013) define student satisfaction as the desirous outcome of a job or task striving to meet the individual's esteem. Student satisfaction from teaching quality education at the universities plays an integral part in determining the accuracy and originality of the system. In this case, the satisfaction of the students denotes the level of grooming their mentality, course knowledge, and skill development. Students' satisfaction from teaching quality education is, therefore, the resultant outcome of the University's educational and administrative coherent performance of the system.

Moreover, the institutions that facilitate UAE's learning environment make student motivated or more satisfied from completing their studies. For that to happen, the individual institution must have proper educational utility infrastructure accumulated with academic and essential parameters of professional development. For example, students are more motivated, performer better, and become loyal to their universities if their institution has basic educational facilities with effective training and teaching staff. Improved student satisfaction, motivation, and impartiality directly depend on the teachers' performance outside and inside the classroom. Therefore, the students' evaluation of their course performance is related their instructors and methodology used in teaching. That also determines the students' successful completion and educational development of their studies because they believe that instructors with the highest intellectual ability as better teachers and reliable. We can deduce that students' satisfaction is largely dependent on quality standard. Teachers' reasonability, coordination, excellence, and ability are salient factors to be considered in ensuring standard for good higher institution. Since educational programs are coordinated for them by their instructors or teachers (Owston, York & Murtha, 2013).

### **Perceived Service Quality:-**

The perceived quality of service refers to the students' justification for the approach adopted in teaching quality by their lecturers and course instructors. For students to perceive the services as excellent, they must be of standardized output and better. Educational excellence in the universities depends on the service quality (Owston, York & Murtha, 2013). Students also perceive the institutional service as being standardized and offered in a quality education environment if the University provide them with appropriate infrastructural and learning facilities and intellectual faculty to ensure they retain confidence and interest in the organization. Administrative and academic efficiency of the University, therefore, plays a major role in the motivation of the student. That happens through the institution's professional development, training and feedback for the student's mental development, transparency in the evaluation of the student, teachers' intellectual ability, and organizational harmony (Owston, York & Murtha, 2013).

The quality of the University service in education further encompasses medical facilities, security systems, updated and well-managed libraries, class facilitation and sitting arrangements and decoration coupled with multimedia as well as the cooperation of the administrative staff. Support services also contribute to their educational development and support (Owston, York & Murtha, 2013).

In conclusion, we can say that both administrative and academic aspects of a University are significant in determining the students' performance, development of quality assurance and organizational image. Hence, the students' satisfaction is associated with the performance of a University's knowledge advisor, ability to get desired classes, instructor excellence, overall quality instruction, knowledgeable faculty, secure and safe campus, approachable advisor, worthwhile investment in paid tuition, availability of advisor, reasonable and clear requirements for major, unbiased and fair faculty, adequate computer labs, and access to information (Austin et al., 2014).

#### **Research Significance and Problem:-**

The significance of this research emerged from the importance of sustainable knowledge economy in which participation in providing quality standard education for higher education institution ensure student satisfaction thus enhance economic growth in the country (Coates, 2009), introduces continuous improvements to educational institutions' services, and adapts these improvements to achieve substantial improvements in service quality (Hafeez et al., 2011). The motivation for this study emanated from the administration of higher institution in UAE, which appropriate policies with regards to quality standard of the service rendered has been a major concern. Accordingly, the study problem can be demonstrated by answering the following questions and investigating the following hypotheses:

#### **Research Questions:-**

Q1: What is the relationship between oversight bodies and agencies determine teaching quality education on student satisfaction in higher education institutions of UAE.

Q2: To what extent has AACSB's Hiring Standards affected teacher Qualifications in higher education institutions of UAE

Q3: To what extent has university hiring standards affected teachers' qualification in higher education institutions of UAE

Q4: What is the association between Teachers' qualification and presence of AACSB Hiring standard in higher education institutions of UAE

Q5: What is the relationship between Private Universities Hiring Standards and AACSB are not in ensuring student satisfaction in higher education institutions of UAE

Q6: To what extent has the five dimensions of service quality viz: assurance, empathy, responsiveness, tangibles, and reliability influenced students' satisfaction in higher education institutions of UAE.

#### **Research Hypotheses:-**

The hypothesis as per Turner (2015) is the most suitable guess a researcher can make based on the planned study.

The study's hypotheses are:

H1: There is no significant relationship between oversight bodies and agencies determine teaching quality education on student satisfaction in higher education institutions of UAE.

H2: AACSB's Hiring Standards does not have any significant impact on the teacher Qualifications in higher education institutions of UAE

H3: There is no significant effect of university hiring standards on teachers' qualification in higher education institutions of UAE

H4: Teacher qualification has no significant association to the presence of AACSB Hiring standard in higher education institutions of UAE

H5: Private Universities Hiring Standards and AACSB are not significantly related in ensuring student satisfaction in higher education institutions of UAE

H6: There is no significant linkage between students' satisfaction and the five dimensions of service quality viz: assurance, empathy, responsiveness, tangibles, and reliability in higher education institutions of UAE.

**Methodology:-****Underpinning Theory for Quality Standard and Student Satisfaction:-**

The study adopted Herzberg's theory of job satisfaction to theorize the impact of quality standard in teaching process on student satisfaction in Private Higher Education Institutions in Dubai. In applying Herzberg's theory to this study, desired classes, instructor excellence, overall quality instruction, knowledgeable faculty, secure and safe campus, approachable advisor, worthwhile investment in paid tuition, availability of advisor, reasonable and clear requirements are directly related to the student satisfaction and may be considered motivators or satisfiers (e.g. growth and achievement).

While the absence of desired classes, instructor excellence, overall quality instruction, knowledgeable faculty, secure and safe campus, approachable advisor, worthwhile investment in paid tuition, availability of advisor, reasonable and clear requirements may lead to dissatisfaction, For example, fair and equitable rules and policies are expected at a higher educational institution. It is only in the absence of fairness in availability of those salient factors that the student experiences dissatisfaction. The more, standard and desired classes, instructor excellence, overall quality instruction, knowledgeable faculty, secure and safe campus, approachable advisor and availability of advisor, the higher the quality of standard rendered and thus, the increase in satisfaction of the students.

**Source of Data and Sample:-**

The chapter on collecting quantitative data is used for researching and analyzing questionnaires used to collect quantitative information. The questionnaires were distributed to 50 male and female students of Private Universities in Dubai aged between 20 to 40 years. The coping strategies adopted and the questions asked strived to elicit participants' perspective regarding the quality of teaching in the university and subsequently, the impact it has on the students' level of satisfaction (Pickard, 2012). Specific questions were developed to establish the students' view purposely to enhance the situation. The selected respondents had diversified cultural and educational backgrounds since some of them came from foreign countries like Syria, Russia, Lebanon, Iran, Asia, Europe, India, and Emirates among others.

**Data Analysis Method:-**

The following methods and statistical indicators were used for statistical analysis and hypothesis testing:

1. Frequencies and percent for study sample distribution breakdown.
2. Means and standard deviations to indicate concentration levels or dispersion of sample responses regarding statements related to the application of service quality standards and student satisfaction.
3. T-test for independent variables to investigate whether there is a difference in the sample's attitudes toward service quality application in the universities and to ascertain the participants' attitudes toward their own satisfaction with university service quality (H1-H6).
4. Regression test to determine the effect of independent variables on dependent variables (H1-H5)
5. Reliability analysis to ensure the instrument reliability of Cronbach's alpha coefficient (H6)

**Findings and Discussion:-**

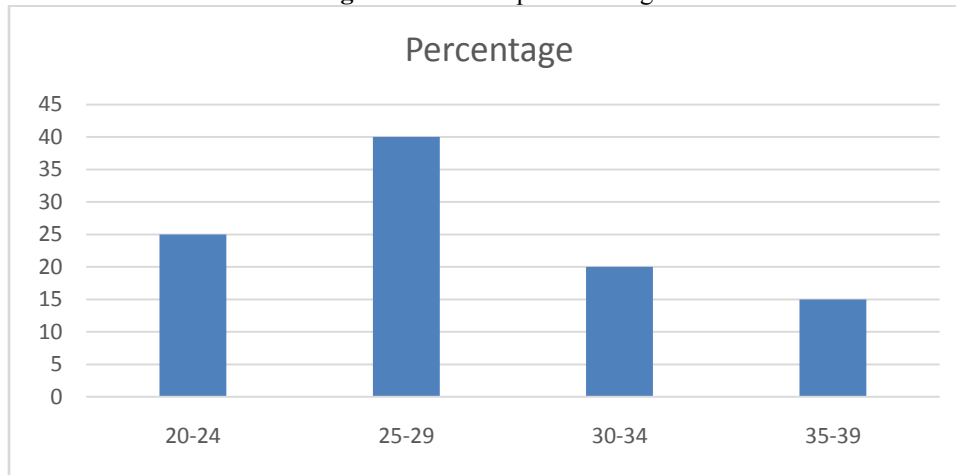
The survey established that 50% and above of the participants gained appropriate skills and knowledge at the university under study and that the teaching approach adopted by the institution was relevant to their expectations.

**Respondents' demographic profile:-**

Respondents' age:-

The researcher asked respondents to write their age limits when answering the questions asked in the questionnaire. The diagram below depicts the participants' response.

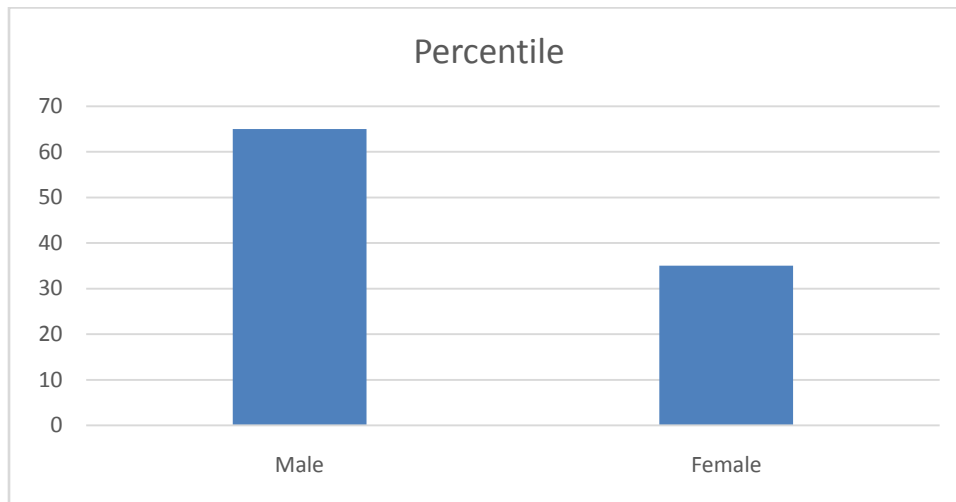


**Figure 4.2.1:- Respondents' age**

The figure indicates that 25% of the respondents were aged between 20-24 years, 40% between 25-29 years and 20% fell in the age bracket of 30 to 34 years. About 15% of the participants were aged between 35-39 years. The findings further established that a huge chunk of Private Universities students was below the age of 35 years constituting approximately 85% of the total student population. On the other hand, students aged above 35 years were less attracted to the institution since they were representation by 15% only.

#### **Distribution by gender:-**

The questionnaires also tasked respondents to show their gender when answering questions. The diagram below show what the outcome of the survey indicated.

**Figure 4.1.2:- Distribution by gender**

The chart shows that male students represented 65<sup>th</sup> percentile as opposed to the 35<sup>th</sup> percentile of their female counterparts. The results indicate that the research was not gender-balanced because the variation between the male and female respondents was at 30 percentile. The big variance in gender representation is a further indicator that the student population at Private Universities was male dominated because the institution is science-oriented. Given that most female students detest studying science courses, it could be the reason for the huge variance in gender representation.

**H2: Questionnaire Questions on the Determinants of Teaching Quality Education****Teacher Education Accreditation:-**

AACSB-accreditation may be the reason behind high standards of teaching at Private Universities and UAE in general. This is because AACSB has high-quality teaching standards it has established under which all universities and other institutions of higher learning prescribe to.

**Table 4.2.1:-** Relating Teacher Qualification and AACSB Accreditation

Beta Coefficient	% of Teachers that are well-qualified	% of Teachers who are well-qualified in English	% of Math Teachers who are well-qualified	% of out-of-field math teachers	% of out-of-field English Teachers
AACSB's Accredited Universities	.43*	.48*	.35*	-.38*	-.38*

\*P&lt;.05

\*\*P&lt;.01

The percentage of AACSB-accredited universities is negatively correlated at a significant level with that of out-of-field math and English teachers. The reason may be due to the fact that AACSB-accredited universities must demonstrate high teaching standards in their respective fields particularly in science fields as per the case of Private Universities. There may be other institutional policies that may lead to quality teaching at Private Universities and other related institutions other than guidelines set by AACSB and subsequently supporting and leading to recruiting high-quality teachers.

As indicated in table 4.2.2, the extent to which university supervised by AACSB particularly Private Universities maintain high recruitment standards highly predict (P<.001) of the uncertified teachers' percentage. It also well indicates a strong correlation between fully certified teachers and new ones.

**Table 4.2.2:-** H2:Correlations between AACSB's Hiring Standards and Teacher Qualifications

AACSB Hiring Standards	
% of Newly Certified Teachers	.29**
% of all newly certified teachers	.32**
% of uncertified newly certified teachers	-.52***
% of all uncertified teachers	-.65***

\*P&lt;.05

\*\*P&lt;.01

\*\*\*P&lt;.001

**Table 4.2.3:-** H3: Relationship between University Hiring Standards and Teacher Qualifications

Beta Weight/Variable	% uncertified new teachers	% uncertified all teachers	% fully certified new teachers	% full certified all teachers
University hiring standards****	-0.501 (-3.18)**	-0.637 (-4.74)***	0.338 (2.15)*	0.394 (2.51)*
Professional Board Standards	-0.081 (-.49)	-0.172 (-1.72)		
% students in poverty	-0.107 (-0.50)	0.173 (0.95)	-0.062 (-0.26)	-0.147 (-0.63)
% LEP students	0.046 (0.24)	0.106 (0.64)	0.375 (2.03)	0.227 (1.24)
% minority students	-0.104 (-0.41)	-0.353 (-1.67)	-0.111 (-0.42)	0.124 (0.57)

\*P&lt;.05

\*\*P&lt;.01

\*\*\*P&lt;.001

\*\*\*\* Is the percentage university teachers as a criteria for recruitment, graduation from an approved institution of education program, full certification, and a university minor or major degree certificate in the course to be taught.

The findings indicate that university teaching standards are both a local and state job. Taking a quasi-professional teaching scenario, we find a complex interplay between the procedures adopted by Private Universities and the standards set by AACSB sometimes in violation of and sometimes in accord with government or state requirements.

AACSB enforce standards of teachers recruited in higher institutions. However, they do in an inviolable way to that of other professionals including lawyers and doctors. While other professionals embrace the use of professional standards boards established in UAE as the enforcement and standard-setting body. Based on the level of autonomy and authority used to measure the characteristics, UAE has bodies mandated to manage and administer teaching standards in the region.

As indicated in table 4.2.4, there is a significant relationship between AACSB's recruitment standards and teacher qualification. In table 4.2.5, there is a huge relationship between uncertified and certified teachers and the establishment of AACSB. Therefore, the connection between the two is working because of the pressure the university is getting from AACSB to employ qualified teachers.

Sometimes universities and other institutions of higher learning recruit uncertified teachers due to bureaucratic and cumbersome hiring procedures, efforts to minimize salary costs, lack of recruitment incentives or effort, or patronage. AACSB has the power and authority to ensure all universities including Private Universities recruit certified and qualified teachers to ensure teaching quality education.

**Table 4.2.4:- H4; Correlations (Pearson r) of Teacher Qualification and Presence of AACSB**

% universities demanding graduation from accredited teacher education institutions	0.26*
% of Universities demanding a minor or major degree in the course to be taught	.31**
% uncertified teachers	-.26*
% fully certified teachers	.20*
% new fully certified teachers	.22*
Weeks needed for teaching students	.24*

\*P<.05 \*\*P<.01

**Table 4.2.5:- H5:Relationship between Private Universities Hiring Standards and AACSB**

	Private Universities Hiring Standards
AACSB	.412 (2.50)**
% Poor Students	.131 (.57)
% Students LEP	-.428 (-2.19)*
Minority Students	.068 (.27)

\*P<.05 \*\*P<.01

The link between AACSB and teacher hiring practices or education may be very important but are somehow modest (correlations ranging 0.2 to 0.3). This indicates that there are other factors contributing to teaching quality education in higher institutions of learning and Universities in Dubai in particular. It is a fact that Private Universities are in position and does develop and implement high teaching standards without being pressured by AACSB. AACSB's existence has led to high recruitment standards of teachers at Private Universities and in the UAE's education sector in general.

#### **Effects of Teaching Quality Education in the Universities:-**

##### **Data Collection and Research Instruments:-**

Five dimensions of quality teaching were adopted in this study including (assurance, tangibility, reliability, empathy, and responsiveness). These elements were subsequently used in five points Likert scale whereby 5 strongly agree and 1 strongly disagree. Respondents, like I said, were randomly sampled.

##### **Reliability Test:-**

Reliability test strives to yield consistent results through free measure. This indicates the consistency and stability with which the instrument used in the exercise measures the worthiness of the adopted measure. The coefficient reliability that is close to 1.0 indicates the measure is better while those close to 0.80 are good. Acceptable values fall within 0.70 while those within 0.60 and below are poor. The researcher used Cronbach's alpha reliability analysis method to test all the constructs for consistency reliability. The used values are as put in the table below.

Participants' confidentiality was also assured. The findings indicated that all the constructs exceeded the 0.70 thresholds meaning the constructs' scales of measurement used in the study were consistent and stable (Pedhazur&Schmelkin, 2013).

**Table 4.3.2:-** H6: Reliability Test based on Cronbach's Alpha

Construct	Number of Items	Alpha
Customer Satisfaction	50	.874
Empathy	40	.732
Tangibles	45	.848
Reliability	40	.756
Responsiveness	40	.732
Assurance	50	.829

#### **Pearson Correlation Coefficient:-**

Pearson's correlation coefficient (r) measures the relationship between two research variables. Besides Standard and mean deviations between independent and dependent variables, the researcher further strives to establish the closeness between one variable to the others. The strength of association or correlation between the dependent and independent variables is required in any study (Pedhazur&Schmelkin, 2013).

In this case, the researcher wants to know the significance of the correlation between the identified variables. Correlations may vary from 1.0 to +1.0. Regarding information, the acceptable conventional level is significant of  $p=.5$  in any social study like this one. A true significant variable correlation is between 95 times out of 100 (Pedhazur&Schmelkin, 2013). This indicates that 95 times out because it would mean that the researcher's findings are only 5% unreliable. According to our mean values, students' satisfaction is based on the five dimensions, assurance, empathy, responsiveness, tangibles, and reliability. If the universities are offering education that is at their expectations, they are likely to be satisfied. If the education is beyond their expectations, they will be very satisfied. Alternatively, the students will be extremely satisfied if they are offered education that is more than their expectations.

Variables	International Students		Local Students	
	Mean	SD	Mean	SD
Student Satisfaction	4.13	1.01	4.26	1.03
Empathy	3.29	.712	3.48	.732
Tangibles	3.32	.734	3.36	.724
Reliability	3.44	.862	3.42	.882
Responsiveness	3.49	.704	3.44	.734
Assurance	3.76	.717	3.32	.727

Pearson Correlation was used in this research. Results for empathy indicate that international students' mean is 3.29 while that of their local counterparts is 3.48. This shows that private universities students confirm that the institution offers empathy education service and was more satisfied as opposed to their international counterparts. Tangibility mean at 3.36 for local students and 3.32 for international ones indicate that the local students are more satisfied with the university's tangible service. Reliability mean for local students is 3.43 while for international ones is 3.44. This shows that international students at Private Universities were more satisfied compared to their local counterparts because they believe the institution is offering reliable service. The responsiveness of the local students is 3.44 while for the international students is 3.49. This means regarding the institution's ability to offer responsive services, the international students are more satisfied as opposed to their local counterparts. About assurance, the local Private Universities students are 3.32 while that of international ones is 3.76 indicating international learners were more satisfied with the service assurance of the university.

#### **Conclusion:-**

The study strived to explore teaching quality education in higher institutions of learning particularly at Private Universities. The research indicated that the student's satisfaction level is dependent on many aspects including the learning environment and the quality of teaching at the University. Students want institutions where there are well experienced, learned, and qualified faculty to cater for their professional and academic needs. They want teachers with reasonability, liberty, expertise, and knowledge that is up to the mark. The teachers' teaching attitude must also

be friendly and the methodology of executing the task and course appropriate. The institution must also have a good learning environment and be well equipped to guarantee an excellent education. The student's security and access to information among other elements fundamentally determine their level of satisfaction in the Universities as well.

Private Universities is a Center for excellence given that it offers courses that are in high demand in the labor market. The institution is well facilitated both by infrastructure and staff service. Students at Private Universities have high satisfaction levels because the institution offers courses that impact on the students with right skills and knowledge. However, the university's IT infrastructure underdeveloped hence the need to invest more resources in upgrading the system. By doing so, the institution will attract students from the region and other parts of the world.

The study recommends policy to enhance high quality standards in the Teaching Process in Higher Education Institutions such that managers and administrative executives should consider enhancing the academic and institutional status the University with regard to the highlighted determinants of teaching quality education as well as the different student dimensions of quality perception. They should adhere to the requirements, standards, and necessities of quality education based on the students' demand. That includes ensuring the university has reliable facilities as well have the administrative staff ability to have empathy among other factors mentioned in the discussion.

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### RESEARCH ARTICLE

#### EVALUATION OF ANTICANCER ACTIVITY OF SOME VENOMOUS ANIMAL TOXINS ON HUMAN BREAST AND COLON CANCER CELL LINES AND RELATED ANTIOXIDANT PROFILE

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#### Abstract

**Background:-** Breast and colon cancers are the most types of cancer in Egyptian patients. Radiation and chemotherapy have undesirable side effects, so the drugs are used instead. Venoms have been used as folk medicine since ancient times.

**Purpose and aim:-** This study examines the anticancer potential of Egyptian snake (*Naja haje*), scorpion (*Leiurus quinquestratus*) and bee (*Apis mellifera*) venoms then compared to a synthetic anticancer drug 5-Flurouracil (5-FU).

**Methods:-** The cytotoxicity activity of tested venoms was determined using SRB assay. Antioxidant potential was determined by the evaluation of the variation in MDA, NO. and GSH content. RNA was extracted to evaluate the expression of P53, Bcl2 and Bax genes using semi-quantitative RT-PCR analysis after 24hrs. treatment.

**Results & Discussion:-** MCF-7 cells were more sensitive than Caco-2 cells to tested venoms while 5-FU was more toxic to both cell lines. The *Naja h.*, *Leiurus q.* and *Apis m.* venoms had IC<sub>50</sub> as 3.5, 27.8 and 2.5 µg/ml with MCF-7 cell line and 20, 32.3 and 14 µg/ml with Caco-2 cell line respectively. The *Naja h.* venom had apoptotic effect against MCF-7 and Caco-2 cell lines through the elevation of p53 and depletion of Bcl-2 gene expression with increasing NO. and decreasing in GSH contents. The *Leiurus q.* venom had apoptotic effect against MCF-7 and Caco-2 cell lines through the elevation of Bax and depletion of Bcl-2 gene expression with elevation in NO. level. The *Apis m.* venom had apoptotic effect against MCF-7 and Caco-2 cell lines through the elevation of p53 and Bax with depletion of Bcl-2 gene expression and increasing NO. and decreasing in GSH contents. While 5-FU was toxic through depletion of Bcl-2 gene expression and increasing NO. level.

**Conclusion:-** Finally, it can be concluded that snake (*Naja h.*), scorpion (*Leiurus q.*) and bee (*Apis m.*) venoms had anticancer

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potentials on human breast and colon cancer cells and this is positively related to the antioxidant profile and apoptotic gene expression.

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### Introduction:-

Cancer has characterized features as an accelerated cell proliferation and uncontrolled growth of a set of abnormal cells which has insufficient apoptosis and metastasis ability (**Jain, 2014**). Breast cancer is the second most common cancer worldwide and, by far, the most frequent cancer among women with an estimated 1.67 million new cancer cases (11% of all cancers) followed by colon cancer incidence was estimated 1.4 million (9.7% of all cancers) diagnosed in 2012 (**Ferlay et al., 2015**).

The use of traditional drugs is declining and naturally extracted drugs are used instead. The bioactive molecules in animal venoms have stimulated new pharmaceutical discoveries (**Harvey, 2014**). Several pharmacological anticancer applications have been found in many venomous animals, such as snakes, scorpions, bees, spiders and frogs (**Gomes et al., 2010**). Captopril and Escozul medicines are derived from snake and scorpion venoms are used to treat cancers (**Bryan, 2009; Lorenzo et al., 2012**).

The medical value of venoms is important because of its complex bioactive components that are characterized by its high degree of specificity. Up till now, a number of studies have investigated the effects of snake, scorpion and bee venoms as an effective tool in cancer therapy development (**Vyas et al., 2013; Ortiz et al., 2015; Zheng et al., 2015**).

Snake venom is a complex mixture of bioactivity peptides and proteins that have cytotoxic, antitumor and apoptotic effect on different cancer cells (**Corrêa et al., 2002; Son et al., 2007; Song et al., 2012; Badr et al., 2014**). Collectively, these studies outline a critical role in biotherapy of cancer for these components of snake venom like Atropin from *Crotalus atrox*, Kaotree from *Naja naja kaouthia*, Trigramin from *Trimeresurus gramineus*, Rhodostomin from *Calloselasma rhodostoma* and Contortrostatin from *Agkistrodon contortrix* (**Swaim et al., 1996; Lipps, 1999; Zhou et al., 2000; Yeh et al., 2001**).

Scorpion venom is a complex mixture of salts, nucleotides, biogenic amines, enzymes, mucoproteins, as well as peptides and proteins. Due to the medical relevance of scorpion venoms have been applied in traditional medicine, mainly in Asia and Africa for thousands of years (**Goudet et al., 2002; Shao et al., 2007**). Thus far, some studies have focused on some components of scorpion venom that have an antitumor effect like Bengaline from *Heterometrus bengalensis*, Iberiotoxi from *Buthus tamulus*, Margatoxin from *Centruroides margaritatus*, Chlorotoxin from *Leiurus quinquestriatus* and Neopladine 1 and 2 from *Tityus discrepans* (**Galvez et al., 1990; Debin et al., 1993; Garcia-Calvo et al., 1993; D'Suze et al., 2010; Gupta et al., 2010**).

The medical use of bee venom has been known since ancient times due to its healing properties. It can be seen in many religious texts including the Quran, Bible and Veda. The first injectable form of bee venom is developed by Dr. Franz Kretsky (1928) from Austria (**Kim, 2013**). Mellitin and apamin are the most important peptides in bee venom that have an antitumor effect (**Zhou et al., 2013**).

P53, BCL-2 and BAX are proteins play important role in the control of apoptosis. P53 is a protein which plays a critical role in the intrinsic apoptosis pathway activation. Bcl-2 may act upstream of the p53 pathway. The induction of Bax mRNA and protein were found to be stuck in the presence of Bcl-2. The cross-like between Bcl-2, p53 and Bax genes is a significant determinant of drug-induced apoptosis (**Fesik, 2005; Giménez-Bonafé et al., 2009**).

An important therapeutic strategy was suggested to use antioxidant inhibitors and/or reactive oxygen species (ROS)-generating compounds to generate apoptosis in cancer cells (**Haddad, 2004**). ROS stimulate cell death by inducing apoptosis through provide lipid peroxidation and DNA damage. The end product of lipid peroxidation reacts with deoxyadenosine and deoxyguanosine in DNA leading to DNA fragmentation (**Marnett, 1999; Barrera et al., 2008**). GSH depletion affects apoptosis sensitivity by the activation of death signals (caspases 3,8 and 9) and leads to overexpression of Bax and P53 and inhibition of Bcl-2 expression (**Higuchi, 2004; Franco and Cidlowski,**

2009). High concentration of NO. induces cell apoptosis while lower concentration can be antiapoptotic (Nicotera *et al.*, 1995; Dimmeler *et al.*, 1997).

So this work aims to evaluate the possible anticancer effects of some natural venoms of *Naja h. Leirus q.* and *Apis m.*, compared to a synthetic anticancer drug (5-FU). The evaluation parameters include cell viability, the expression of some genes related to apoptosis by semi-quantitative RT-PCR technique and oxidant/antioxidant system analysis.

### Material and Methods:-

5-Fluorouracil, 250mg/ 5mL from EBEWE Pharma Company was diluted in RPMI-1641 media (BioWhittaker™ Classical Media, Lonza) to prepare test concentrations.

### Preparation of venoms:-

Dried snake venom of Egyptian cobra *Naja haje* and scorpion venom of the deathstalker *Leirus quinquestriatus* were kindly supplied from Sera plant VACSERA, Dokky, Giza, Egypt and bee venom of Egyptian bee *Apis mellifera* was supplied from Economic Entomology and Pesticides Department of Faculty of Agriculture Cairo University, Giza, Egypt. Both were dissolved in 2.5mL sterile double distilled water to contain 10mg/mL and sterilized using 0.22 m syringe filter (Millipore-USA) and serially diluted in RPMI-1641 media (BioWhittaker™ Classical Media, Lonza) to the needed concentrations (Gajski *et al.*, 2014).

### Cell lines and culture conditions:-

MCF-7 (Human breast cancer cell line, HTB-22) and Caco-2 (Human colon cancer cell line, HTB-37) and trypsin 0.25% were provided by VACSERA - Cell Culture Unit, Dokky, Giza, Egypt. These cell lines were originally supplied from the American Type Culture Collection (ATCC). Cells were seeded at a density of  $2 \times 10^5$ /ml and routinely cultured in RPMI-1641 medium in tissue culture flasks (Griener, Germany). This medium was supplemented with 5% fetal bovine serum plus 1% penicillin-streptomycin and 1% non-essential amino acids. Then the flasks were incubated at 37°C in a humidified chamber and 5% CO<sub>2</sub> atmospheric condition. When the cells reached confluent monolayer, the cells were trypsinized according to (Masters, 2000).

### Cytotoxicity using sulphodiamine-B assay (SRB):-

MCF-7 and Caco-2 cells were seeded at the density of  $4 \times 10^4$ /mL into 96-well cell culture plates (Nune, USA) in the growth medium. After the confluence of cells, they were treated with different concentrations of test venoms and 5-FU (0.01, 0.1, 1, 10 and 100 µg/ml) as a reference anticancer drug. At 48 h, cells were treated for 1 h with 100 µL of 10% TCA at 4°C and stained with 0.4% (W/V) SRB in 1% (V/V) acetic acid. The optical density was measured at 570 nm after reformation of the dye in 10 mM Tris base (Sigma-Aldrich, USA) using ELIZA reader (Dynatec medical products, England) according to (Houghton *et al.*, 2007). TCA, SRB and acetic acid were purchased from (Sigma-Aldrich, USA).

$$\text{The Viability percentage \%} = \frac{\text{O.D. of treated cells}}{\text{O.D. of untreated cells}} \times 100$$

The half-maximal growth inhibitory concentrations were calculated using (Sigma Plot software).

### Morphological changes:-

Morphological changes were detected 24hrs.post MCF-7 and Caco-2 cells treatment with different test venoms and 5-FU IC<sub>50</sub> values. Cells were investigated using inverted microscope (Leica, Germany) at 20 X magnification.

### RT-PCR (Reverse Transcriptase Polymerase Chain Reaction):-

The primer sequences of the oligonucleotides used for PCR were (Table 1) as follows: GAPDH, sense: 5' CAA GGT CAT CCA TGA CAA CTT TG 3', antisense: 5' GTC CAC CAC CCT GTT GCT GTA G 3'; P53, sense: 5' TCA GAT CCT AGC GTC GAG CCC 3', antisense: 5' GGG TGT GGA ATC AAC CCA CAG 3'; BAX, sense: 5' ATG GAC GGG TCC GGG GAG CA3', antisense: 5' CCC AGT TGA AGT TGC CGT CA3'; Bcl2, sense: 5' GTG AAC TGG GGG AGG ATT GT 3', antisense: 5' GGA GAA ATC AAA CAG AGG CC 3'. Total RNA was extracted by using RNeasy® Mini Kit (QIAGEN®) according to manufacturer's instruction. Total RNA (2µg) was applied for the synthesis of cDNA with QuantiTect® Reverse Transcription Kit (QIAGEN®). PCR was performed in a DNA Thermal Cycler (Applied Biosystems) using QuantiTect SYBR Green PCR Master Mix. The melting curve analysis of the PCR products was performed by StepOne™ Real-Time Systems software V.2.2.2.



**Biochemical evolution:-****Oxidative stress marker:-**

The cells were treated with the IC<sub>50</sub> concentration of venoms and 5-FU for 24h. After 24hrs. post treatment, the cell suspensions were centrifuged. The cell pellets were suspended with PBS (BioWhittaker™ Classical Media, Lonza) and moved into reaction tubes.

**Nitric Oxide (NO):-**

NO. level was measured as total nitrite concentration with Griess method (Green *et al.*, 1982). Griess reagents (1:1) of Sulfanilamide and NEDD were added one by one

**Table 1:-** primers used in RT-PCR assay.

The gene	Primer sequences	Annealing temperature
GAPDH	F: 5' CAA GGT CAT CCA TGA CAA CTT TG 3'	48 °C
	R: 5' GTC CAC CAC CCT GTT GCT GTA G 3'	53 °C
P53	F: 5' TCA GAT CCT AGC GTC GAG CCC 3'	53 °C
	R: 5' GGG TGT GGA ATC AAC CCA CAG 3'	51 °C
Bax	F: 5' ATG GAC GGG TCC GGG GAG CA3'	55 °C
	R: 5' CCC AGT TGA AGT TGC CGT CA3'	49 °C
Bcl-2	F: 5' GTG AAC TGG GGG AGG ATT GT 3'	49 °C
	R: 5' GGA GAA ATC AAA CAG AGG CC 3'	47 °C

F: Forward strand and R: Reverse strand

one, mixed and left 10 min in dark at 25°C. The absorbance of the supernatant was measured photometrically at 540 nm.

**Malondialdehyde (MDA):-**

Lipid peroxidation was measured by the thiobarbituric acid assay (Draper and Hadley, 1990), which measures the production of MDA. 10% trichloroacetic acid was added to cell suspension. The tubes were placed in a water bath and kept at 95 °C for 15 min. After cooling, the suspensions were centrifuged at 3000 rpm for 10 min. 0.67% thiobarbituric acid was added. The tubes were placed in a water bath and kept at 95 °C for 15 min. After cooling, the absorbance of the supernatant was measured photometrically at 532 nm.

**Antioxidative enzymes (Reduced Glutathione GSH):-**

The procedure to estimate the reduced glutathione (GSH) level was according to (Ellman, 1959). The suspended cells were added with sulfuric acid and mixed well. Tubes were left for 10 min at 25°C. The addition of tungstate solution was followed by mixing for 5 min and centrifugation for 20 min at 860 rpm. After 30-60 seconds of the addition of Tris buffer and DNTB reagent to the clear supernatant, the solution colors were measured at 412 nm.

**Statistical Analysis:-**

For statistical comparison of results from different experiments, data were analyzed using one way ANOVA and T-test at significance level (P < 0.05) using Graphpad Prism 5 (Graphpad software, USA)

**Results:-****Cytotoxicity by sulphodiamine-B assay (SRB):-**

MCF-7 cells was treated with venoms derived from *Naja h.*, *Leiurus q.* and *Apis m.* and 5-FU as a standard anticancer drug using 0.01, 0.1, 1, 10 and 100 µg/ml for 48 hours compared with a control of untreated cells. Data recorded revealed that viability percentage and concentration were related. The cytotoxic effect 5-FU wasn't significantly related to the effect of *Leiurus q.* venom (P > 0.05). In the meantime, there was a significant correlation between the effect of 5-FU and the effect of *Apis m.* and *Naja h.* venoms (P > 0.05). Also, there was a non-significant difference in the cytotoxicity of venoms namely *Apis m.* and *Naja h.* (Table 2). Regarding Caco-2 cell, data revealed that the viability percentage was concentration dependent. There was a significant difference of venoms toxicity compared with in MCF-7 cell line due to the difference between effects of test venoms in both cell lines (P > 0.05). Except in case comparison between *Naja h.* and *Apis m.* venoms, the viability was the least in *Naja h.* venom compared with others (P < 0.05) (Table 3). The data recorded revealed the toxicity of test venoms showing a variable reactivity which was cell line and concentration dependent. The IC<sub>50</sub> of *Apis m.* venom is non-

significantly toxic in comparison with *Naja h.* venom ( $P > 0.05$ ) while both were significantly toxic compared to the *Leiurus q.* venom recording  $IC_{50}$  values of 2.5, 3.5 and 27.8  $\mu\text{g/ml}$  for MCF-7 (Table -1). At the same time, the  $IC_{50}$  of test venoms to Caco-2 cells showed that there was a significant toxicity of *Naja h.* venom to both *Apis m.* and *Leiurus q.* venoms by 20, 32.3 and 14  $\mu\text{g/ml}$  respectively. 5-FU as a positive control showed a significant toxicity to both cell-lines than test venoms recording  $IC_{50}$  values of 0.5 and 2.6  $\mu\text{g}$  in case of MCF-7 and Caco-2 respectively (Table 4).

The  $IC_{50}$  values of 5-FU, *Naja h.*, *Leiurus q.* and *Apis m.* venoms was summarized in (Table 3). Data recorded showed that 5-FU as chemotherapeutic agent has a highly cytotoxic effect on both MCF-7 and Caco-2 cells more than venoms as bio-therapeutic agents. *Naja h.*, *Leiurus q.* and *Apis m.* venoms had a medium, low and high cytotoxic effect on both MCF-7 and Caco-2 cells respectively.

**Table 2:-** Percentage viability of MCF-7 cells post 48 hrs. treatment *Naja h.* venom, *Leiurus q.* venom and *Apis m.* venom and 5-FU relative to concentration.

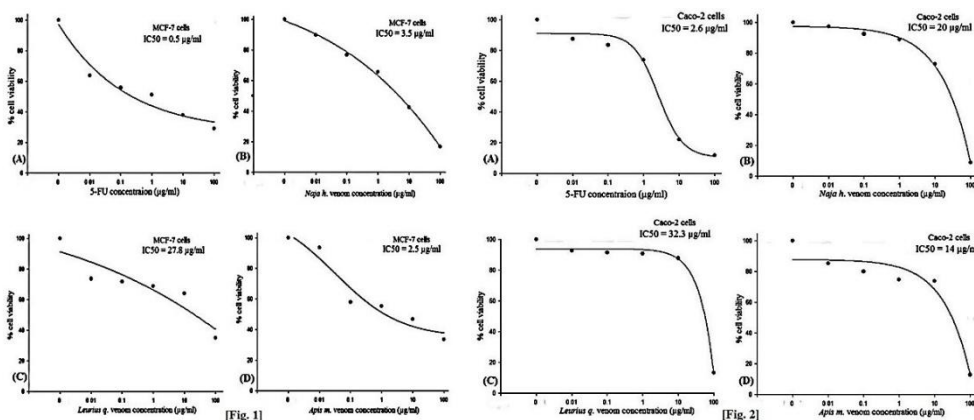
Concentration ( $\mu\text{g/ml}$ )	Percentage viability of MCF-7 cells treated with			
	<i>Naja h.</i>	<i>Leiurus q.</i>	<i>Apis m.</i>	5-FU
0	100	100	100	100
0.01	89.67 $\pm$ 7.58	73.74 $\pm$ 8.82	93.64 $\pm$ 0.36	63.87 $\pm$ 1.5
0.1	76.77 $\pm$ 0.68	71.94 $\pm$ 8.11	57.98 $\pm$ 1.3	55.82 $\pm$ 1.8
1	65.54 $\pm$ 2.94	68.8 $\pm$ 1.83	55.34 $\pm$ 1.16	51.14 $\pm$ 1.44
10	42.54 $\pm$ 9.57	64.2 $\pm$ 3.4	46.94 $\pm$ 0.21	37.94 $\pm$ 1.99
100	16.72 $\pm$ 0.85	35.13 $\pm$ 1.97	33.49 $\pm$ 2.19	29.17 $\pm$ 0.95

Data obtained from triplicate results of three experiments and shown as mean  $\pm$  standard deviation (SD).

**Table 3:-** Percentage viability of Caco-2 cells post 48 hrs. treatment *Naja h.* venom, *Leiurus q.* venom and *Apis m.* venom and 5-FU relative to concentration.

Concentration $\mu\text{g/ml}$	Percentage viability of Caco-2 cells treated with			
	<i>Naja h.</i>	<i>Leiurus q.</i>	<i>Apis m.</i>	5-FU
0	100	100	100	100
0.01	97.27 $\pm$ 5.18	92.69 $\pm$ 4.57	85.25 $\pm$ 0.6	87.56 $\pm$ 2.36
0.1	92.54 $\pm$ 3.45	91.57 $\pm$ 3.08	80.03 $\pm$ 3.62	83.48 $\pm$ 5.25
1	88.98 $\pm$ 8.75	90.78 $\pm$ 8.21	74.84 $\pm$ 1.69	73.87 $\pm$ 5.13
10	72.99 $\pm$ 9.97	87.86 $\pm$ 0.94	73.83 $\pm$ 7.91	22.1 $\pm$ 5.33
100	8.82 $\pm$ 1.03	13.26 $\pm$ 0.3	12.84 $\pm$ 1.21	11.87 $\pm$ 1.2

Data obtained from triplicate results of three experiments and shown as mean  $\pm$  standard deviation (SD).



**Figure 1:-** Survival curve of MCF-7 cells 48 hrs. post treatment with different concentrations of venoms and anticancer drug: (A) 5-FU, (B) *Naja h.* venom (C) *Leiurus q.* venom. and (D) *Apis m.* venom.

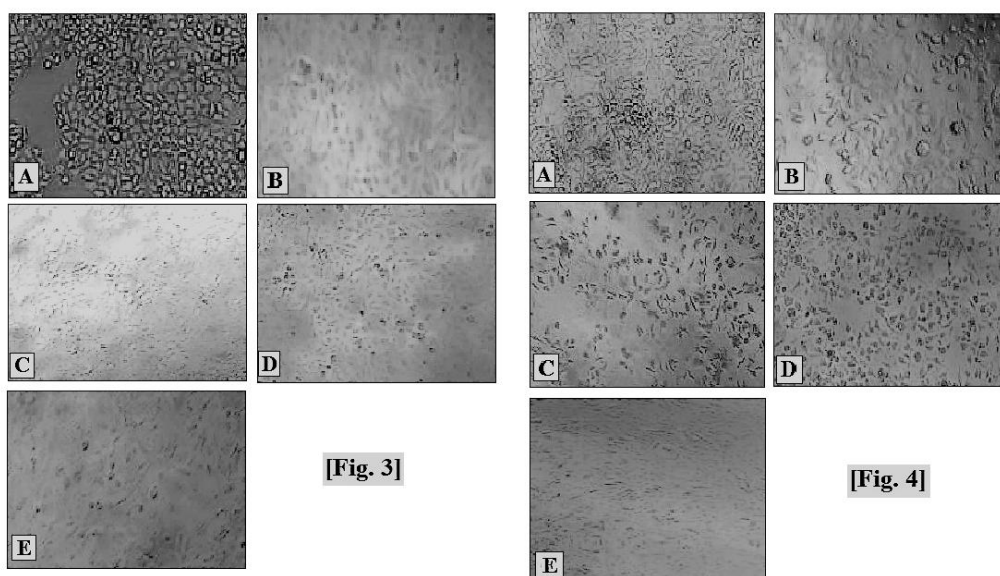
**Figure 2:-** Survival curve of Caco-2 cells 48 hrs. post treatment with different concentrations of venoms and anticancer drug: (A) 5-FU, (B) *Naja h.* venom (C) *Leiurus q.* venom. and (D) *Apis m.* venom.

**Table 4:-** IC<sub>50</sub> of 5-FU, *Naja h.*, *Leiurus q.* and *Apis m.* venoms treatment for 48 hrs.

Treatment	IC <sub>50</sub> (µg/ml) for 48 hrs.	
	MCF-7	Caco-2
<i>Naja h.</i> venom	3.5	20
<i>Leiurus q.</i> venom	27.8	32.3
<i>Apis m.</i> venom	2.5	14
5-FU	0.5	2.6

**Morphological changes:-**

Untreated MCF-7 and Caco-2 cells were well adhered and homogeneously distributed in the culture field exhibiting an epithelial shape with distinct boundaries. Morphological changes of MCF-7 and Caco-2 cells treated with IC<sub>50</sub> concentrations of *Naja h.*, *Leiurus q.* and *Apis m.* venoms and 5-FU for 24 hrs. were obvious whereas cells lost their characteristic appearance and started showing gradual cell shrinkage, cell rounding and detaching from the surface of tissue culture flasks. Finally it was followed by cell swelling and rupture leading to destruction of the cell sheet. It was demonstrated in Caco-2 more than MCF-7. These morphological changes were obvious in the (Figures 3 and 4).



**Figure 3:-** A photograph shows the effect of IC<sub>50</sub> concentration of venoms and 5-FU on MCF-7 cells, non-treated MCF-7 cells (A) and MCF-7 cells treated with 5-FU (B) and MCF-7 cells treated with *Naja h.* venom (C) and MCF-7 cells treated with *Leiurus q.* venom (D) and MCF-7 cells treated with *Apis m.* venom (E) for 24 hrs.

**Figure 4:-** A photograph shows the effect of IC<sub>50</sub> concentration of venoms and 5-FU on Caco-2 cells, non-treated Caco-2 cells (A) and Caco-2 cells treated with 5-FU (B) and Caco-2 cells treated with *Naja h.* venom (C) and Caco-2 cells treated with *Leiurus q.* venom (D) and Caco-2 cells treated with *Apis m.* venom (E) for 24 hrs.

**Effect of *Naja h.*, *Leiurus q.* and *Apis m.* venoms on apoptosis related genes:-**

Regarding the anti-cancer potential of test venoms and the positive control drug it was recorded that P53 gene in MCF-7 and Caco-2 cells treated with the *Naja h.* and *Apis m.* venoms showed a variable significant up regulation of P53 gene post 24 hrs. cell treatment recording elevation rate in the order of 100 % in MCF-7 and 51.9% in Caco-2 for *Naja h.* venom, 50 % in MCF-7 and showed insignificant gene expression recording 15.5% in Caco-2 for *Apis m.* venom. While, *Leiurus q.* venom showed non-significant up regulation of P53 gene compared with its value in non-treated cells by 30% in MCF-7 and non-significant down regulation by 15% in Caco-2. As compared to a synthetic anticancer drug, (5-FU) showed down regulation in the order of 60% and 18.8% in MCF-7 and Caco-2 respectively and compared with negative untreated cell control (Fig. 5).

In the meantime the second pro apoptotic gene (Bax) showed a significant up regulation post MCF-7 cells treatment with *Naja h.* and *Apis m.* venoms recording 30% for both venoms compared to its value in negative cell control. While, *Leiurus q.* venom showed somewhat lower significant up regulation of Bax gene by 10% compared to

negative control cells. However 5-FU drug showed a highly significant down regulation of target gene by 90% compared to non-treated cells (Fig. 5). It was noticed that there was an undetected expression rate in Caco-2 cells treated with *Naja h.* venom followed by the lowest expression rate post cellular treatment with 5-FU 0.09% compared to untreated cells. While, the up regulation rate of Bax gene was significant up regulated in *Leiurus q.* and *Apis m.* venoms treated cells recording 9% and 3.4 % respectively when compared to non-treated cells.

Regarding the Antiapoptotic gene(Bcl2): it was noticed that the Bcl-2 gene was significantly down regulated in both MCF-7 and Caco-2 cells post 24 hrs treatment with *Naja h.*, *Apis m.* and *Leiurus q.* venoms. When MCF-7 cell line was treated for 24 hrs with *Naja h.*, *Apis m.* and *Leiurus q.* venoms and 5-FU, the Bcl-2 gene down regulation rate was significant 40%, 30%, 20% and non-significant 10% respectively ( $P < 0.05$ ). While its down regulation rate was 35%, 88.84% and 97.8% when Caco-2 cell line was treated for 24 hrs. with *Leiurus q.*, *Naja h.* and *Apis m.* venoms and 5-FU respectively ( $P < 0.05$ ) (Fig 5).

**Table 5:-** Expression of Pro and Antiapoptotic genes in test venoms treated cells compared with 5-FU as a positive control and non-treated cells as a Negative control using RT-PCR.

Treatment	P53		Bcl-2		Bax	
	MCF-7	Caco-2	MCF-7	Caco-2	MCF-7	Caco-2
<i>Naja h.</i> venom	2	1.519	0.6	0.7	1.3	---
<i>Leiurus q.</i> venom	1.3	0.85	0.8	0.65	1.1	1.09
<i>Apis m.</i> venom	1.5	1.185	0.7	0.1116	1.3	1.034
5-FU	0.4	0.812	0.9	0.22	0.1	0.00093

**Table 6:-** Effect of IC<sub>50</sub> concentration of Test venoms and 5-FU on the level of MDA, NO. and GSH in MCF-7 treated cells compared to negative control

Antioxidant Treatment	MDA ( $\mu\text{M/ml}$ ) $\pm$ SE		NO. (m M/ml) $\pm$ SE		GSH (mg/ml) $\pm$ SE	
	MCF-7	Media	MCF-7	Media	MCF-7	Media
Control	0.99 <sup>B</sup> $\pm$ 0.02	2.13 <sup>A</sup> $\pm$ 0.02	2.66 <sup>B</sup> $\pm$ 0.05	2.5 <sup>C</sup> $\pm$ 0.02	13.51 <sup>AB</sup> $\pm$ 0.1	10.2 <sup>B</sup> $\pm$ 0.04
<i>Naja h.</i> venom	0.51 <sup>D</sup> $\pm$ 0.03	1.38 <sup>B</sup> $\pm$ 0.01	2.95 <sup>A</sup> $\pm$ 0.07	3.27 <sup>B</sup> $\pm$ 0.0	10.82 <sup>C</sup> $\pm$ 0.1	5.93 <sup>D</sup> $\pm$ 0.18
<i>Leiurus q.</i> venom	0.73 <sup>C</sup> $\pm$ 0.03	1.38 <sup>B</sup> $\pm$ 0.01	2.66 <sup>B</sup> $\pm$ 0.09	3.72 <sup>A</sup> $\pm$ 0.07	11.18 <sup>C</sup> $\pm$ 0.42	13.89 <sup>A</sup> $\pm$ 0.06
<i>Apis m.</i> venom	1.17 <sup>A</sup> $\pm$ 0.01	1.11 <sup>C</sup> $\pm$ 0.08	2.84 <sup>AB</sup> $\pm$ 0.02	3.48 <sup>AB</sup> $\pm$ 0.09	12.04 <sup>BC</sup> $\pm$ 0.12	7.33 <sup>C</sup> $\pm$ 0.13
5-FU	0.54 <sup>D</sup> $\pm$ 0.02	1.1 <sup>C</sup> $\pm$ 0.01	2.92 <sup>A</sup> $\pm$ 0.01	3.57 <sup>A</sup> $\pm$ 0.11	15.27 <sup>A</sup> $\pm$ 0.08	7.53 <sup>C</sup> $\pm$ 0.21

**Table 7:-** Effect of IC<sub>50</sub> concentration of Test venoms and 5-FU on the level of MDA, NO. and GSH in Caco-2 treated cells compared to negative control

Antioxidant Treatment	MDA ( $\mu\text{M/ml}$ ) $\pm$ SE		NO. (m M/ml) $\pm$ SE		GSH (mg/ml) $\pm$ SE	
	Caco-2	Media	Caco-2	Media	Caco-2	Media
Control	0.97 <sup>C</sup> $\pm$ 0.04	2.25 <sup>A</sup> $\pm$ 0.04	2.76 <sup>B</sup> $\pm$ 0.03	3.18 <sup>CD</sup> $\pm$ 0.07	15.69 <sup>B</sup> $\pm$ 0.55	8.78 <sup>C</sup> $\pm$ 0.26
<i>Naja h.</i> venom	0.63 <sup>D</sup> $\pm$ 0.01	1.32 <sup>C</sup> $\pm$ 0.01	2.78 <sup>B</sup> $\pm$ 0.03	3.56 <sup>AB</sup> $\pm$ 0.05	7.93 <sup>C</sup> $\pm$ 0.43	8.33 <sup>C</sup> $\pm$ 0.17
<i>Leiurus q.</i> venom	1.38 <sup>B</sup> $\pm$ 0.06	1.57 <sup>B</sup> $\pm$ 0.02	2.52 <sup>C</sup> $\pm$ 0.05	3.37 <sup>BC</sup> $\pm$ 0.06	18.11 <sup>A</sup> $\pm$ 0.59	6.89 <sup>D</sup> $\pm$ 0.09
<i>Apis m.</i> venom	1.32 <sup>B</sup> $\pm$ 0.03	1.62 <sup>B</sup> $\pm$ 0.01	3.23 <sup>A</sup> $\pm$ 0.06	2.92 <sup>D</sup> $\pm$ 0.06	15.18 <sup>B</sup> $\pm$ 0.51	14.53 <sup>A</sup> $\pm$ 0.04
5-FU	1.61 <sup>A</sup> $\pm$ 0.04	1.38 <sup>C</sup> $\pm$ 0.03	2.76 <sup>B</sup> $\pm$ 0.04	3.79 <sup>A</sup> $\pm$ 0.03	15.31 <sup>B</sup> $\pm$ 0.85	11.35 <sup>B</sup> $\pm$ 0.04

#### Evaluation of MDA, NO. and GSH in cells and media:-

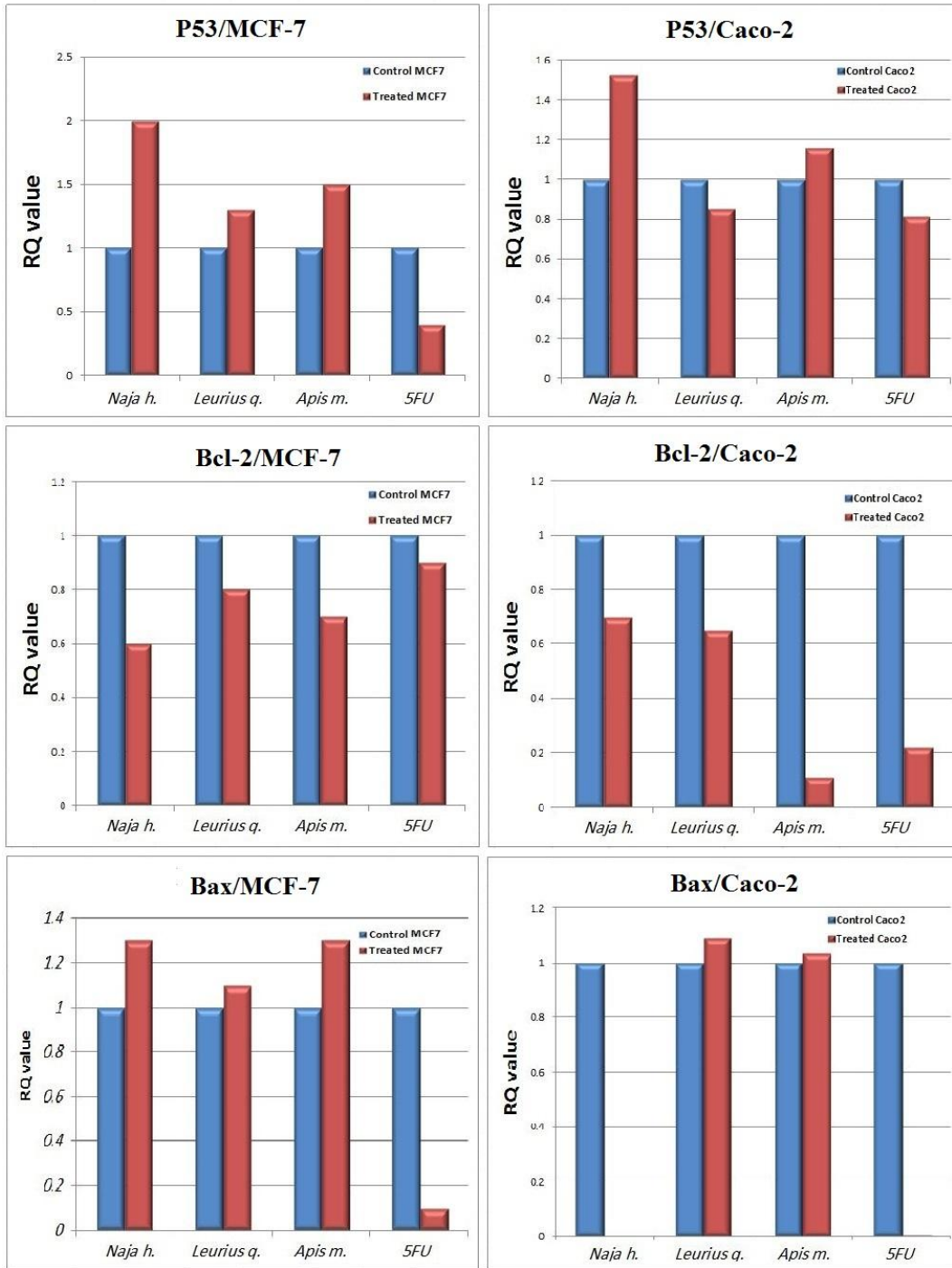
The data recorded of *Apis m.* venom treated MCF-7 cell line revealed that there was a significant increase in MDA level ( $p < 0.001$ ) by 18.18%, while *Leiurus q.* venom showed significant decrease by 26.27%. whereas *Naja h.* venom and 5-FU had highly significant decrease of MDA level ( $P < 0.001$ ) by 48.49% and 45.46% respectively, compared to

the control. MDA level was significantly decreased post MCF-7 cell culture media treated with *Naja h.* and *Leiurus q.* venoms ( $p < 0.001$ ), while *Apis m.* venom and 5-FU showed highly significant decrease compared to the control. In the meantime, the MDA level in Caco-2 cell line showed significant ( $p < 0.001$ ) increase by 42.27% and 36.08% and 65.98% post treatment with *Leiurus q.*, *Apis m.* venoms and 5-FU respectively, while *Naja h.* venom showed a significant ( $P < 0.001$ ) decreased MDA level recording 35.05% compared to the control respectively. MDA level was significantly decreased post Caco-2 cell culture media treated with *Apis m.* and *Leiurus q.* venoms ( $p < 0.001$ ), while *Naja h.* venom and 5-FU showed highly significant decrease compared to the control.

There was no change in the NO. level in MCF-7 cells post *Leiurus q.* venom treatment. Whereas *Apis m.* venom had a non-significant increase of NO. level in MCF-7 cells by 6.77% and *Naja h.* venom and 5-FU showed significant increase in NO. level ( $p < 0.001$ ) in the MCF-7 cells by 10.9% and 9.77% respectively compared to the control. In the MCF-7 cell media *Leiurus q.* venom, 5-FU, *Apis m.* and *Naja h.* venoms showed highly significant increase in NO. level ( $p < 0.001$ ) recording 48.8%, 42.8%, 39.2% and 30.8% respectively compared to the control. While in the case of Caco-2 cells treatment with test venoms it was recorded that *Naja h.* venom and 5-FU had no change in NO. level while *Leiurus q.* venom showed significant decreased value of NO. level recording 8.7% ( $p < 0.001$ ), whereas *Apis m.* venom showed a significant elevation in NO. level recording 17.03% ( $P < 0.001$ ) compared with its values in control cells. Moreover in the Caco-2 cells media treated with 5-FU, *Naja h.*, *Leiurus q.* venoms showed highly significant increase in NO. level ( $p < 0.001$ ) recording 19.18%, 11.95% and 5.97% respectively compared to the control. On the other hand *Apis m.* venom showed non-significant ( $p < 0.001$ ) decrease in Caco-2 media by 8.18%.

GSH level showed a non-significant elevation in MCF-7 cells treated with 5-FU by 13.03% while *Naja h.*, *Leiurus q.* and *Apis m.* venoms recording 19.91%, 17.25% and 10.88% ( $P > 0.001$ ) respectively. In the MCF-7 cell media 5-FU, *Apis m.* and *Naja h.* venoms showed significant decrease in GSH level recording 26.2%, 28.14% and 41.86% ( $P > 0.001$ ) respectively. While *Leiurus q.* venom showed a significant increase in GSH level in media ( $p < 0.001$ ) by 36.18%.

In the meantime the GSH level in Caco-2 cell line had a significant ( $p < 0.001$ ) increase in *Leiurus q.* venom treated cells recording 15.42%. While, *Apis m.* venom and 5-FU had non-significant decrease by 3.25% and 2.42% respectively and *Naja h.* venom had a highly significant decrease recording 49.46% ( $p < 0.001$ ) compared to the control. Also, GSH insignificantly decreased post Caco-2 cell media treated with *Naja h.* venom recording 5.13% ( $p > 0.001$ ). While *Leiurus q.* venom showed significant decrease in GSH level by 21.53% ( $P < 0.001$ ). On the contrary, there was a significant elevation of GSH level detected post cell treatment with 5-FU as



**Figure 5:-** Evaluation of p53, BAX and Bcl2 mRNA expression levels 24h Post MCF-7 and Caco2 cells treatment with IC<sub>50</sub> of *Naja h.*, *Leirius q.* *Apis m.* and 5-FU.

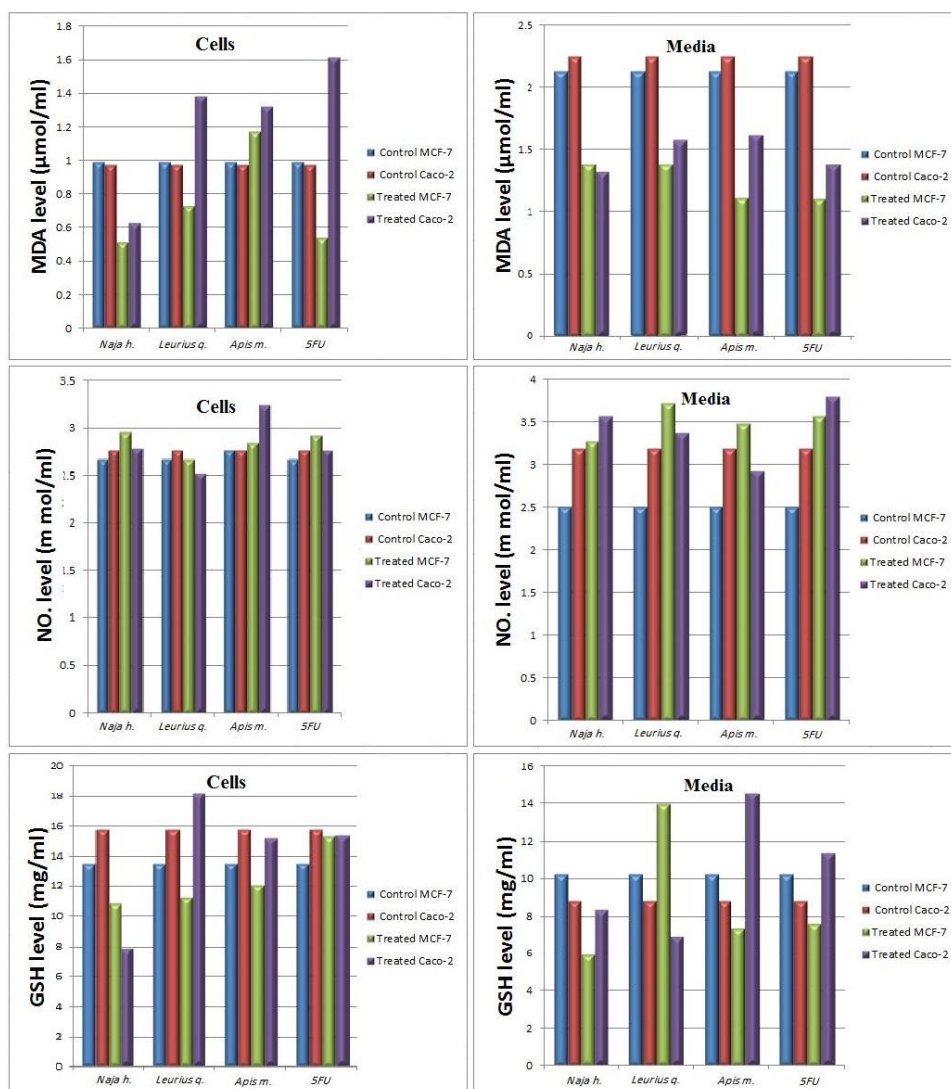
well as *Apis m.* venom recording 29.27% and 65.49% respectively (p < 0.001) compared to the control.

### Discussion:-

Cancer is primarily a genetic disease and is one of the most reasons of death worldwide. Cancer has wide enormous chances to be controlled. There is a vital need to discover a better treatment because of its fast spreading rate in the present era. Recently a significant movement has been made in the direction of understanding suggested hallmarks of cancer growth and treatment. Anticancer drug development from natural resources is offered all over the world.

Venoms of several animal species including snakes, scorpions and bees as well as their biochemical derivatives have shown therapeutic potential against cancer as Captopril and Escozul (Bryan, 2009; Lorenzo *et al.*, 2012). In the near future, these molecules may become well-known anticancer drugs.

In the present study, we traced the apoptotic pattern and anti-proliferation factors to evaluate the probable mechanism of action of *Naja h.*, *Leiurus q.* and *Apis m.* venoms on breast and colon cancer cells. This is done by evaluating the anticancer potentials through measuring the pro-apoptotic and anti-apoptotic genes and related antioxidants profile in treated and non-treated cells compared to the effect of 5-FU as a synthetic anti-cancer drug. Compatible with previous studies, animal venoms have a cytotoxic and anti-proliferation effect on cancer cells (Zargan *et al.*, 2011<sub>b</sub>; Zargan *et al.*, 2011<sub>c</sub>; Park *et al.*, 2011; Ebrahim *et al.*, 2016).



**Figure 6:-** Bar diagram showing the levels of MDA, NO. and GSH in the MCF-7 and Caco-2 cells and media treated with *Naja h.*, *Leiurus q.* and *Apis m.* venoms and 5-FU exposure for 24 hrs. Data are represented the mean  $\pm$  SE.

In another study, *Naja h.* and *Apis m.* venoms and their derivatives showed cytotoxic anti proliferative effect on breast and lung cancer cell lines (El Sharkawi *et al.*, 2015). Another important finding is *Leiurus q.* venom inhibits the proliferation of breast and prostate cancer cells (Omran, 2003). In addition, the Al-Asmari *et al.* study reported that colon and breast cancer cells are sensitive to *Leiurus q.* venom (Al-Asmari *et al.*, 2016a).

Variation in the cytotoxic concentration between the three venoms may be attributed to the variations of venom constituents. In the present study data regarding the morphological findings accompanied with reduction in cell viability was in accordance with data reported by (Akbari and Javar, 2013) assuring that 50% of MCF-7 cells proliferation has been inhibited by 0.38 µg/ml of 5-FU after 48 hours. Also, a study conducted by (Gomez-Monterrey *et al.*, 2013) reported that the proliferation of human colon cancer cells in response to 5-FU, showed that the IC<sub>50</sub> of 5-FU on Caco-2 cell line after 48 hours is 46 µM/ml, which is equal to 5.9 µg/ml. The difference between the results of this study and the previous studies may be due to the difference in evaluation protocols, and species and habitat of used animal as a source of venom.

It is known that oxidative stress occurs as a defense mechanism which is imbalanced by free radicals. This imbalance can be caused by either increased free radical formation or decreased antioxidant capacity (Birben *et al.*, 2012). The mitochondria plays a key role in cell apoptosis and ROS production. ROS have critical actions on both DNA and proteins. The increasing level of ROS causes receptors activation as Fas receptor. ROS oxidize the mitochondrial pores and disrupt the mitochondrial membrane potential that leads to cytochrome C release, mitochondrial membrane lipid peroxidation, membrane fluidity reduction, membrane lipid degradation and *etc.* (Simon *et al.*, 2000).

GSH is one of the main intracellular antioxidants with several biological functions. One of its important functions is to protect against ROS-caused oxidative damage. Also, MDA level provides other marks of oxidative stress association in venom toxicity. Moreover nitric oxide level which is elevated in cancer cells has antitumor activity, but at a lower concentration it stimulates tumor growth (Jenkins *et al.*, 1995). So, this study provides evidence supporting the theory that GSH, NO. and MDA play an important role in genotoxicity of venom treatment.

Regarding the anticancer activity of test venoms based on the elevated or unelevated levels of antioxidant, our data was in agreement with others. For example in Al-Quraishy *et al.* study, it showed that rats injected with *Naja h.* venom had a significant increase of the NO. level in serum and liver tissue by 42.97% and 49.23% respectively (Al-Quraishy *et al.*, 2014). Similar observation was reported by (Dkhil *et al.*, 2014) that *Naja h.* venom increased the NO. level in kidney tissue by 82.2%. Snake venom of *Walterinnesia a.* was found to have an increasing effect on NO. level in breast and prostate cancer tissues by 130% and 100% respectively (Badr *et al.*, 2013). The mechanism of how snake venom increases the nitric oxide concentration was thought to be by up regulating of iNOS gene expression (Al-Quraishy *et al.*, 2014; Dkhil *et al.*, 2014). Al-Asmari and co-workers found that different snake venoms could cause apoptosis in colon and breast cancer cell lines through increasing ROS (Al-Asmari *et al.*, 2016b). Dkhil *et al.* found that *Naja h.* venom induced renal toxicity to rat kidney tissue through decreasing GSH content by 41.02% and through the reduction of GR, GST, and GPx genes expression (Dkhil *et al.*, 2014). In another research, the reduced GSH in liver tissue of envenomed rats with LD<sub>50%</sub> of *Naja h.* venom is due to reduction of GR expression (Al-Quraishy *et al.*, 2014). *Naja h.* venom induced significant increase in lipid peroxidation in the liver and kidney tissues, but not in the heart tissue (Moneim *et al.*, 2015). On the opposite view, *Naja h.* venom induced high lipid peroxidation with LD<sub>50%</sub> to rat kidney and liver tissues and serum by 78.54%, 18.8% and 34.54% respectively (Dkhil *et al.*, 2014; Al-Quraishy *et al.*, 2014).

Also, *Leiurus q.* venom showed a variable effect in antioxidant level and our data was compatible with others. According to Zargan and his team studied the *Odontobuthus d.* venom on MCF-7 cell line and found that 50µg/ml and 100µg/ml scorpion venom increased the NO. level. Also, its concentration in supernatant is increased by 31.23% and 47.95% respectively, when compared to control. In another study of Zargan team but on SH-SY5Y cell line, found that the scorpion venom increased the NO. concentration in supernatant by two fold or four fold by 50µg/ml and 100µg/ml. Another research of this team found that the venom of scorpion *Androctonus c.* (50µg/ml) increased the NO. concentration in supernatant of MCF-7 and SH-SY5Y cell lines by 38.89% and 324.26% respectively (Zargan *et al.*, 2011a; Zargan *et al.*, 2011b; Zargan *et al.*, 2011c). In previous studies, the mechanism of how scorpion venom increases the extracellular nitric oxide concentration is still unknown. Scorpion venom of *Odontobuthus d.* decreased the GSH level in human breast cancer cell line MCF-7 (Zargan *et al.*, 2011b). Envenomed rats with *Leiurus q.* venom had an elevated GSH level in heart and lung tissues (Fatani *et al.*, 2006).



Human lung cancer cell line (NCI-H358) treated with *Androctonus a.* venom showed a significant decrease in GSH level by 16.66 % (Béchohra *et al.*, 2016). Envenomed rats with *Leiurus q.* venom had an elevated MDA level in heart tissue but no change in lung tissue (Fatani *et al.*, 2006). Human lung cancer cell line (NCI-H358) treated with *Androctonus a.* venom showed a significant increase in MDA level (Béchohra *et al.*, 2016).

Most previous studies described that bee venom decreased the NO content and NOS mRNA expression as in BV-2 cell line study (Han *et al.*, 2007). The bee venom has a critical role in increasing the intracellular Ca<sup>++</sup> (Tu *et al.*, 2008). Ca<sup>++</sup> has a role in NO. production as described previously. Furthermore this study of bee venom had neuroprotective effects in mice brain; bee venom neutralized the GSH level in brain tissue (Khalil *et al.*, 2015). And Melittin; the most predominant component of bee venom, slightly reduced the GSH levels in human peripheral blood lymphocytes (Gajski *et al.*, 2012; Gajski *et al.*, 2016). By studying bee venom neuroprotective effects in mice brain was found that bee venom increases the MDA levels in brain by 77.7% (Khalil *et al.*, 2015). Bee venom increased the MDA levels in human peripheral blood lymphocytes by 37.21% (Gajski *et al.*, 2012). Also melittin increased the MDA levels in HPBLs cells (Gajski *et al.*, 2016).

Besides, it was reported that 5-FU induced endogenous nitric oxide in BEL-7402 human liver carcinoma by 173%. *In vivo* and *in vitro* studies of 5-FU induces the expression of iNOS that might be by induction of cytokines (Yin *et al.*, 2007). On the other hand, 5-FU had no effect on nitric oxide production in the DLD-1 colon cancer cell line but also inhibited the cell ability to express NOS mRNA (Jin *et al.*, 1996). In patients with colorectal cancer, GSH levels in plasma and erythrocytes decreased and the lipid peroxidation levels increased after 5-FU treatment (Koçer and Naziroğlu, 2013). In patients with breast cancer, the GSH levels increased and the lipid peroxidation levels decreased after 5-FU treatment (Suhail *et al.*, 2012).

Fighting tumor cells by most anticancer strategies now used in clinical oncology, for example, chemotherapy, radiation, gene therapy or immunotherapy, has been linked to activation of apoptosis signal transduction pathways in cancer cells such as the intrinsic and/or extrinsic pathway. Venoms that have anticancer effect may induce apoptosis by extrinsic and/or intrinsic pathway (Jo *et al.*, 2012; Song *et al.*, 2012). The intrinsic signaling pathway of apoptosis has reported a non-receptor mediated stimuli and production of intracellular signals that act directly on targets within the cell. The stimuli that initiate the intrinsic pathway produce the intracellular signals may be radiation, oxidant agent and toxins. This stimuli depends on the change in the inner mitochondrial membrane and the release of a pro-apoptotic protein such as cytochrome C that activates caspases especially caspase 9 (Fulda and Debatin, 2006).

The control and regulation of apoptotic mitochondrial pathway occurs through members of the Bcl-2 family proteins that can either be pro-apoptotic or anti-apoptotic. The tumor suppressor protein p53 has a critical role in regulation of the Bcl-2 family Proteins (Adams and Cory, 2007). The tumor suppressor gene p53 is activated in the nucleus by DNA damage or oxidative stress. The resulting increase in p53 level leads either to the induction of the cell cycle arrest or apoptosis that suppress the tumor growth (Kruiswijk *et al.*, 2015). Bcl-2 is an anti-apoptotic protein that prevents cell death and apoptosis whereas BAX is a pro-apoptotic protein that stimulates apoptosis (Adams and Cory, 2007).

In agreement with the present study, initiation of apoptosis is explained by up regulation of both p53 and Bax genes expression and down regulation of Bcl-2 gene expression. In other studies, snake venom from *Vipera lebentina turnica* induced apoptotic cell death of human lung cancer cells via increasing of caspase 3, Bax, p21 and p53, but decreasing cIAP and Bcl-2 expressions (Lee *et al.*, 2015). The East-Asian scorpion *Buthus martensi Karsch* on human prostate cancer cells has an apoptotic effect by stimulating the expression of p27 and Bax while decreasing cyclin E and Bcl-2 (Zhang *et al.*, 2009). Bee venom inhibits the cell growth and apoptosis of the human ovarian cancer cells through the inhibition of STAT3 and Bcl2 proteins and increasing pro-apoptotic proteins including caspase-3, 8, and Bax (Jo *et al.*, 2012).

The mRNA expression of apoptosis related genes in MCF-7 cells treated with *Apis m.* venom were more affected than these in Caco-2 cells. In MCF-7, P53 and Bax mRNA expression were increased by 50% and 30% respectively but Bcl-2 mRNA expression was decreased by 30%, when compared to untreated cells. In Caco-2, P53 and Bax mRNA expression were increased by 15.5% and 3.4% respectively but Bcl-2 mRNA expression was decreased by 88.84%, when compared to untreated cells. In the study of bee venom neuroprotective effects in mice brain, it was found that bee venom increases the mRNA levels of caspase-3, Bcl-2 and Bax genes in brain tissues of mice (Khalil

*et al.*, 2015). Furthermore bee venom induced apoptosis in human breast cancer MCF-7 cells, human cervical epidermoid carcinoma Ca Ski cells, human Lung NCI-H1299 cells, human leukemic U937 cells and human bladder cancer TSGH-8301 cells through increasing in P53 and Bax expression and decreasing in Bcl-2 expression (**Jang et al.**, 2003; **Ip et al.**, 2008a; **Ip et al.**, 2008b; **Ip et al.**, 2012). Also, Melittin up regulated the mRNA levels of TP53 (1.4-fold), caspase-7 (2.36-fold), Bcl-2 (2.95-fold) and Bax genes (3-fold) in human peripheral blood lymphocytes (**Gajski et al.**, 2016).

In agreement with the present study, initiation of apoptosis is explained by up regulation of both p53 and Bax genes expression and down regulation of Bcl-2 gene expression. In other studies, snake venom from *Vipera lebetina turnica* induces apoptotic cell death of human lung cancer cells via increasing of caspase 3, Bax, p21 and p53, but decreasing cIAP and Bcl-2 expressions (**Lee et al.**, 2015).

It was reported by (**Ayman et al.**, 2017) that *Cerastes cerastes* venom showed anti-cancer potential against both prostate (PC3) and colon (Caco-2) cancer cell lines and their potential was significantly elevated under the effect of BCG derived PPD protein in a concentration dependent way. Besides, it was reported by (**Abd-Elrahem et al.**, 2017) that propolis, PLA2 and *Apis m.* venom showed anticancer potential in a variable way proving that anticancer activity is P53 gene pathway dependent. Also, it was recorded by (**Ayman et al.**, 2017) and (**Abd-Elrahem et al.**, 2017) that The main phase of cell cycle arrest was G2/M in both cancer cell lines, with a minor S-phase arrest. According to our study results, there is an increase in ROS level in human colon cancer Caco-2 cells more than human breast cancer MCF-7 cells in response to *Apis m.* venom treatment. The elevated ROS level is through increasing of NO. and MDA levels and decreasing of GSH level. GSH, NO. and MDA are well-established signs of oxidative stress and these results might have a role in bee venom cytotoxicity and apoptotic effect. These results are compatible with previous studies that observed bee venom treatment induced ROS production in human cervical epidermoid carcinoma Ca Ski cells (**Ip et al.**, 2008b), human bladder cancer TSGH-8301 cells (**Ip et al.**, 2012) in addition to an increase in hydroxyl radicals and hydrogen peroxides production in human melanoma A2058 cells (**Tu et al.**, 2008). While in mice, bee venom induced an elevation in serum MDA and NO (**Prado et al.**, 2010) and an elevation in brain MDA and a decrease in brain GSH (**Khalil et al.**, 2015). Also, previous studies that described the mode of action of bee venom in cancer treatment found that bee venom induced apoptosis in cancer cells (breast, cervical, prostate and ovarian) through many factors. These may be through ROS production, dysfunction of the mitochondrial membrane potential, suppression of the activated NF- $\kappa$ B, release of cytochrome C from mitochondria, increase in the levels of caspases as caspase-3,8,9, activates DRs as DR3, DR4 and DR6 and increases in the levels of Fas, p53, p21, iNOS, COX-2 and Bax, but decreases in the level of Bcl-2 and STAT3 genes expression. Also Bee venom induces cell cycle arrest and necrosis in some cells (**Ip et al.**, 2008a; **Ip et al.**, 2008b; **Park et al.**, 2011; **Jo et al.**, 2012 ; **Ayman et al.**, 2017; **Abd-Elrahem et al.**, 2017).

Regarding our data concerning the mRNA expression of apoptosis related genes of MCF-7 treated with *Leiurus q.* venom that was more sensitive than these of Caco-2, our result was in agreement with **Alyan et al.** study that studied the effect of a safe concentrations of crude and pure *Leiurus q.* venom on MCF-7 and Caco-2 cell lines. This study found that *Leiurus q.* venom had no effect on caco-2 cells but showed a slight effect on mcf-7 apoptosis related genes (**Alyan et al.**, 2014). While Scorpion venom of *Rhopalurus j.* had dissimilar effect on different cancer cell types. Cervix adenocarcinoma cells (Hela) treated with scorpion venom had a significant increase in p53 and bax expression but Bcl-2 depletion. Also, Scorpion venom has an effect on lung carcinoma cells (A549) through a significant decrease in p53 and bcl-2 but no change in Bax expression (**Díaz-García et al.**, 2013).

Furthermore MCF-7 cells treated with *Naja h.* venom were more sensitive than these of Caco-2 in the mRNA expression of apoptosis related genes. MCF-7, P53 and Bax genes were up regulated by 100% and 30% respectively but Bcl-2 mRNA expression was down regulated by 40%, when compared to untreated cells, while in Caco-2 cells, P53 mRNA expression was increased by 51.9% while Bcl-2 mRNA expression was decreased by 30%, compared to untreated cell control. On the other hand there is no expression in Bax mRNA. MCF-7 cells that was treated with safe concentration of *Naja h.* venom had no effect on the apoptotic related genes. On the other hand, Caco-2 cells had an effect on P53 and Bax and no effect on Bcl-2 (**Alyan et al.**, 2014). Also, *Naja h.* venom up regulated Bax but down regulated Bcl2 protein levels in liver, heart, and kidney tissues (**Moneim et al.**, 2015).

5-FU treated MCF-7 cells showed a down regulation in Bcl-2 and P53 gene expression by 10% and 60% respectively. MCF-7 treated with IC<sub>50%</sub> of 5-FU induced apoptosis by slightly down regulation of Bcl-2 with slight up regulation of P53 genes (**Hernández-Vargas et al.**, 2006). Also, the effect of 5-FU on Caco-2 cells down

regulated P53, Bcl-2 and Bax by 18.8%, 97.8% and 99.91% respectively. In the study that evaluated the apoptosis in various colon cancer cell lines treated with 5-FU, 5-FU induced the lowest Bax expression and not changing in regulation of mutant P53 but a variation in Bcl-2 expression pattern (Nita *et al.*, 1998). Also, it was reported by (Chan *et al.*, 2008) that 5-FU could induce apoptosis in absence of p53 in colon cancer cell lines.

The above results suggest that the half lethal dose (IC<sub>50</sub>) of snake (*Naja h.*), scorpion (*Leiurus q.*) and bee (*Apis m.*) venoms had anticancer potentials on human breast and colon cancer cells and this is positively related to the antioxidant profile and apoptotic gene expression. Hence, we concluded that tested venoms possess many bioactive substances, especially peptides and proteases that bind with high affinity to physiological targets and can be trapped for therapeutic purposes in the near future.

Finally, it can be concluded that snake (*Naja h.*), scorpion (*Leiurus q.*) and bee (*Apis m.*), venoms have anticancer potentials on human breast and colon cancer cells and this is positively related to the antioxidant profile and apoptotic gene expression.

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### RESEARCH ARTICLE

## EFFICACY OF TRANEXAMIC ACID IN REDUCING BLOOD LOSS AND BLOOD TRANSFUSION IN IDIOPATHIC SCOLIOSIS; A SYSTEMATIC REVIEW AND META-ANALYSIS

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#### Abstract

**Background:** Tranexamic acid is a synthetic lysine-analogue antifibrinolytic that competitively inhibits the activation of plasminogen to plasmin, it's a well-documented blood sparing agent. However, its routine use in idiopathic scoliosis surgery is poorly documented. The objective of this meta-analysis was to determine TXA's efficacy in reducing blood loss and blood transfusion in idiopathic scoliosis surgery.

**Methods:** Five databases (*MEDLINE, PUBMED, WEB of SCIENCE, EMBASE and The COCHRANE CENTRAL REGISTER of CONTROLLED TRIALS*) were searched to identify the relevant randomized controlled trials, prospective cohort control, and retrospective controlled trails regarding the TXA efficacy in idiopathic scoliosis surgery. Mean differences (MDs) of blood loss and blood transfusions in TXA-treated group compared to control and/or placebo group were extracted and combined using random-effect meta-analysis model.

**Results:** A total of 7 studies comprising 426 patients were included in the meta-analysis of blood loss according to the pre-defined selection criteria. TXA-treated group had an overall significantly ( $p < 0.005$ ) less volume of blood loss (ES (MD) = 727.71 mL; CI=281.86 – 1173.56 mL). 6 studies comprising 346 patients were included in the meta analysis of blood transfusion, the TXA-treated group had an overall significantly ( $p < 0.001$ ) less transfusion volume (ES (MD) = 268.30 mL; CI= 105.19 – 431.44 mL).

**Conclusion:** Patients treated with TXA had a significantly lower blood loss and lower rates of allogeneic blood transfusion than the control group. Further investigation is required regarding the safety of TXA before it can be generalized in the use of idiopathic scoliosis surgery.

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#### Introduction:-

Idiopathic scoliosis is the commonest type of spinal deformity confronting spinal surgeons.<sup>i</sup> With an insidious onset, relentless progression, and a deadly end result. Scoliosis represents a disturbance of the well organized twenty five member intercalated series of spinal segments. It is, at times, grossly oversimplified as mere lateral deviation of the spine, when in reality, it is a complex three-dimensional deformity.<sup>ii</sup> Two-dimensional imaging systems (plain radiographs or X-ray) remain somewhat limiting, and scoliosis is commonly defined as greater than 10° of lateral deviation of the spine from its central axis.<sup>iii</sup> Once active intervention is indicated, surgical treatment to achieve solid



bony fusion is the treatment of choice.<sup>iv</sup> It is well known that one of the main concerns regarding patients undergoing major operative procedures is the risk of increased perioperative bleeding<sup>v</sup> and major morbidity and mortality rates are associated with intraoperative blood loss and transfusion, thus the use of antifibrinolytics and other measures to control bleeding is crucial. In response to large volumes of blood loss, patients will face an increase in the need of blood transfusion as well as other measures such as intraoperative blood salvage, hemodilution, and controlled hypotension<sup>vi</sup>. Tranexamic acid is a synthetic lysine-analogue antifibrinolytic that competitively inhibits the activation of plasminogen to plasmin; at high concentrations it non-competitively blocks plasmin, thus tranexamic acid inhibits the dissolution and degradation of fibrin clots by plasmin<sup>vii</sup>. It has been implicated in major surgical specialties including cardiac surgery<sup>viii</sup>, trauma<sup>ix</sup> and total knee arthroplasty<sup>x</sup>. Over the last decade, the use of pharmacological approach to control blood loss has highly been promising and recommended<sup>xi</sup>. The use of TXA in spinal surgery has been studied and documented<sup>xii</sup>, but the literature still lacks strong data studying its effectiveness in major spinal procedures. Scoliosis in particular, adolescent idiopathic scoliosis to be specific has a strong impact on patients undergoing scoliosis correction surgery whether it involves posterior or anterior spinal fusion. The procedure itself is not quite simple, in which the surgeon might have to face many objectives and difficulties whether they are intraoperative or postoperative which might include postoperative infection, spinal cord injury, and blood loss associated with major spinal instrumentation and its corresponding procedures. In a retrospective analysis that involved 340 patients and aimed to predict the operative blood loss during spinal fusion of adolescent idiopathic scoliosis, the estimated blood loss was  $907 \pm 775$  mL for posterior spinal fusion,  $323 \pm 171$  mL for anterior spinal fusion, and  $1277 \pm 821$  mL for combined procedures<sup>xiii</sup>, which emphasize that the blood loss in spinal fusion to correct adolescent idiopathic scoliosis cannot be neglected nor underestimated. The objective of this meta-analysis is to determine if the antifibrinolytic tranexamic acid is effective in reducing the amount of blood loss and allogeneic blood transfusion in patients with idiopathic scoliosis undergoing spinal fusion in order to correct the deformity.

## **Methods:-**

### **Study Design:-**

We conducted a meta-analysis and systematic review according to predefined guidelines provided by the Cochrane Collaboration. Five databases (*PUBMED*, *MEDLINE*, *COCHRANE CENTRAL REGISTER of CONTROLLED TRIALS*, *WEB of SCIENCE* and *EMBASE*) were searched to identify the relevant randomized controlled trials (RCTs), prospective cohort control (PCC), and retrospective control trials regarding the effectiveness of TXA in idiopathic scoliosis surgery.

### **Search Strategy and Data Source:-**

Interrelated randomized controlled trials (RCTs), prospective cohort control, and retrospective control trials were distinguished in the MEDLINE and EMBASE, PUBMED, WEB of SCIENCE databases and the COCHRANE CENTRAL REGISTER of CONTROLLED TRIALS from January 1960 through December 2016. Key words used in the search included “antifibrinolytics”, “tranexamic acid”, “cyklokapron”, “aprotinin”, “trasyol”, “epsilon aminocaproic acid”, “amicar” and, “spinal curvatures”, “kyphosis”, “scoliosis”, “lordosis”, “anterior fusion” “posterior fusion”, “randomized controlled trial”, and “comparative study”, “prospective” and “retrospective”.

### **Inclusion and Exclusion Criteria:-**

All the studies were included in accordance to all criteria included mutually based on criteria from 1 to 5 as follows; (1) randomized controlled trials, prospective cohort control and/or retrospective control; (2) subjects who underwent spinal fusion including cervical, thoracic and lumbar scoliosis correction surgery irrespective of anterior or posterior approach; (3) the route of intervention was TXA intravenous (IV) administration in the treatment (experimental) group, accompanied with matched control group and (4) the primary outcome measures should include one of the following outcomes: volume of total blood loss reported outcomes including intraoperative, postoperative, and total blood loss (primary outcomes); and (5) the outcomes that were described included the number of patients receiving blood transfusion, volumes of transfusion packed cells.

### **Studies should be excluded if they:-**

(1) had no interventions of which was described above; (2) studies that included patient with a history of coagulation disorder or recent intake of anticoagulation drugs (one month). (3) Patients with severe cardiopulmonary, renal, and hepatic dysfunction and (4) did not contain any of the outcomes mentioned above (5) involved procedures in idiopathic scoliosis patient other than primary deformity correction.

**Literature Search Results:-**

The internet literature search on TXA yielded a total of 88 studies; PubMed (n=25); Medline (n=24); Cochrane Central Registered Controlled Trials (n=18); EMBASE (n=15) and Web of Science (n=16). Of these 88, only 25 articles were found to be relevant articles on scoliosis corrective surgery regardless of approach. Although all 25 studies were relevant, only 7 were selected for data extractions. The remaining 19 studies did not meet the inclusion criteria and/or did not contain the required information.

**Data Extraction:-**

Eligible articles were reviewed independently by 2 investigators. The titles and abstracts of the references were read. Any disagreement on a controversial study was settled by discussion and consensus with a third author. The collected data included the first authors' name, publication date, region/ethnicity, genotyping method and the total number of cases and controls.

**Bias Risk Assessment:-**

The included studies were assessed for risk of bias by 2 independent researchers and a managing reviewer. Methodological domains were graded individually according to (1) study's design; (2) specific to randomization sequence; (3) adequacy of the methods; (4) level of accuracy of the measurements of blood volumes; (5) appropriateness of the statistical tests used for reporting results. The included studies were graded accordingly (A) adequate = methods were reported and appropriate; (B) inadequate = methods were reported but inappropriate; or (C) unclear = methods were not reported. In addition, all efforts were made to ensure the implementations of Cochrane guidelines for literature search.

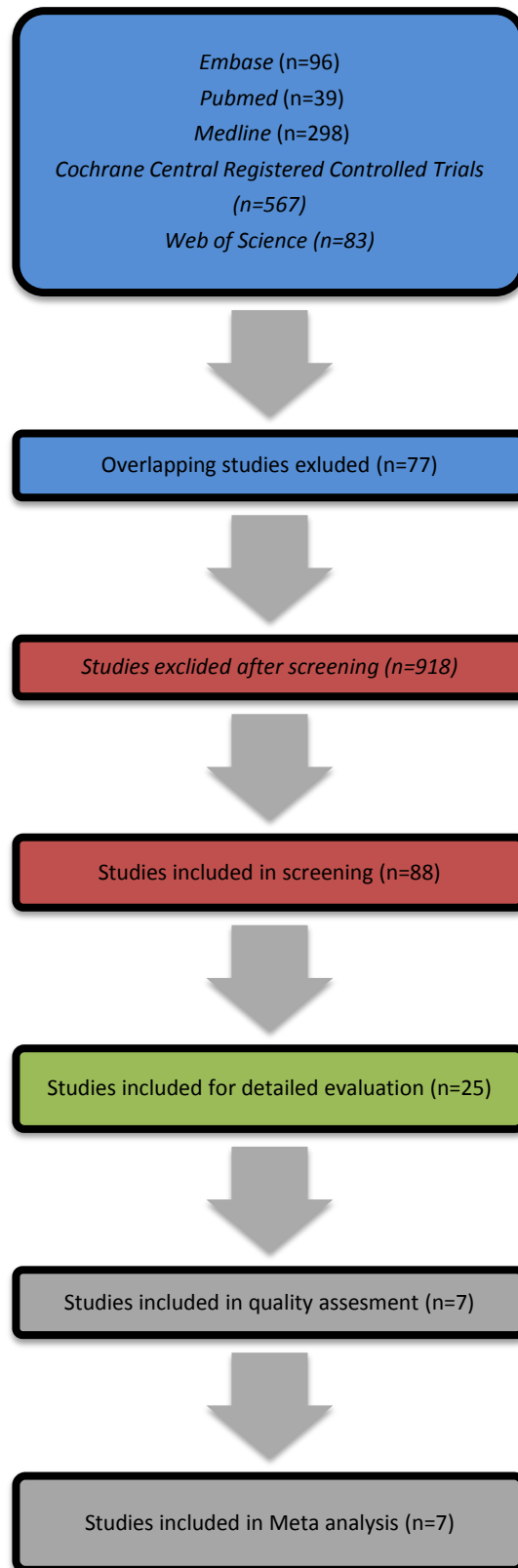
**Statistical Analysis:-**

The effect size (mean differences - MD) of blood loss and blood transfusions in TXA-treated group compared to control and/or placebo group were extracted and combined using random-effect meta-analysis. Heterogeneity parameters (I<sup>2</sup>, r<sup>2</sup> and Q<sup>2</sup>) were used to evaluate the variability among studies relative to the overall effects size. Forest-Plot was generated to display the range of each study relative to the overall range of the model.

**Results:-**

After full text review of the relevant 25 studies, only 7 qualified studies were used in the meta-analysis for blood loss. (*Neilipovitz et al., 2001; Navil et al., 2005; Kaabachi et al., 2007; Grant et al., 2009; Yagi et al., 2012; Bobby et al., 2015; Vinicius et al., 2015*).

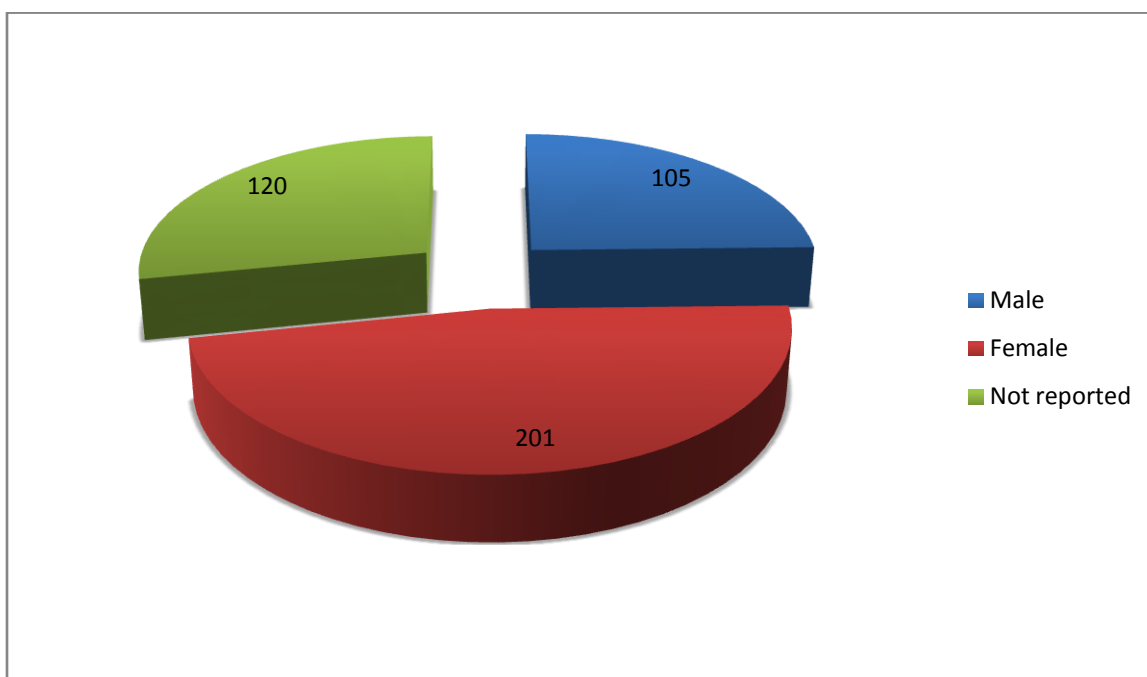
Additionally, 6 studies (*Neilipovitz et al., 2001; Navil et al., 2005; Grant et al., 2009; Yagi et al., 2012; Bobby et al., 2015; Vinicius et al., 2015*) were included in the final analysis for blood transfusion. The basic gender and anthropometric characteristics of the studies are involved in this meta-analysis presented in Table (1), Graph (1) and Graph (2).



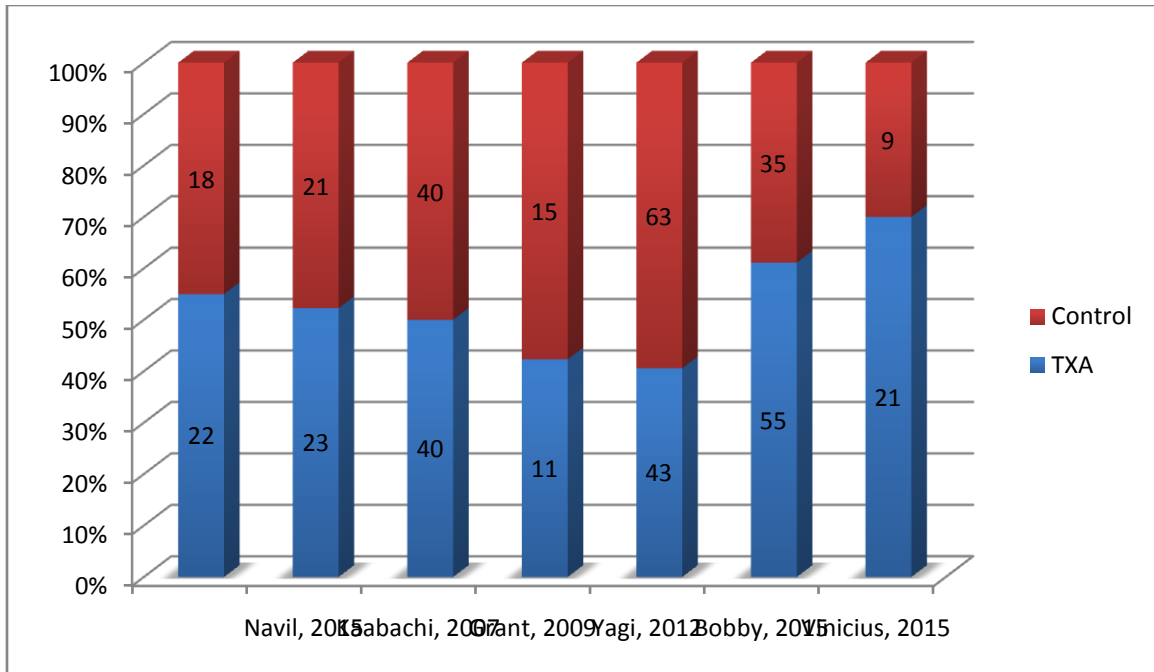
**Flow chart 1:-**showing the process of the Literature review

**Table 1:-** Basic Characteristics of the Studies Involved in the Meta-analysis of the Present Study

Studies	Gender		Age (yrs)		Weight (kg)	
	Male	Female	TXA	C/P	TXA	C/P
Neilipovitz, 2001	17(12/5)	23(10/3)	14.1±2.1	13.7±2.5	41.8±16.7	50.6±20.2
Navil, 2015	30(17/13)	14(6/8)	13.6±1.8	14.0±2	59.4±18.3	52.4±15.7
Kaabachi, 2007	Not reported		11-20		Not reported	
Grant, 2009	15(8)	11(11/0)	15.4±2.2	14.7±2	58.0±10.8	50.3±8.6
Yagi, 2012	43(3/40)	63(4/59)	15.2±2.9	15.5±3	43.9±8.1	43.8±6.8
Bobby, 2015	0	55/35	15.2±2.6	15.3±3	45.3±8.9	42.9±7.8
Vinicius, 2015	Not reported		18.6±4.4	21.61±8	55.5±6.1	51.8±5.9



**Graph 1:-**Overall Gender variation in Meta-Analysis .



**Graph 2:-** Number of patients in tranexamic acid group (TXA) and Control group.

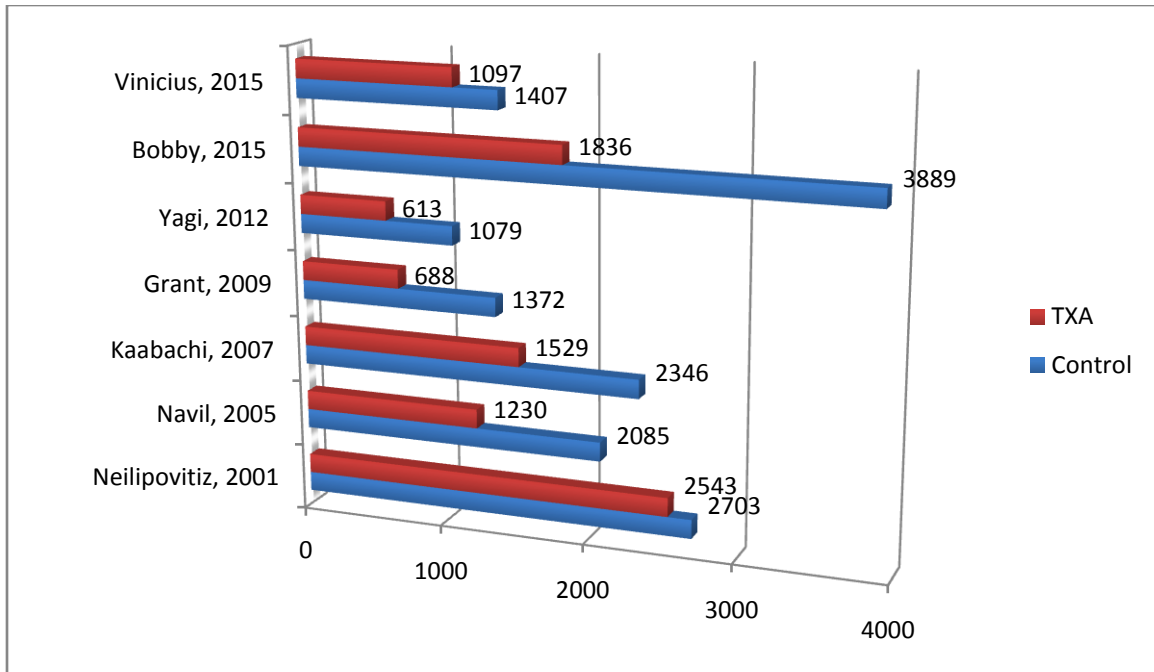
**Meta-analysis for Blood Loss Volume (BLV):-**

For intraoperative blood loss, a total of 7 studies comprising 426 patients were included in the meta-analysis according to the pre-defined selection criteria, described in the methods section. (Table 1) summarized the characteristics and weight effect of the 7 studies included for blood loss (BLV).

**Table 2:-** Studies Profile, Effect Size, Confidence Intervals and Weight for Blood Loss (MBL).

Study (Author&Yr)	Control		TXA		MD	Confidence Interval		Weight
	N	MBL	N	MBL		LL	UL	
Neilipovitz, 2001	18	2703	22	2453	250	-623.734	1123.734	10.81
Navil, 2005	21	2085	23	1230	855	301.848	1408.152	14.40
Kaabachi, 2007	40	2346	40	1529	817	374.214	1259.786	15.64
Grant, 2009	11	1372	15	688	684	-64.316	1432.516	12.16
Yagi, 2012	63	1079	43	613	466	346.818	585.182	18.26
Bobby, 2015	35	3889	55	1826	2063	1205.244	2920.536	10.98
Vinicius, 2015	19	1407	21	1097	310	91.979	526.421	17.72

As shown in (Table 2), all studies’ profile for both TXA and control groups included effect size (MD), upper and lower limits of the confidence intervals (CI) and weight. Graph (3) illustrated the Mean blood loss in both control and TXA. Clearly observed overlap in Forest’s Plot among the CI’s for all studies that indicated generalized homogeneity (Figure 1). The overall model results indicated that the effect size of blood volume loss was 727.71mL with confidence interval (CI) ranged from 281.86 – 1173.56 ml which was significant (p<0.005), implying that the use of TXA caused a substantial reduction in blood loss volume during operation. The model also displays a 95% CI for the between-studies variance estimate implying perfect overlap, hence the observed scatter is due to sampling error, and the null hypothesis is rejected. It can be concluded that the true effects of TXA in all studies are identical. This was also true as I<sup>2</sup> = 90.34% (Table 3), implying more than 90.34% of the proportion of blood loss volume reduction inducted by TXA, treatment effect (Table 3).



Graph 3:- Mean Blood Loss volume (ml).

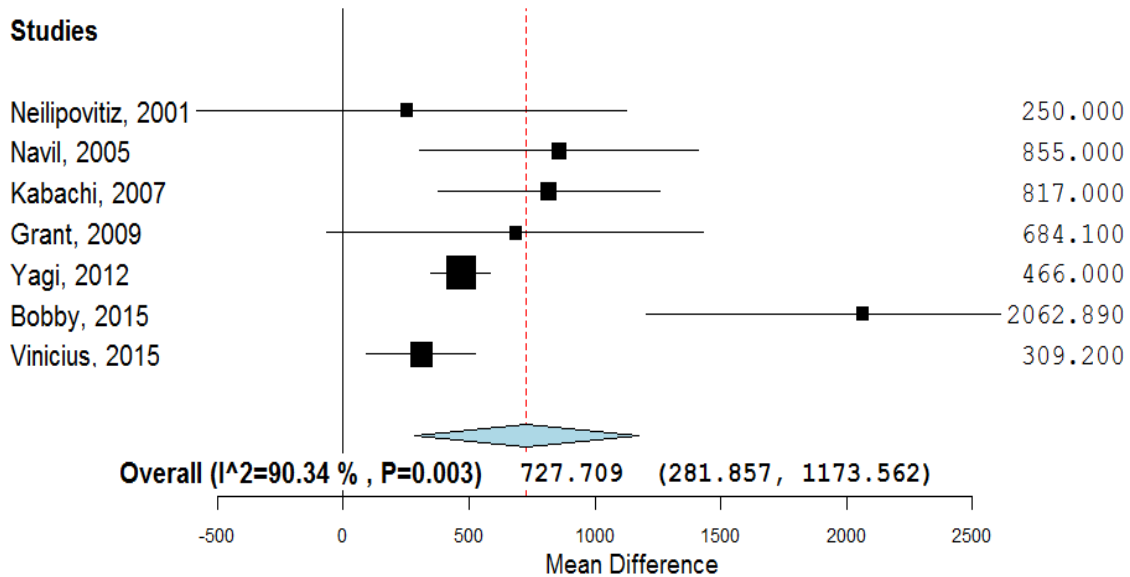


Figure 1:-Forest plot displaying PL meta-analysis

Table 3:- Heterogeneity Measures of Blood Loss

Source	Value	df	p-value
Cochrane Q	20.05	6	0.001
I <sup>2</sup> (%)	90.34		

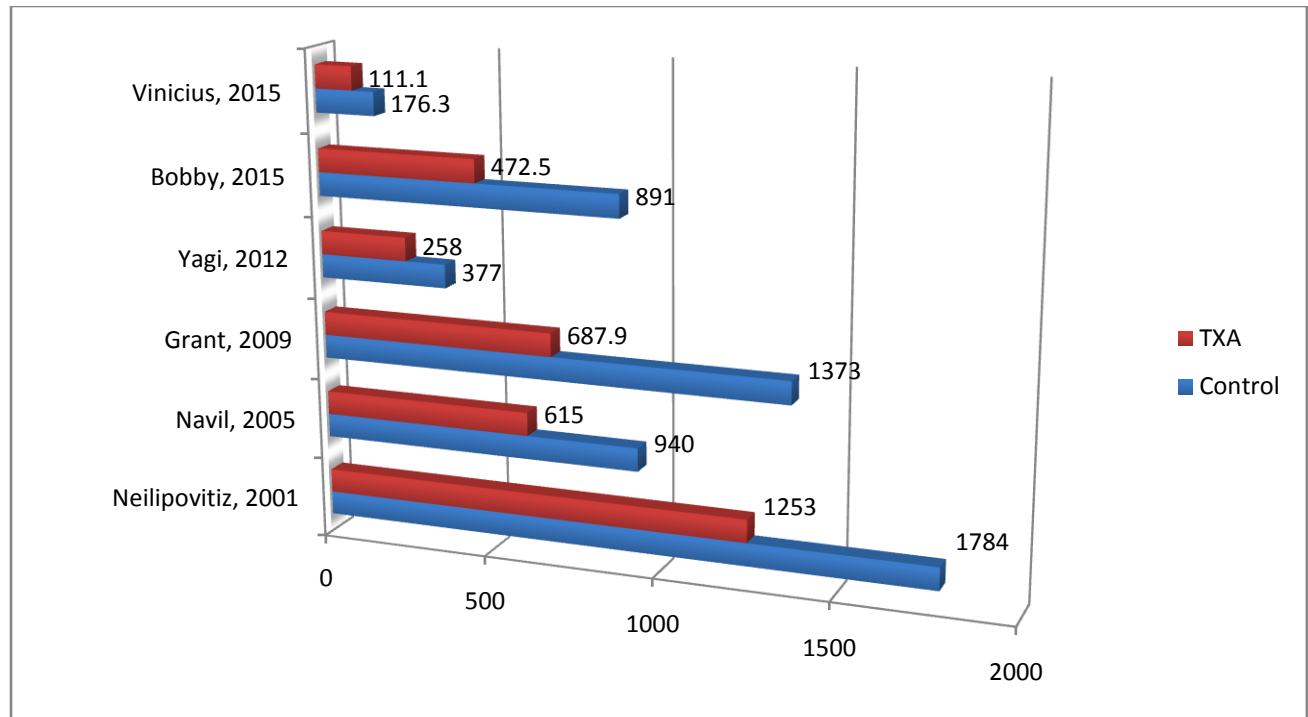
**Meta-analysis for Blood Transfusion:-**

For post-surgical blood transfusions, a total of 6 studies comprising 346 patients were included in the meta-analysis according to the pre-defined selection criteria, mentioned in the methods section. (Table 4) summarized the characteristics and weight effect of the 6 studies included for blood loss. Graph (4) also summarizes the mean blood transfusion. As can be seen from (Table 3), all studies' profile for both TXA and control groups that included

sample size, mean blood transfusion volume (BTV), effect size (MD), upper and lower limits of the confidence intervals (CI) were overlapped as observed in Forest Plot (Figure 2) and that indicated generalized homogeneity. The overall model results indicated that the effect size of blood volume transfusion (BVT) was 268.30 mL, with confidence interval (CI) ranged from 105.51 – 431.41 ml which was significant ( $p < 0.001$ ), implying that the use of TXA induced substantial reduction in blood transfusion postoperatively. As observed from Forest Plot (Figure 2), an overlap among all the CI's of all studies exists. The observed scatter is due to sampling error, and the true effects of TXA in all studies are identical. This is also true as  $I^2 = 72.27\%$ , implying more than 72.27% of the proportion of blood transfusion reduction induced by TXA, treatment effect (Table5).

**Table 4:-** Studies Profile, Effect Size, Confidence Intervals and Weight for Blood Transfusion (BVT).

Studies (Author & Year)	Control		TXA		MD	Lower	Upper	Weight (%)
	N	BVT	N	BVT				
Neilipovitiz, 2001	18.00	1784.00	22.00	1253.00	531.00	29.89	1032.12	7.78
Navil, 2005	21.00	940.00	23.00	615.00	325.00	-35.06	685.06	12.06
Grant, 2009	15.00	1373.00	11.00	687.90	685.10	108.34	1261.86	6.28
Yagi, 2012	63.00	377.00	43.00	258.00	119.00	30.43	207.57	26.95
Bobby, 2015	35.00	891.00	55.00	472.50	418.50	264.78	572.22	23.23
Vinicius, 2015	19.00	176.30	21.00	111.10	65.20	-81.13	211.53	23.69



**Graph 4:-** Mean Blood Transfusion .

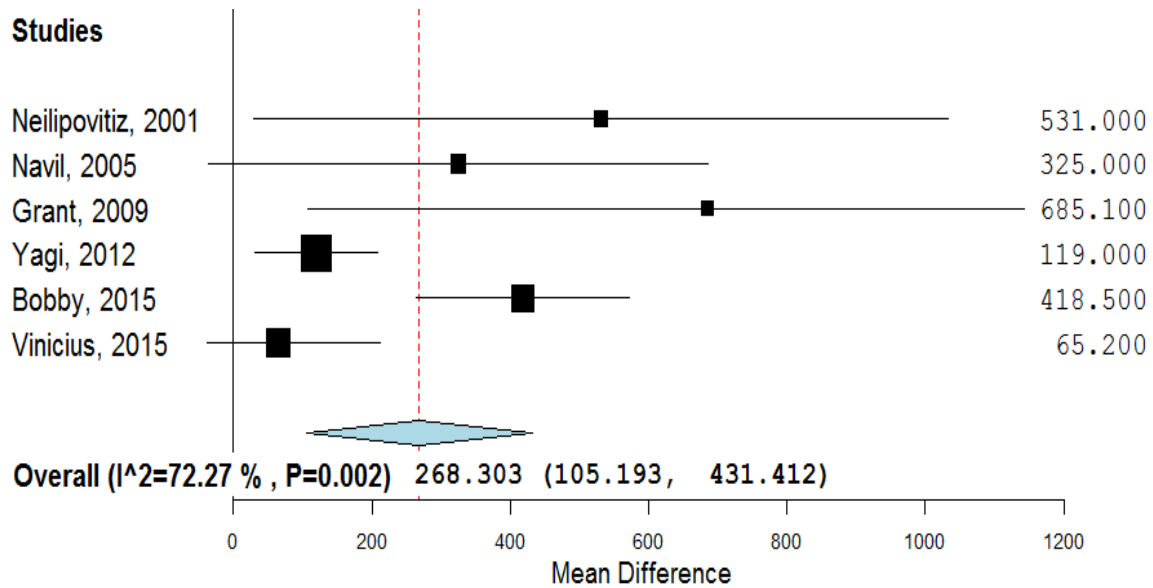


Figure 2:-Forest Plot Displaying PL meta-analysis for Blood Transfusions

Table 5:- Heterogeneity Measures of Blood Transfusion

Source	Value	df	p-value
Cochrane Q	18,87	5	0.001
I <sup>2</sup> (%)	72.27		

**Discussion:-**

This study is ultimately a step forward to generalize the use of Tranexamic Acid in spinal surgery, scoliosis reduction. The results showed positive outcomes and significant differences in terms of blood reduction and transfusions, potentially making TXA the drug of choice. Despite its effectiveness, studies on its prophylactic use in scoliosis surgery are limited. Subsequently, not one article has yet been published in Saudi Arabia. Questions arise on the role of TXA in perioperative blood reduction and postoperative allogeneic transfusion. Having said that limitations can be found in this study due to the inclusion of retrospective studies. However, similar benefits of blood loss reduction and transfusion under the use of TXA have been documented in various surgical specialties such as in total knee arthroplasty<sup>xiv</sup> and radical surgery<sup>xv</sup> to that of spine surgeries. In addition, adverse effects play major role when selecting a drug. David T. Neilipovitz et al.,<sup>xvi</sup> evaluated the risks in a randomized-control trial revealing no cases of clinical thrombotic events or hemodynamic instability. Another study showed the safety of TXA use in scoliosis surgery upon postoperative examination detecting no clinical evidence of deep venous thrombosis<sup>17</sup>. Subsequent to these two studies, numerous other studies support its perioperative safety as shown in the studies included in our meta-analysis (Table 6). Another point to add is the presence of co-morbidity. Patients with preexisting renal or hepatic disorders, bleeding diathesis, or coagulation abnormalities are most commonly excluded from studies due to their vulnerability and susceptibility to adverse events. On the other hand, safe use of TXA can be achieved in variant situations such as adjusting the dosage for patients with renal insufficiency<sup>18</sup>.

When weighing the risks and benefits, dose regimens should be taken in consideration. Not having an established optimal dose can be quite challenging. In high dose versus low dose study, the group of patients on a loading dose of 50mg/kg and a maintenance dose of 5mg/kg/h had a lower estimated blood loss than those who were on a loading dose of 10mg/kg and a maintenance dose of 1mg/kg/h by P=0.01 difference.<sup>19</sup> Nevertheless, high doses of drug raise great concern regarding toxicity, and to which extent of increase can the drug safely be administered. In a TXA study of different dose regimens, Jing-Ming Xie et al.,<sup>20</sup> declared that a loading dose of 100mg/kg with a maintenance dose of 10mg/kg/h, double of which mentioned in the previous study, showed no signs of renal toxicity, seizures, DVT, or MI upon assessment. Conclusively, TXA is a safe drug though an optimum dose is greatly recommended for exploration. Further to be considered is the etiology of the disorder, secondary scoliosis, neuromuscular or congenital etiologies, manifested greater blood loss tendency than that of idiopathic etiology, though the mechanism behind the increase bleeding is undetermined<sup>21</sup>. With such variables, study's results may be



deviated. To illustrate, various measures should be taken in order to minimize the high amount of blood loss experienced in patients' with Duchenne Muscular Dystrophy undergoing posterior spinal fusion such as deliberate hypotension technique and patient positioning, yet with the use of TXA, minimal of 740ml blood reduction and 2135ml maximum is to be expected<sup>21</sup>. Which happens to make TXA the advanced management of neuromuscular scoliosis.

Moreover, hospitals' protocols on autologous blood transfusion, hemoglobin level, and the use of cell saver can bias the study's results. In Ho Yong Choi et al.,<sup>22</sup> study on the effectiveness and safety of TXA in spinal deformity surgery, same blood transfusion guidelines were used for both TXA group and control group, allogeneic transfusions were preformed to maintain hemoglobin level between 7-8 mg/dl. In some institutions, anesthesia protocols are standard in scoliosis surgery which leads to limitations in the study<sup>23</sup>. As well, in randomized-control trials, patients' demographic data such as age, gender, body mass index, medical history vary between the two groups contributing to alteration in the results, but such differences are minor and of little or no clinical relevance. Furthermore, Scoliosis surgery is based on medical criteria. Skeletal maturity, degree of curvature, and progression of the curvature are included when considering the surgery<sup>24</sup>. However, patients as young as 8 years old may undergo idiopathic scoliosis surgery. Hence, introducing a drug for study in a vulnerable age group can be demanding leading to limited studies of TXA in spine surgery. More emphasis on its safety and significant efficacy on both patients and hospitals is crucial. According to the CRASH 2 trial<sup>25</sup>, TXA administration is remarkably cost-effective in low, middle, high income settings directly, and indirectly by reducing the cost of additional hospital stays. In other circumstances, economical saving by decreasing the costs of treatment for allogeneic transfusions' side-effects is promising.

When covering the intraoperative aspect of TXA use, surgeons' and anesthesiologists' preferences are taken into account. In surgery for instance, intraoperative transfusion is based on the surgical team's decision such when hemoglobin level reaches 7.0g/dl or less<sup>26</sup> and the TXA dose to be administered is under the anesthesiologist's preference. David T. Neilipovitz et al.,<sup>16</sup> study conducted a short questionnaire at the end of the surgery that was completed by the attending surgeon rating the level of surgical difficulty on a visual analogue scale of 0 (no difficulty) to 10 (extremely difficult) and the operative conditions in term of bleeding, 0 (negligible bleeding) to 10 (massive bleeding). The results were similar for both TXA group (n=22) and the control group (n=18)<sup>16</sup>. However, upon perspectives, results may respectfully fluctuate. One of the most significant advantages health practitioners will face with the use of TXA is the decline in number of cases of blood-borne infections and immunologic reactions associated with blood transfusions as such cases present to be challenging for surgeons. In our results, a notable reduction of blood transfusion was seen in patients treated with TXA, that happens to make TXA a deal breaker when measuring the consequences. From anesthesia's point of view, it has been addressed that the use of TXA with regional and general anesthesia has no complications<sup>27</sup>. In fact, the use of TXA with epidural anesthesia followed 65% of reduction in blood loss<sup>27</sup>. It is clear that TXA plays a tremendous role in the decline of perioperative blood loss and allogeneic transfusions. Thus, this meta-analysis will help guide future scoliosis management and further study exploration on its use in spine surgeries.

**Table 6:-Post-Surgical Risks**

No.	Author	Post-surgical Risk
1	Neilipovitz, 2001	Safe procedure
2	Navil, 2005	Safe procedure
3	Kaabachi, 2007	No data regarding risks
4	Grant, 2009	No data regarding risks
5	Yagi, 2012	No interoperative complications
6	Bobby, 2015	Safe procedure
7	Vinicius, 2015	Not mentioned

### **Conclusion:-**

Although the number of the patients of each of the study included in this meta-analysis is relatively small, tranexamic acid has been shown to effectively reduce blood loss and blood transfusion in idiopathic scoliosis correction surgery. Further multi-center double blinded randomized control trials involving a larger number of patients is required to confirm the efficacy and safety of tranexamic acid in idiopathic scoliosis surgery.

**Acknowledgement:-**

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### RESEARCH ARTICLE

#### INVESTIGATIONS ON PHOTOLUMINESCENCE PROPERTIES OF NANOCRYSTALLINE ZNO PARTICLES SYNTHESIZED BY SOL-GEL ROUTE.

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#### Abstract

ZnO nanoparticles (ZnO-NPs) were synthesized using sol-gel method. The structural and optical properties were investigated by X-ray diffraction (XRD), scanning electron microscopy (SEM), and photoluminescence (PL). In this study, the effects of annealing temperature on photoluminescence (PL) of ZnO-NPs were studied. ZnO was annealed at various temperatures between 500 and 800 °C. The X-ray diffraction (XRD) results demonstrated that grain size increased with increase of annealing temperature. The average size of the nanoparticles was determined by SEM as well as XRD data and found to be 50 nm after annealing at 800 °C. As the annealing temperature increased from 500 to 800 °C, the intensities of both UV peak and that of green luminescence (GL) enhanced monotonously. The enhancement in the UV peak intensity is attributed to the decrease of grain boundaries and surface states; whereas, the remarkable improvement in the GL is assigned to the out-diffusion of oxygen from the sample up to 800 °C. It supports that GL is induced by the singly ionized oxygen vacancies. These oxygen vacancies are saturated due to the finiteness of the defects at 800 °C.

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#### Introduction:-

ZnO is a promising material for short-wavelength photonic devices since it has a large direct band gap of 3.36 eV, and a large exciton binding energy of 60 meV, all of which are advantageous for light-emitting diode and low-threshold optical pumped laser applications at room temperature. ZnO nanostructures, as well as ZnO films, have gathered considerable attention because they have a wide range of high technology applications like surface acoustic wave filters [1], photodetectors [2], light emitting diodes [3], photodiodes [4], gas sensors [5], and solar cells [6]. ZnO is also receiving a lot of attention because of its antibacterial property and its bactericidal efficacy has been reported to increase as the particle size decreases [7]. However, there is a compromise in the development of a method for preparing low cost ZnO-NPs on a large scale and with high crystalline quality for optoelectronic application. Recently, several new ways have been developed to synthesize ZnO-NPs, such as the sonochemical method [8], oxidation process [9], sol-gel synthesis [10], a polymerization method [11], precipitation [12,13], solvothermal and hydrothermal methods [14-16], CVD [17,18], laser ablation [19] and sol-gel-combustion [20]. In general, the preparation of nanoparticles is a complicated process, and a wide variety of different variables may affect the properties of the final product. Some important variables have distinct effects on the properties of the final product, while others may have only minor effects. In the case of preparation of nanoparticles such as ZnO-NPs, it is very important to obtain a narrow size distribution of the final product, and to be able to control the morphology

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of the ZnO-NPs. This paper reports the synthesis of ZnO nanopowders through sol gel process. The as-grown ZnO-NPs were annealed at various temperatures to improve the crystalline quality and nanoparticle sizes. The structural properties and morphology of the synthesized and annealed ZnO-NPs were characterized by X-ray diffraction (XRD) and scanning electron microscopy (SEM) measurements, respectively. Low temperature photoluminescence (PL) spectra were used to investigate both the optical quality and property of the annealed ZnO-NPs. This is a key aspect for studying the applications of ZnO film in the UV region.

#### Experimental Procedure:-

The ZnO nanopowders (NPs) were grown from sol-gel method. The sol was prepared using zinc acetate dehydrate [ $\text{Zn}(\text{CH}_3\text{COO})_2 \cdot 2\text{H}_2\text{O}$ ; 0.18 M] as the starting material, methanol as the solvent, and citric acid ( $\text{C}_6\text{H}_8\text{O}_7$ ) as the stabilizer. The precursor solution was mixed thoroughly with a magnetic stirrer in 80 °C water bath until the formation of a sol. The sol was preheated in a furnace at 80 °C for 10 h to evaporate the solvent and remove the organic residuals. The powders obtained from the dried sol were then annealed at different temperatures (500, 600, 700 and 800 °C for 3 h at ambient air.

#### Results and Discussion:-

The XRD patterns of the as-synthesized ZnO nanoparticles and those annealed at temperatures of 500–800 °C for 2 h are shown in Fig. 1. Several significant peaks are shown. By comparing with the JCPDS No. 36-1451, the three pronounced diffraction peaks at about  $2\theta = 31.8^\circ$ ,  $34.5^\circ$ , and  $36.3^\circ$  are identified, respectively, as the (100), (002), and (101) peaks of ZnO. The results confirm the hexagonal wurtzite structure of the calcined ZnO NPs. By further increasing the calcination temperature, the three pronounced peaks showed enhanced intensity with reduced full-width at half-maximum (FWHM). It means that crystalline quality was improved and nanoparticle size was increased with annealing temperature. The results show improved crystalline quality of ZnO-NPs by raising the calcinations temperature. The average particle size in the calcined ZnO-NPs was estimated by the Scherrer's relation. The approximate size of the as

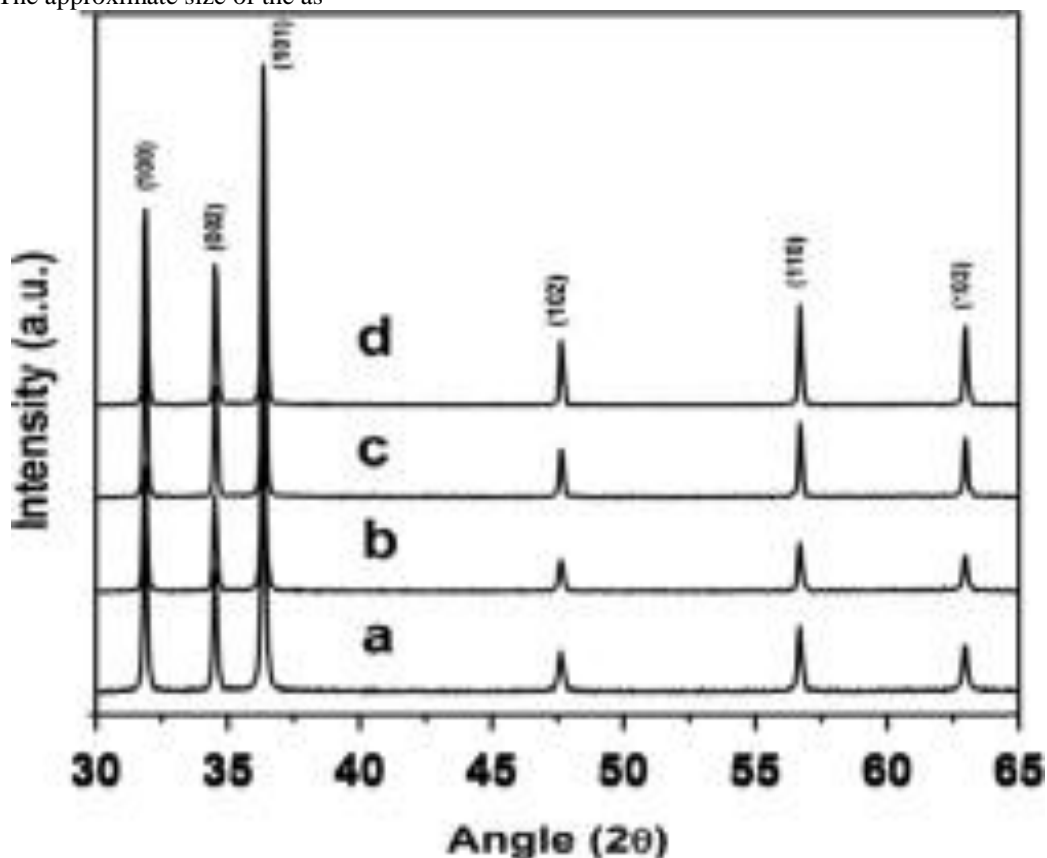
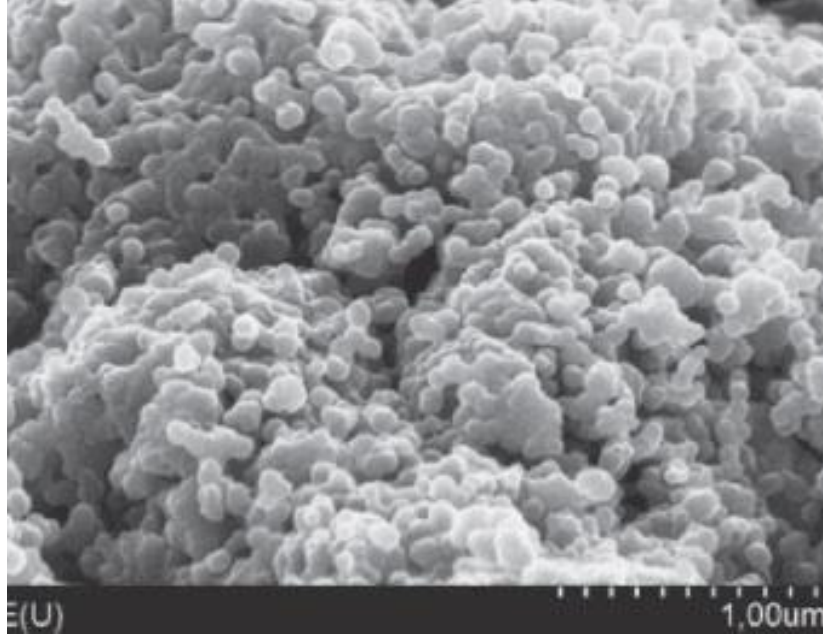
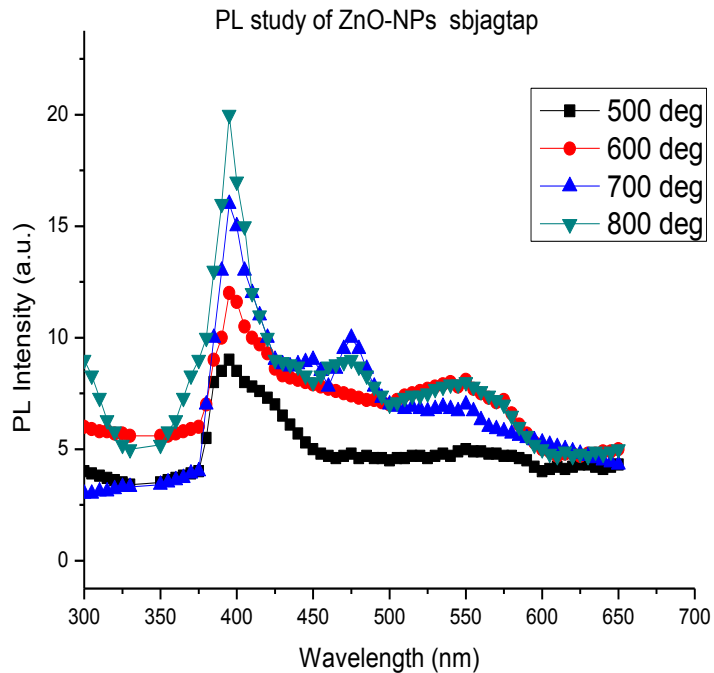


Fig. 1. XRD pattern of ZnO-NPs prepared at different calcinations temperatures of (a) 500 (b) 600, (c) 700 and (d) 800 °C.



**Fig. 2** SEM image of ZnO-NPs after annealing at 800 °C

grown particles is close to 200 nm. The average particle size of ZnO annealed at 500, 600, 700, and 800 °C has been estimated to be about 18, 22, 30, and 52 nm, respectively. The observation shows that by increasing the annealing temperature the crystalline quality and particles size of ZnO-NPs can be increased. The morphology and powder size of the annealed ZnO nanoparticles were studied by SEM. as shown in Fig. 2. The PL spectra from ZnO Fig. 3, consist of a UV emission band and a visible broadband emission. The UV emission is usually attributed to exciton recombination, while the visible luminescence is mainly due to point-like structural defects related to deep-level emissions, such as zinc vacancies, oxygen vacancies, interstitial zinc and interstitial oxygen.



**Fig.3** PL spectra of ZnO nanoparticles annealed at 500, 600, 700 and 800 °C

**Conclusions:-**

ZnO nanoparticles were prepared using the sol-gel method. Sol-gel synthesis is inexpensive process and can be used for wide range of materials. XRD analysis at room temperature shows single phase formation of the sample with hexagonal crystal Symmetry and the crystalline quality was found to be enhanced by annealing temperature. After annealing at 800 °C the mean particle size estimated was found to be around 50 nm using Scherer's formula and SEM analysis shows the particle size to be 70 nm. A sharp, strong and dominant UV emission with a suppressed green emission has been observed which confirms that the synthesized ZnO nanoparticles have good optical properties with low defects. This is a very promising step towards simple, low-cost and high quality synthesis of ZnO nano-powders.

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### RESEARCH ARTICLE

#### RADIATION DOSE AND ASSOCIATED EXPOSURE PARAMETERS IN SELECTED MDCT SCANNERS IN MULTIPHASE SCAN OF ABDOMEN- PELVIC REGION: A CLINICAL STUDY.

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Abdomen-pelvic region, computed tomography, exposure parameters, radiation dose.

#### Abstract

We sought to estimate the radiation dose and associated exposure parameters in the multiphase abdomen - pelvic scan of Multidetector Computed Tomography (MDCT) studies in clinical practice.

This was a retrospective cross sectional study describing radiation dose associated with main exposure parameters in diagnostic multiphase abdomen - pelvic scans performed on 152 consecutive patients by two different sixteen (16) slice CT scanners. Patient information, exposure parameters of CTDI<sub>(volume)</sub>, DLP, kVp, mAs and pitch were recorded for every phases of abdomen- pelvic study from dose report of MDCT scanners.

Patient age range from 18 to 87 years. Overall CTDI<sub>(volume)</sub> median was 63.8 (±10.4)mGy for multiphase abdominal-pelvic scan with scanner A while it was 35.4 (±15.6)mGy for scanner B. Effective dose for patients in multiphase abdomen - pelvic CT scan range from 8.2 mSv to 58 mSv. Median effective dose for patients, who underwent multiphase abdomen- pelvic scan with scanner A and B were 38.5 (± 8.2) mSv and 21.3 (± 8.6) mSv respectively. Median value of exposure parameters of mAs, kVp and pitch were 150 (±29.7), 130 (±15.3) and 1.3 (±0.1) respectively in scanner A. In scanner B; they were 60 (±14.5), 120(±0)and 1(±0). The median effective dose for patients between multiphase abdomen-pelvic scan of both MDCT, a significant difference ( $P<0.05$ ) was observed. Multiphase abdomen – pelvic scan of clinical study shows significant variation of effective dose with reference level of phantom studies (8-14 mSv) and it is highly depend on type of vendors.

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#### Introduction:-

Computed tomography (CT) is useful for diagnostic purposes of abdominal and pelvic diseases and is one of the most important radiological examinations undertaken worldwide [1], [2]. Approximately 3 million scans were performed annually in the United States in 1980, and by 2008 that number had grown to 67 million[3]. CT allows

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physicians to diagnose the injuries and diseases which are related with abdominal and pelvic regions more quickly, safely and accurately than alternative more invasive or less sensitive imaging techniques[2],[3]. In general a CT examination of the abdomen and pelvis includes transaxial images from above or level of the dome of the diaphragm to the just below the ischial tuberosities [4]. In certain cases, it may be appropriate to limit the area exposed and focus only on the area or organs of concern in order to limit the radiation dose. This is especially advised in patients with multiple CT studies and follow-up examinations [4],[5].

Optimizing abdominal CT examination technique requires the supervising physician to develop appropriate CT abdominal protocols based on careful review of the patient history and clinical indications, as well as all relevant imaging studies when available [6],[7]. This optimization process may include determining whether CT examinations of the abdomen, pelvis, or both are necessary. Normally abdominal or pelvic CT examinations may be performed with multiple acquisitions, which include non-contrast, contrast injection of arterial and venous phases. Further according to the pathological condition delay phase also will be included [7-9].

Even though the risk to an individual patient may be small, the increasingly large number of people are exposed, coupled with the increasingly high exposure per CT examination, could transform into many cases of cancer resulting directly from the radiation exposure from CT. The Effective dose from CT is much higher than effective dose in conventional radiography; greater use of CT has resulted in a concurrent increase in the medical exposure to ionizing radiation. Studies of occupational exposure to radiation have provided some direct estimates of the risk at lower doses for adults. Undergoing 2 to 3 abdominal CTs over a person's lifetime can increase the possibilities to develop cancer [10-14]. Relatively fewer data describe how much radiation is received through the most common types of CT examinations for abdomen-pelvic area when applied in clinical practice, as most published studies focused on phantom studies.

Previous literature estimates the radiation dose for an abdomen - pelvic CT to be equivalent to 100 to 250 two view chest series (Anterior posterior and lateral) [15-18]. It is impractical to directly measure the radiation dose absorbed by individual patients even when the radiation emitted by a machine is precisely known. Instead, radiation exposure may be quantified using various methods. Modern multidetector CT scanners (MDCTs) provide two dose parameters that both became available by the scanner manufacturers: the Volume CTDI (CTDI<sub>vol</sub>) measured in mGy, and the dose-length product (DLP) measured in mGy-cm [19], [20]. The total amount of radiation delivered to a standardized phantom is represented by the DLP, which is the product of (CTDI<sub>vol</sub>) and the scan length. Organ doses in CT should well below the threshold for the induction of deterministic effects. CT examinations should be performed only when a net patient benefit is anticipated. Further, the amount of radiation used should always be kept as low as reasonably achievable (ALARA) [21-23]. According to the phantom studies typical effective dose limit of abdominopelvic examination is 8–14 mSv [24].

Higher numbers of MDCT scanners are observed in government and private hospitals in Srilanka, sixteen slices CT scanner is common trend and have higher numbers among MDCT scanners, based on we planned to investigate patient effective dose during multiphase abdominopelvic scan in MDCT [25].

## **Materials and Methods:-**

### **Study Design:-**

This was a retrospective cross sectional study describing radiation dose associated with main exposure parameters in diagnostic multiphase abdomen - pelvic scans performed on 152 consecutive patients by two different sixteen slice CT scanners between January 5<sup>th</sup> and October 5<sup>th</sup>, 2015. Data was collected only from patient who underwent to the multiphase abdomen- pelvic CT examination at one of the hospital in Srilanka. CT data was divided into routine non-contrast phase, contrast triple phase (non- contrast, arterial and venous phases) and multiphase abdomen - pelvic scan (non-contrast, contrast triple and delay phases). Demographic information of patient' age, sex and radiation factors kVp, mAs, pitch, DLP and CTDI<sub>(volume)</sub>, in non-contrast and contrast phases of arterial, venous and delay were recorded from automatically generated dose report from each scanners after the scan is completed. Each hospital use same generation of MDCT but from different vendors.

**Table 1:-** Selection of exposure parameters.

MDCTs	Exposure parameters	Phases	Min	Max	Median
		(n)			
A	kVp	317	85	210	130 ( $\pm 15.3$ )
	mAs	317	75	225	150 ( $\pm 29.7$ )
	Pitch	317	0.8	1.5	1.3 ( $\pm 0.1$ )
B	kVp	302	120	120	120
	mAs	302	60	119	60 ( $\pm 14.5$ )
	Pitch	302	1	1	1

Multiphase abdominal scans performed by same radiological technologist and same time it was interpreted by one particular specialized radiologist. Automatic tube current modulation (ATCM) did not apply for all abdomen – Pelvic scans since it compromising image quality.

#### Calculation of the Effective Dose:-

It is impractical to directly measure the radiation dose received by an individual patient even when the radiation emitted by a MDCT is precisely known. Instead, there are various methods can be used to measure radiation exposure. In our study we used the “effective dose” to quantify the radiation exposure associated with each MDCT multiphase abdomen- pelvic scan; this is one of the most frequently reported measurements. Furthermore, effective dose allows comparison of distribution of radiation dose among individual who referred to the multiphase abdominal – pelvic scan. . The effective dose defines that, the amount of radiation to the exposed organs and each organ’s sensitivity to developing cancer from radiation exposure. Radiation parameter of DLP in MDCTs is combined with the conversion factor  $K$  to translate into the effective dose. Abdomen- pelvis region conversion factor ( $K$ ) is  $0.015 \text{ mSv mGy}^{-1} \text{ cm}^{-1}$ .

$$\text{Effective Dose} = \text{DLP} \times K (\text{Abdomen-pelvis})$$

#### Results:-

##### Demographic Information of Patient:-

Every recorded data is analysed by commercially available Miniab statistical software. Among 152 consecutive patients from both MDCTs, 78 patients were from scanner A while 74 were from scanner B. Mean age of patients from scanner A was  $58.94 (\pm 15.1)$  years and it ranged from 18 – 86 years. In scanner B mean age was  $55.5 (\pm 15.7)$  years; it ranged from 14 – 87 years. Main reasons for multiphase CT examination were due to suspected liver and renal neoplasm, pancreatitis or hepatitis, suspected renal stones or obstructions.

##### Comparison of kVp, mAs and Pitch among MDCTs:-

Many parameters influence to radiation dose in MDCTs. Among these factors kVp, mAs and pitch have a significant contribution to radiation dose which may be changed according to the type of the patient and type of the exam protocol in abdomen- pelvic examination.

A total of 619 phases were performed in 153 patients, 51.21% (317/619) phases received from scanner A while 48.79 (302/619) phases were recorded in scanner B. Some patients received two or more delayed phases from both MDCTs according to disease condition or medical consultant referral. Median value of main exposure parameters of mAs, kVp and pitch were 130 ( $\pm 15.3$ ), 150 ( $\pm 29.7$ ) and 1.3 ( $\pm 0.1$ ) respectively in scanner A. For scanner B; they were 120, 60 ( $\pm 14.5$ ) and 1 respectively. Specially kVp and pitch factors were not changed during multiphase abdominal- pelvis scan with phases for a patient as well as among the patients in scanner B. Overall kVp, mAs and pitch range from 85, 60 and 1 to 210, 225 and 1.5 respectively in both MDCT scanners in multiphase abdominal- pelvis scan.

##### Comparison of Median CTDI (volume) in MDCTs:-

Scanner B had lower median CTDI (volume) value in every phase of multiphase abdomen – pelvis scan than scanner A. Recorded lowest CTDI (volume) was 26.50 mGy. Scanner B had maximum CTDI (volume) for Abdomen – pelvis scan in non-contrast phase, was 23.2 mGy while A had 22.4 mGy. There was a significant difference between the mean and median values in routine contrast and multiphase abdomen-pelvis scan of scanner A. this is due to wide adjustment of exposure parameters between scans.

**Distribution of Median Effective Dose Received By Patients:-**

All phases patient who underwent abdominal–pelvic scan by scanner A received higher median effective dose than patient with scanner B. Minimum effective dose received in patients in non-contrast phase was 2.0 mSv in scanner B , the maximum effective dose was 14.8 mSv in scanner A. The minimum effective dose received by the patient was 6.8mSvand which was from the scanner B. The maximum effective dose received by the patient was 43.4mSv and it has from the scanner A. In multiphase abdomen - pelvic phase maximum effective dose was observed among patients with scanner A, was 58.0 mSv while minimum was observed with canner B, 8.2mSv. Overall median effective dose for patients among both MDCTs differfrom 21.3mSv to 38.5 mSv.

Two tail *t- sample* test performed to check whether any significant differences between the median values of effective dose of patients in every phases, among both MDCTs. It revealed the both scanner median effective dose showed significant difference in any phases ( $P>0.05$ ). Patient received higher amount of effective dose by scanner A than scanner B in every phases of multiphase abdomen- pelvis scan.

**Table 2:-** Variation of CTDI (volume); mGy among scanners

	Number of Patients (n)		CTDI (volume); mGy		
			Median (±SD)	IQR	Min-Max
A	78	NC - phase	16.7 (±3.5)	2.4	5.4 - 22.4
		Triple phase	47.6 (±9.1)	7.6	16.8 - 68.4
		Multi-phase	63.8 (±10.4)	9.7	32.8 - 90.8
	74	NC - phase	8.2 (±4.2)	6.3	1.9 - 23.2
		Triple phase	26.2 (±11.3)	18.2	19.4 - 58.0
		Multi-phase	35.4 (±15.6)	24.2	26.5 - 81.1

**Table 3:-** Variation of Effective Dose; mSv among the scanners

MDCTs	Patients (n)	Phases	Effective Dose; mSv		
			Median (±SD)	IQR	Min-Max
A	78	NC - phase	10 (± 2.5)	2.8	3.4 - 14.8
		Triple phase	29.5 (± 6.4)	7.5	13.5 - 43.4
		Multi-phase	38.5 (± 8.2)	9.5	18.6 - 58.0
B	74	NC - phase	5.25 (± 2.8)	2	2.0 - 18.3
		Triple phase	14.6 (± 6.2)	10.3	6.2 - 40.4
		Multi-phase	21.3 (± 8.6)	9.4	8.2 - 57.3

**Figure 01:-** Distribution of effective dose

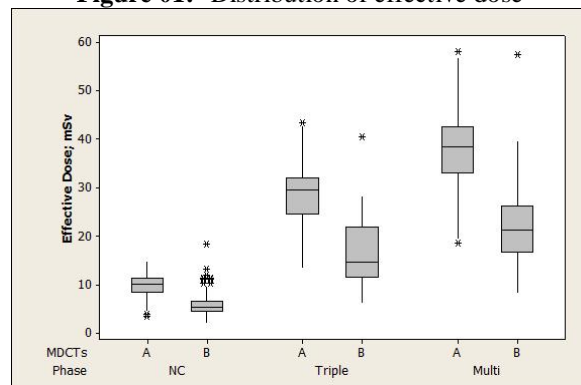


Figure 02:- Effective Dose versus mAS

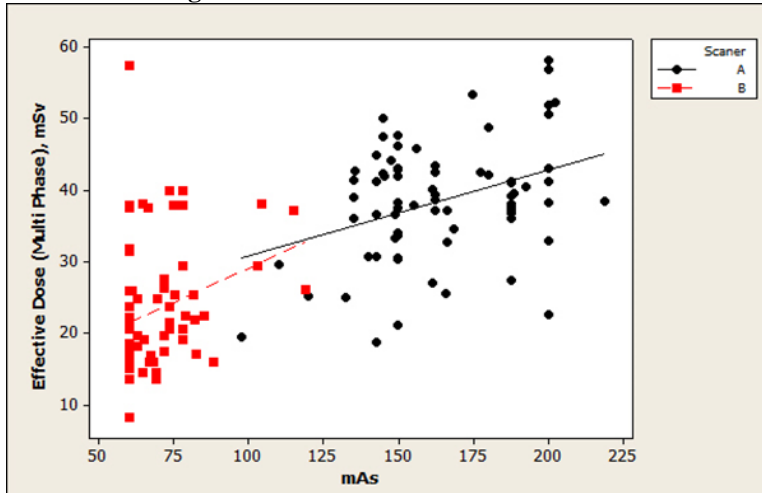


Figure 03:- Effective dose Versus CTDI (Volume)

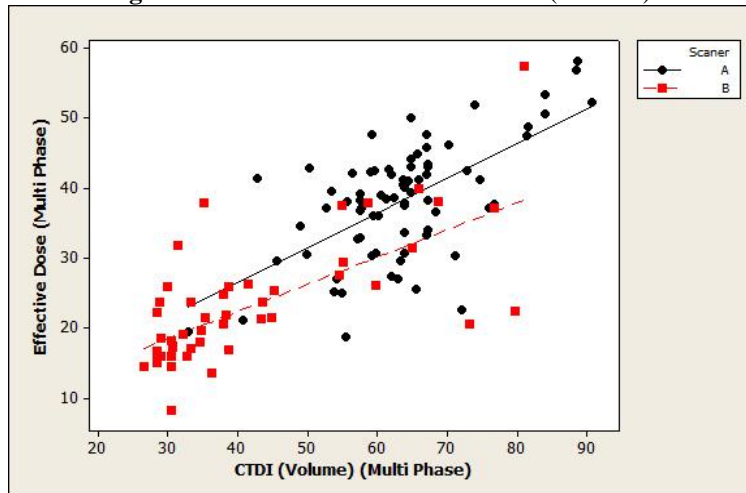
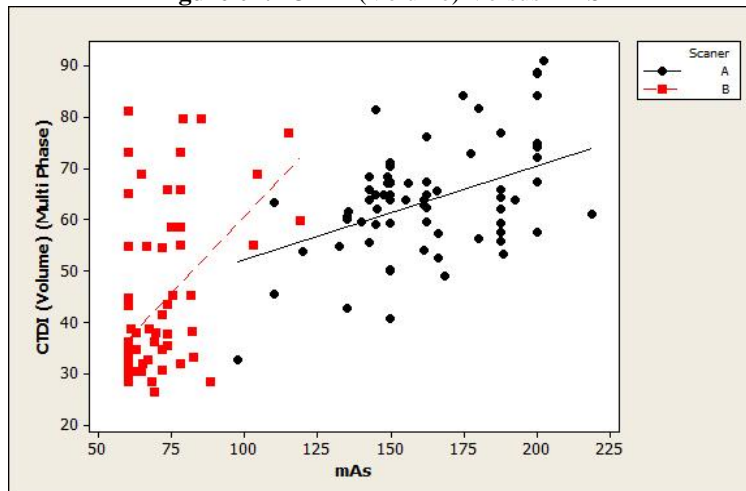


Figure 04:- CTDI (Volume) Versus mAS



**Discussion:-**

The motivation for this study was the anecdotal observation that large number of multiphase abdomen – pelvis scans performed on the patients. In our study we depicted that higher and more variable calculated effective dose than references level of phantom studies (8-14 mSv).

Our calculated median effective dose for patients from both MDCTs A and B were 38.5 ( $\pm$  8.2) mSv and 21.3 ( $\pm$  8.6) mSv respectively, it showed significant difference with phantom studies ( $P > 0.05$ ). Thus, this value depend on where and which MDCTs used to scan an individual with the specific technical parameters used to perform that particular scan. While some of these variations may be clinically indicated to accommodate patients of different size or specific to the clinical question that was being addressed, The variation in effective dose was dramatic and of greater magnitude than widely considered acceptable, particularly considering that the patients were already stratified within relatively well-defined clinical groups.

The doses we documented may be higher than typically reported for following the main reasons. First, we estimated radiation doses received by patients in clinical practice, whereas many previous studies have assessed the dose received in idealized settings on phantoms. Study parameters applied in phantoms may differ substantially from those used in actual clinical settings. Second, most prior work described experience in a single type of MDCT study, where the specific instructions for conducting studies may be standardized. We studied patients in clinical practice, who underwent imaging for a range of clinical indications. For example, a common clinical indication for a multiphase abdomen-pelvic CT scan is suspected renal cancer in a patient.

Other researchers also concluded that calculated effective dose showed considerable variation and different compared to phantom studies [1]. As well we observed through our study according to the type of MDCTs patient will receive various amount of effective doses from abdomen-pelvic scan of MDCT. Mainly it depends on the main exposure parameters kVp, mAs and pitch and the type of scanner.

We conducted our study only on sixteen slice multi detector computed tomography while prior researchers' have not mentioned the type of MDCT scanner, they generally quoted as MDCT. Effective dose for abdomen-pelvic region primarily depend on the type of imaging technique that radiological technologists used to obtain consistent acceptable diagnostic CT images and type of MDCTs.

We noticed radiologic technological technologist performed two or more delay phase scan on abdomen-pelvic region on some patients. This is one of the reasons for high variation values of CTDI<sub>(volume)</sub> and calculated effective dose also. Although the retrospective nature of this study did not allow us to investigate the reasons behind the performance of multiphase abdomen- pelvic scan relay with dose limits according to the international guidelines. We suspect that a lack of focus on performing protocols based dose restriction or automatic mA or kVp modulations were not applied by the radiological technologist during the scan procedure.

There is a possibility that CT may cause more adverse effect than its strength in diagnosing the disease conditions with respect to screening of Multiphase abdomen- pelvic scan conducted in asymptomatic persons [25]. In contrast, CT is generally considered to have a very favorable risk to benefit profile among symptomatic patients.

The patients' exposure to radiation through medical imaging needs to be reduced specially in CT, and we believe that three general approaches should be taken. First, CT examination protocols and techniques should be optimized and standardized to limit the radiation associated with individual scans. This would include standardizing protocols across the hospital and among radiological technologist.

Second, Physicians who recommend the CT scan and radiological technologist who perform the scan should reduce the unwanted multiple series of scan within each examination. Every radiological technologist should possess the knowledge or special training regarding to the implementation of the dose reduction strategies according to the MDCTs types, for example, for certain CT study types, dose reduction techniques can reduce the dose by 50% or greater [26] and encouraging participation in accreditation programs such as that offered by international professional associations. Creating specific standards for CT examinations and requiring adoption would lead to a reduction in median and outlier doses, however in practice, these guidelines have not been widely embraced, perhaps because no regulatory component is associated with their use.

The third approach is to reduce exposure according to the evidence based practice. A good record keeping methods according to the standard regulations will improve the knowledge related to the dose reduction. Picture archiving and communication system (PACS) enable the radiologist and radiological technologist to review the previous record related with CT images and to improve their knowledge.

Our study also has several weaknesses. Our cohort was insufficiently small to understand the reasons for the variation of the dose associated with each individual patient, including the radiological technologist's experience, the availability of physicians to check the studies in real time that might lead them to add or subtract additional series, geographic variation, type and specific dose-reduction or dose modulation algorithms available or used. Patients' body mass index (BMI) is the main factor which will determine how much radiation dose they will receive during the CT examination. However in our study we did not measure the BMI of each patient.

Our work highlights the need for large national studies to understand how these factors contribute to variation in radiation dose. Similarly, we did not access the quality of the CT images through specialized image processing software to check whether they have same image quality or not. We predicted that image quality will be the same because same radiological technologists and radiologist have been worked with both MDCTs.

The methods we used to assess radiation dose may be reliable. We presented "effective dose," calculated using the scanner-provided DLP measurement, because this is simple to calculate, straightforward, and reliable and thus can be used as an easy starting point to begin to record patient-level exposure. Although different metrics yielded slightly different estimates and these methods are based on assumptions of patient size that may not be applicable to all patients, this method is highly concordant with other methods of estimating dose [28].

### Conclusion:-

A significant difference in median effective dose was observed between the two scanners for patient who underwent multiphase abdomen-pelvic scan. Multiphase abdomen – pelvic scan of clinical study shows significant variation of effective dose with reference level of phantom studies (8-14 mSv) and it is highly depend on type of vendors.

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### RESEARCH ARTICLE

## CHYLOUS ASCITES MISTAKEN AS PEG TUBE LEAKAGE IN PATIENT WITH CREUTZFELDT-JAKOB DISEASE IN VEGETATIVE STATE, A DIFFICULT MANAGEMENT SITUATION

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#### Abstract

This paper tries to find out the implications of trade liberalization on international trade tax revenues and its macroeconomic implication on Pakistan economy. The theoretical approach of trade reforms and its impact on the direction of change of revenue is ambiguous because of its dependence on the productivity of 'trade tax revenues'. By using the data of twenty five years, the paper first establishes the productivity of 'trade tax revenues' in Pakistan, then by an econometric analysis exploration of the relationship between trade revenues and trade liberalization in Pakistan is done. It was observed through our analysis that there is high productivity of trade tax revenues, further, our results show a positive and significant relationship between trade liberalization and collection of trade tax revenue. To support this relationship, a second test of Granger's causality is also performed which confirm the causal relationship between trade tax revenues and trade liberalization. It was suggested that supportive macroeconomic policies are prerequisite for successful trade liberalization.

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#### Introduction:-

Chylous ascites is a rare condition characterized by an intra-abdominal accumulation of a milky-appearing fluid that contains high amount of triglycerides<sup>1</sup>. The incidence of chylous ascites is scarce with only one case reported in 20,000 cases admitted in a hospital<sup>1</sup>. To the best of our knowledge the literature is lacking any reported cases in adult from our country and that is due rarity of the condition and probably underreporting.

We report this case as it is the first case we have encountered in our hospital which is a large secondary/tertiary hospital over the last 15 years and because of difficulty in reaching diagnosis and difficulty in management.

#### Case Report:-

A 61-year-old Saudi male known case of diabetes mellitus, hypertension, Creutzfeldt - Jakob disease (diagnosed in USA in 2012) and dementia. He's bedridden on PEG tube and tracheostomy for the last 4 years. He was brought to the emergency department by his family with history of undetectable low BP by their home electronic BP meter. He also, had fever and loose watery stool for 2 days prior to admission.

He had no drug allergies. He was a non-smoker, non-alcoholic and has no history of liver or heart diseases.

He was admitted to ICU on Nov 15th as a case of sepsis/septic shock secondary to urinary tract infection/gastroenteritis, to Rule out MERS-CoV (Middle East respiratory syndrome Coronavirus) and H1N1.He

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developed acute kidney injury, respiratory failure put on mechanical ventilation. Later on, he developed Multi-organ dysfunction syndrome on the 27<sup>th</sup> of Nov which was managed accordingly with broad spectrum antibiotics and vasopressors. He improved gradually.

During the course of his illness the gastroenterologist was consulted for a possible leak from the PEG tube site. On examination the day of consultation, vitals were: Temp 36.5, Pulse 92, BP 123/49, RR 23 on mechanical ventilation through tracheostomy, O<sub>2</sub> sat 97%. Generally, the patient was contracted, opening eyes but not responsive not communicating. His baseline GCS was 4/15 for the last 4 years.

No jaundice, pallor, or lymphadenopathy. Chest was clear bilateral vesicular breathing. Cardiovascular examination normal. No LL edema and no signs of DVT.

Abdomen was Soft, lax and distended, with no scars or dilated veins. There was large ascites.

PEG tube Ex: The tube site was above and left to the umbilicus, there is erythema around it with greenish-yellowish discharge coming freely and with pressure. There was no pus. The PEG tube moves freely to the inside and out and to right and left.

Ascetic tapping was performed and 6 liters of ascetic fluid were drained initially, then the GI consultant was again contacted during the night by ICU. They thought that any feeding given to the patient through the PEG tube was coming out through the ascetic tube drain. The gastroenterologist came to assess the case and possibility of migration of the PEG tube to the peritoneal cavity. Gastrografin dye given through the tube confirmed its presence in the stomach with no leak, also Methylene blue give through the tube did not appear in the ascetic fluid drain that support tube is intact with no leak.

**Lab Test:-**

**Complete Blood Count (CBC):-**

WBCs 9.79x10<sup>3</sup>/μL, HGB 9 g/dL, Platelet Count 242x10<sup>3</sup>/μL, MCV 79.5 fL, MCH 25.2 pg.

**Basic Screen:-**

NA 149 mmol/L, K 4.3 mmol/L, CL 120mmol/L, HCO<sub>3</sub> 19 mmol/L, BUN 13.4 mg/dL, CR 94 mmol/L, Random Glucose 15.4 mmol/L.

**Renal Profile:-**

GFR 76 mL/min, Adjusted Calcium 2.21 mmol/L, Phosphate 1.11 mg/dL, Magnesium .98 mEq/L, Uric Acid 317 μmol/L.

**Liver Profile:-**

Total Bilirubin 9.9 umol/L, Total Protein 42 g/L, Alkaline Phosphatase 82 IU/L, AST 15 IU/L, ALT 14 IU/L, ALB 27 g/L.

**Coagulation Profile:-**

PT 14.4 sec, INR 1.5, PTT 39.9 sec.

**Coronary Risk Profile:-**

Cholesterol 1.33 mmol/L, Triglyceride 0.70 mmol/L, HDL 0.35 mmol/L, LDL 0.57 mmol/L.

**Ascetic Fluid:-**

appearance was turbid, milky. The analysis showed RBCs 111x10, WBCs 3889x10, lymphocyte 2%, monocyte 3%, Segs 95%, LDH 647 U/L, Triglyceride 9.58 mmol/L (848mg/dl), albumin 18 g/L, total protein 35 g/L, amylase 42 U/L, cholesterol 1.17mmol/L and culture revealed no organisms.

Cytology report: Negative for malignant cells. TB PCR was negative. Adenosine deaminase was negative. TB culture negative.

Echo: Showed EF of 55-60%, RVSP 52 mmHg, normal biventricular systolic function, Mild LVH with impaired relaxation, trivial mitral regurgitation. Mild to moderate tricuspid regurgitation and trivial pericardial effusion.

Abdominal and pelvic CT scan showed no definitive contrast leakage at the gastrostomy site and no pneumoperitoneum. Bowel wall thickening involving part of the jejunum and the left recto-sigmoid area with mild abdominal ascites. In addition it showed small left pleural effusion and diffuse bony osteopenia.

Colonoscopy: Showed large diffuse ulcerations at the recto-sigmoid area. Rest of the colon was normal. Multiple biopsies and cultures taken.

The biopsies showed large bowel-type mucosa with benign ulceration, with no evidence of granulomas, dysplasia or malignancy.

With the above investigations there's no clear identified cause for the chylous ascites. It was decided to perform a diagnostic laparoscopy and peritoneal biopsy to rule out tuberculosis and malignancy but because of the patient's general condition and vegetative state the surgeon and family did not agree for the procedure. The patient was managed conservatively and started on octreotide 100 mcg subQ every 8 hrs, plus trial of Orlistat and medium chain fatty acid diet with repeated paracentesis in case of increase abdominal distension. It was noticed that re-accumulation of fluid is becoming less.

Patient stayed in the ICU for 6 weeks receiving broad spectrum antibiotic and supportive care.

He improved gradually, weaned of ventilator and kept on O<sub>2</sub> through tracheostomy tube. His general condition stabilized and return to the base line status transferred to step down ward. Finally he was taken home to be cared-of by his special nurse with tracheostomy and O<sub>2</sub>, PEG tube and Foley catheter to be followed by home health care team accordingly.



### Discussion:-

Chylous ascites is a rare condition defined as an intra-abdominal accumulation of a milky-appearing fluid<sup>1</sup>. It was first identified by Morton in 1691<sup>2</sup>. Thereafter the first acute case was admitted by Renner in 1910<sup>3</sup>. The characteristic feature of chylous ascites is the presence of high fat (triglyceride) content in the ascetic fluid, usually greater than 110 mg/dl<sup>1</sup>. The incidence of chylous ascites is scarce with only one case reported in 20,000 cases admitted in a hospital<sup>1</sup>. However, the incidence of this condition is increasing with time due to prolonged lifespan of patient with malignancies and due to vigorous cardiothoracic and abdominal procedures<sup>2</sup>. Regardless, there have not been many cases reported until this given day.

From our country there has been no reported case in adult. We have seen one case in patient with liver cirrhosis (not reported). There has been one report of infantile intestinal lymphangiectasia and chylousascites<sup>4</sup>. We think the discovered cases are underreported.

There are a wide variety of conditions that can lead to chylous ascites. Causes of chylous ascites can be categorized into two main groups traumatic and non-traumatic. Traumatic causes include surgically-induced chylous ascites for example, retroperitoneal lymphadenectomy, peritoneal dialysis catheter placement, Nissen fundoplication, and pancreaticoduodenectomy<sup>5</sup>. Abdominal aortic aneurysm repair procedure accounts for more than 80% of the post-operative Chylous ascites cases<sup>6</sup>. And non-surgically induced chylous ascites like in case of radiotherapy<sup>7</sup>. Non-traumatic causes comprise some congenital conditions like Kippel-Trenaunay syndrome, primary lymphatic hypoplasia and lymphangioma<sup>8</sup>. According to a recent reported case, appendicitis can be a cause for the development of Chylous ascites<sup>9</sup>.

Liver diseases like cirrhosis can frequently give rise to chylous ascites. Furthermore, cardiac diseases like congestive heart failure, gastrointestinal conditions like small bowel volvulus, intestinal malrotation and celiac disease can contribute to chylous ascites. Tuberculosis and filariasis are the commonest infectious causes. Inflammatory disorders like pancreatitis, fibrosing mesenteritis, sarcoidosis, systemic lupus erythematosus and nephrotic syndrome can induce chylous ascites as well<sup>6</sup>.

According to a recent study, abdominal malignancies, liver cirrhosis and tuberculosis are the most common encountered contributors for this condition<sup>8</sup>.

Our patient's clinical condition did not allow extensive investigations partly due to patient's factors since he has poor general condition, bedridden in vegetative state for 4 years and partly due to family issues as they don't like to expose the patient to any more invasive procedures like laparoscopy and lymphangiography. However the patient has almost satisfactory investigations to rule out cardiac, liver, malignant or infectious causes. There has been no history of trauma since he did not undergo any invasive procedure.

Filariasis is very rare in our region and there hasn't been any cases reported. Patient didn't have any risk factors to get filariasis.

People with this condition present with progressive, painless abdominal distention which occurs over weeks to months, according to the primary cause. A non-specific pain could be the only presenting complaint<sup>8</sup>. Ascites can cause dyspnea owing to the high intra-abdominal pressure. Other clinical features include edema, weight gain, anorexia, weakness, lymphadenopathy, night sweats, early satiety, fever and other characteristic of the underlying disease. Physical examination could reveal ascites with positive fluid wave and/or shifting dullness, pleural effusions, lower extremity edema, lymphadenopathy, cachexia, temporal wasting, abdominal masses, hernias and other stigmata of the underlying illness<sup>1,10</sup>.

Since our patient was in vegetative state and bed ridden, the ascites was noticed late when it became large.

The diagnosis is mainly based on the analysis of ascetic fluid and paracentesis. Chylous ascites is characterized by its odorless milk-like appearance, alkali bacteriostatic nature, specific gravity of more than (1.012), sterile culture and resisting putrefaction, positive fat staining and ether test<sup>11</sup>. The serum to ascites albumin gradient should be calculated to determine if the ascites is related to portal hypertension or other causes<sup>12</sup>. The triglycerides level in chyle is greater than that in plasma, typically 2-8 times the plasmalevel<sup>13</sup>.

**Table 1:-** Characteristics of Chyle

Chyle content	2.5-7 g/dl
Triglycerides	>200 mg/dl
Cholesterol	Ascites: serum <1
Total solids	>4%
Cell count	>500 (predominantly lymphocytes)
SAAG	<1.1

SAAG: Serum ascetic fluid gradient

Gram staining, lactate dehydrogenase, amylase, lipase cytology, culture, glucose and ascetic fluid for cell count should be performed as well<sup>3,14</sup>.

In addition Adenosine deaminase activity (ADA), culture and tuberculosis smear when Tuberculosis is suspected<sup>15</sup>. In our case the tuberculosis PCR, culture and adenosine deaminase all were negative that make abdominal tuberculosis unlikely. Cytology was also negative in two occasions.

The initial ascetic tap result with high neutrophils count suggested superadded acute bacterial peritonitis which has been treated. The culture was negative because the patient had been on broad spectrum antibiotics prior to the tapping.

Other diagnostic tools include laparotomy, lymphangiography, lymphoscintigraphy and computed tomography<sup>1</sup>. In our case we were unable to proceed for invasive diagnostic procedures because of the patient's clinical condition, in addition the surgeon and family reservations.

Looking at the major causes of chylous ascites we think that our patient has idiopathic chylous ascites since no obvious cause could be identified after doing most of the necessary investigations.

The main stay of therapy is treating the underlying cause, especially in infectious, malignant or inflammatory causes. Regardless, conservative management is usually effective for most patients. It consists of stopping the patient's oral nutrition, administering somatostatin analog, diuretic and diet therapy with medium-chain triglycerides (MCTs) and administration of total parenteral nutrition (TPN), alone or in combination<sup>16</sup>. These measures are directed to decrease chyle formation and enhance nutritional states<sup>17</sup>. Paracentesis is both diagnostic and therapeutic method in chylous ascites management. In the face of various certain disadvantages and complications, among the non-operative management plan, a frequently done paracentesis is routinely included to lessen abdominal distention<sup>18</sup>. Urgent exploration is compulsory in some acute presentations<sup>19</sup>. Peritone-venous shunting could be the ultimate choice if the case is unqualified for surgery and not responding to non-operative options<sup>20</sup>.

In the present case a definite cause has not been identified therefore we opted to treat him conservatively, initially he has been tried on octreotide and Orlistat. Later on medium chain fatty acid diet was introduced. He showed some improvement but upon transfer from ICU to step down the medications were mistakenly not continued therefore, the ascetic fluid recollected. However the initial effect has been satisfactory. The actual effect of the treatment will need to be observed and follow up for a while.

### Summery:-

We are reporting a rare case of chylous ascites that had initially been mistaken as a leakage of PEG tube into the peritoneum. There was no identifiable cause in this case after performing almost most possible investigations that could make it idiopathic.

This case demonstrates that in occasions there are uncontrollable factors which lead to major limitations in reaching the diagnosis and completing ideal management for such cases.

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### RESEARCH ARTICLE

## INTRAPERITONEAL BUPIVACAINE FOR POSTOPERATIVE PAIN RELIEF AFTER LAPAROSCOPIC CHOLECYSTECTOMY

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#### Abstract

Pain is defined as “an un-pleasant sensory and emotional experience associated with actual or potential tissue damage”. Laparoscopic cholecystectomy is now an established form of treatment for patients with symptomatic gallstones. Recent studies have shown that patients may experience considerable pain after laparoscopic cholecystectomy. The various methods used with variable success are NSAID'S, infiltration of wound with local anesthetics and intermittent intramuscular narcotics. In Laproscopic Cholecystectomy after removal of gall bladder from the abdominal cavity using an endobag the position of the patient was made supine and 0.25% of 10 ml bupivacaine was instilled in the gall bladder fossa under direct laparoscopic control in Group A patients while Group B patients did not receive any such solution. Group A showed less intensity of pain with time duration as compared to Group B. A descriptive analysis of the VAS pain scores was in table 1. Statistically significant stepwise decrease in pain score at 4 hrs, 8 hrs, 12 hrs and 24 hrs were found in Group A and B. Intraperitoneal bupivacaine for laparoscopic cholecystectomy in a dose of 10 ml of 0.25% rather than using a higher dose reduces pain in the initial postoperative period and also in first 24 hrs, it is easy to administer with no adverse effects and may become a routine practice for this procedure.

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#### Introduction:-

Pain is defined as “an un-pleasant sensory and emotional experience associated with actual or potential tissue damage”.<sup>1</sup> From this definition it is clear that pain is a multi-modal entity and is the end result of diverse input conditioned by the individual's constitution and prior experience.<sup>2</sup> Postoperative pain remains one of the most prevalent problems in healthcare today and pain control is a topic of current interest.<sup>3</sup>

Laparoscopic cholecystectomy is now an established form of treatment for patients with symptomatic gallstones. Although thought to result in less postoperative pain, recent studies have shown that patients may experience considerable pain after laparoscopic cholecystectomy.<sup>4, 5</sup> The various methods used with variable success are NSAID'S<sup>6</sup>, infiltration of wound with local anesthetics<sup>7</sup> and intermittent intramuscular narcotics<sup>8</sup>. Narchi et al observed reduction in postoperative shoulder pain in minor gynecological surgery after intraperitoneal instillation of local anesthetics<sup>9</sup>. With the possibility that a similar beneficial effect might be achieved in laparoscopic cholecystectomy a number of studies were carried out with variable results<sup>4, 5, 10, 11</sup>. Keeping in view the variable results obtained by Bupivacaine is used to control postoperative pain after laparoscopic procedures. In many studies

0.125 % to 0.5% bupivacaine is used intraperitoneally<sup>12</sup> or in the wound<sup>13</sup> but with conflicting result. While in others, the use of intraperitoneal bupivacaine is found safe and effective. This technique for relieving postoperative pain is easy to perform in patients undergoing laparoscopic cholecystectomy.<sup>14-20</sup>

This study was conducted to see the efficacy of instillation of 10 ml 0.25% bupivacaine intraperitoneally after removal of gall bladder in gall bladder fossa for post-operative pain relief after laparoscopic cholecystectomy and then to apply the same for the future laparoscopic cholecystectomies.

### Material & Methods:-

The study was conducted in Department of General surgery, in a multispeciality hospital at Lucknow from August 2013 till June 2014. Sampling technique is non-probability purposive. After the approval of local ethical committee a study was done on 120 patients undergoing Laparoscopic Cholecystectomy. Written and informed consent was taken from all the patients. The method of using Visual Analogue Scale was explained to the patients pre operatively. Same surgical team performed all the surgical procedures. Laparoscopic cholecystectomy was completed with the standard four-port technique and carbon dioxide pneumoperitoneum. Patients with mucocele, empyema and patients in whom drain was placed, were excluded from the study. After removal of gall bladder from the abdominal cavity using an endobag the position of the patient was made supine and 0.25% of 10 ml bupivacaine was instilled in the gall bladder fossa under direct laparoscopic control in Group A patients while Group B patients did not receive any such solution.

Simultaneously, each group was assessed for intensity of pain at rest through Visual Analogue Scale at 4, 8, 12 and 24 hrs after surgery. All the patients were discharged 24 hours post operatively. The consumption of analgesics was also recorded. All the assessments were performed by a single observer (post graduate on duty) who was blinded to the group allocations. Data regarding mean pain score was collected through structured performa. Data was analyzed at SPSS version 15.0. Baseline data (intensity of pain) was first analyzed through VAS after 4 hrs after surgery. The intermediate readings were at 8 and 12 hrs and final assessment at 24 hrs after surgery. Paired t test were applied to assess the data. The results were concluded significant when p-value less than 0.05 (p < 0.05).

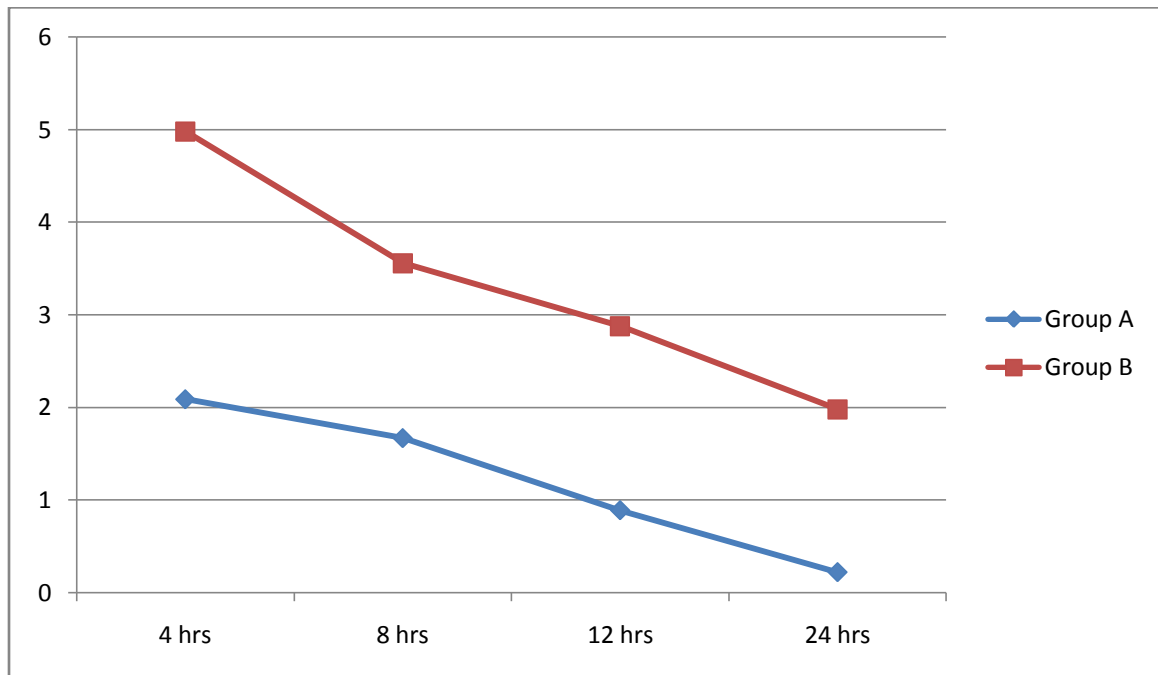
### Results:-

A total of 120 patients planned for elective cholecystectomy were included in this study divided in two groups. All were adult males and females. The gender distribution between two groups showed non-significant difference (Fishers Exact Test = 0.325 with P = 0.16). Overall male to female ratio was 1:3.7. Mean age (years) of Group A was 45.04 ± 13.85 ranging from 25 to 70 years while in Group B it was 44.86 ± 15.07 ranged from 20 to 65 years. The difference in age between two groups was found statistically insignificant (t = 0.068, P = 0.95). Weight (kgs) between two groups was found statically insignificant (t = 0.24, P = 0.81). In Group A mean weight was 57.87 ± 8.65 kgs and in Group B it was 58.23 ± 7.56 kgs. ASA Status I was more frequent in both groups as compared to Status II. Status I were 59.2% whereas Status II were 40.8% in Group A. In Group B, ASA Status I were 69.4% and Status II was 30.6%. There is no statistical difference in frequency distribution of two groups in ASA status (Fishers Exact Test = 0.40, P = 0.25).

Group A showed less intensity of pain with time duration as compared to Group B. A descriptive analysis of the VAS pain scores was in table 1. Statistically significant stepwise decrease in pain score at 4 hrs, 8 hrs, 12 hrs and 24 hrs were found in Group A and B as shown in figure & table below.

Variables	Group	N	Mean	SD	t-value	p-value
Age	Group - A	60	45.04	13.85	t = 0.068	0.95*
	Group - B	60	44.86	15.07		
Weight (kg)	Group - A	60	57.87	8.65	t = 0.24	0.81*
	Group - B	60	58.23	7.56		
VAS at 4 hrs	Group - A	60	2.09	0.87	t = 17.0825	< 0.0001 <sup>#</sup>
	Group - B	60	4.98	0.98		
VAS at 8 hrs	Group - A	60	1.67	0.57	t = 13.8519	< 0.0001 <sup>#</sup>
	Group - B	60	3.56	0.89		
VAS at 12hrs	Group - A	60	0.89	0.34	t = 20.0391	< 0.0001 <sup>#</sup>
	Group - B	60	2.88	0.69		
VAS at 24hrs	Group - A	60	0.22	0.48	t = 13.14	< 0.0001 <sup>#</sup>
	Group - B	60	1.98	0.92		

\*Statistically insignificant #statistically significant



**Figure:** -A statistically significant difference was seen in VAS after 4,8,12 and 24 hrs of laparoscopic cholecystectomy.

### Discussion:-

Although minimally invasive surgery characterized by reduced pain, it is not painless. Patients undergoing laparoscopic cholecystectomy suffered considerable pain on the day of surgery frequently requiring narcotic analgesics. Local infiltration of analgesia had been used successfully in combination with General anesthesia for breast surgery, facial cosmetic operations and body contouring procedures.

In the early post operative period visceral pain accounts for the most of the pain experienced after laparoscopic cholecystectomy.<sup>5</sup> Local anesthetics induced anti nociception by acting on the nerve membranes. These analgesics interventions need to produce a sufficiently dense and long duration of blockade for them to block the transmission of noxious afferent information from the periphery to the spinal cord and brain.<sup>6</sup>

There is little evidence with regard to which type of LA is most effective because limited data are available for drugs other than bupivacaine. Bupivacaine itself (or levobupivacaine) is an excellent choice for intraperitoneal LA because of its long duration of action.<sup>7</sup> The originality of this trial was the instillation of 0.25% of 10 ml bupivacaine intraperitoneally only after the removal of gall bladder in the gallbladder fossa. At trocar site or incisional site no local anesthetic was instilled, as many studies did not support port site local anesthetic infiltration of wound.<sup>21, 22</sup> Clinical studies of intraperitoneal bupivacaine had inconsistent results. Few authors have found a statistically significant difference with the use of local anesthetics<sup>10, 20, 23-25</sup> others could not repeat these results.<sup>26, 27</sup> Furthermore in a few studies that have found a statistically significant difference with the use of bupivacaine, the difference between the average pain scores was less than 1 in a scale of 10.<sup>23, 25</sup>

Narchi et al found intraperitoneal local anesthetics to be more effective in reducing pain up to 48 hrs postoperatively in patients undergoing diagnostic laparoscopy<sup>9</sup>. Subsequent studies failed to demonstrate the beneficial effect of intraperitoneal instillation of local anesthetics in patients undergoing laparoscopic cholecystectomy<sup>4, 5, 10, 12</sup>.

Utilizing 20 ml of either 0.25% bupivacaine or 0.5% lignocaine, Rademaker et al failed to demonstrate any reduction in postoperative pain.<sup>4</sup> A possible explanation of the failed effect given by them was the small amount of



local anesthetics used as compared to Narchi et al. Also instillation of local anesthetics in the supine position prevented its flow over the coeliac plexus and phrenic nerve endings.

Joriset et al studied the characteristics of pain after laparoscopic cholecystectomy and the effect of intraperitoneal instillation of 80 ml of 0.125% bupivacaine with adrenaline<sup>5</sup>. They found that visceral pain accounts for the major discomfort experienced in early postoperative period whereas shoulder tip pain becomes the main complaint on the second day. The intensity of shoulder pain in their study was less than the study of Narchi et al probably because of careful emptying of carbon dioxide pneumoperitoneum. The author felt that because of existence of several components of pain, its relief will depend on therapy for each of these components. In addition an anatomic intraperitoneal flow directs local anesthetics away from cholecystectomy wound and therefore cannot attain sufficient concentration to block the nociceptive input from abdominal wall incisions. Keeping in view the importance of positioning while instilling the local anesthetic, Scheinin et al administered 100 ml of either 0.15% plain bupivacaine or with adrenaline in 20 degree head down tilt maintained for 20min.<sup>11</sup> They found no relief of pain after laparoscopic cholecystectomy. The lack of analgesic efficacy can be attributed to the lower concentration of bupivacaine used and more extensive and longer duration of surgery compared to gynecological laparoscopies.

Studies done previously used 20 ml of 0.5 % Bupivacaine had also shown similar results as ours.<sup>28,29</sup> In our study a statistically significantly low VAS was seen in Group A using 0.25% of 10 ml Bupivacaine as compared to Group B using no intraperitoneal anesthetic agent instillation.

### Conclusion:-

Intraperitoneal bupivacaine for laparoscopic cholecystectomy in a dose of 10 ml of 0.25% rather than using a higher dose reduces pain in the initial postoperative period and also in first 24 hrs, it is easy to administer with no adverse effects and may become a routine practice for this procedure.

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### RESEARCH ARTICLE

#### STUDY OF COUPLE'S AWARENESS ABOUT THE RELATIONSHIP BETWEEN STREP THROAT AND RHEUMATIC FEVER IN THE WESTERN AREA OF THE KINGDOM OF SAUDI ARABIA.

Dr. Mohammed Ateih Awwad Alsofyani, Dr. Maryam Hussain Ali Alessa, Dr. Hassan Ahmed Alsahaf and Dr. Malak Fahad Almogthali.

#### Manuscript Info

##### Manuscript History

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#### Abstract

**Objectives:** The aim of the study to assess the family habit and status related to the factors associated with the development of the rheumatic fever and be aware about it.

**Methods:** The Type Of The Study Is Cross Sectional, It Will Include Collection Of Data From The Community's To Measure Their Awareness About Sore Throat And Its Relation To Rheumatic Fever. The Data Will Be Collected In The Western Area Of Kingdom Of Saudi Arabia, By Distributing A Form To The Families Which Included Questions About The Awareness Based On The Literature Review.

**Results:** This Study Was Applied On (407) Husbands And Wives From Different Cities In Western Area Of Kingdom Of Saudi Arabia. Most Of Them Were Female 260 (63.9 %) And 147 (36.1) Were Male.

**Conclusion:** We Conclude That The Parent Who Lived In The Eastern Region Of Saudi Arabia Need To Be More Educated Regarding The Sore Throat And Its Complication To Reduce The Incidence In The Future. This Could Be Done By Conducting Many Voluntarily Campaigns To The Family, Educative Accounts In The Social Media, Distribution Of Leaflet To The Parents.

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#### Introduction:-

A Sore Throat Is Frequently The Primary Indication Of A Cold. In Any Case, A Sore Throat Usually Improves Or Cures After A Day Or Two. Other Cold Manifestations, For Example, A Runny Nose And Clog May Take After The Sore Throat. Strep Throat, Which Is A Contamination Because Of Streptococcus Microorganisms, Is Another Reason For Sore Throats And Tonsillitis. With Strep Throat, The Sore Throat Is More Serious. (1)

In United States The Frequency Of An Intense Rheumatic Scene Taking After Streptococcal Pharyngitis Is 0.5-3% . (2)

Acute Rheumatic Fever (ARF) And Its Sequelae Remain The Leading Cause Of Cardiovascular Disease In Children And Young Adults Especially In Developing Countries. It Represents A Major Public Health Problem Causing A Lot Of Suffering To The Patient And Their Families. (3)

In Western Locale In Saudi Arabia Rheumatic Heart Disease Was 24 For Every 10,000 Schoolchildren (6-15 Years) Higher In Country Ranges And In Females And 34% Is The Bearer Rate Of Beta-Hemolytic Streptococci. (2) Around The World, Rheumatic Heart Disease (Rhd) And Its Confusions Result In Around 233 000 Passings Every Year. The World Wellbeing Association (Who) Appraises That Around 16 Million Individuals Are At Present Influenced By The Disease. The Dominant Part Of Rhd Cases Happen In Africa Where Commonness Rates Are As High As One In 10 Individuals In A Few Groups. (4)

Consistently, Around 15 Million Individuals Are Influenced, 200,000 Bite The Dust, And 100,000 Get To Be Disabled.(5)

We Have Proven From Past And Current Activities, Founded In Different Parts Of The World, That Far Reaching Programs Joining Mindfulness Raising, Observation, And Anticipation Can Control RHD As Well As Make A Worldwide RHD Plan And Develop A Stage For Cooperation. (6)

Starting Here, We Do A Poll To Assess Awareness About Rheumatic Fever To Know Degree Of Awareness In Group As A First Study In Kingdom Of Saudi Arabia Done To Know The Couple's Awareness About Rheumatic Fever.

### **Methodology:-**

The Type Of The Study Is Cross Sectional, It Will Include Collection Of Data From The Community's To Measure Their Awareness About Sore Throat And Its Relation To Rheumatic Fever.

The Data Will Be Collected In The Western Area Of Kingdom Of Saudi Arabia, By Distributing A Form To The Families Which Included Questions About The Awareness Based On The Literature Review And Who Recommendation.

The Questions Include Ages, Number Of Children, City, Financial Status, And General Information About The Disease.

The Ethical Approval Will Be From The Research Committee In The College Of Medicine, Taif University.

### **Results:-**

The Aim Of The Study To Assess The Couple's Awareness About Sore Throat And Its Relation To Rheumatic Fever. This Study Was Applied On (407) Husbands And Wives From Different Cities In Western Area Of Kingdom Of Saudi Arabia. ( Table 1 ) .Most Of Them Were Female 260 (63.9 %) And 147 (36.1) Were Male (Graph 1). The Age Of The Studied Group Was Above 18 Years ( Distribution Of Age Will Be Shown On The Graph Below ( Graph 2 ) ).

Education Level Of The Studied Group Is Shown On Table (2) 71.5% (291) Of The Studied Group Were Having University Or Higher Education, 22.4% (91) Were Having Secondary School Education, 4.2% (17) Were Having Intermediate School Education, While 2.0% (8) Were Having Primary School Education. Works Areas Of The Studied Group Were 37%(151) Were Not Working, 33% (133) Were In Educational Field, 13% (52) Were Health Care Workers , 8% (34) Were In Army Field , 7% (27) Were Private Sector And 2% (10) Were General Work Or Business(Graph 3 ).

Monthly Income Of The Studied Group Is Shown On Table (3) 45.2% (184 ) Were More Than 10000 SR, 27.8% (113) Were 5000-10000 SR , 19.2% (78) Were Between 2000-5000 SR, 7.9% (32) Were Less Than 2000 Sr. 88.5% (360) Of All Studied Group Had Children While 11.5% (47) Did Not Have Children (Graph 4). 38.33% (156) Of All Studied Group Had More Than Three Children, 19.17% (78) Had One Child, 15.72% (64) Had Three Children While 15.32% (62) Had Two Children (Graph 5).

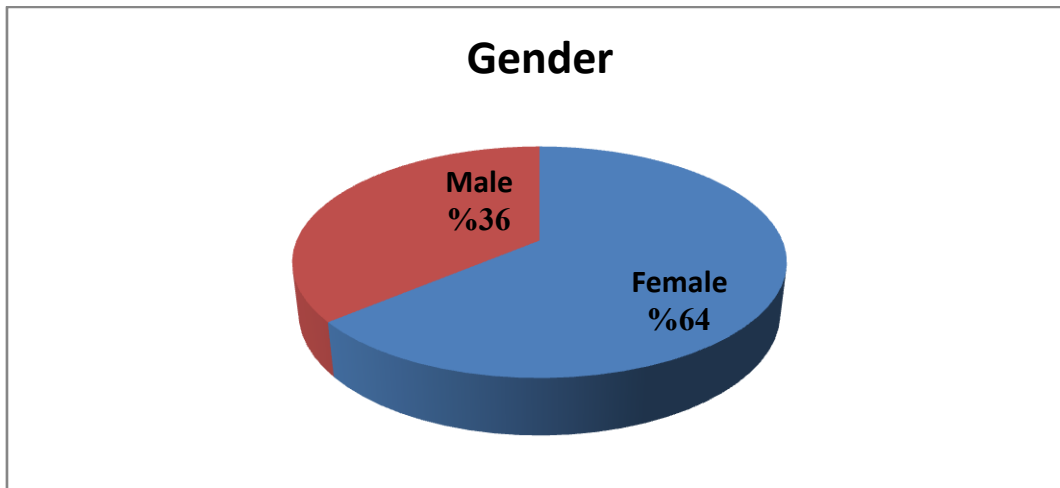
86.4% (352) Have The Children Previously Had Sore Throat While 13.6% (55) Did Not Have (Graph 6). 71.7% (292) Of All Studied Group Went To A Doctor To Treat His/hers Infected Child With Sore Throat, 9.34% (38) Did Not Do Anything And 5.4% (22) Home Remedies (Graph 7). 86.2% (351) Of All Studied Group Had An Infected Child With Sore Throat While 13.8% (56) Did Not Have An Infected Child With Sore Throat (Graph 8). 31.2%

(127) ) Of The Studied Group Were Believe That The Cause Of Sore Throat Is Virus , 11.5 (47) They Did Not Know, 10.1% (41) Bacteria, 2.9% (12) Dry Throat, 2.7 % (11) Allergy, 0.2 % (1) Gastroesophageal Reflex Disease,0.5 (2) Tumors, 33.2% (135) Some Of Them While 7.6% (31) Were Believe All Of Them Can Cause The Sore Throat (Graph 9). 33.9% (138) Were Believe That There Is A Relationship Between Sore Throat And Some Heart Diseases, 14.3% (58) Were Believe That There Is No Relationship Between Sore Throat And Some Heart Diseases While 51.8% (211) They Did Not Know (Graph 10).

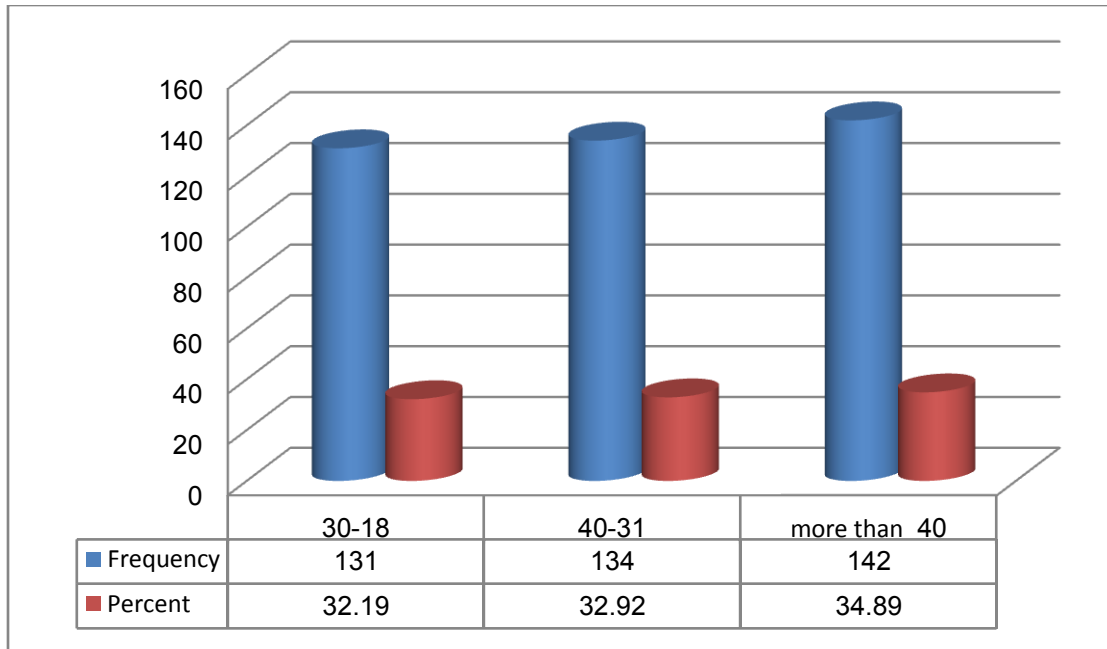
45.5% (185) Of All Studied Group Were Think That The Best Treatment For Sore Throat Has A Relationship To Prevent Heart Disease, 6.1% (25) Think That The Best Treatment For Sore Throat Has No A Relationship To Prevent Heart Disease While 48.4% (197) They Did Not Know (Graph 11) . 15.5% (63) Of All Studied Group Had Family Member Or Friend Diagnosed With Rheumatic Fever While 84.5% (344) Did Not Have (Graph 12) . 45.7% (186) Of All Studied Group Believe That The Age From 5 To 15 Years OldAre More Affected Of Rheumatic Fever, 21.6% (88) Believe That The Age More Than 36 Years Old Are More Affected, 17.2% (70) Less Than 5 Years And 15.5% (63) Believe That The Age From 16 To 35 Years Old Are More Affected (Graph 13). 14.0% (57) Of All Studied Group Think That Fever, Pain In The Joints, Involuntary Movements, Rash On The Body, Protrusions In The SkinAre Signs Some Of Heart Disease, 15.7% ( 64) Did Not Think , 70.3% (286) They Did Not Know (Graph 14) . 16.7% (68) Of All Studied Group Were Know That To Treatment A Patient Who Had A Rheumatic Fever, Has To Follow A Course Of Antibiotic (Mostly By Injections) For A Five To Ten Years Old If His Case Affecting The Heart While 83.3% (339) They Did Not Know (Table 4).

**Table (1 ):-** The Cities Of The Studied Group

City	Frequency	Percent
Jeddah	129	31.7
Laith	4	1.0
Makkah	57	14.0
Qanfatha	5	1.2
Rabig	3	.7
Taif	209	51.4



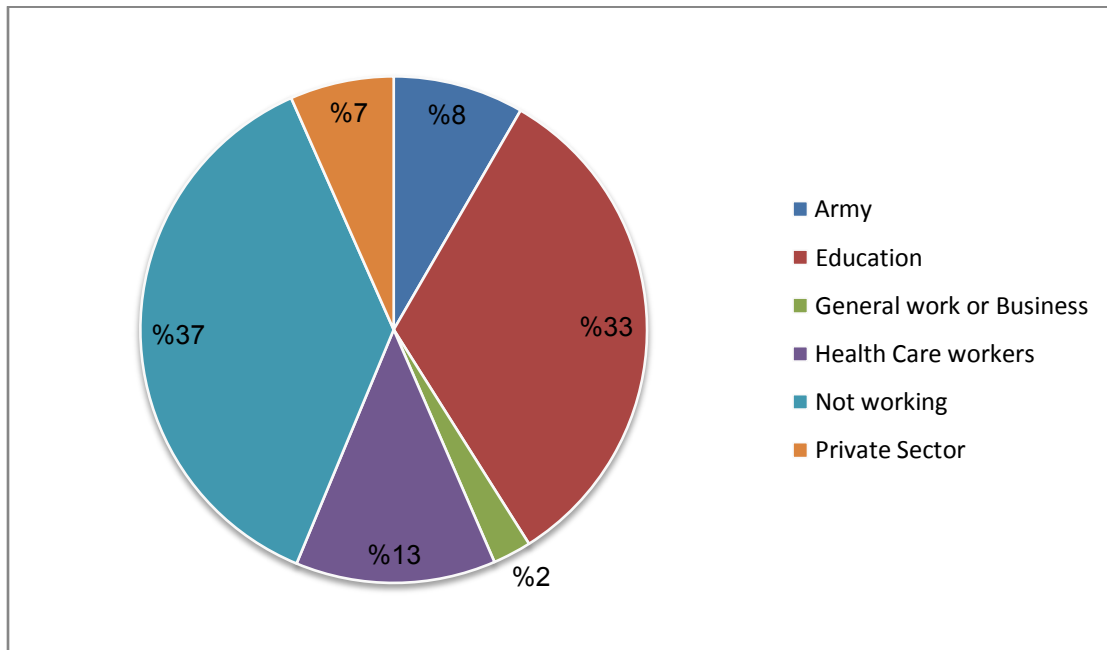
**The Graph (1):-** Show The Gender Distribution Of The Studied Group : 260 (63.9 %) Were Females And And147 (36.1) Were Males



The Graph (2):- Show The Age Distribution Of The Studied Group.

Table (2):- Education Level Of The Studied Group Is Shown On.

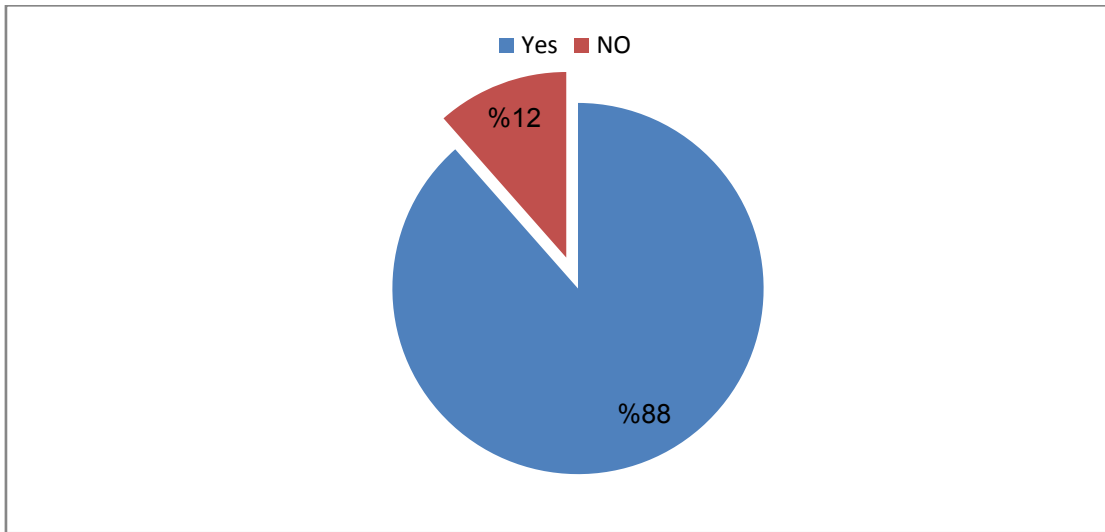
Education Level	Frequency	Percent
Intermediate School	17	4.2
Primary School	8	2.0
Secondary School	91	22.4
University Or Higher Studies	291	71.5



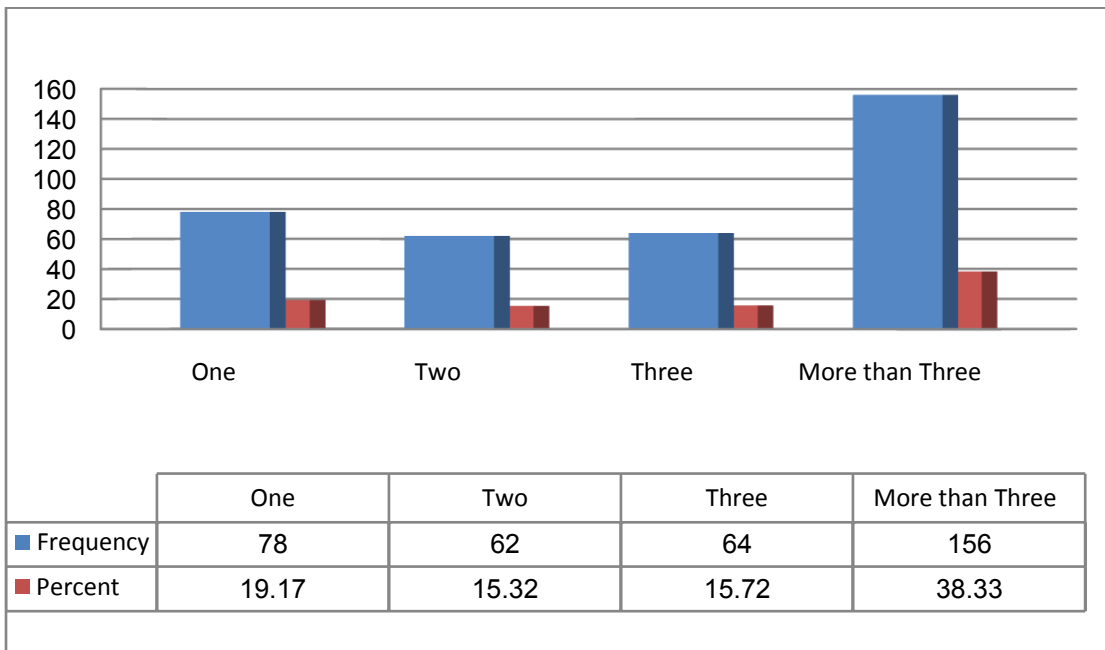
The Graph (3):- Show Works Areas Of The Studied Group.

**Table (3):-** Monthly Income Of The Studied Group.

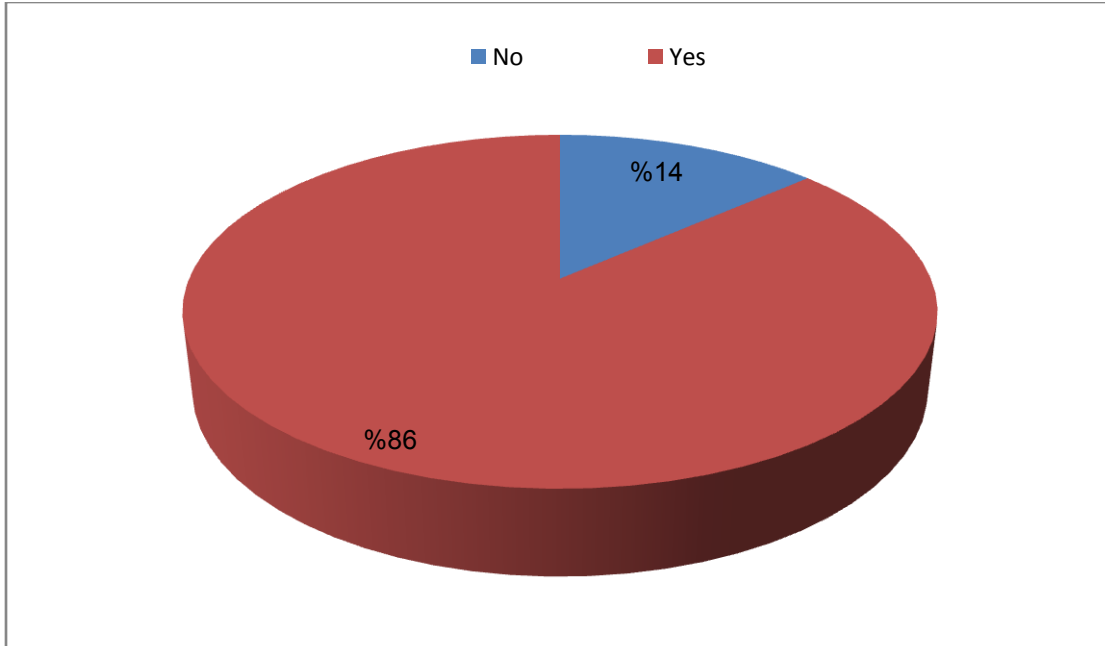
Monthly Income	Frequency	Percent
Less Than 2000	32	7.9
2000-5000	78	19.2
5000-10000	113	27.8
More Than 10000	184	45.2



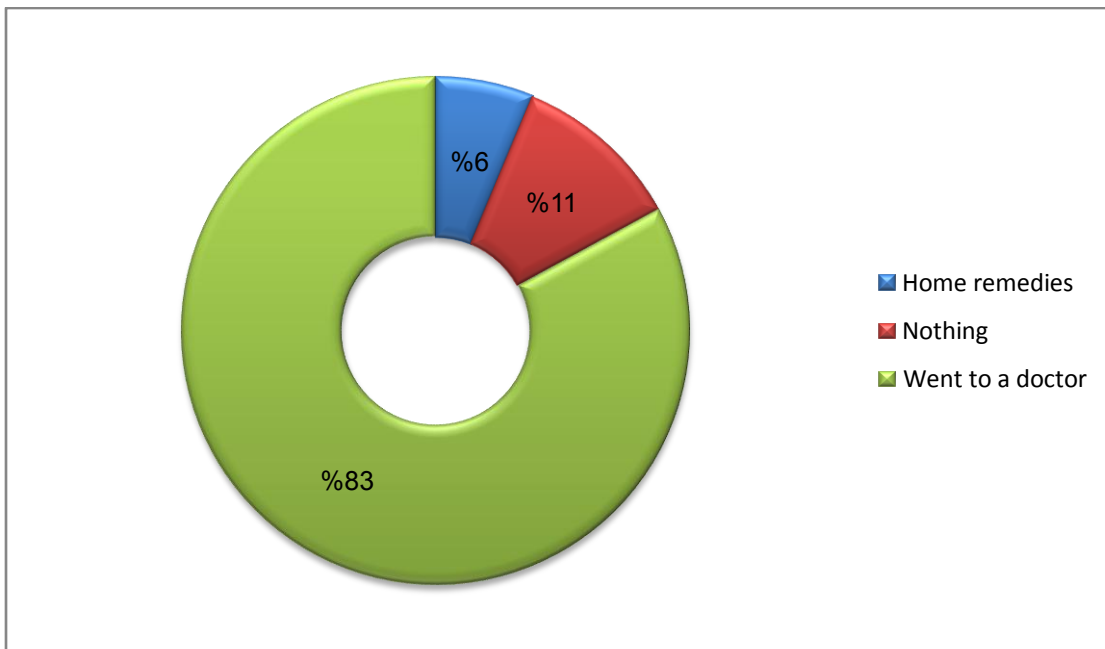
**The Graph (4):-** Showing The Percentage Of Couples Have Children In The Studied Group.



**(Graph 5):-** Show The Number Of Children Of The Studied Group

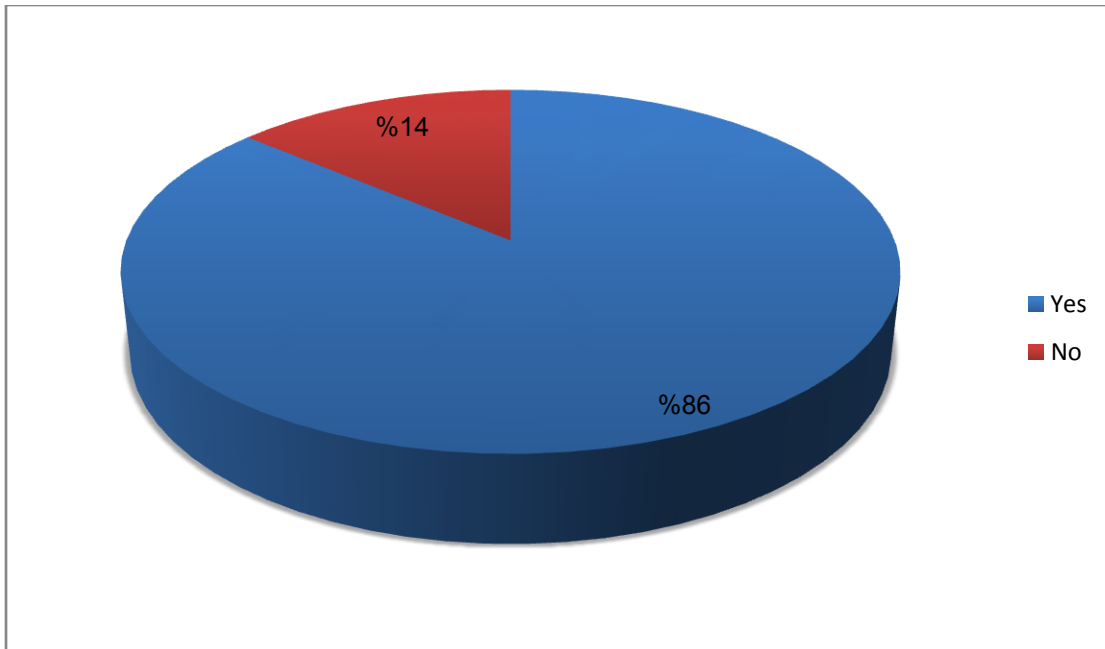


(Graph 6):- Show Percentage Have The Children Previously Had Sore Throat In The Studied Group.

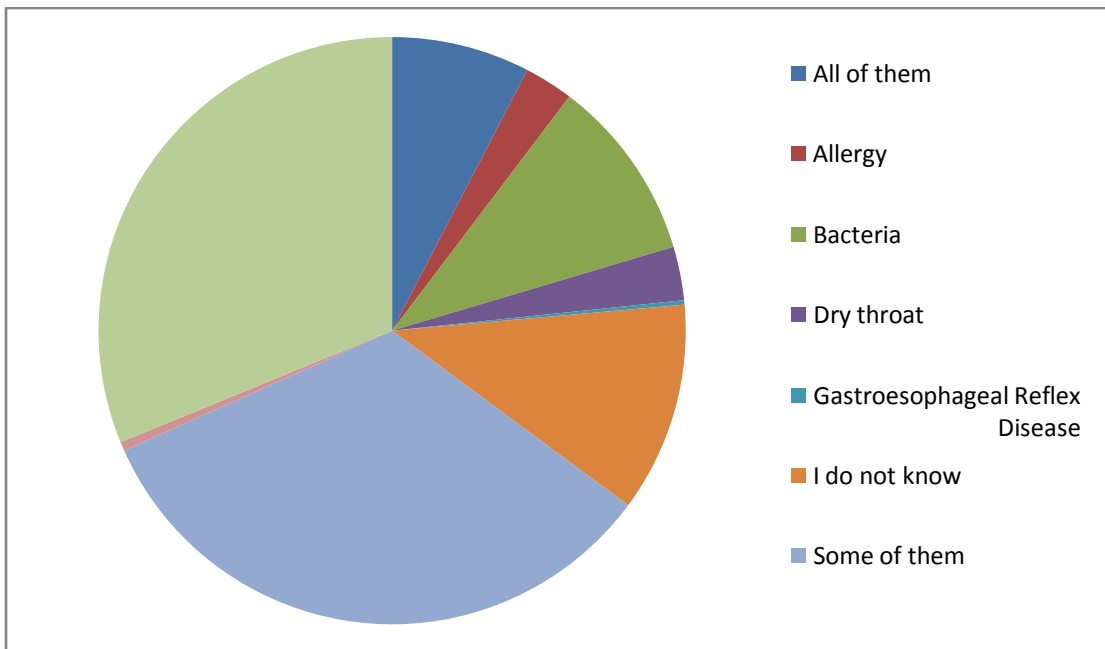


(Graph 7):- Show What To Did To Treatment Of Sore Throat In The Studied Group.

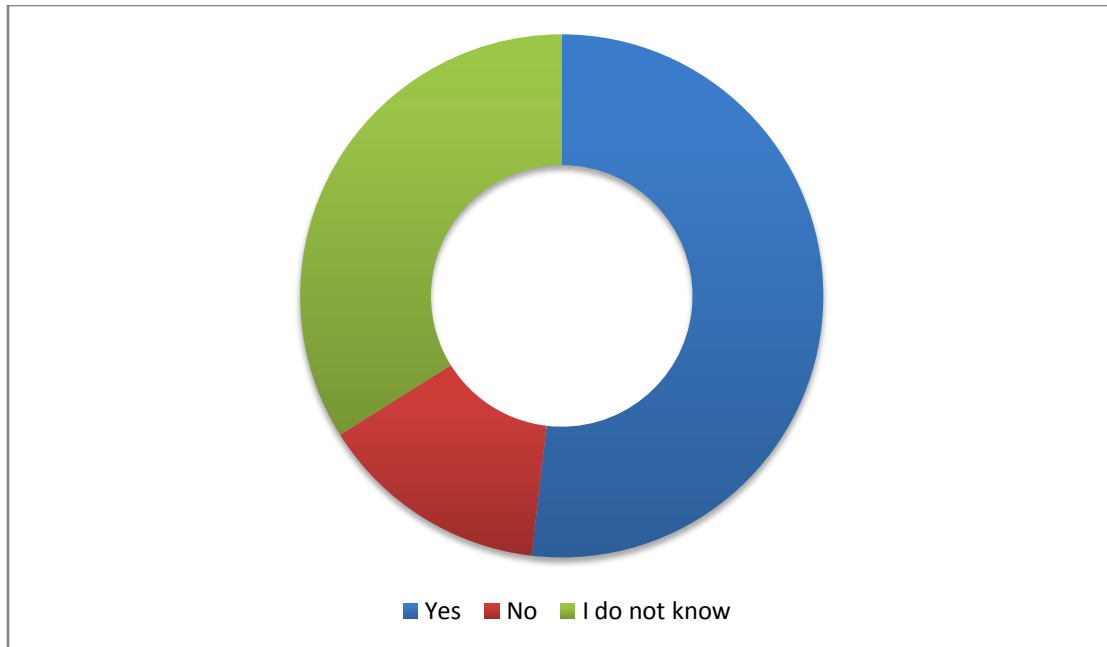




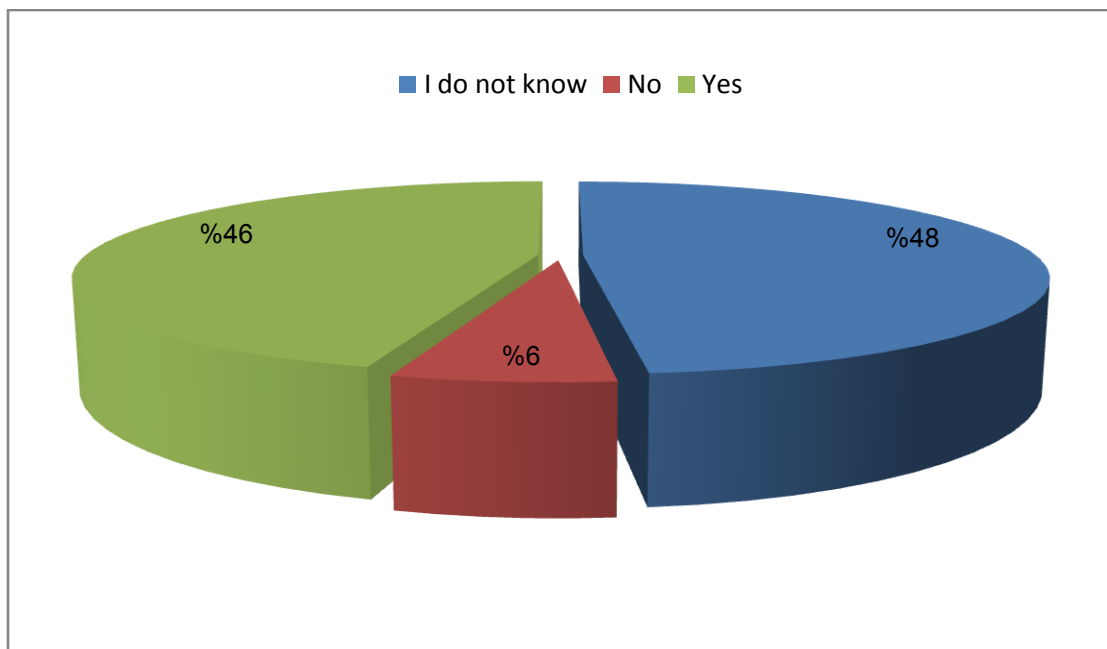
The Graph (8):- Showing The Percentage Of Couples Have Had An Infected Child With Sore Throat In The Studied Group.



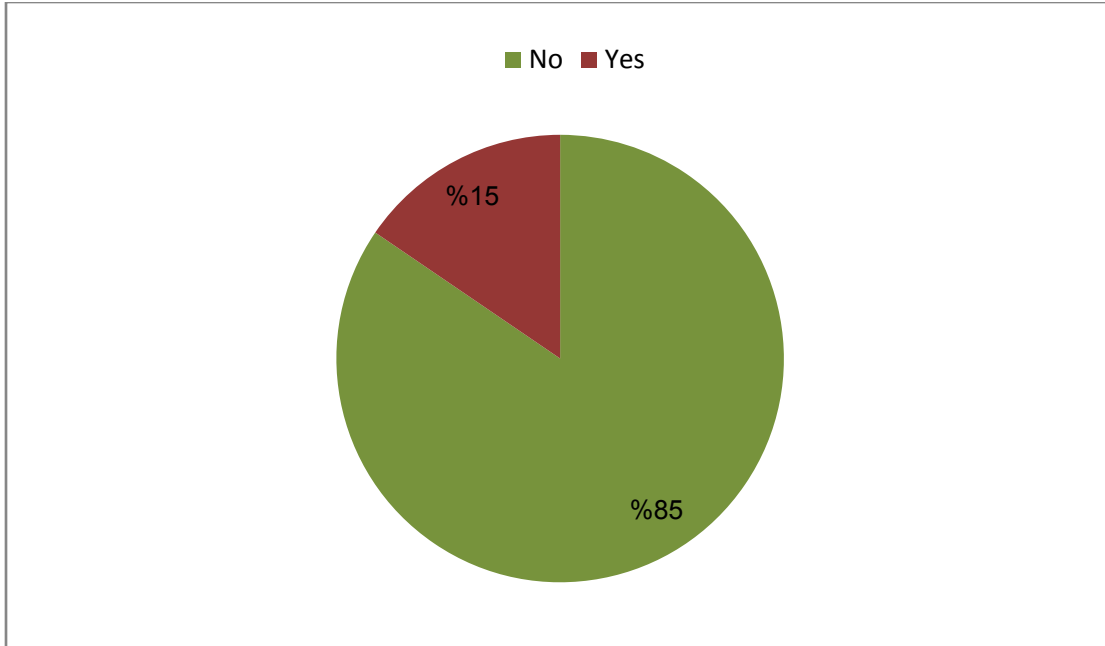
The Graph (9):- Showing The Causes Of Sore Throat That The Studied Group Believe



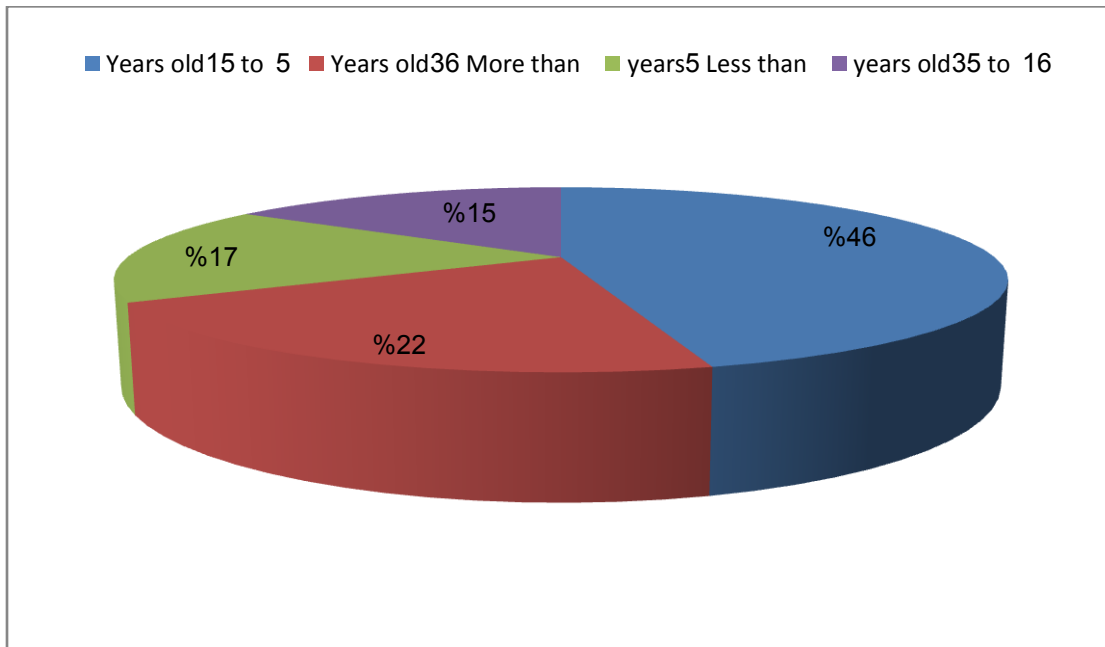
**The Graph (10):-** Show The Best Treatment For Sore Throat Relationship To Prevent Heart Disease In The Studied Group.



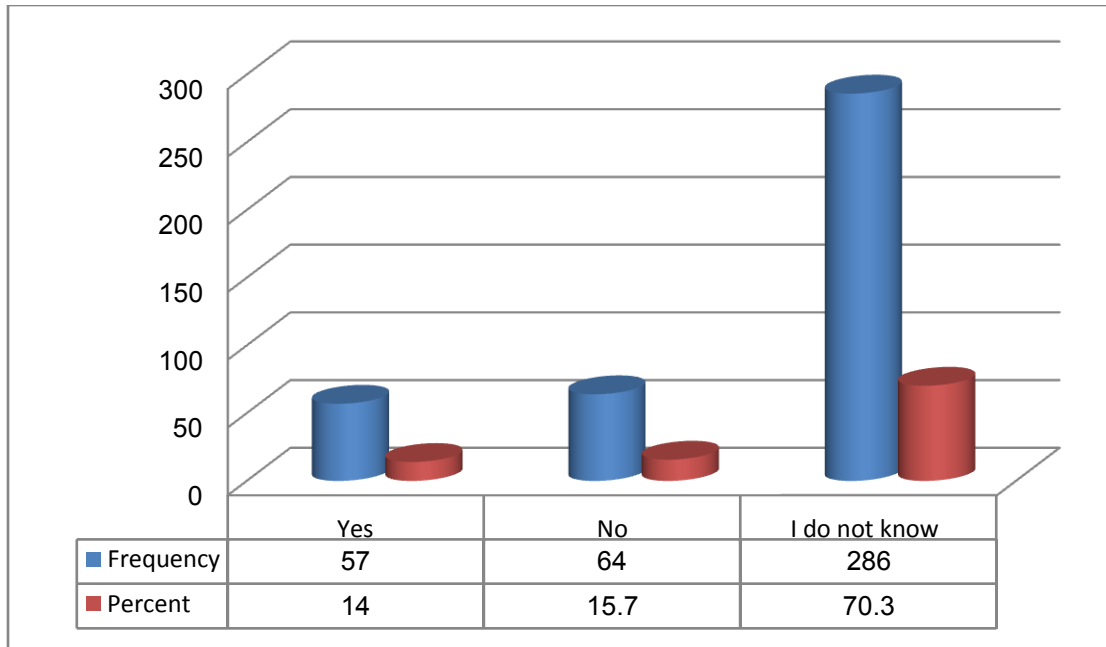
**Graph (11):-** Show The Think Of The Studied Group.



(Graph 12):- Show Family Member Or Friend Diagnosed With Rheumatic Fever In The Studied Group



(Graph 13):- Group Of Ages Are More Affected Of Rheumatic Fever In Believe Studied Group



(Graph 14):- Show The Think Of The Studied Group About The Some Signs Of Heart Disease.

Table (4):- Treatment A Patient Who Had A Rheumatic Fever Affecting The Heart With Antibiotic.

Treatment With Antibiotic	Frequency	Percent
No	339	83.3
Yes	68	16.7

**Discussion:-**

Confusions Of Strep Throat Are Uncommon Yet Can Happen, Particularly If Strep Throat Is Not Appropriately Treated With Antibiotics, Now And Again Because Of A Strep Disease, The Body's Safe Framework Will Assault Solid Tissues, Bringing About Complexities, For Example, Rheumatic Fever.<sup>(7)</sup>

Rheumatic Fever Can Bring About Long Haul Confusions In Specific Circumstances. A Standout Amongst The Most Common Confusions Is Rheumatic Coronary Illness. Kids Who Experience The Ill Effects Of Long Haul Harm Identified With Rheumatic Fever Might Be Qualified For A Specialized Curriculum And Other Related Administrations.<sup>(8)</sup>

The Quality Of Our Review Is The Main Overview In The Kingdom Of Saudi Arabia Do To Know The Couple's Mindfulness About Rheumatic Fever, In Our Insight .

Constraints In Our Review Incorporate Utilization Of An Online Overview That May Prompt To Determination Inclination And Not All Couples Can Be Utilize Web. Consequently, We Couldn't Sum Up Our Discoveries To All Couple's .

**Conclusion:-**

We Conclude That The Parent Who Lived In The Eastern Region Of Saudi Arabia Need To Be More Educated Regarding The Sore Throat And Its Complication To Reduce The Incidence In The Future. This Could Be Done By Conducting Many Voluntarily Campaigns To The Family, Educative Accounts In The Social Media, Distribution Of Leaflet To The Parents.

**Acknowledgment:-**

We are a group of doctors from different cities who shared together in finishing this research under supervision of Dr. Mamdouh Ari Nasser Alshareef hoping that it will be benefit in the medical field.

Dr. Mohammed Ateih Awwad Alsofyani, Dr. Maryam Hussain Ali Alessa, Dr. Hassan Ahmed Alsahaf and Dr. Malak Fahad Almogthali.

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### RESEARCH ARTICLE

## THE EFFECT OF ALKALOIDS, SAPONINS AND THYMOQUINONE OF *NIGELLA SATIVA* SEEDS ON BIOFILM PRODUCTION, MOTILITY, OUTER MEMBRANE PROTEINS AND LIPOPOLYSACCHARIDE OF SOME BACTERIA.

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#### Key words:-

*Nigella sativa*, bacteria, thymoquinone, alkaloids, saponins, antimicrobial, anti-cancer.

### Abstract

Alkaloids, saponins and thymoquinone of *Nigella sativa* are active against both Gram-positive and Gram-negative bacteria. Subinhibitory concentrations of these constituents were tested for their effect on biofilm production, motility and the expression of the proteins and the lipopolysaccharides of the outer membrane of Gram-negative bacteria. While all the three tested constituents reduced the biofilm formation by *E. coli*, only saponins and alkaloids reduced the biofilm formation in *K. pneumoniae* and *Sal. Typhimurium*. Nonetheless, alkaloids, saponins and thymoquinone, enhanced the biofilm formation in *P. aeruginosa* and *Sh. flexneri*. On the other hand, thymoquinone inhibited the motility of *Escherichia coli*, *P. aeruginosa* and *Sal. Typhimurium*. There were changes in the level of expression of seven and three outer membrane proteins of *E. coli* and *P. aeruginosa*, respectively. Amongst these changes in *E. coli*, the amounts of OmpF apparently decreased and those of OmpA increased. Also, three outer membrane proteins of *P. aeruginosa* were affected by the phytochemicals including OmpF. The expression of the latter was increased by alkaloids. Electron microscopy revealed some morphological changes in *S. aureus* and *P. aeruginosa*. It may be concluded that thymoquinone, alkaloids and saponins affect several pathogenesis mechanisms in both Gram-positive and Gram-negative bacteria.

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### Introduction:-

For centuries, *Nigella sativa* L. (Family *Ranunculaceae*) seeds have been traditionally used in bakery as pungent appetizer and aromatic, and folk medicine in the Middle East, Eastern Europe, Asia, and Africa, as thermogenic, diuretic, expectorant, purgative, stimulant, sudoriferous, sedative, carminative and for many other diseases in different (1, 2). Muslim communities, in particular, considered *N. sativa* seeds as one of the most important prophetic medicinal plants because its healing effects were referred to by the Prophet Muhammad (Peace be upon him) (3).

*Nigella sativa* seeds contain different pharmacologically active constituents like alkaloids, saponins and essential oil (4). These constituents have been investigated for their pharmacological effects both *in vitro* and *in vivo* (5,6). They have been demonstrated to enhance the immune system (7), and to have galactagogue, carminative, laxative

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(2), anti-inflammatory (8), anti-cancer (9,10) antimicrobial (11-15), anti-parasitic (16), antioxidant (17), hypoglycemic (18) activities.

The different extracts of *N. sativa* seeds were found to possess broad-spectrum antimicrobial activity against bacteria, viruses and fungi (19). This broad-spectrum of antimicrobial activity may be attributed to their effect on the key biochemical elements of microorganisms (20).

Extracts of *N. sativa* were found to inhibit both Gram-positive and Gram-negative bacteria. Water extracts of the seeds were active against *Staphylococcus aureus* (21, 22). Diethyl-ether, Methanol and chloroform extracts of the seed of *N. sativa* inhibited the growth of *Escherichia coli*, *Helicobacter pylori*, *Bacillus subtilis* and *Streptococcus fecalis* (23,24).

The antibacterial activity of crude extracts and phytochemicals of *N. sativa* have also been found to be active against multi-drug-resistant bacteria, including both Gram-positive bacteria like *Staphylococcus aureus* and Gram-negative bacteria like *Pseudomonas aeruginosa* and *Escherichia coli* (15, 25, 26).

Some purified constituents of *N. sativa* have also been tested for their antibacterial activity. The first reported constituent which possessed an anti-bacterial activity was the phenolic fraction of *N. sativa* oil (13). The essential oil of *N. sativa* and some of its components like thymoquinone and hydrothymoquinone were found to be lethal to fungi, Gram-positive and Gram-negative bacteria (27-31). The antibacterial activity of alkaloids and saponins, of *N. sativa*, were evaluated both qualitatively and quantitatively (15, 32, 33).

In a previous study, we demonstrated the antibacterial activity of alkaloids, saponins and thymoquinone of *N. sativa* seeds on a wide range of antibiotic sensitive and resistant bacteria (15). In this report, we investigated the effect of these active constituents on slime production, motility, outer membrane proteins and lipopolysaccharide.

## **Materials and Methods:-**

### **Bacteria and chemicals:-**

The six pathogenic bacteria used were *Escherichia coli* ATCC 35218, *Salmonella enterica* serovar Typhimurium ATCC 14028 (*Sal. Typhimurium*, *Pseudomonas aeruginosa* ATCC 27853 (*P. aeruginosa*), *Klebsiella pneumoniae* (*K. pneumoniae*), *Shigella flexneri* (*Sh. Flexneri*) and *Staphylococcus aureus* (*S. aureus*) were clinical isolates of the culture collection of the Department of Microbiology, College of Pharmacy, Taif University. Thymoquinone and organic solvents were purchased from Sigma-Aldrich.

### **Extraction of alkaloids:-**

Powdered seeds of the plant were extracted with 70% methanol. The extract was evaporated under reduced pressure, dissolved into distilled water and acidified with 3% hydrochloric acid. The solution was extracted with petroleum ether. The acidic solution was made alkaline with 25% ammonium hydroxide (pH 9-10) and then extracted with chloroform. The combined chloroform extracts were dried to get the crude *N. sativa* alkaloids (34).

### **Extraction of saponins:-**

Powdered seeds of the plant were defatted with n-hexane. Further extraction was performed with 70% methanol. After evaporation of the methanol under vacuum, the crude residue was acidified with 5% hydrochloric acid and left overnight in the refrigerator. The precipitate was extracted with chloroform: methanol (75:25), to get crude saponins (35).

### **Biofilm production (36):-**

Thymoquinone, saponins and alkaloids of *N. sativa* were two-fold serially diluted with a minimum medium (M9) to give series of concentrations in sterile 96-well polystyrene microtitration plates. Each series of dilutions was inoculated with  $10^4$  CFU/ml of the tested bacteria and incubated at 37°C for 18 hours. Bacteria suspension was aspirated and wells were washed-buffer saline (pH 7.5), ethanol, and stained with 0.1% crystal violet for 30 min. Wells were rinsed with water and filled with ethanol for 30 min and their contents were transferred to another microtiter plate. Plates were read at 595nm using an ELISA reader.

**Effect of some constituents on swarming and motility of bacteria (37):-**

Bacteria were grown onto swarming or swarming plates containing subinhibitory concentrations of *N. sativa*: Plates were incubated overnight at 30°C and zones of swimming or swarming were measured and compared to those of control plates.

**Effect on outer-membrane proteins(38):-**

Log phase bacteria treated with sub-inhibitory concentrations of some constituents of *N. sativa* were harvested and sonicated. Debris was harvested by centrifugation and membranes were collected by high-speed centrifugation. Inner and outer membranes were separated by differential solubilisation and with sarkosyl and subjected to SDS-PAGE

**Purification of lipopolysaccharide:-**

Log phase bacterial cells were lysed at 100°C with SDS in presence of glycerol and  $\beta$ -mercaptoethanol. Lysed cells were treated with proteinase K at 60°C for 1 hr(39), subjected to SDS-PAGE (40).

**SDS-PAGE:-**

Components of different fractions were separated by the SDS-PAGE as described before. Briefly, proteins were stacked in 4.5% acrylamide and separated in 12.5% acrylamide. Gels were run at a constant current of 20 mA per gel, and proteins were visualised with Coomassie blue (40) or silver stain (39, 41).

**Electron microscopy:-**

Bacterial cells grown at a sub-lethal concentration of the purified constituents were fixed with 2.5% glutaraldehyde and were negatively stained with 2% (w/v) phosphotungstic acid in 0.1 M sodium phosphate buffer (pH 6.5)(42). Bacteria were examined by transmission electron microscope (JEM, Japan).

**Statistical Analysis:-**

All determinations were carried out in triplicates and the statistical analyses were carried out using SPSS 13.0 and Microsoft Excel programs

**Results:-**

Biofilm formation by *S. aureus*, *P. aeruginosa*, *E. coli*, *K. pneumoniae*, *Sh. flexneri* and *Sal. Typhimurium*, was investigated in presence and absence of the thymoquinone, saponins and alkaloids (Table 1). Biofilm production by *S. aureus* was not very much affected by the three active constituents of *N. sativa*. On the other hand, while biofilm production by *E. coli*, was reduced, its production by *P. aeruginosa* and *Sh. flexneri* was enhanced (Table 1). The percentage of production of biofilm by *E. coli* was 19-85% compared to the control. On the other hand, biofilm production was 210-235% and 117-240% increased as compared with the control in the case of *P. aeruginosa* and *Sh. flexneri* respectively (Table 1). In the cases of *K. pneumoniae* and *Sal. Typhimurium* there was an enhancement of biofilm production by thymoquinone and a reduction of production by both alkaloids and saponins at 1/2 MIC (Table 5).

**Table 1:-** Effect of some active contents of *N. sativa* on biofilm production by different types of bacteria (in M9 medium)

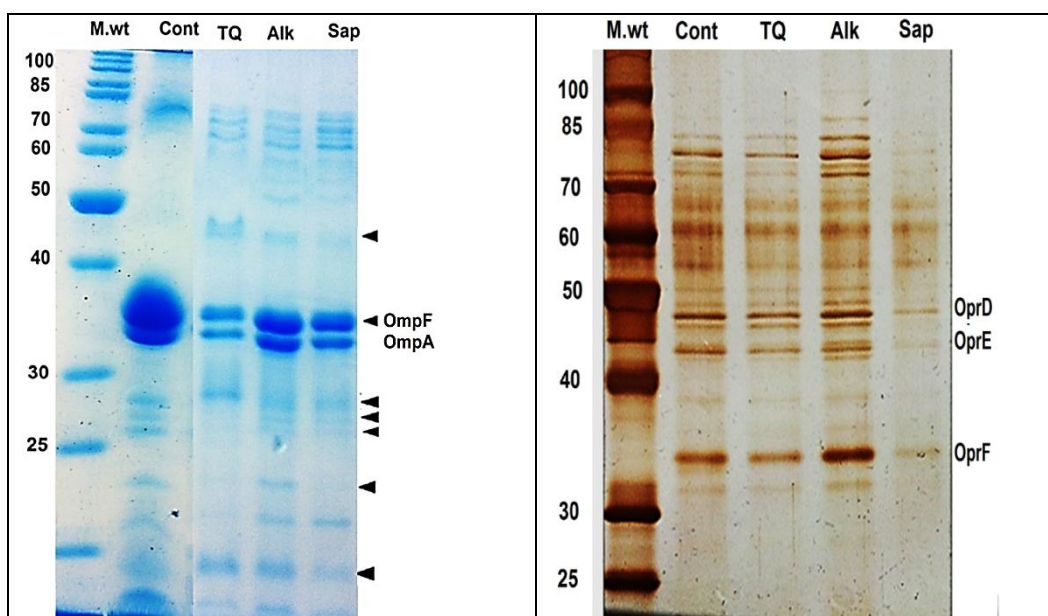
Constituent	Conc.	Bacteria					
		<i>Staph. aureus</i>	<i>Pseudomonas aeruginosa</i>	<i>Escherichia coli</i>	<i>Klebsiella pneumoniae</i>	<i>Shigella flexneri</i>	<i>Salmonella Typhimurium</i>
% biofilm production compared to control							
Thymoquinone	1/2 MIC	101.6	125.3	29.9	125.3	235.0	153.4
	1/4 MIC	103.7	112.7	85.1	154.1	240.0	88.6
Saponins	1/2 MIC	106.5	140.6	19.4	30.3	125.4	50.6
	1/4 MIC	95.0	110.2	26.9	25.0	143.4	53.2
Alkaloids	1/2 MIC	107.1	210.7	30.9	54.5	126.0	65.3
	1/4 MIC	104.6	125.3	39.4	102.6	117.7	74.7



The effect of thymoquinone and saponins on swimming capacity of three motile bacteria (*P. aeruginosa*, *E. coli*, and *Sal. Typhimurium*) was investigated (Table 1). While thymoquinone inhibited the motility of the tested bacteria, saponins enhanced it (Table 2). The diameters of zone of swarming of untreated bacteria, were 11, 8, and 20mm for *Ps. aeruginosa*, *E. coli* and *Sal. Typhimurium* respectively, while their respective swarming diameters in presence of ½ the MICs of saponins were 22, 20 and 50mm (Table 2).

**Table 2:-** Effect of phytochemicals on swimming of bacteria

Constituent	Conc.	Bacteria		
		<i>Ps. aeruginosa</i>	<i>E. coli</i>	<i>Sal. Typhimurium</i>
		Zone Diameter (mm)		
Control	0	11	8	20
Thymoquinone	( <sup>1/2</sup> MIC)	No S	No S	No S
	( <sup>1/4</sup> MIC)	13	No S	No S
Saponins	( <sup>1/2</sup> MIC)	22	20	50
	( <sup>1/4</sup> MIC)	18	13	44



**Fig 3:-** Effect of *Nigella sativa* active constituents at ½ MIC concentrations on outer membrane of *Escherichia coli*(left, Coomassie blue stained) and *Pseudomonas aeruginosa* (right, silver stained). Mw, molecular weight markers; TQ, thymoquinone; Alk, alkaloids; Sap, saponins.

**Table 3:-** Summary of the effect of *Nigella sativa* active constituents at ½ MIC concentrations on the expression of outer membrane proteins of *Escherichia coli* and *Pseudomonas aeruginosa*

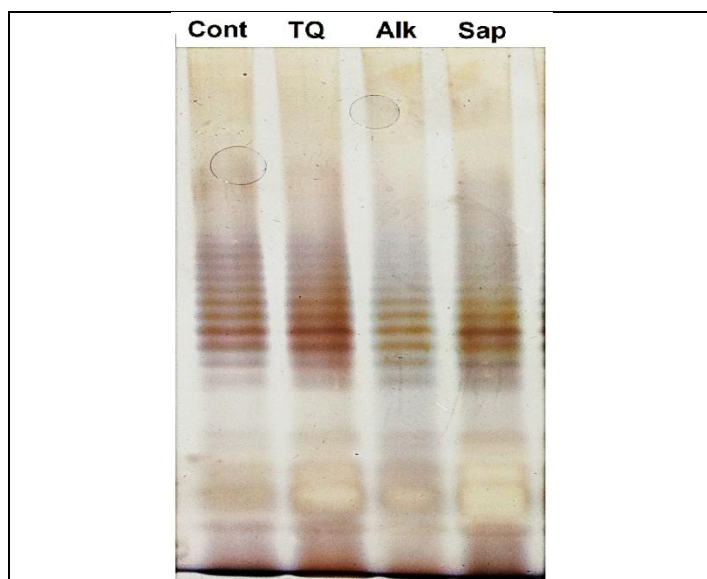
Bacteria	Protein apparent molecular weight (kDa)	Effect of <i>Nigella sativa</i> active constituent on protein level *		
		Thymoquinone	Alkaloids	Saponins
<i>Escherichia coli</i>	36 (OmpF)	-	-	-
	46	+	+	+
	28 (OmpA)	+	+	+
	27	-	+	+
	26	-	+	+
	22	NC	NC	-
	17.5	+	NC	NC
<i>Pseudomonas aeruginosa</i>	86	NC	+	NC
	80	-	NC	-
	33 (OprF)	NC	+	NC

\*NC, no change; -, decrease in amounts; +, increase in amounts

The changes of the apparent level of expression of some outer membrane proteins of *E. coli* and *P. aeruginosa* exposed to 1/2 MICs are shown in figure 3 and table 3. Changes in the levels of expression of seven proteins in *E. coli* and three proteins in *P. aeruginosa* were observed and

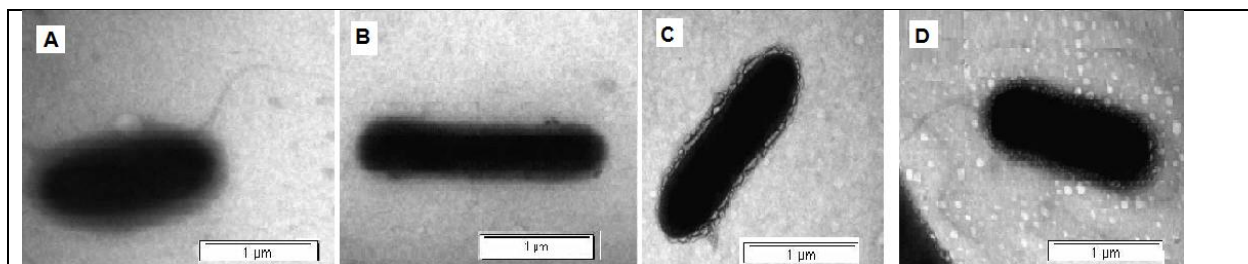
Thymoquinone caused an increase in the expression of 3 proteins in *E. coli* and a decrease in 3 others. On the other hand, it caused an apparent decrease in the amount of a protein which has a molecular weight of 80 kDa in *P. aeruginosa* (Table 3). Alkaloids cause an increase in the level of 4 proteins and a reduction in one protein in *E. coli* and an increase in the level of expression of two proteins one of which was OprF in *P. aeruginosa* (Table 3). Saponins increased the level of expression of 4 proteins and reduced two in *E. coli* and reduced the level of only one protein in *P. aeruginosa* (Table 3).

Thymoquinone, alkaloids and saponins affected the expression of lipopolysaccharides in *E. coli* and not *P. aeruginosa*. As shown in figure 4, there was a decrease in the amount of high molecular weight LPS in *E. coli* treated with thymoquinone, alkaloids and saponins.



**Fig 4:** -Effect of *Nigella sativa* active constituents at 1/2 MIC concentrations on lipopolysaccharide of *Escherichia coli*. Mw, molecular weight markers; TQ, thymoquinone; Alk, alkaloids; Sap, saponins.

*S. aureus*, *E. coli* and *P. aeruginosa* as treated with thymoquinone, saponins and alkaloids, were examined for changes in their morphology. While no apparent changes in the morphology of *E. coli*, (data not shown), some changes were observed in both *P. aeruginosa* and *S. aureus*. Thymoquinone and alkaloids caused *P. aeruginosa* cells to become more elongated and thinner compared to the control (Fig. 1). This was more apparent in the case of thymoquinone. On the other hand, *S. aureus* exposed to saponins at sub-inhibitory concentration suffered from protoplasting and some cells suffered from the retraction of their cytoplasmic contents away from the cell wall as shown in Fig 5B.



**Fig. 1:-** *Pseudomonas aeruginosa* after growth for 24 h in M9 (A) and in M9 containing subinhibitory concentration of thymoquinone (B), alkaloids (C), and saponins (D).

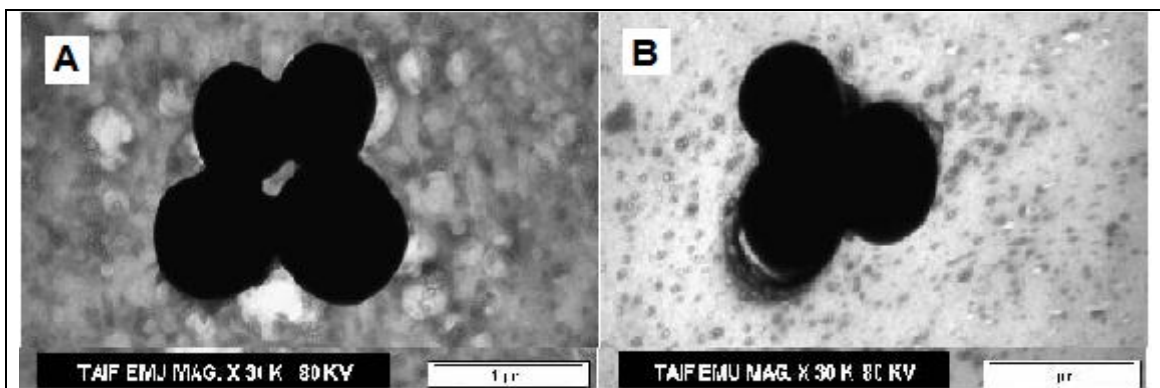


Fig. 2:- *Staphylococcus aureus* after growth for 24 h in M9 (A) and in M9 containing saponins at subinhibitory concentration (B).

### Discussion:-

The saponins, alkaloids, and thymoquinone were previously reported to be inhibitory to different types of bacteria even though they might be multi-drug resistant clinical isolates (15, 32). In this study, we investigated the effect of subinhibitory concentrations of saponins, alkaloids, and thymoquinone of *N. sativa* on some pathogenesis mechanisms of some Gram-positive and Gram-negative.

In this study, *S. aureus*, *P. aeruginosa*, *E. coli*, *K. pneumonia*, *Sh. flexneri* and *Sal. Typhimurium*, were grown at  $\frac{1}{2}$  and  $\frac{1}{4}$  the MICs of thymoquinone, saponins and alkaloids and were tested for their capability of forming biofilms.

Biofilms are formed on surfaces of living tissues, medical devices and contact lenses, etc. (43). Biofilms help bacteria to survive and withstand hostile conditions on surfaces and contribute to the persistence of chronic infections (44). Several studies have been performed to find natural antimicrobial agents that influence microbial biofilm formation (45-48).

While there was a reduction in the ability of *E. coli* to produce biofilms by the three tested constituents, only saponins and alkaloids were capable of reducing biofilm formation by *K. pneumoniae* and *Sal. Typhimurium*. On the other hand, biofilm formation was enhanced in *P. aeruginosa* and *Sh. flexneri* and was indifferent in the case of *S. aureus*.

The induction of biofilm formation, in *P. aeruginosa*, and the failure to reduce biofilm formation in *S. aureus*, contradicts with Chaieb, *et al.*, (49), who reported a reduction in biofilm formation by both *S. aureus* and *P. aeruginosa* treated with thymoquinone. However, it should be mentioned that the inhibition detected was at concentrations higher than their reported MICs. Therefore, while thymoquinone caused inhibition of biofilm formation at concentrations 22 and >512, for *S. aureus* and *P. aeruginosa* respectively, the MICs reported were 8 and >512 respectively (49).

Motility plays a key role in the colonisation of surfaces by bacteria (50,51). In this study, thymoquinone inhibited the motility and swarming of *Escherichia coli*, *P. aeruginosa* and *Sal. Typhimurium*. In a previous study, tannins of cranberry fruit and the hydrolysable tannin in pomegranate were reported to inhibit swarming motility but did not block swimming or twitching motilities (51). Sub-inhibitory concentrations of alkaloids like piperine of black pepper and reserpine of snakeroot, decreased bacterial swarming and swimming motilities (52). Tannic acid and epigallocatechingallate were found to block swarming motility in *Pseudomonas aeruginosa* (53).

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*Escherichia coli*, *P. aeruginosa* and *S. aureus* treated with a sub-inhibitory concentration of thymoquinone, alkaloids and saponins were examined under transmission electron microscope for morphological changes. Thymoquinone and alkaloids caused cells of *P. aeruginosa* to become thinner and elongated, compared to the

control. Though, the morphological changes might be attributed, to their effect on penicillin-binding proteins, however, this is not necessary because quinolone antibiotics, which do not bind to penicillin-binding proteins, affect the morphology of *E. coli* (55).

*S. aureus* exposed to saponins at a sub-inhibitory concentration suffered from protoplasting and retraction of the cytoplasmic contents away from the cell wall. Morphological changes of *S. aureus* exposed to aqueous extracts of green tea (56) or extracted catechingallates (57) have been reported in *S. aureus*. Methanolic extract of a soft sponge, *Haliclona* sp., caused internal shrinkage of methicillin-resistant *S. aureus* and *B. subtilis* cells which finally collapsed after prolonged exposure to the extract (58).

There is evidence that several outer membrane proteins are involved in adherence of bacteria to mammalian cells (59-61). In this study, the effect of thymoquinone, alkaloids and saponins at 1/2 MICs on the outer membrane proteins was examined. There were indeed apparent changes in the levels of expression of seven and three proteins in *E. coli* and *P. aeruginosa* respectively. While in *E. coli* OmpF outer membrane protein apparently decreased in amounts by treatment with the three constituents, OmpA increased.

On the other hand, three outer membrane proteins of *P. aeruginosa* were affected by the tested phytochemicals one of which was OprF. The expression of the latter was increased by the treatment with alkaloids. Recent studies have shown that the expression of 5% of bacterial promoters may be affected by sub-inhibitory concentrations of antibiotics (62). Likewise, it seems that phytochemicals like thymoquinone, alkaloids and saponins affect the expression of bacterial promoters.

The effect of phytochemicals on the expression of some bacterial proteins has been previously documented. Bioactive fraction 9EA-FC-B of *Acalyphawilkesianai* inhibited the production of MRSA by reducing the amount PBP2a in the matrix (63). Proteomic analysis of bacterial expression profiles following exposure to flower extracts of *Melastomacandidum* affected the expression of four proteins in *E. coli* and one protein in *S. aureus* (64).

In this study, alkaloids and saponins were found to reduce the amounts of high molecular weight Lipopolysaccharide (LPS) in *E. coli*. LPS is a main outer membrane component of Gram-negative bacteria (65). It causes pathophysiological effects such as fever, leucopenia, leucocytosis and Shwartzman reactivity (65). It is also involved in the attachment to host cells and it is important for the virulence and pathogenesis of many bacterial species, including *Pseudomonas aeruginosa*, *Salmonella* species, and *Escherichia coli* (66-68).

LPS is associated closely with the OmpF protein of the outer membrane (69). The low expression of OmpF caused by alkaloids and saponins might have a role in the decreased in the detected amounts of high molecular weight LPS. LPS are essential for the pathogenesis of bacteria. It is an important mechanism to evade complement activation (70). This implies that alkaloids and saponins could affect the pathogenesis of *E. coli*.

### Conclusion:-

Thymoquinone, saponins and alkaloids of *N. sativa* at subinhibitory concentrations affect motility, biofilm formation and the expression of some proteins and LPS of the outer membrane of bacteria. This presumably would affect the pathogenesis of bacteria.

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### RESEARCH ARTICLE

#### STOCHASTIC BEHAVIOUR OF A SYSTEM WITH PATIENCE TIME FOR REGULAR REPAIRMAN

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#### Abstract

The present paper presents analysis of a two unit redundant system with the concept of regular repairman and patience time. As regards to repairing of the system, it has to be wait for repair due to unavailability of repair facility after common cause failure. The analysis is carried out using the supplementary variable technique and Laplace transformation for evaluating reliability measures such as availability, reliability, mean time failure, mean time to repair and expected number of visits by the repair facility.

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#### Introduction:-

Agnihotri, Satsangi and Agarwal (1995), Chandrashekar (1996), Kumar and Garg (1991), Wang (2002) and many authors engaged in the field of reliability theory analyzed many engineering systems with the assumptions that only available regular repair facility completes the repair of the failed unit without considering the time factor taken by the repair facility to complete its repair. Ram, Singh and Varshney (2013) investigated the reliability of a standby system under human failure but it is quite reasonable to fix an amount of time known as patience time i.e. if the regular repair facility is able to complete the repair of the failed unit within the patience time then it is okay otherwise an urgent call should be send for expert repairman who is very costly and specialist for repair. The expert repairman takes a random amount of time to become available and repair the failed unit with the help of regular repairman. Keeping this view, the present paper analyse a two unit redundant system with the concept of regular repairman and patience time. Using regenerative point techniques with Markov renewal process the following reliability characteristics of interest which are useful to system designers are obtained.

- Transition and steady state transition probabilities
- Mean Sojourn times in various states
- Mean time to system failure (MTSF)
- Point wise and steady state availability of the system
- Expected busy period of the repairman in  $(0, t]$
- Expected number of visits by the repairman in  $(0, t]$

#### Model Description and Assumptions:-

1. The system consists of only two non-identical units in which first is operative and the second unit is kept as warm standby.

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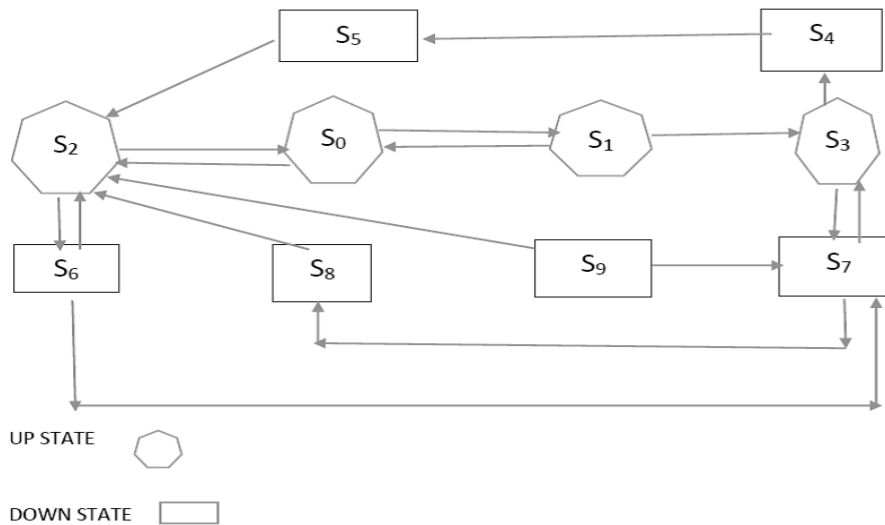
2. First unit gets priority over second unit for both operation and repair.
3. A single repair facility known as regular repairman is available in the system for both the units.
4. There is a patience time for regular repairman i.e. if the regular repairman is unable to repair the failed priority unit within patience time then an urgent call is send to expert repairman. Expert repairman is very costly which takes a random amount of time to become available. The expert repairman repairs the failed unit with the collaboration of regular repairman. The concept of patience time is applicability only for priority unit.
5. The failure time distribution of both the units are negative exponential. Also rate of completing patience time for regular repairman and rate of availability of expert repairman are negative exponential.
6. The repair time distributions of the failed unit by the regular and expert repairman are general.

**Notation and Symbols:-**

$N_0$	:	Normal unit as operative
$N_5$	:	Normal unit kept as warm standby
$F_{wr}$	:	Failed unit waiting for repair by regular repairman
$F_{rr}$	:	Failed unit under repair by regular repairman
$F_{RR}$	:	Repair of failed unit by regular repairman is continued from earlier state
$E_{UC}$	:	Expert repairman is under urgent call
$F_{re}$	:	Failed unit under repair by expert repairman
$F_{RE}$	:	Repair of failed unit by expert repairman is continued from earlier state
$\alpha$	:	Constant rate of first unit
$\beta$	:	Constant rate of second unit
$\gamma$	:	Constant rate of completing patience time
$\delta$	:	Constant rate of time to available expert repairman
$f(\cdot), F(\cdot)$	:	pdf and cdf of time to repair of first unit by regular repairman
$g(\cdot), G(\cdot)$	:	pdf and cdf of time to repair of second unit by regular repairman
$h(\cdot), H(\cdot)$	:	pdf and cdf of time to repair of first unit failed by expert repairman
$m_1, m_2, m_3$	:	Mean time for repair

The possible states of the system are here under using the notations and symbols above:

<b>Up States</b>	:	$S_0 \equiv (N_0, N_s)$	$S_1 \equiv (F_{rr}, N_0)$	$S_2 \equiv (N_0, F_{rr})$
		$S_3 \equiv (E_{UC}, N_0)$	$S_4 \equiv (F_{re}, N_0)$	
<b>Down States</b>	:	$S_5 \equiv (F_{RE}, F_{wr})$	$S_6 \equiv (F_{rr}, F_{wr})$	$S_7 \equiv (E_{UC}, F_{rr})$
		$S_8 \equiv (F_{re}, F_{wr})$	$S_9 \equiv (F_{RR}, F_{wr})$	



**Transition Probabilities:-**

Let  $T_0 (= 0), T_1, T_2, \dots$  be the epochs at which enters the states  $S_i \in E$ . Let  $X_n$  denotes the state entered at epoch  $T_{n+1}$  i.e. just after the transition of  $T_n$ . Then  $\{T_n, X_n\}$  constitutes a Markov-renewal process with state space  $E$  and

$$Q_{ik}(t) = \Pr [ X_{n+1} = S_k, T_{n+1}-T_n \leq t | X_n = S_i ] \tag{4.1}$$

is semi Markov over  $E$ . The stochastic matrix of embedded Markov chain is

$$P = p_{ik} = \lim_{t \rightarrow \infty} Q_{ik}(t) = Q(\infty) \tag{4.2}$$

By simple probabilistic consideration, the non-zero elements of  $Q_{ik}(t)$  are:

$$Q_{01}(t) = \int_0^t \alpha e^{-(\alpha+\beta)u} du = \frac{\alpha}{\alpha+\beta} [1 - e^{-(\alpha+\beta)t}]$$

$$Q_{02}(t) = \int_0^t \gamma e^{-(\alpha+\beta)u} du = \frac{\beta}{\alpha+\beta} [1 - e^{-(\alpha+\beta)t}]$$

and similarly, other elements are  $Q_{10}, Q_{13}, Q_{19}, Q_{20}, Q_{26}, Q_{34}, Q_{37}, Q_{40}, Q_{45}, Q_{62}, Q_{67}, Q_{73}, Q_{78}, Q_{82}, Q_{92}, Q_{97}$  and

$$Q_{12}^{(9)}(t) = \int_0^t \beta e^{-\beta u} e^{-\gamma u} \bar{F}(u) \cdot du \int_u^t dH(x)/\bar{F}(u) = \frac{\beta}{\beta+\gamma} [\int_0^t dF(x) - \int_0^t e^{-(\beta+\gamma)x} dF(x)]$$

$$Q_{42}^{(5)}(t) = \int_0^t \beta e^{-\beta u} \bar{H}(u) \cdot du \int_u^t dH(x)/\bar{H}(u) = \int_0^t dH(x) - \int_0^t e^{-\beta x} dH(x) \tag{4.3}$$

Taking limit as  $t \rightarrow \infty$ , the steady state transition  $p_{ij}$  can be obtain from equations in (4.3)

i.e.  $p_{ik} = \lim_{t \rightarrow \infty} Q_{ik}(t)$  (4.4)

Thus,

$$\begin{aligned} p_{01} &= \frac{\alpha}{\alpha+\gamma}, p_{02} = \frac{\beta}{\alpha+\beta}, p_{10} = f^*(\alpha + \beta), p_{13} = \frac{\gamma}{\beta+\gamma} [1 - f^*(\beta + \gamma)], \\ p_{19} &= \frac{\beta}{\beta+\gamma} [1 - f^*(\beta + \gamma)], p_{20} = g^*(\alpha), p_{26} = 1 - g^*(\alpha), p_{34} = \frac{\delta}{\beta+\delta}, p_{37} = \frac{\beta}{\beta+\delta}, \\ p_{40} &= h^*(\beta), p_{45} = 1 - h^*(\beta), p_{62} = f^*(\gamma), p_{67} = 1 - f^*(\gamma), p_{73} = g^*(\delta), \\ p_{78} &= 1 - g^*(\delta), p_{82} = 1, p_{92} = f^*(\gamma) \text{ and } p_{97} = 1 - f^*(\gamma). \end{aligned} \tag{4.5}$$

From these probabilities, we can have following relations:

$$\begin{aligned} p_{01} + p_{02} = 1 = p_{10} + p_{13} + p_{19}, p_{20} + p_{26} = p_{34} + p_{37} = 1, p_{40} + p_{45} = 1 = p_{62} + p_{67} \text{ and} \\ p_{73} + p_{78} = p_{82} = p_{92} + p_{97} = 1 \end{aligned} \tag{4.6}$$

**Mean Sojourn Times:-**

The mean time taken by the system in a particular state  $S_i$  before transiting to any other state is known as mean sojourn time and is defined by

$$\mu_i = \int_0^\infty P[T > t] dt \tag{5.1}$$

where  $T$  is time of stay in state  $S_i$  by the system.

We assume that so long as the system is in state  $S_i$ , it will not transit to any other state. Therefore mean sojourn time  $\mu_i$  in state  $S_i$  are:

$$\mu_0 = \int_0^\infty e^{-(\alpha+\beta)t} dt = \frac{1}{\alpha+\beta}, \mu_1 = \int_0^\infty e^{-(\beta+\gamma)t} \bar{F}(t) dt = [1 - f^*(\beta + \gamma)] \text{ and similarly,}$$

$$\mu_2 = \frac{1}{\alpha} [1 - g^*(\alpha)], \mu_3 = \frac{1}{\beta+\delta}, \mu_4 = \frac{1}{\beta} [1 - h^*(\beta)], \mu_6 = \frac{1}{\gamma} [1 - f^*(\gamma)], \mu_7 = \frac{1}{\delta} [1 - g^*(\delta)],$$

$$\mu_8 = \int_0^\infty t \cdot h(t) dt \text{ and } \mu_9 = \frac{1}{\gamma} [1 - f^*(\gamma)] \tag{5.2}$$

The mean sojourn time in state  $S_i \in E$  in the occurrence of non-generative state can also be contributed as:

$$m_{ij} = \int_0^\infty t \cdot q_{ij}(t) dt = q_{ij}^*(0) \tag{5.3}$$

Therefore,

$$m_{01} = \frac{\alpha}{(\alpha+\beta)^2}, m_{02} = \frac{\beta}{(\alpha+\beta)^2}, m_{10} = \int_0^\infty t \cdot e^{-(\beta+\gamma)t} f(t) dt, m_{13} = \gamma \cdot \int_0^\infty t \cdot e^{-(\beta+\gamma)t} \bar{F}(t) dt$$

$$m_{19} = \int_0^\infty \beta \cdot t \cdot e^{-(\beta+\gamma)t} \bar{F}(t) dt, m_{20} = \int_0^\infty t \cdot e^{-\alpha t} g(t) dt, \dots, m_{26}, m_{34}, m_{37}, m_{40}, m_{45}, m_{62}, m_{67}, m_{67}, m_{73}, m_{78}, m_{82}, m_{92}, m_{97} \text{ and finally}$$

$$m_{12}^{(9)} = \frac{\beta}{\beta + \gamma} \left[ \int_0^\infty t \cdot f(t) dt - \int_0^\infty t \cdot e^{-(\beta+\gamma)t} f(t) dt \right]$$

$$m_{42}^{(5)} = \int_0^\infty t \cdot h(t) dt - \int_0^\infty t \cdot e^{-\beta t} f(t) dt \tag{5.4}$$

Hence,

$$m_{01} + m_{02} = \frac{1}{\alpha+\beta} = \mu_0, m_{10} + m_{13} = \mu_1, m_{20} + m_{26} = \mu_2, m_{34} + m_{37} = \mu_3,$$

$$m_{40} + m_{45} = \mu_4, m_{62} + m_{67} = \mu_6, m_{73} + m_{78} = \mu_7, m_{82} = \mu_8, m_{92} + m_{97} = \mu_9 \tag{5.5}$$

**Mean Time to System Failure (MTSF):-**

The mean time to system failure (MTSF) can be obtained by E (T) given below by using Laplace Stieltjes transform of the relations for the distribution function  $\pi_i(t)$  of the time to system failure with starting time  $S_0$

$$E(T) = \frac{d}{ds} \pi_0(s)|_{s=0} = \frac{D'_1(0) - N'_1(0)}{D_1(0)} \tag{6.1}$$

Where

$$N_1 = \mu_0 + m_1 p_{01} + m_2 p_{01} p_{13} p_{34} + p_{01} p_{13} \mu_3 + \mu_2 (p_{02} p_{12}^{(9)} + p_{01} p_{13} p_{34}) \tag{6.2}$$

and

$$D_1 = 1 - p_{01} p_{10} - p_{01} p_{13} p_{34} p_{42}^{(5)} - p_{01} p_{12}^{(9)} p_{20} - p_{02} p_{20} - p_{01} p_{13} p_{34} p_{20} \tag{6.3}$$

**Availability analysis:-**

System availability is defined as

$A_i(t) = P_r$  [Starting from state  $S_i$  the system is available at epoch  $t$  without passing through any regenerative state]

$M_i(t) = P_r$  [ Starting from up state  $S_i$  the system remains up till epoch  $t$  without passing through any regenerative state]

Hence, obtaining  $A_i(t)$  by using elementary probability argument, we get

$$\begin{aligned} A_0(t) &= M_0(t) + q_{01} \odot A_1(t) + q_{02} \odot A_2(t) \\ A_1(t) &= M_1(t) + q_{10} \odot A_0(t) + q_{12}^{(9)} \odot A_2(t) + q_{13} \odot A_3(t) + q_{17}^{(9)} \odot A_7(t) \\ A_2(t) &= M_2(t) + q_{20} \odot A_0(t) + q_{26} \odot A_6(t) \\ A_3(t) &= M_3(t) + q_{34} \odot A_4(t) + q_{37} \odot A_7(t) \\ A_4(t) &= M_4(t) + q_{40} \odot A_0(t) + q_{42}^{(5)} \odot A_2(t) \\ A_6(t) &= q_{62}(t) \odot A_2(t) + q_{67} \odot A_7(t) \\ A_7(t) &= q_{73}(t) \odot A_3(t) + q_{78} \odot A_8(t) \\ A_8(t) &= q_{82}(t) \odot A_2(t) \end{aligned} \tag{7.1}$$

Where  $M_0(t) = e^{-(\alpha+\beta)t}$ ,  $M_1(t) = e^{-(\beta+\gamma)t}$ ,  $M_2(t) = e^{-(\alpha)t} \cdot \bar{G}(t)$ ,  $M_3(t) = e^{-(\beta+\gamma)t}$ ,

$$M_4(t) = e^{-(\beta)t} \cdot \bar{H}(t) \tag{7.2}$$

Taking Laplace transform of the equations (7.1) and solving for point wise availability by omitting the arguments ‘s’ for brevity, the steady state functioning availability of the system, when the system starts operation from the state  $S_i$ , we get

$$A_0(\infty) = \lim_{t \rightarrow \infty} A_0(t) = \lim_{s \rightarrow 0} A_0^*(s) = \frac{N_2(0)}{D_0(0)} = \frac{N_2}{D_2} \tag{7.3}$$

$$\text{where in terms of } M_0^*(0) = \mu_0, M_1^*(0) = \mu_1, M_2^*(0) = \mu_2, M_3^*(0) = \mu_3, M_4^*(0) = \mu_4 \tag{7.4}$$

$N_2$  and  $D_2$  can be easily obtained.

**Busy Period Analysis:-**

Let  $W_i(t)$  be the probability that the system is under repair by repair facility in the state  $S_i \in E$  at time  $t$  without transiting to any regenerative state. Therefore,

$$\begin{aligned} W_1(t) &= \bar{F}(t) = W_6(t) \\ W_2(t) &= e^{-\alpha t} \bar{G}(t) \\ W_3(t) &= e^{-(\beta+\delta)t} \\ W_7(t) &= e^{-\delta t} \bar{G}(t) \end{aligned} \tag{8.1}$$

Let  $B_i(t)$  be the probability that the system is under repair at time  $t$ . We obtain the following recursive relations among  $B_i(t)$ 's:

$$B_0(t) = q_{01}(t) \odot B_1(t) + q_{02}(t) \odot B_2(t) \text{ and similarly for } B_1(t), B_2(t), B_3(t), B_4(t), B_6(t), B_7(t) \text{ and } B_8(t).$$

Taking Laplace transform of the equations (8.1) and solving the equations by omitting the argument for brevity we get the fraction of time for which the repair facility is busy in repair as

$$B_0(t) = \lim_{t \rightarrow \infty} B_0(t) = \lim_{s \rightarrow \infty} B_0^*(s) = N_3(0)/D_3'(0) = N_3/D_3 \tag{8.2}$$

where  $N_3 = \mu_0 + p_{24} \mu_4$  and  $D_3$  is same as  $D_2$  in (4.3).

**Expected number of visits by repair facility:-**

Let  $V_i(t)$  be the expected number of visits by the repair facility in  $(0, t]$  given that the system initially started from regenerative state  $S_i$  at  $t = 0$ . The following recurrence relations among  $V_i(t)$ 's can be obtained as:

$$\begin{aligned}
 V_0(t) &= Q_{01}(t)[1 + V_1(t)] + Q_{02}(t)[1 + V_2(t)] \\
 V_1(t) &= Q_{10}(t)V_0(t) + Q_{12}^{(9)}(t)V_2(t) + Q_{13}(t)V_3(t) + Q_{17}^{(9)}(t)V_7(t) \\
 V_2(t) &= Q_{20}(t)V_0(t) + Q_{26}(t)V_6(t) \\
 V_3(t) &= Q_{34}(t)V_4(t) + Q_{37}(t)V_7(t) \\
 V_4(t) &= Q_{40}(t)V_0(t) + Q_{42}^{(5)}(t)V_2(t) \\
 V_6(t) &= Q_{62}(t)V_2(t) + Q_{27}(t)V_7(t) \\
 V_7(t) &= Q_{73}(t)V_3(t) + Q_{78}(t)V_8(t) \\
 V_8(t) &= Q_{82}(t)V_2(t)
 \end{aligned} \tag{9.1}$$

Using Laplace Stieltjes transform of the above equations and omitting the argument 's' for brevity, we can get the number of visits per unit of time when the system starts after entrance into state  $S_0$  as:

$$V_0 = \lim_{t \rightarrow \infty} [V_0(t)/t] = \lim_{s \rightarrow 0} s \tilde{V}_0(s) = N_5/D_5 \tag{9.2}$$

Where  $N_5 = (1 - p_{26}p_{62})(1 - p_{37}p_{73}) - p_{26}p_{67}p_{72} - p_{26}p_{67}p_{73}p_{34}p_{42}^{(5)}$  and  $D_5$  is same as in (4.3).

With the help of this study we concluded that the performance of the manufacturing system can be improved by improving the procedures on considering patience time, proper training of employees and proper maintenance of the system. The results derived in this paper are valuable in a study of improving the reliability of the systems and additionally they can be extensively used in many engineering disciplines.

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### RESEARCH ARTICLE

#### PARENTING STRESS ASSOCIATED WITH DIFFERENTLY ABLED CHILDREN...THAT MAY INFLUENCE SEEKING DENTAL CARE?

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#### Abstract

Parenting a differently abled child is not an easy task. Such parents experience variety of stress related issues. For this difficult task parents especially mothers' require every help and possible encouragement. Parents and siblings should experience variety of extreme adjustments to adapt to the presence of a disabled child. Analysis have shown that families which can cope successfully with a differently abled child are able to mobilize their internal and external means of support to tackle efficiently with the special needs of their child. This review article highlights the parenting stress associated with differently abled children which may indirectly influence their approach towards seeking dental care.

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#### Introduction:-

Parents play an important role in child's life, influencing their social, emotional, and academic development and adjustments. Parents also play an important role in supervising and maintaining their health care needs including oral hygiene and dietary habits. It has been reported that parents with good oral health knowledge can be responsible in sustaining favorable oral health of their children<sup>1-3</sup>. But the question is – "Is that enough just to educate parents and expect them to begin changing their daily oral hygiene routine, especially in parents of disabled children – Are they in a state to provide the necessary health care??"

Just educating parents about oral hygiene maintenance may not be adequate. Children who are normal advance from one stage of development to the next and their parents perceive them with satisfaction. When behavior of the child diverge from the ideal standards, family problems may develop<sup>4</sup>.

Differently abled child's birth is an unanticipated tense event which disturbs the entire family and will impair family development. Parents go through intense stress which may be emotional, psychological, social etc<sup>5</sup>.

Attractive, smart, graceful, sophisticated and athletic children are expected by most of the parents. Parents of differently abled child not only grieve for the loss of unfulfilled expectations but frequently encounter colossal

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burden on their emotional and financial assets have excessive stress and reduced level of comfort as compared to the parents of normal children<sup>5,6</sup>.

Parenting behavior is influenced by many factors and one such aspect is parenting stress. Parenting stress can be described as excess anxiety and tension specifically related to the role of a parent and to parent-child interactions<sup>7</sup>. Plethora of evidence is there that additional amount of emotional stress is experienced by parents of children with retardation. It is reported that parents of mentally and physically challenged children are more upset, socially secluded and confined in their parental roles in comparison with parents of children with normal behaviour<sup>8</sup>. Increased levels of stress across all sections in parents of children with developmental disorders have been reported by Beckman<sup>9</sup>. It is reported that behavioral and developmental disability was linked with excessive parenting stress than medical disorder <sup>10</sup>.

It is documented that parental stress and adaptation rely upon the kind of disability, the family's coping facilities, conventional and unconventional supports in the society. Parent's previous psychological make up, accessibility and standard of professional assistances, marital interaction, religious perspectives, attitudes, number of members in the family also affects family adaptation. The quantity of assistance the parents obtain from companions, family members and professionals, regulates the self-resolution and intellectual performance of the parents<sup>6,11</sup>.

#### **Type of stress:-**

The nature of stress and areas of stress in parents of the mentally challenged have been studied extensively<sup>12-15</sup>.

- a. Care stress
- b. Social stress - poor social relationships and lack of holidays or free time
- c. Emotional stress
- d. Financial stress –Families with low income is reported to be correlated with increased stress because of insufficient facilities.

#### **Factors affecting stress:-**

1. **Mothers' vs Fathers** - The mothers experience higher stress than the fathers when it comes to daily care, emotional and social stress as mothers are usually directly involved in child care. Father's stress is attributed from disturbed behavior and decreased leisure time. Regarding financial stress, there were no differences between the parents<sup>15</sup>.
2. **Siblings** - Effect on siblings such as that of adjustment creates stress on both the parents but absence of normal siblings in the family of mentally challenged children does not make significance difference in stress experienced by the parents<sup>16</sup>.
3. **Gender of the child** - Gender and age of the child influences the stress in parents. Tangri and Verma<sup>17</sup> report higher stress in parents of female retarded children. When the child with disability is female, marital stress among parents is also seen and affinity is compromised <sup>18</sup>.
4. **Age** - Lower age of the mentally challenged individual is associated with an increase in stress.<sup>14,19</sup> Lesser the parents age higher is the parental stress, probably due to reduced experience and restrictions involved<sup>20</sup>.
5. **Severity of retardation:** It is observed that parents of severe and profoundly retarded children have higher stress<sup>21</sup> but in Indian scenario parents of mildly retarded group also exhibit higher stress<sup>13</sup>.
6. **Educational level of parents** - Educational level of parents does show clear influence on parental stress and higher stress is reported in educated group, which may be due to the additional social stress involved<sup>22</sup>. Prabhu<sup>23</sup> found that mental retardation is not considered as a serious problem especially in the agricultural communities, which may due to impaired sense of competence, less restrictions in their lifestyles, etc. Higher stress among educated parents may exist because of increased expectations of their children, higher sense of humiliation, annoyed at incapable of not being able to rehabilitate the state of the child and more limitations on their community and professional actions<sup>24-25</sup>. Increased stress was encountered in parents who worked as professionals and managers as compared to parents who were employed as laborers and assistants. Impaired sense of ability, limitations put on other lives, insufficient social assistance and depression can be the reasons <sup>26</sup>.
7. **Support and resources** - The studies reveals that knowledge on the value of informal support by extended family is inconsistent. Parents in joint families have support from grandparental and other family members thus reducing parental stress<sup>27</sup>. But it has been reported that family support can be a troublesome because of more behavior issues or excessive demands. Family adaptation has been encouraged and a decrease stress has been found by the assistance from the spouse and nearby relatives<sup>28</sup>. Most of the parents in India do not use

formal resources such as social support groups or family counselling due to the disgrace linked to disability and the harm to the family's prestige and this may further increase the stress.

#### **Burden reported 29-32:-**

The kind of burdens reported by family members vary from

- a. Difficulties in transportation of the child to the place of service delivery
- b. Management of behavior problems
- c. Disruption of their daily routine
- d. Economic, physical and social burden.

#### **Parental Coping mechanisms:-**

Trust in God, spirit and self-belief to the external aids such as assistance from family members, relatives, professionals, and Governmental policies are various coping resources<sup>33</sup>. Parenting stress is found to be reduced by religious coping<sup>34,35</sup>. It is also intriguing to be aware that music and television has been used by the parents to decrease the stress of handling with the situation.

#### **Conclusion:-**

Stress may also interfere in parent's ability to provide good oral health care. It is therefore necessary not only to educate parents but also to understand, assess and counsel parental stress related issues. Most of the time importance is given only to the difficult areas associated with children with special needs such as soft diet high in carbohydrates, lack of muscle movement and coordination making it difficult to effectively brush the teeth predisposing these children to a higher risk for dental caries and gingival disease etc, but the parental stress is totally ignored.<sup>36</sup>

Formation of dental teams with knowledge, empathy and providing education keeping in mind the associated stress involved, is what parents need. The dental community has to increase its effort for providing full support to parents and these children in the form of continuous encouragement apart from providing oral health education and dental care facilities.

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### RESEARCH ARTICLE

#### VERMICOMPOST AND FARMYARD MANURE INCREASE FERTILITY OF SODIC SOIL AND THE PRODUCTIVITY OF GREEN VEGETABLES.

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#### Abstract

Soil degradation due to salinization and sodication in arid and semiarid region is of global concern and studies on management of such soils can provide pragmatic solutions. In this study, we used different organic and inorganic amendments to investigate their likely effects of sodic soil properties (pH, electrical conductivity; EC, exchangeable sodium percentage; ESP) and productivity (growth and seed production) of two vegetables crops Spinach (*Spinacia oleracea*) and the Pea (*Pisum sativum*). We have selected a patch of sodic soil (sodicity: pH 9.04, EC 1.05 dSm<sup>-1</sup>, ESP 78.5) divided into six blocks and each block with eight unit plots (total 48 unit plots). Dietary crops were grown with eight different amendments of chemical fertilizers and organic manures (Control, T1; NPK, T2; farmyard manure (FYM), T3; vermicompost (VC), T4; NPK+VC, T5; FYM+VC (1:1), T6; FYM+VC (1:2), T7; FYM+VC (2:1), T8). The combined use of FYM and VC showed approximately 5.97, 41.9 and 48% respective decrease in soil pH, EC and ESP and 33.2, 78.3, 29.5 and 152 increase in soil nitrogen, phosphorus, potassium and soil organic carbon (OC), respectively. This decrease in soil sodicity and the increase in soil fertility showed significant increase at  $P < 0.05$  in crops' different morphological growth parameters and growth indices such as the relative growth rate (RGR), root shoot ratio (RSR), leaf weight ratio (LWR) and leaf area ratio (LAR). We also observed a remarkable increase in seed yield of spinach and pea by 186 and 72.35 % in organic amended soil. The study reveals that combined use of FYM and VC in sodic soil might be adopted as alternate farming technology to diminish the unproductive effect of sodicity in the Indian agricultural economy.

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## Introduction:-

Land degradation has now become a burning issue at a global level as its spatial distribution varies from 1 billion ha to over 6 billion ha (Gibbs and Salmon, 2015). Deforestation, accelerated soil erosion, lost of biodiversity pollution, lost of soil fertility and the accumulation of salt on the soil surface are some major causes of degraded land (Keesstra, 2007; Dai et al., 2015; Eskandari et al., 2016; Kasem and Mohamed, 2016; Prosdociami et al., 2016; Rodrigo et al., 2016). Salt induced land degradation is one of very important issues as affecting the status of food, productivity as well as health along the planet (Wicke et al., 2011; Ivits et al., 2013; Murtaza, 2013). According to recent data, the world salt affected area (saline  $397 \times 10^6$  and sodic soils  $434 \times 10^6$  ha) may lead about 27.3 \$ billion current annual economic losses and  $441 \text{ ha}^{-1}$  \$ inflation-adjusted cost at global level (Qadir et al., 2014). In case of India, this scenario is more critical as India (329 Mha geographical area) with only 2.4 % world land area, supports 18% and 15% world human and livestock population respectively and provide employment for 54.6% Indian people (Bhattacharya, 2015). India has INR 10714 annual potential losses and INR 7737 annual actual losses  $\text{ha}^{-1}$  due to 3.77 Mha acidic soils of 6.73 Mha salt affected land area. With respect to crops in Rice about a 33 % yield reduction in slight and 57% in moderate acidic soil is reported (Dwivedi and Qadar, 2011). However, 45% in slight and 100% yield loss is noted for wheat crop (Sharma et al., 2010; Thimmappa et al., 2014).

Application of slow release fertilizers, biological nutrient sources, organic matter management, natural predators, crop rotations and manual weed control are some key characteristics of organic farming to maintain agriculture sustain. In 2013 India occupies about 1.18% (5,10,000 ha) organic agricultural land 15<sup>th</sup> world position which in 2014 become 7.20,000 ha (1.64%) with 11<sup>th</sup> rank in the world (FiBL, 2016). Based on extensive research it has been scientifically and undoubtedly established, that organic farming systems are most productive, environment-friendly system, sustain natural resources and agriculture and reducing the impact of agriculture on the atmosphere. In this direction a lot of patches of literature based on reclamation of sodic soil with organic amendments using various agricultural crops such as cereals, millets, pulses except dietary vegetable crops are existing in the last five years (Walpola and Arunakumara, 2010; Cha-um and Kirdmanee, 2011; Diacono and Montemurro, 2015; Drake et al., 2016; Mbarki et al., 2016). Thus this study reflects whole picture of growth pattern through relative growth rate (RGR), relative shoot ratio (RSR), leaf weight ratio (LWR), leaf area ratio (LAR), plant biomass and productivity status of common Indian dietary crops such as *Spinacia oleracea* (leafy vegetable) and *Pisum sativum* (fruit vegetable) along with sodic soil properties which is very significant in direction to overcome the losses of agricultural economy due to salt affected soil in India as well as vegetable crop cultivation in sodic soil.

## Materials and Methods:-

### The study area:-

A large area of sodic soil was selected as the study field in Babasaheb Bhimrao Ambedkar University, campus Lucknow ( $26^{\circ} 50'21''$  N,  $80^{\circ} 55'23''$  E and 126 m above sea level) during year 2014 – 2016. The meteorological data of the study area were obtained from the Indian Meteorological Department (IMD), Amausi, Lucknow (3 km away from the experimental site) during the study period. On this basis an average annual rainfall during the last five years was measured as  $789.4 \pm 100$  mm, the minimum-maximum temperature varied from  $19.2 \pm 1.08^{\circ}\text{C}$  to  $40.1 \pm 0.16^{\circ}\text{C}$ , and the average annual relative humidity was recorded as  $60.7 \pm 2.01\%$ .

### Experimental Design:-

The experiment was designed with eight soil amendments. (1) T1, Control (without amending soil); (2) T2, NPK (a synthetic fertilizer with recommended dose); (3) T3, FYM (farmyard manure); (4) T4, VC (vermicompost) (5) T5, NPK + VC; (6) T6, FYM: VC (1:1); (7) T7, FYM: VC (1:2); (8) T8, FYM: VC (2:1). Synthetic fertilizers (NPK) were used as per established recommended practices at the rate of  $40 \text{ kg ha}^{-1} \text{ y}^{-1}$  for N,  $20 \text{ kg ha}^{-1} \text{ y}^{-1}$  for P and  $15 \text{ kg ha}^{-1} \text{ y}^{-1}$  for K. FYM and VC were used @  $30 \text{ t ha}^{-1}$  and  $5 \text{ t ha}^{-1}$  respectively. Soil without any amendment was taken as a control (C) for data comparison with other treatments. All amendments were applied in the study area as a randomized complete block design (18 x 18 m) with six blocks (18 m x 3 m). Each block was again divided into eight plots (2 m x 2 m) and hence there were 48 (6 x 8) unit plots. The distance between two adjacent blocks and plots were 1 m and 0.5 m, respectively. The eight treatments were randomly assigned to each plot within the individual blocks with a separate randomization for each block.

### Soil sampling and Analysis:-

Random soil samples from 0-25 cm depth was collected in triplicate form from each block of sampling sites with the help of an auger before and after the amendment application and before and after the cultivation of the crops at 15

days intervals from 2014-2016. Soil pH and conductivity (EC) were analyzed by pH and conductivity meter respectively. Phosphate – P and total Nitrogen – N were determined by the Olsen's sodium bicarbonate method (Mackereth, 1963) and Micro-Kjeldahl distillation assembly (Misra, 1968), respectively. Available potassium  $K^+$  was estimated with the help of a flame photometer. Exchangeable sodium percentage was calculated as follows: ESP = (exchangeable sodium concentration (cmol/kg)/cation exchange capacity (cmol/kg))  $\times$  100. The titrimetric method (wet digestion method) was used for determination of soil organic carbon (OC).

#### Vegetal sampling and analysis:-

Two dietary vegetables such as Spinach (*Spinacia oleracea* L.) and the Pea (*Pisum sativum* L.) were selected as experimental test crops. These vegetables are among the most important/common dietary vegetables of north India because of their high nutritional values. Seeds of test crops were sown uniformly in differently amended sodic soil plots. After cultivation six random plant samples were taken at 15 day intervals of each crop for plant analysis. Before analysis, plant samples should be properly washed with tap water to remove the dust. To study the effect of different amendments on crop growth variables, four different growth indices such as a relative shoot ratio (RSR), relative growth rate (RGR), leaf area ratio (LAR) and leaf weight ratio (LWR) was computed. For computation of these indices formulae given by Hunt (1982) were used.

$$RGR (g g^{-1} d^{-1}) = \frac{\ln W_2 - \ln W_1}{t_2 - t_1}$$

$$LAR (cm^2 g^{-1}) = \frac{\text{Leaf Area}}{\text{Total Biomass}}$$

$$LWR (g g^{-1}) = \frac{\text{Leaf Dry Weight}}{\text{Total Biomass}}$$

$$RSR (g g^{-1}) = \frac{\text{Root Dry Weight}}{\text{Shoot Dry Weight}}$$

Where,

$W_1$  = total plant dry weight at time  $t_1$  (initial)

$W_2$  = total plant dry weight at time  $t_2$  (final)

ln = natural logarithm

#### Statistical analysis:-

All the obtained data were subjected in IBM SPSS statistics 21 for the measurement of mean, standard error, range, variance  $P \leq 0.05$  as significant, followed by a post hoc Tukey test. All the graph designing and regression analysis employed to determine the relationship between the ESP, OC and crop yield was accomplished using Sigma Plot 11.0.

### Results and Discussion:-

#### Physico-chemical properties and soil nutrient status as influenced by organic Amendments:-

After about 4.5 months of application of organic amendments soil pH, EC and ESP (an important indicator of sodicity) were decreased significantly from 0.11% – 5.97 %; 9.5 – 41.9% and 3.56 – 48.0% respectively in soils amended together with FYM and VC in comparison to control (Table I). The highest decrease in soil pH, EC and ESP were observed in FYM and VC (T8) treated plots. The soil nutrients N, P, K and SOC contents were significantly higher in organic amendments sodic soils than soils amended with chemical fertilizers (T3; NPK amended soil) and control soil. The highest soil nutrients were observed in FYM and VC treated plots (T8). The increased values were N (2.62% - 33.2%), P (3.69% – 78.3%), K (2.72% - 29.5%) and OC % (16%-152%) in comparison to pre harvest values. Various physico-chemical properties of used organic amendments such as FYM and VC were also analyzed and given in Table II.

Reduction of pH in sodic soil on the application of organic amendments is likely due to higher production of  $CO_2$  and organic acids in soil followed by solubilization of  $CaCO_3$  and sodicity neutralization is well reported (Ansari, 2008; Rai et al., 2010; Shaimaa et al., 2012; Rehman and Nath, 2013) but this phenomenon found more efficient here with the application of FYM and VC in 2:1 ratio may with their some acidic pH values in this study (Table II). Reduction at the level of 41.5% of EC in organically amended sodic soil may attribute to improved physical

properties of soil as well as an increased leaching process with the resourceful coupling of FYM and VC in T8 treatment (Kahlowan and Azam, 2003; Shaimaa et al., 2012; Wang et al., 2014). After harvesting, ESP reduction was 48% in experimental soil leads to increase organic carbon content and humic acid in soil. These contents in turn reduce redox potential and increase the replacement of  $\text{Na}^+$  to  $\text{Ca}^{++}$  leaching (Ansari and Ismail, 2008; Wang et al., 2014; Diacono and Montemurro, 2015). Thus, these results indicate that organically amended soil have efficient potential to reduce the sodic effect of soil in the direction to make them fertile. Moreover FYM and VC in 2:1 may act as boosting element to reduce the dispersion effect of soil to improve the soil structure which facilitates the growth of microbial population in sodic soil.

Available N, P, K (primary macronutrients) and OC are the fertile soil indicator. Use of biological nutrient resources, organic matter management and slow release fertilizer are key functions of organic amendments which might be the results of high level of micro and macronutrients in T8 (FYM+VC, 2:1) (Ros et al., 2003; Clark et al., 2007). On the other hand, production of organic acid and products of mineralization during decomposition solubilizes the insoluble compounds also and enhances the N, P and K availability in soil (Bhandari et al., 1992; Rahman and Nath, 2013). On account of literature, organic amendments promote the high binding ability of micronutrients as well as their slow release (Cooperband, 2002; Withers and Bailey, 2003) in the atmosphere which enhance the OC% in organically amended soil.

**Table 1:-** Physico-chemical properties of sodic soil as influenced by organic amendments in sodic soil. Values are in means and range. Values in parenthesis represent % increase (+) or decrease (-) with respect to pre-harvest values over 2014.

Variables	Pre harvest	T1	T2	T3	T4	T5	T6	T7	T8
pH	9.04	9.03 (-0.11) 9.01-9.06	9.03 (-0.11) 9.00-9.05	8.64 (-4.42) 8.62-8.66	8.64 (-4.42) 8.62-8.68	8.72 (-3.50) 8.71-8.74	8.55 (-5.42) 8.55-8.66	8.53 (-5.64) 8.52-8.55	8.50 (-5.97) 8.50-8.51
Ec ( $\text{dSm}^{-1}$ )	1.05	0.95 (-9.5) 0.95-0.96	0.94 (-10.4) 0.90-0.95	0.75 (-28.5) 0.70-0.79	0.71 (-32.3) 0.70-0.73	0.77 (-26.6) 0.77-0.78	0.65 (-38.0) 0.64-0.66	0.64 (-39.0) 0.63-0.65	0.61 (-41.9) 0.60-0.62
N ( $\text{kg ha}^{-1}$ )	268	264 (-1.49) 257-272	275 (+2.61) 264-283	317 (+18.2) 311-324	322 (+20.1) 315-327	294 (+9.70) 291-298	351 (+30.9) 343-359	353 (+31.7) 346-357	357 (+33.2) 344-363
P ( $\text{kg ha}^{-1}$ )	21.7	22.5 (+3.69) 21.2-23.8	24.4 (+12.4) 23.3-25.7	33.6 (+54.8) 25.5-39.7	35.3 (+62.6) 27.4-42.8	30.6 (+41.0) 23.7-34.6	36.8 (+69.5) 27.4-39.3	38.1 (+75.5) 26.8-49.4	38.7 (+78.3) 28.6-46.4
K ( $\text{kg ha}^{-1}$ )	184	182 (-0.76) 174-185	189 (+2.72) 167-196	205 (+11.5) 188-218v	214 (+16.6) 187-233	196 (+6.68) 178-216	225 (+22.2) 199-140	231 (+25.8) 195-258	238 (+29.5) 197-248
OC (%)	0.25	0.24 (-4.0) 0.23-0.25	0.29 (+16) 0.23-0.33	0.53 (+112) 0.51-0.55	0.55 (+120) 0.54-0.56	0.43 (+72) 0.42-0.44	0.56 (+124) 0.55-0.58	0.64 (+156) 0.62-0.65	0.63 (+152) 0.61-0.64
ESP	78.5	75.7 (-3.56) 74.3-77.2	81.3 (+3.56) 78.4-83.2	63.3 (-19.3) 61.3-66.3	66.4 (-15.4) 63.4-68.5	74.4 (-5.22) 71.6-77.4	54.1 (-30.1) 51.6-57.3	47.68 (-39.3) 44.8-50.6	40.8 (-48.0) 38.5-52.6

T1=control; T2=NPK; T3=FYM (farmyard manure); T4=VC (Vermicompost); T5=NPK+VC; T6=FYM+VC (1:1); T7=FYM+VC (1:2); T8 =FYM+VC (2:1)

**Table 2:-** Chemical and nutrient status of used organic amendments applied in sodic soil.

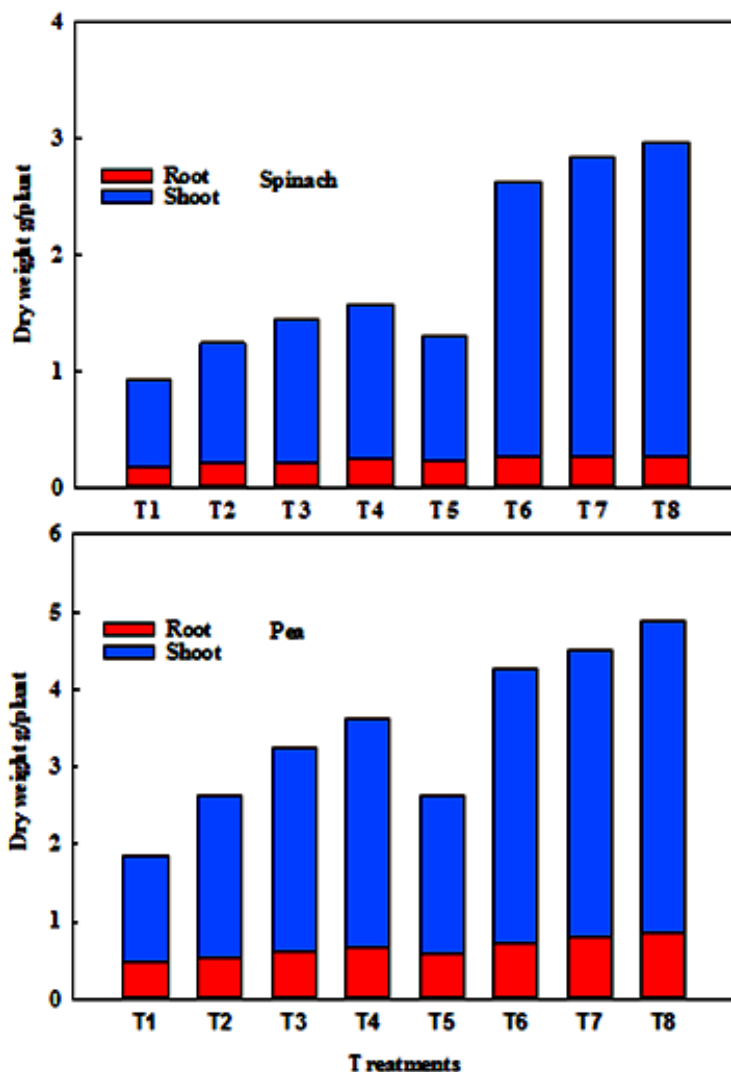
Parameters	Farmyard Manure (FYM)	Vermicompost (VC)
pH	6.4	7.1
Ec (dSm <sup>-1</sup> )	10.24	8.3
N %	1.98	1.42
P %	0.63	0.66
K %	2.84	1.72
Na <sup>+</sup> (meqL <sup>-1</sup> )	-	18.5
OC %	17.4	12.6
Ca <sup>2+</sup>	4.68	2.95
Mg <sup>2+</sup>	0.33	0.27

**Table 3:-** Yield of Spinach and Pea as influenced by soil amendments in sodic soil.

Treatments	Spinach (t ha <sup>-1</sup> )	% increase	Pea (t ha <sup>-1</sup> )	% increase
T1	2.07		4.34	
T2	3.12	50.72	5.67	30.65
T3	3.87	86.96	6.13	41.24
T4	4.11	98.55	6.46	48.85
T5	3.56	71.98	5.84	34.56
T6	5.65	172.9	7.24	66.82
T7	5.78	179.2	7.48	76.73
T8	5.94	186.9	7.67	72.35

**Effect of organic amendments on dry matter allocation pattern:-**

Dry matter distribution in between root and shoot in Spinach and Pea crops under organic soil amendments in sodic soil is shown in Figure 1. The dry matter allocation is more than 70% in the shoot than root in both the crops which is statistically significant in different soil amendments ( $p \leq 0.01$ ). In Spinach, shoot biomass distribution was increased from 0.76 g/plant in control to 2.37 – 2.70 g/plant in organically amended soil grown crops (FYM and VC i.e., T6, T7 and T8) in comparison to NPK amended grown crops (1.02 -1.08 g/plant) which is very significant as their high nutritional value in the daily diet. In case of pea, dry mass allocation was maximum in T8 treated grown crops (4.02 g/plant) which is approx double than chemically amended grown crop. Therefore, this biomass percentage increase in combination of FYM + VC in acidic soil is very effective in view of soil fertility as well as economic agriculture in salt affected soil.



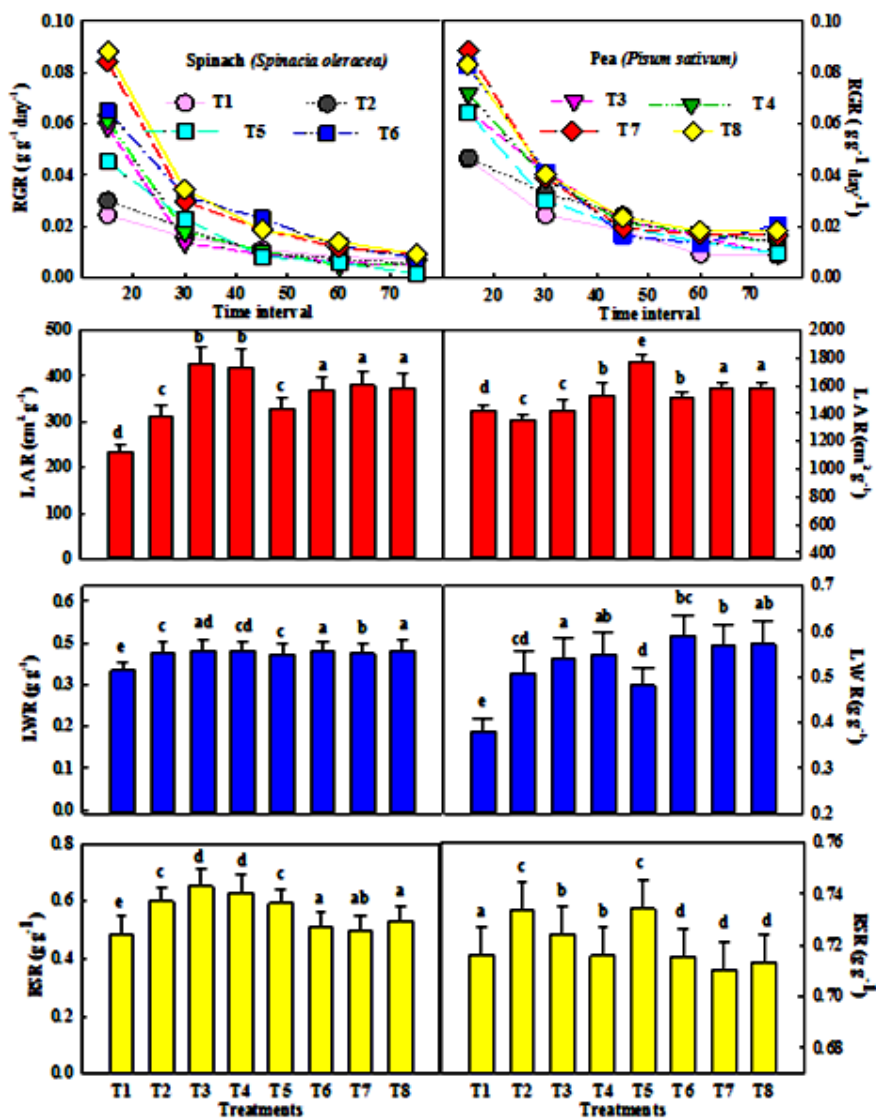
**Figure 1:-** Dry matter distribution in root and shoot parts under the influence of different amendments in sodic soil in Spinach and Pea crops. Values are means (n=6). T1=control; T2=NPK; T3=FYM (farmyard manure); T4=VC (Vermicompost); T5=NPK+VC; T6=FYM+VC (1:1); T7=FYM+VC (1:2); T8 =FYM+VC (2:1).

Adequate amount of nitrogen in soil and their availability in soil to uptake are different views of biomass allocation in plants. On account of Harris (1992), high level of nitrogen promote, shoot growth while phosphorous stimulates root growth. As in this study amount of phosphorus in preharvest soil as well as in using amendments were lower than nitrogen, which may attribute to higher shoot biomass than root. Organic amendments on soil not only enhance the amount of NPK in soil as well as increase their availability in the form of slow release in the soil is more than other used treatments (Khalilzadeh et al., 2012; Singh and Agarwal 2007) which may leads the maximum shoot dry biomass in T6, T7 and T8 in comparison to control and NPK treated sodic soil.

#### **Growth Indices in terms of RGR, LAR, LWR and RSR as influenced by organic amendments:-**

Relative growth rate, RGR is the total dry weight increase in comparison to initial dry weight in unit time interval. In both crops, RGR is reduced with increasing plant age in all the treatments (Figure 2). In spinach, crop grown under T8 treatment have the highest RGR value ( $0.02 - 0.082 \text{ g g}^{-1} \text{ day}^{-1}$ ) followed by T7 and T6 i.e., other combinations of FYM and VC. Meanwhile in case of pea the maximum RGR was found in T7 ( $0.046 - 0.088 \text{ g g}^{-1} \text{ day}^{-1}$ ) in comparison to other FYM and VC combinations and control treatment. To analyze the allocation of biomass between leaf and plant dry weight, LWR (leaf weight ratio) is considered. In Spinach leaf weight ratio indicated not much significant variation in different treatments and found high in T8 ( $0.378-0.429 \text{ g g}^{-1}$ ), however in

pea maximum LWR (0.378-0.590 g g<sup>-1</sup>) was reported in T6 with significant increase in comparison to T1 (Figure 2). To evaluate amount of leaf area per unit total mass LAR (leaf area ratio) is a valuable factor. Highest LAR was noticed in T3 (426 cm<sup>2</sup> g<sup>-1</sup>) and T4 (420 cm<sup>2</sup> g<sup>-1</sup>) in spinach with the trend of T3>T4>T7>T8>T6>T5>T2>T1. However in pea LAR was maximum in T5 (1777 cm<sup>2</sup> g<sup>-1</sup>) followed by T8>T7>T4>T6>T1>T3>T2 (Figure 2). Root shoot ratio (RSR) is ratio of distribution of plant biomass in root and shoot. In this study, maximum RSR was reported in T3 (0.716 g g<sup>-1</sup>) followed by T4, T2, and T5 in spinach crop. On the other hand in pea, highest RSR was reported in T6 (0.754 g g<sup>-1</sup>) with the trend of T2>T3>T1>T4>T8>T7>T5 (Figure 2).



**Figure 2:-** Effect of soil amendments on growth indices of spinach and pea crop. Values are mean (n=6). Means in on each bar followed by different letters are significantly different (LSD at 0.05). T1=control; T2=NPK; T3=FYM (farmyard manure); T4=VC (Vermicompost); T5=NPK+VC; T6=FYM+VC (1:1); T7=FYM+VC (1:2); T8 =FYM+VC (2:1).

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Highest relative growth rate of pea and spinach in FYM and VC combinations such as T7 and T8 is attributed with positive and significant correlation of RGR with LWR in both spinach ( $r = 0.6612$ ,  $p < 0.0001$ ) and pea ( $r = 0.555$ ,  $p < 0.0001$ ). The result is also attributed in the study of Riccardi et al., 2014. In case of the Leaf weight ratio (LWR), T6, T7 and T8 due to the highest soil fertility improvement of FYM and VC biomass of the plant is also high which leads to higher LWR. LWR shows significant positive correlation with RGR. In spinach and pea, leaf area ratio was noticed highest in T3 or FYM and T5 NPK+VC amended grown vegetables respectively. In both the amendment T3 and T5 plant biomass is low in comparison to T6, T7 and T8 due to slow effect of organic amendment, however the high leaf area has already reported in NPK treatment (Gairola et al., 2009). Thus, increased leaf area and reduced plant biomass lead to highest LAR. The root shoot ratio is a photosynthetic translocation between above and below ground parts. Soil fertility is directly proportional to the reduced root shoot ratio (Harris, 1992; Fageria and Moreira 2011). The lowest root shoot ratio was found in organic amended soil in both crops explain its own efficient fertility potential.

#### Effective combination study of FYM and VC in terms of yield:-

The effects of organic amendments on vegetable crops were also considered in terms of economic yield (Table III). For this purpose fresh weight of edible components was taken as the response variable. Economic yield shows an increase from 86.96 to 186.96 % in organically amended grown spinach vegetable in comparison to 50.72 % to 71.98 % in chemically amended crop. The similar yield pattern was found in case of pea also although the maximum yield was reported in T7 amendment i.e., 76.73% in pea.

In yield of spinach and pea, the highest yield in T8 and T7, respectively, may be attributed to the significant effect of increased organic carbon and decreased ESP after application of a combination of FYM and VC in acidic soil. A linear regression equation was also plotted (Figure 2) which clearly indicates the reclamation effect of organic amendments to reduce the sodicity of soil. In fact, due to the higher production of  $\text{CO}_2$  and humic acids in vermicompost application introduce a drop in redox potential and the replacement of exchangeable  $\text{Na}^+$  ions by  $\text{Ca}^{+2}$  ions leaching out of the root zone (Ansari, 2008). It reduces the level of ESP and increase SOC. Therefore a significant increase in crop yield was reported.

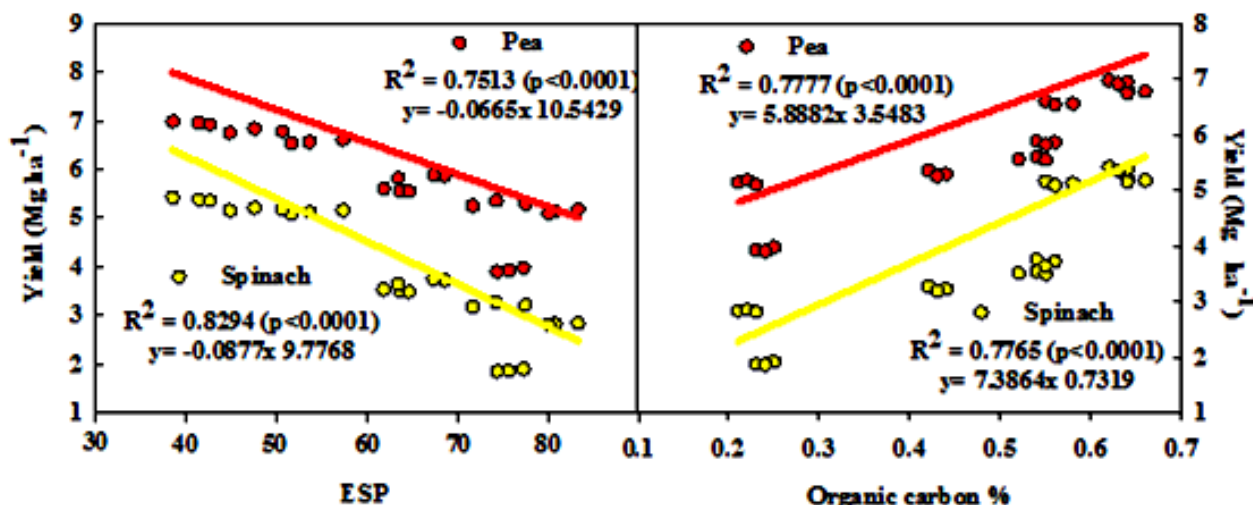


Figure 3:- Correlation coefficient between ESP and OC% with economic yield in Spinach and Pea crops.

#### Conclusions:-

The study concludes that combined use of organic amendments of farm yard manure and vermicompost significantly decreases the soil sodicity and increased soil fertility. These changes in sodic soil properties have a profound effect on crop productivity and therefore such combinations of organic amendments can be promoted to enhance the crop productivity on widely distributed sodic soils in India and other arid and semiarid regions in the world.



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### RESEARCH ARTICLE

#### LIFE OF TRIBAL WOMEN AGRICULTURAL LABOURER IN GAJAPATI DISTRICT OF ODISHA: A DEVELOPMENT PERSPECTIVES

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#### Abstract

This paper emphasizes on the present situation of women in agriculture and suggests possible roadmaps to mainstream women in development process. Women's contribution in any economy is inevitable. Their roles vary region to region, work to work, state to state, and country to country. The poor tribal farmers that make use of low cost renewable inputs family and community labour for solving the food crises through their traditional practice or traditional wisdom which need documentation make the future agricultural sustainable practices. According to Swami Vivekananda "There is no chance for welfare of the world unless the condition of women is improved". The poor tribal are practices own ideas and own traditionally agricultural wisdom though the people had changed their cultivation pattern from traveller's cultivation to settled cultivation, but some of the practices have remained unchanged among many group of farmers. The poor tribal or valleys tribal are practices own ideas through their cultivators land like a jhoom cultivation, traveller cultivation and mixed cultivation. On This paper identified that women agricultural labourers are practiced on their own cultivators land i.e. highest in sowing, weeding, picking, threshing and transplanting.

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#### Introduction:-

Agricultural labourers constitute the most neglected class in India rural structure. Their income is low and employment irregular. Since they possess no skill or no training, they have no alternative employment opportunities. Socially a large number of agricultural labourers belong to scheduled castes and scheduled tribes. Therefore, they are a suppressed class. They are not organised and they cannot fight for their rights. Because of all these reasons their economic lot has failed to improve even after four decades of planning. According to the national commission on labour "an agricultural labourer is one who is basically unskilled and unorganised and has little for its livelihood, other than personal labourer. The classification of agricultural labourers can be divided into four categories i.e. (i) landless labourer, who are attached to the land lords. (ii) Landless labourers, who are personally independent and who work exclusively for others. (iii) Petty farmers with tiny bits of land who devote most of their time working for others. (iv) Farmers who have economic holdings but who have one or more of their sons and dependents working for other prosperous farmers. The main features, characterizing Indian of Agricultural labourers i.e. agricultural labourers are scattered, agricultural labourers are unskilled with lack training, next is unorganised sectors mean-agricultural labourers are not organised like industrial labourers, they are illiterate and ignorant. Another is low

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social status mean- most agricultural labourers belong to the depressed classes, which have been neglected for ages, they are low caste and depressed classes have been socially handicapped and they had never the courage to assert themselves. In some parts of India, agricultural labourers are migratory, moving in search of jobs at the time of harvesting (*Padhi, K: 2007*).

The status of women in a society is a signification reflection of the level of social justice in that society. Women’s status is often described in terms of their level of income, employment, education, health and fertility as well as their roles within the family, the community and society. In tribal communities, the role of women is substantial and crucial. They constitute about half the total population but in tribal society women are more important than in other social groups, because they work harder and the family economy and management depends on them. Even after industrialization swamped the tribal economy, women continued to play a significant role. Collection of minor forest produce is done mostly by women and children. Many also work as labourers in industries, households and construction, contributing to their family income. Despite exploitation by contractors and managers, tribal are more sincere and honest than non-tribals. The tribal women face problems and challenges in getting a sustainable livelihood and a decent life due to environmental degradation and the interference of outsiders. Tribal women have adjusted themselves to live a traditional life style in the local environment and follow occupations based on natural resources.



Tribal women known for their deep association with the forests are an economically active lot but nevertheless, they suffer disproportionately more from illiteracy, poverty and social abuse. Tribal women are found to be lagging in most development indicators, their occupations largely agriculture based, their integration with the forest related economic activities at low level and their manufacturing enterprise in need of modernization (*Ghosh,N:2007*). The tribal people’s dependence on the forests is well studied and noted for its intensity and immeasurability. The tribal women are spend considerable time, collecting fuel wood, lac, honey, silk cocoon, medicinal herbs and fruits as part of their domestic chore but since they also often sell the surplus if possible, the border between household and commercial motivation becomes extremely porous (*Arnold.,J.E.M: 1994*). Over 80% of tribals work in the primary sector against 53% of the general population. About 45% are cultivators against 32.5% of the general population. A tribal women can participates actively in all agricultural operations including, ploughing, digging, sowing, manuring, transplanting, weeding, harvesting, and preparing the granary, threshing, winnowing and storing food grains. In agriculturally back ward areas, tribal women are forbidden to touch a plough and cannot dig the ground but in all other agricultural operations, women participate actively and traditionally these are a female’s job. Processing of food grain is exclusively a women’s job. Every morning tribal women dehusk millet and paddy in husking levers and then clean the grains and cooks them. They not only save money, but also earn it, unlike females of other communities. Tribal women work as men’s partners in agriculture, yet their status remains the same. Tribal women work very hard for the livelihood of the family but live a poor life, in spite of their many contributions in the house and on the farm. Tribal women are important for the improvement and progress of tribals. They are the pivot

of tribal agriculture, performing many household and agricultural jobs (Awais, M., et al: 2009). Swaminathan, the famous agricultural scientist describes that it was woman who first domesticated crop plants and thereby initiated the art and science of farming. While men went out hunting in search of food, women started gathering seeds from the native flora and began cultivating those of interest from the point of view of food, feed, fodder, fibre and fuel. Women have played and continue to play a key role in the conservation of basic life support systems such as land, water, flora and fauna. They have protected the health of the soil through organic recycling and promoted crop security through the maintenance of varietal diversity and genetic resistance. That women play a significant and crucial role in agricultural development and allied fields including in the main crop production, livestock production, horticulture, post harvest operations, agro/ social forestry and fisheries. The nature and extent of women's involvement in agriculture, no doubt, varies greatly from region to region. Even within a region, their involvement varies widely among different ecological sub-zones, farming systems, castes, classes and stages in the family cycle. But regardless of these variations, there is hardly any activity in agricultural production, except ploughing in which women are not actively involved. Studies on women in agriculture conducted in India and other developing and under developed countries all point to the conclusion that women contribute far more to agricultural production than has generally been acknowledged. Recognition of their crucial role in agriculture should not obscure the fact that farm women continue to be concerned with their primary functions as wives, mothers and homemakers. It may not be out of place to mention here that considering their dual responsibilities within and outside the home, it would be in the fitness of things that more and more in the village training is organized for rural farm women to suit their convenience with due realization that institutional training is important in its own place. In order that farm women get a fair deal at the hands of change agents, one of the remedial measures that needs to be undertaken is to induct a sizeable number of well trained women personnel in training and extension programmes of agricultural development agencies at all levels and more so at the grass-root level. (Lal, Roshan., et al: 2011).

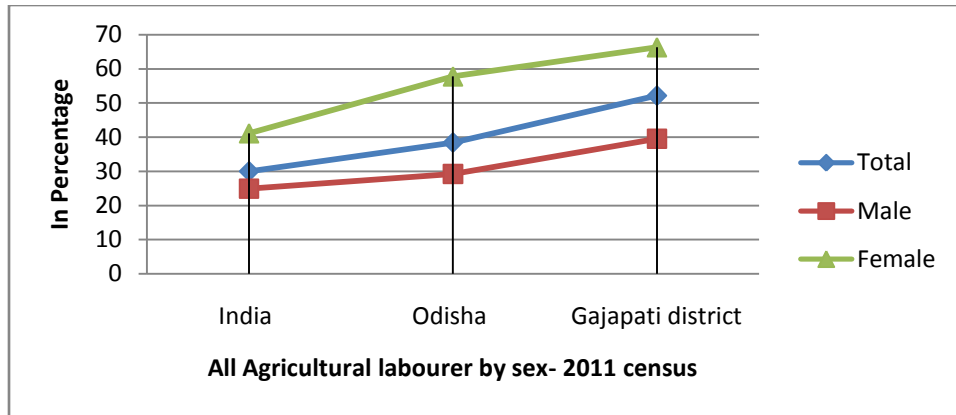
The comparison between the women agricultural labourer of so many different situation brought out the following difference. We found in Odisha seasonally different from all district women agricultural labourer. During summer session in Cuttack district, the women agricultural labourer mostly got employment for harvesting sugarcane, bond work, work in betel farm and harvesting groundnut. In Dhenkanal district women agricultural labourer were engaged for collection of fuel, for kendu leaves and bidi making, collection for palm leaves mat making and brass handcraft as caste professional and another making in cow-dung cake preparation for household cooking purpose. But in Gajapati district women agricultural labourers were engaged the comparison between the following districts. Women agricultural labourers were engaged collection for fuel, collection mahuli flower, plantationing turmeric and engaged in rice harvesting.

In rainy season, majority of women agricultural labourers were more than 80% in irrigated and more than 70% in non-irrigated were employment in transplantation for most be 24-60 days respectively. In both the situation more than 80% of women agricultural labourer were engaged in weeding. At the time of rainy season they did different type of part time activities like moping clayhoure, fuel collection, winning of milled rice, rearing animals, cow-dung cake preparation, calf rearing and cleaning cow-shed without any wage (Mishra, S: 2009). The economy of schedule tribe area is primarily subsistence oriented and based upon a combination of agricultural, forestry, wage labourer and the key role of farm women in crop husbandry, animal husbandry, fishery, forestry and post harvest activities and kitchen gardening in homestead land, inadequate attention both from scientific and administrative sides is given for the training of farm women (Hans, A: 2014). The work done report a majority of the women, in the state of Odisha is unnoticed and unaccounted. As per the 2001 census, women work participation rate in Odisha is 41 percent against national average of 39 percent. This major segment of the state's resources, however, is absorbed in the unorganised sector that is plagued with poor or irregular wages, no structured work environment, and no labourer union to voice the issues of the women workers. As most of them are engaged in work that fall in the unpaid category, the work goes unrecognised. These poor women have no alternative than to resort to poor wages and simultaneous exploitation and marginalisation (Satapathy, S. S: 2014).

**Table 1:- All Agricultural labourer by sex- 2011 census (In Percentage)**

All Agricultural labourer by sex- 2011 census (In Percentage)			
Person	India	Odisha	Gajapati district
Total	30.0	38.42	52.12
Male	24.9	29.25	39.54
<b>Female</b>	<b>41.1</b>	<b>57.78</b>	<b>66.33</b>

\*Census of India-2011, Directorate of census operation Odisha.

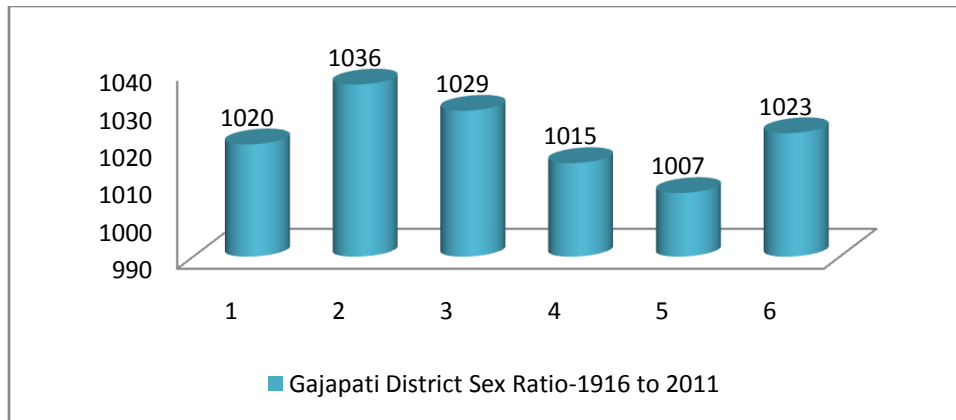


The table-1 and figure-1 shows all agricultural labourers by sex-wise in 2011 census. We define i.e. India women agricultural labourers in 2011 census were 41.1 percentages but in Odisha women agricultural labourers were 57.78 percentages out of total Odisha agricultural labourers. In Gajapati district total agricultural labourers by sex-wise as 52.12percentage but in this years women agricultural labourers are more than all women agricultural labourers i.e. India and Odisha. The Gajapati district women agricultural labourers are 66.33 percentages.

**Table 2:-** Tribal Sex Ratio in Gajapati District- 1961-2011

Tribal Sex Ratio in Gajapati District- 1961-2011						
Years	1961	1971	1981	1991	2001	2011
Sex Ratio	1020	1034	1029	1015	1007	1023

\*Source: Census of India ' 1961to 2011, Statistical Profile of Scheduled Tribes in India 2013.



**Sex Ratio:** Sex Ratio is the primary variables that are necessary for almost all classification related to population characteristic. Sex ratio (females per 1000 males) is an important indicator to study the gender balance among the tribal in Gajapati district. The Gajapati district tribal Sex Ratio among shows from 1961 to 2011 census, i.e. 1020, 1036, 1029, 1015, 1007 and 1023 district tribal sex ratio respectively (See table-2&figure).

**Table 3:-** Occupational categories of Respondents (in per cent)

Occupation	Male	Female	Total
Agri- farmers	76.9	-	33.3
Daily wage workers	23.07	97.05	65
Housewives	-	2.94	1.66
Total	99.97	99.99	100

Figure- Occupational categories of Respondents (in per cent)

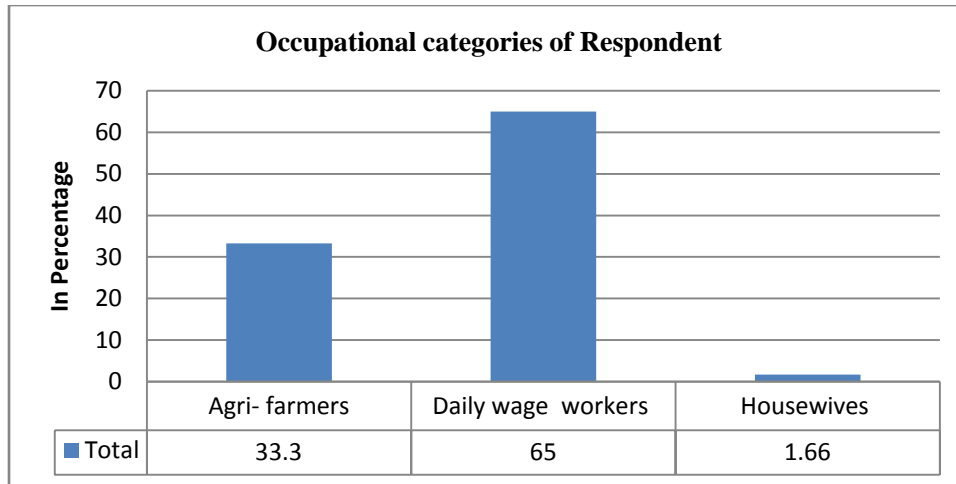
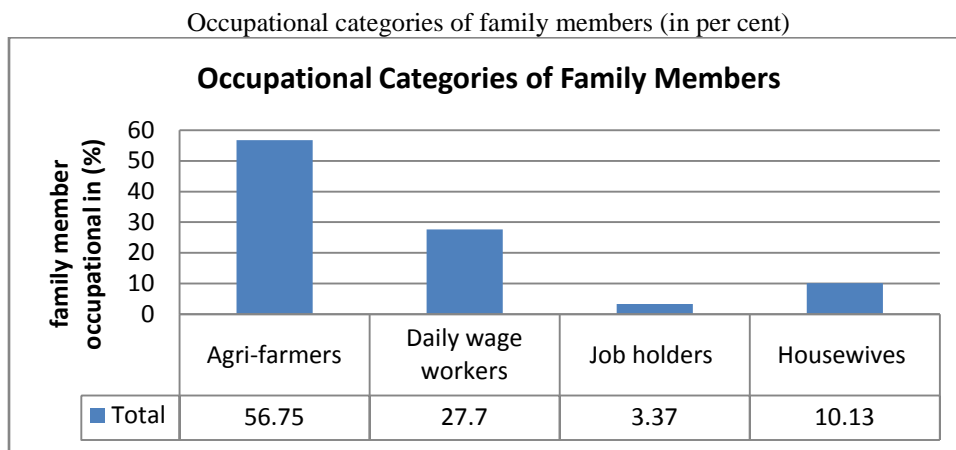


Table 3 reflects occupational structure of respondent. Among men 77 per cent are agricultural farmer and 23 per cent are wage labourer. From among our women respondent, 97 per cent are daily worker and 3% are housewives. But this daily wage worker among female also constitute agricultural workers (See table 3 & figure).

**Table 4:-** Occupational categories of family members (in per cent)

Occupation	Male	Female	Total
Agri-farmers	79.4	31.42	56.75
Daily wage workers	15.33	45.71	27.7
Job holders	5.1	1.42	3.37
Housewives	-	21.42	10.13
Total	100	100	100

Our study area reflects occupational categories of family members. Among men 79 per cent are agricultural farmer and 15 per cent are wage labourer. From among our women respondent, 46 per cent are daily worker, 31% are agricultural farmers and 21 percent are housewives. But this daily wage worker among female also constitute agricultural workers (See table 4 & figure).



**Summary:-**

Agricultural labourer under comes small farmers, who process very little land and therefore, has to devote most of their time working on the lands of others as labourers. Share croppers are those who, while sharing the produce of the land for their work, also work as labourers. Tenants are those who not only work on the leased but also work as labourer. Despite their importance to agricultural production women face severe handicaps. They are in fact, the largest group of landless labourers with little real security in case of break-up of the family owing to death or divorce; inheritance laws and customs discriminate against them land reform and settlement programmes usually



give sole title and hence the security needed for obtaining production credits to the husband. Agricultural development programmes are usually planned by men and aimed at men. Mechanization, for example alleviates the burden of tasks that are traditionally men's responsibility, leaving women's burdens unrelieved or even increased.

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### RESEARCH ARTICLE

#### HOW ODONTOBLASTS REACT ULTRA-STRUCTURALLY TO ORTHODONTIC INTRUSIVE FORCES.

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Odontoblasts, TEM, tooth intrusion, orthodontic force.

#### Abstract

**Background:** The purpose of orthodontic treatment is to move teeth as efficiently as possible with least damage to teeth and their supporting tissues. Previous studies have revealed that varying degrees of force magnitude, frequency, and duration of orthodontic forces express extensive macroscopic and microscopic changes on dental tissues.

**Aim of the work:** The present work aimed to investigate the ultra-structural changes that might occur to odontoblasts in response to light and heavy intrusive orthodontic forces.

**Materials and Methods:** Twenty-four vital maxillary first premolars from orthodontic extraction cases were allocated in three groups. Control group: premolars were not subjected to any force. Group I: light intrusive force was applied. Group II: heavy intrusive force was applied. Extraction was done after three weeks of force application. Coronal and radicular pulpal tissues were examined by transmission electron microscope (TEM).

**Results:** Control, TEM revealed common cellular features regarding coronal and radicular odontoblasts. Evidence of affection of the odontoblasts could be manifested in both experimental groups as they expressed varies degrees of nuclear alterations, chromatin condensation, cytoplasmic organelles affection and loss of cellular junctions.

**Conclusions:** Intrusive orthodontic force can induce ultra-structural changes in odontoblastic cells. Heavy intrusive have greater impact on odontoblastic cells than light force. Generally, radicular cells are more affected than coronal cells by the same magnitude of the intrusive force. Both coronal and radicular odontoblastic cells can transform into multinucleated odontoclastic cells under the influence of heavy intrusive orthodontic force. Light intrusive force could induce odontoclastic differentiation of radicular odontoblastic cells.

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**Introduction:-**

The purpose of orthodontic treatment is to move teeth as efficiently as possible with least damage to teeth and their supporting tissues. Long ago, Orban and Bhaskar, 1976 stated that orthodontic forces had no effect on dental pulp but since then, several studies have evaluated the impact of orthodontic forces on dental tissues. These tissues, when exposed to varying degrees of orthodontic force magnitude, frequency and duration of mechanical loading, express extensive macroscopic and microscopic changes (Krishnan et al., 2006). Then, it was confirmed that the magnitude of applied force does not need to be excessive; even small forces of short duration of around 4 hours may be adequate to evoke cellular responses (Gajapuradal et al., 2016).

Orthodontic forces are capable of stimulating the whole vascular system in the dental pulp, in the form of circulatory vascular stasis to necrosis (Andreassen et al., 2007). It was found that there is an increase in expression of sensory neuropeptides, such as Substance P (SP) and calcitonin gene-related peptide, in dental pulp following orthodontic force application in rats (Yamaguchi and Kasai, 2007).

A wide variety of morphological changes have been documented histologically, in response to orthodontic force, affecting both the inner and outer layers of the pulpal tissue. The majority of these changes are deleterious in nature. The odontoblast expressed varying degrees of vacuolization, degeneration, distortion, separation and elongation (Stenvick et al., 1970), (Mostafa et al., 1991), (Shigehara et al., 2006) and (Ramazanzadeh et al., 2009). These alterations have been more pronounced in the coronal pulp tissue (Villa et al., 2005). It is proposed to be compensated by osteopontin release which stimulates differentiation of new odontoblasts, thereby helping repair of any tissue damage (Shigehara et al., 2006). These deleterious pulpal changes were more noticeable in older patients, possibly due to a reduction in the size of the apical foramen, with concurrent constriction of apical vessels. Therefore, fortunately, younger patients, who are more susceptible to orthodontic treatment, could be at less risk (Hamilton et al., 1999).

Although tooth intrusion is a special and critical type of orthodontic tooth movement, it was thought in the past that intrusion is clinically impossible to occur (Proffit et al., 2012). Now, intrusion is thought to have the greatest impact on internal root resorption (Harris et al., 2006). Internal root resorption is the progressive destruction of radicular dentin along the middle and apical thirds of the canal walls as a result of odontoclastic cells activities or due to "strangulation" of the pulp by occluding the apical blood supply (Veberiene et al., 2009). From a histological perspective, internal root resorption is manifested in one form that is purely destructive, internal (root canal) inflammatory resorption, and in another, that is accompanied by repair, internal (root canal) replacement resorption that is featured by the deposition of metaplastic bone/cementum-like tissues adjacent to the sites of resorption (Patel et al., 2010).

Ramazanzaeh et al., 2009 reported no statistically significant difference between the effect of extrusive and intrusive orthodontic tooth movements on the dental pulp except for the presence of more fibrosis in the extrusive force cases. Recent histological study (Lazzaretti et al., 2014) concluded that orthodontic intrusion force caused vascular changes in the pulpal tissue and also increased the presence of fibrosis and the number of pulp calcifications after 21 days.

According to the done database search, there is relatively little data in the literature regarding the odontoblastic response, especially ultra-structurally, to different magnitudes of intrusive orthodontic tooth movement.

**Aim of the work:-**

The present work aims to investigate the ultra-structural changes that might occur to odontoblasts in response to light and heavy intrusive orthodontic forces. This could help orthodontists to evaluate pulp response to orthodontic forces of different magnitudes, and accordingly case prognosis.

**Materials and Methods:-**

Twenty-four vital and sound maxillary first premolars, from orthodontic male patients (15-22 years old) treated in the Department of Orthodontics, Faculty of Dental Medicine for Girls, Al-Azhar University, Cairo, Egypt, were included in the study. All of the included premolars were selected to be minimally malposed, out of any occlusal trauma and were planned for extraction during comprehensive orthodontic treatment. All cases were selected to be Angle's class I dento-alveolar bimaxillary protrusion with minimal crowding. All patients had good oral hygiene, no previous orthodontic treatment, no history of dental trauma, no missing permanent teeth (with exclusion of 3<sup>rd</sup>

molars), no serious inflammatory systemic or oral conditions. The patients were instructed to stop taking any anti-inflammatory drugs 1 month before bonding till extraction.

The study proposal was approved by the Research Ethics Committee (REC), Faculty of Dental Medicine for Girls, Al-Azhar University, Cairo, Egypt. An informed consent was signed by the patient or his guardian after treatment and research procedures were explained to him/her.

#### **Grouping:-**

Only one premolar from each patient was included in the study and randomly allocated in one of three groups (n=8 for each). First is the control group, in which the maxillary first premolars were not bonded and extracted just prior to the leveling and alignment stage. Second, Group I, in which light intrusive force was applied to the test premolars. Third, Group II, in which heavy intrusive force was applied to the test premolars.

#### **Appliances and loading:-**

All patients were treated with synergy low friction straight wire (LFSW) appliances with 0.022" slot (Rocky Mountain Orthodontics RMO Corp., Colorado, USA ).

In Group I, the test premolars were not bonded until the 0.012" NiTi initial archwire (Ortho Technology, Inc., Florida, USA) was fully engaged in all other bracket slots. Then, the bracket of the test premolar was bonded in a position which allows the bracket slot to be 1mm occlusal to the archwire level and parallel to it. At the same session, the archwire was forcefully engaged in the slot of the newly bonded bracket giving light intrusive force as measured clinically. Measuring the force was done before bonding of the test premolar by deflecting the archwire segment between canine and second premolar brackets 1 mm occlusally using a wire tucker. Then a force gauge dynamometer (White Oak Orthodontic Products, Pennsylvania, USA) was used to measure the force generated due to wire recoil on unloading.

In Group II, the test premolars were not bonded until a 0.16" x 0.22" NiTi archwire (Ortho Technology, Inc., Florida, USA) is passively engaged in all bracket slots. At this time, the bracket of the test premolar was bonded, the archwire was activated and the produced force was measured exactly as in Group I but the generated intrusive force was much higher in Group II.

In both Group I and Group II, the test premolars were a traumatically extracted after 3 weeks of intrusive force application.<sup>9,16</sup>

#### **Preparation of the specimens for transmission electron microscopy (TEM):-**

##### **Preparation and fixation: -**

Immediately after careful extraction of each tooth, a sharp horizontal split was done using chisel and hammer into coronal and radicular parts. These parts were instantly immersed in a mixture of 2.5% glutaraldehyde and 10% formaldehyde (F/G solution) in a labeled jar for each group. After 5 minutes, the coronal and radicular tooth parts were further split vertically. The coronal and buccal radicular pulpal tissues (subgroups a and b respectively) were collected re-immersed in the fixative solution for 24 hours. After that, the extirpated pulpal specimens were prepared according to (Bancroft and Stevens, 2008) for electron microscopic examination. From each part, cross sections (1 mm thick) were cut and washed several times in phosphate buffer solution with pH 7.2-7.4. The specimens were post-fixed in 1% osmium tetroxide for one hour, and washed again in phosphate buffer. The specimens were loaded in ascending concentrations of ethyl alcohol for complete dehydration. The specimens were embedded in (EPON 812) in flat rubber moulds to obtain the specimen blocks. Semi-thin sections were cut with a diamond knife, mounted on glass slides and stained with 1.0% toluidine blue for light microscopic examination. The area of interest, peripheral odontoblastic zone, was selected for ultra-thin sectioning. The cut sections were stained with uranyl acetate and lead citrate to be examined with transmission electron microscope (Joel Ltd., Tokyo, Japan). Then, the specimens were thoroughly examined and reported.

#### **Results:-**

##### **The applied force:-**

The applied force due to archwire unloading in the light intrusive force group (Group I) ranged from 18 to 35 with a mean of  $26.25 \pm 5.18$  grams. In group II where heavier intrusive force was applied, the force was much higher and ranged from 86 to 122 grams with a mean of  $104.5 \pm 12.34$  grams (Table 1).

**Table 1:-** Descriptive statistics of the applied force (in grams) in Group I and Group II

	n	Mean	SD	SE	Median	Mode	Range	Min.	Max.
Group I	8	26.25	5.18	1.83	25.5	25	17	18	35
Group II	8	104.5	12.34	4.38	101.5	---	36	86	122

n: Number of cases      SD: Standard deviation      SE: Standard error

**Control group:-**

Transmission electron microscopic micrographs revealed common cellular features regarding coronal and radicular odontoblasts. They appeared columnar in shape with well-defined cell membrane. Odontoblastic nuclei are oval and most of them were basally situated. The nuclei showed normal chromatin distribution and dominance of euchromatin. There was distinct boundary between condensed and loose chromatin. Their nuclei appeared normal and surrounded by clear regular double nuclear membrane. Cytoplasmic organelles were clearly identified. Well developed strands of rough endoplasmic reticulum (RER) were arranged around the nuclei in the cytoplasm of odontoblasts. The electron-dense strands of RER are parallel to the long axis of the cell in the areas further from the nucleus (the supranuclear zone). Abundant mitochondria were detected in the odontoblastic cytoplasm especially in the apical region of the cells. Although they had a variety of shapes, each of them preserved its typical structure, which is a double membrane with internal cristae. Numerous junctions were seen subjacent to odontoblasts including tight junctions, desmosomes and gap junctions (Figures 1 and 2).

**Subgroup Ia:-**

Coronal pulpal odontoblasts attained some alterations with wide extracellular compartments. The cell membranes remained intact but ill-defined in most of the samples. Cell junctions between cell membranes were almost lost and wide extracellular compartments were markedly observed. Odontoblastic nuclei attained their normal regular double nuclear membrane with slight peripheral or central chromatin clumping in most samples. The cytoplasm was dark homogenous occupied with cytoplasmic organelles. Rough endoplasmic reticulum were numerous and apically situated in many specimens. Multiple mitochondria were detected in some of the specimens but they were swollen and lost their internal cristae (Figures 3-6).

**Subgroup Ib:-**

Electron micrograph of radicular pulpal tissue showed diversity of odontoblastic cellular and nuclear patterns. Cells showed wide range of different sizes. All possessed wide extracellular matrixes and complete loss of cellular junctions. Irregular cell membranes were a common finding in all specimens. Six specimens expressed single nucleus but with prominent chromatin condensation. Two other specimens showed multiple small pyknotic nuclei. Various stages of nuclear division were also detected. The cytoplasmic-nuclear ratio was variable among the specimens. The cytoplasm was dark homogenous with ill-defined organelles. Rough endoplasmic reticulum was ill-defined in most specimens. Multiple faint swollen mitochondria were detected in some of the specimens. Few small sized cytoplasmic electron-dense vesicles were detected in two specimens of this subgroup (Figures 7-10).

**Subgroup IIa:-**

Coronal peripheral pulpal cells showed few regular odontoblastic cells with regular configuration regarding their cell membranes and nuclei. Other cells showed regular outlines but associated with diffuse nuclear chromatin condensation and numerous para-nuclear electron-dense vesicles. Many odontoblastic cells were multinucleated and loaded with numerous intracytoplasmic electron-dense vesicles (Figures 11-14).

**Subgroup IIb:-**

Radicular odontoblastic cells expressed nearly the same ultrastructural pattern. All of the cells appeared shrunken with irregular cell membranes. Cellular junctions were ill-defined with moderate extracellular matrix. The common characteristic feature of all cellular element of this subgroup was multinucleation. Their cytoplasm was dark homogenous with ill-defined cytoplasmic organelles. Electron-dense intracytoplasmic vesicles vanished out in this subgroup. Monocytes obviously detected in the field in some specimens of this subgroup. It was characterized by electron-lucent cytoplasm with a moderately developed rough endoplasmic reticulum (figures 15-18).

**Discussion:-**

Successful orthodontic treatment depends on moving the teeth as efficiently as possible with no or least damage to teeth and their supporting tissues. This study investigated the effect of two magnitudes of intrusive orthodontic force

on pulpal odontoblasts in the human premolars after an interval of three weeks. The variables studied were two magnitudes of intrusive force (independent variable) and their effect on selected area of pulpal tissues, namely the odontoblasts which may accordingly have important clinical relevance.

It was of prime importance to study the effects of the intrusive forces on pulp tissue which is as normal and healthy as possible like in normal clinical conditions. Therefore, the inclusion criteria were set very carefully to select healthy young pupal tissue which is not affected by any disease, trauma or medicine as possible. Ethical considerations aimed to minimize patients' discomfort and damage to their teeth. So patients were allowed to take a pain killer with no anti-inflammatory effect (Paracetamol).

Regarding clinical application of intrusive force, it was set to resemble the force applied during leveling stage with 0.012" archwires and during finishing and detailing stage with the 0.016"x0.022" archwires. Hence, the brackets of the test premolars were bonded only 1mm occlusal to the archwire level which is a common malposition during both treatment stages. Although this mechanics may not apply pure intrusion and will be accompanied by little anticlockwise labiopalatal moment, this momental component seems to be much less than that expected during intrusion applied with cantilever arm from first molar to first premolar (Patel et al., 2010). The mean of applied light force (26.25 grams) was not far from the mean optimum intrusive force reported by (Proffit et al., 2012) for multirrooted teeth (20 grams), while the mean of the applied heavy force was much higher (104.5 grams).

The used bracket system was Synergy Low-Friction Straight Wire (LFSW) appliances with 0.022" slot (Rocky Mountain Orthodontics RMO Corp., Colorado, USA). Both the 0.022" slot and its design in Synergy brackets allow more archwire play especially at the mesial and distal ends of the slot. This makes the actually applied force very close to that measured by the dynamometer.

Extraction was done 3 weeks after intrusive force application. This period was reported by other workers (Ramazanzadeh et al., 2009) and (Lazzaretti et al., 2014) to be sufficient for the intrapulpal chronic inflammatory process to take place.

Extirpation of pulp tissue was selected, in order to minimize the effect of any external factors, such as decalcification, except the applied force. Immediate tooth splitting and immersion in the fixative after extraction was done, that ensured profound fixation and preservation of the tissues before any manipulation or dissection of pulp from dentin. Peripheral pulp tissues were dissected carefully to ensure presence of odontoblastic cell layer. Ultra-structural cellular details were optimally obtained by transmission electron microscope.

Evidence of affection of the odontoblasts could be manifested in all experimental groups as they expressed various degrees of nuclear alterations, chromatin condensation, cytoplasmic organelles affection and loss of cellular junctions. The degenerative changes and aspiration of odontoblasts, were reported by other researchers due to intrusive force application for 21 days (Stenvick et al., 1970), Mostafa et al., 1991), (Shigehara et al., 2006) and (Ramazanzadeh et al., 2009). Cells are constantly adjusting to the mechanical influences of their surroundings, starting a complex mechano-chemical feedback, which depends on mechano-transduction mechanisms. Whereas adhesion structures have been shown to play a central role in mechano-transduction, it now emerges that the nucleus may act as a mechano-sensitive structure (Nejma et al., 2016).

In all experimental groups, loss of odontoblastic orientation is noticed and evident by loss of cellular junctions and wide extracellular compartments. This could be attributed to the sensitivity of odontoblasts, and they are easily disturbed by changes in their external environment such as intrusive force. Application of orthodontic force, induce mechanical strain which could stimulate the cells and their associated extracellular matrix. This stimulation has the ability to regulate integrin expression, focal adhesion proteins, cytoskeletal organization, cell morphology, cell adhesion to extracellular matrices, cell proliferation, and cell differentiation (Masella and Meister, 2006).

When the extracellular matrix is stressed, isometric tension develops in the cells within the matrix. This isometric tension is equal in magnitude to the mechanical tensional force exerted upon them by the extracellular matrix, leading to changes in their cellular cytoskeleton and architecture with activation of cellular transcription factors (Masella and Meister, 2006) and (Cukierman et al., 2002).

This in turn influences the expression of genes involved in cell attachment, proliferation, differentiation, and apoptosis.

Loss of odontoblastic cells junctions of both coronal and radicular parts in all experimental groups indicated that both light and heavy intrusive orthodontic forces affect cellular junctions. This may go with (Gajapuradal et al., 2016) who reported that even small forces of short duration of around 4 hours may be adequate to evoke cellular responses.

Odontoblastic nuclear alteration was very interesting finding in this study. Under light intrusive force, coronal odontoblasts expressed normal nuclear membrane and signs of chromatin condensation. Although, most radicular odontoblasts expressed single nucleus but with prominent chromatin condensation, few cells showed multiple small pyknotic nuclei and various stages of nuclear division were detected. Also, cytoplasmic electron dense vesicles of different sizes detected in radicular cells.

Under heavy intrusive force, many coronal odontoblastic cells were multinucleated and loaded with some intracytoplasmic perinuclear electron-dense vesicles. On the other hand, most radicular odontoblasts were multinucleated with disappearance of perinuclear electron-dense vesicles.

Apparently, odontoblastic nuclei were mostly affected and nuclear division was seen in many electron micrographs of experimental groups, which suggests that the mechanical forces transmitted through the cell could result in internal remodeling of the nuclear architecture and chromatin arrangement. The results revealed that the effect of heavy intrusive force was greater than light force on odontoblastic cells. Furthermore, the impact of the transmitted force was greater on radicular rather than coronal cells that were demonstrated by complete nuclear division and odontoblastic differentiation into odontoclastic cells particularly in radicular portions. Apparently, odontoblasts transform and differentiate into multinucleated cells, which could be odontoclasts, when subjected to mechanical intrusive force.

Intracytoplasmic paranuclear electron-dense granules that were detected in some odontoblasts may indicate cellular activity prior to nuclear division. This explains why these granules were very few and small in subgroup Ib (few nuclear divisions), abundant in subgroup IIa (more nuclear divisions) and almost entirely absent in subgroups Ia and IIb (no nuclear division and completed nuclear division respectively). More investigations are required regarding that point.

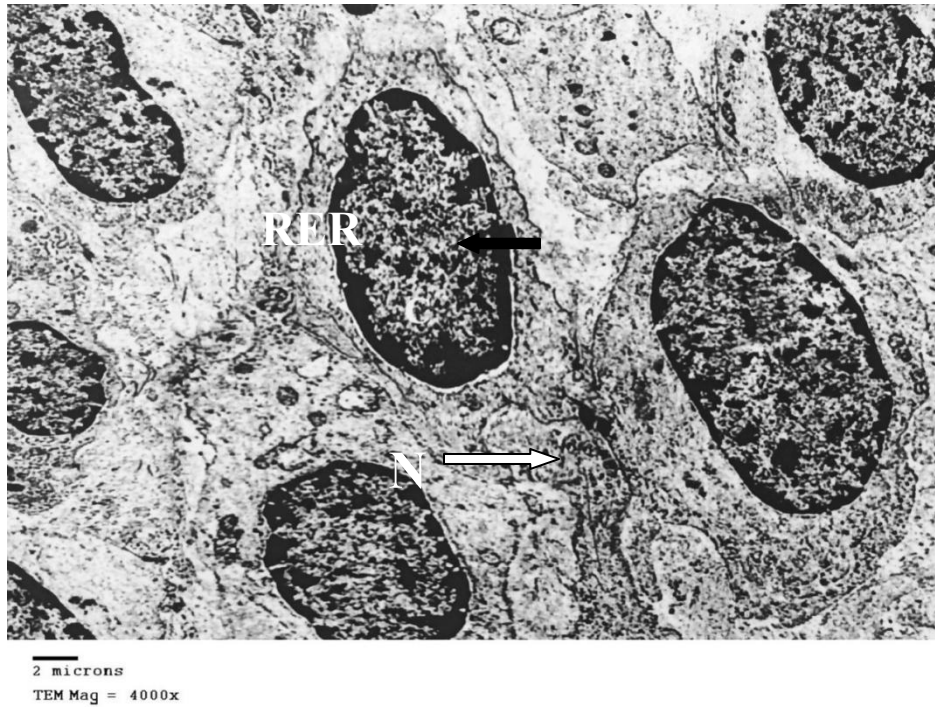
Multinucleation of odontoblastic cells brings us about odontoclastic transformation and subsequent internal root resorption under the influence of intrusive force. Differentiation of odontoclasts in coronal pulpal highlight the idea of internal resorption could be elicited coronal in response to heavy intrusive force. This is in agreement with (Weiland, 2006) who concluded that the type and magnitude of orthodontic forces play a major role in root resorption. He also stated that continuous forces, as produced by materials with pseudo-elastic characteristics, seem to produce more resorption than discontinuous forces and the magnitude of the orthodontic force up to 200 cN is probably not decisive for root resorption.

Blood monocytes have been detected in close approximation to radicular differentiated odontoclasts at the site of heavy force. Furthermore, mononuclear cells were found adjacent to degenerating odontoclasts and resorbed enamel surface from which the odontoclasts had moved or detached in the transitional stage of shedding (Sahara et al., 2004). This might indicate completion of resorptive process in the radicular part under heavy forces.

Cytoplasmic organelles disruption was noticed throughout the experimental groups such as swollen mitochondria. This suggests that even under minimal intrusive force affection of cytoplasmic organelles occur.

We carried out this study in an attempt to discover whether, how and when orthodontic intrusion could be a cause for internal tooth resorption.



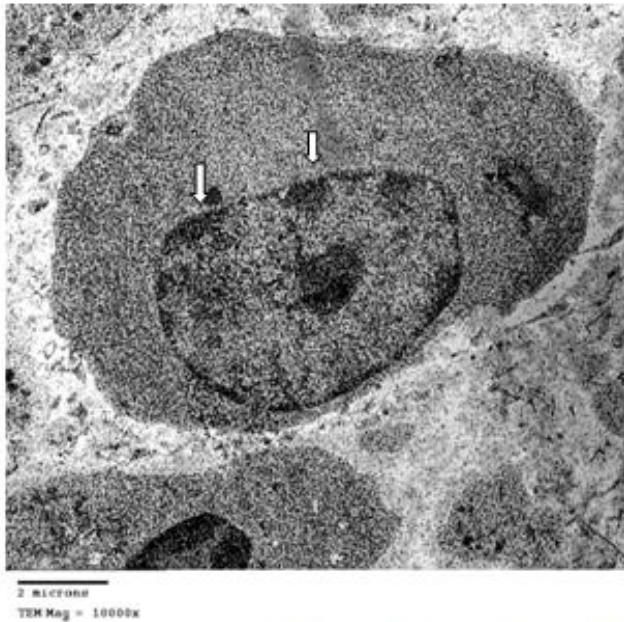


**Fig. 1:-** Electron micrograph showing normal coronal odontoblasts with palisading pattern, normal cell junctions (white arrow) and nuclear membranes (black arrow).



**Fig. 2:-** Electron micrograph showing normal odontoblasts with normal nuclei, chromatin distribution, cytoplasmic organelles ;nucleus (N) mitochondria (M ), rough endoplasmic reticulum (RER) and cell junction (arrow).

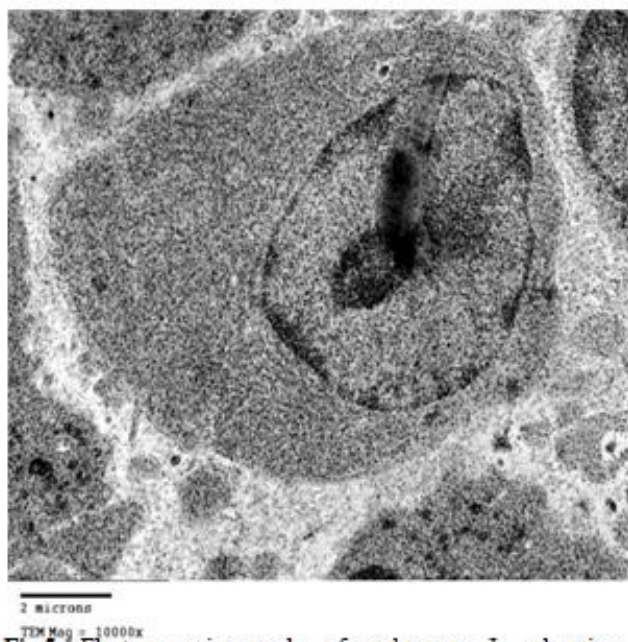




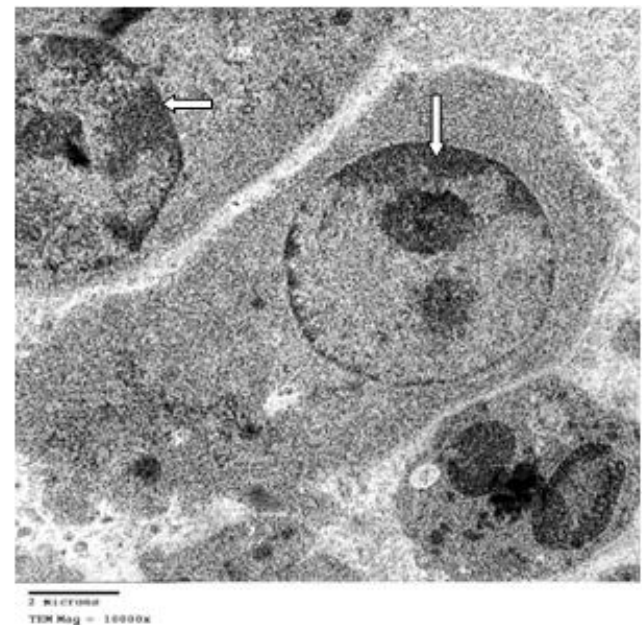
**Fig.3** Electron micrograph of pulp tissue subgroup Ia showing odontoblasts with regular cell membrane, dark homogenous cytoplasm, regular nuclear membrane with peripheral chromatin condensation (arrows).



**Fig. 4** Electron micrograph of subgroup Ia showing odontoblasts with ill defined cell membrane, homogenous cytoplasm, swollen mitochondria (M), open faced nucleus with regular nuclear membrane, slight peripheral chromatin

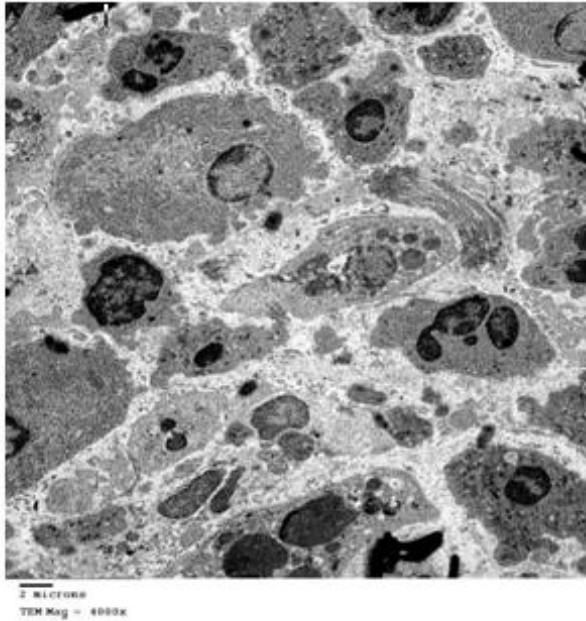


**Fig.5** Electron micrograph of subgroup Ia showing odontoblasts with ill-defined cellular junctions, wide extracellular matrix and numerous rough endoplasmic reticulum. Nuclear chromatin condensation is slightly detected peripherally.

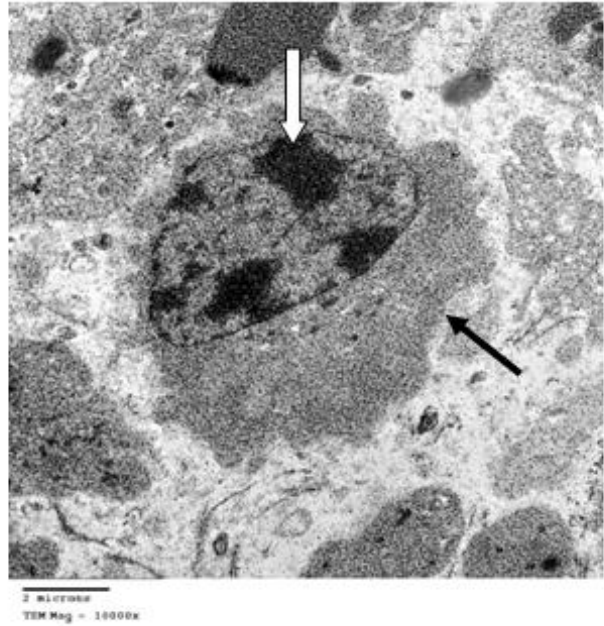


**Fig.6** Electron micrograph of subgroup Ia showing signs of peripheral nuclear chromatin condensation (arrows).

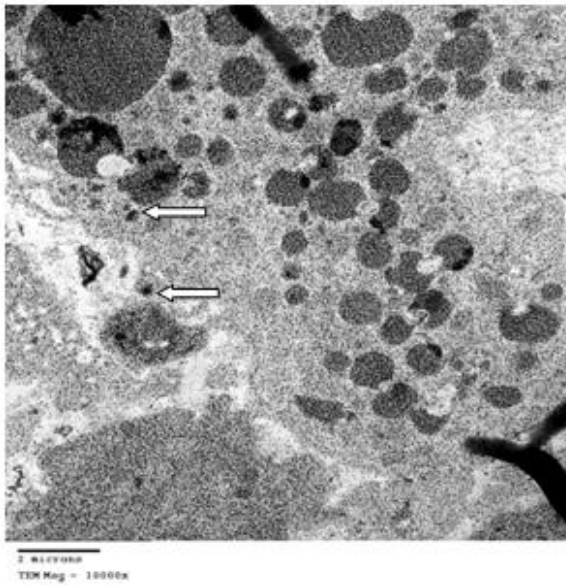




**Fig.7** Electron micrograph of radicular pulp tissue (subgroup Ib) showing diverse odontoblastic pattern, very wide extracellular compartments and various stages of nuclear division.



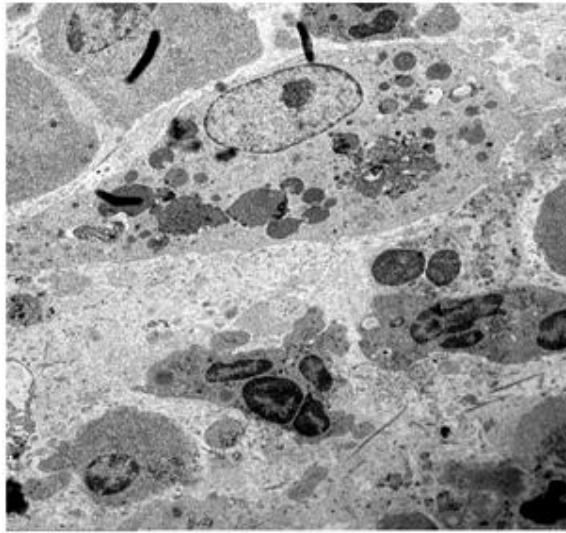
**Fig.8** Electron micrograph of subgroup Ib showing odontoblasts with ill-regular cell membrane (black arrow), shrunken homogenous cytoplasm, large nucleus with prominent diffuse and peripheral chromatin condensation (white arrow).



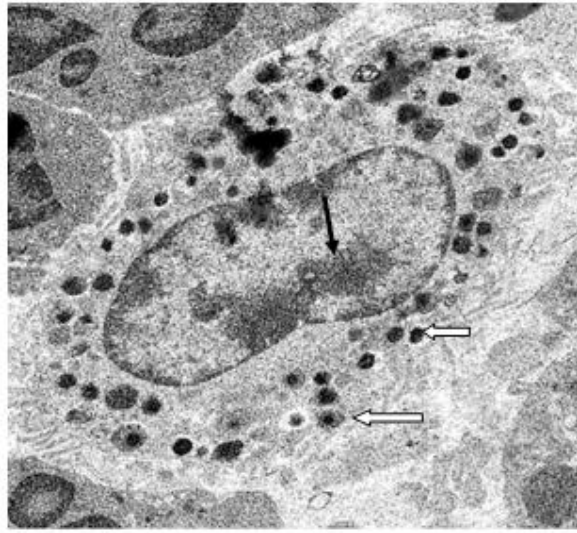
**Fig.9** Electron micrograph of subgroup Ib showing electron-dense cytoplasmic vesicles of various sizes occupying odontoblastic cytoplasm (arrows).



**Fig.10** Electron micrograph of subgroup Ib showing an odontoblast with multiple small pyknotic nuclei.



**Fig.11** Electron micrograph of subgroup IIa showing both regular odontoblasts and multinucleated smaller irregular cells.



**Fig.12** Electron micrograph of subgroup IIa showing an odontoblast with ill-defined cell membrane, intracytoplasmic perinuclear electron-dense vesicles (arrows) and regular nuclear membrane with diffuse chromatin condensation (black arrow).

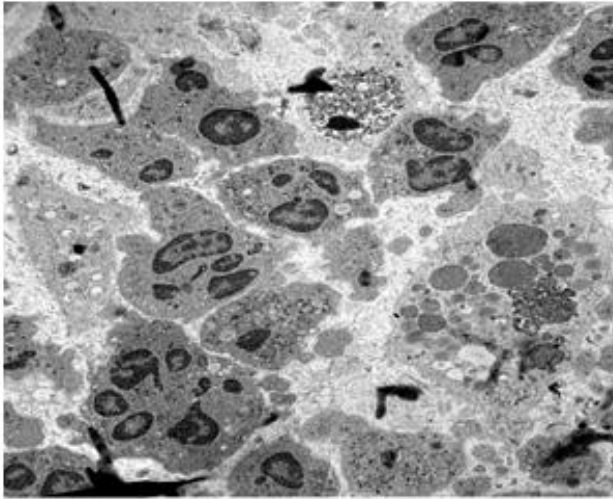


**Fig.13** Electron micrograph of subgroup IIa showing a multinucleated odontoblast.

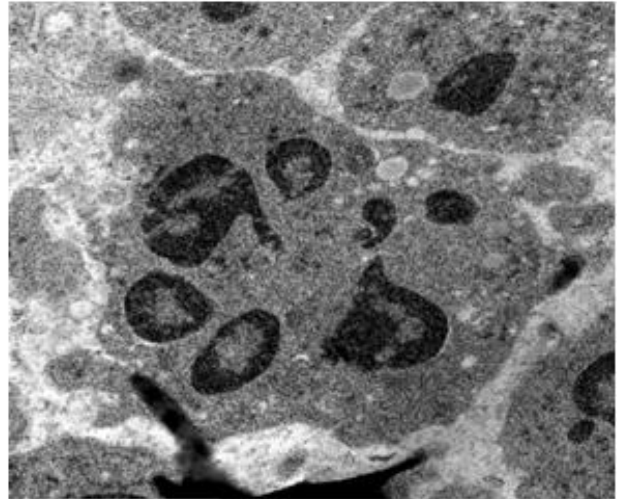


**Fig.14** Electron micrograph of subgroup IIa showing a multinucleated odontoblast with evidence of intracytoplasmic electron-dense vesicles.

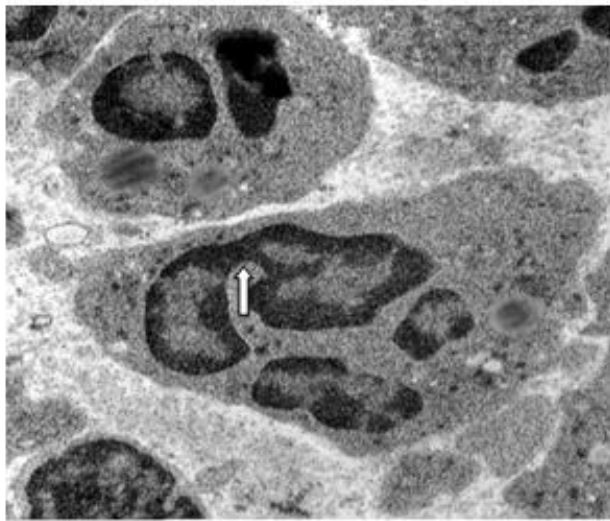




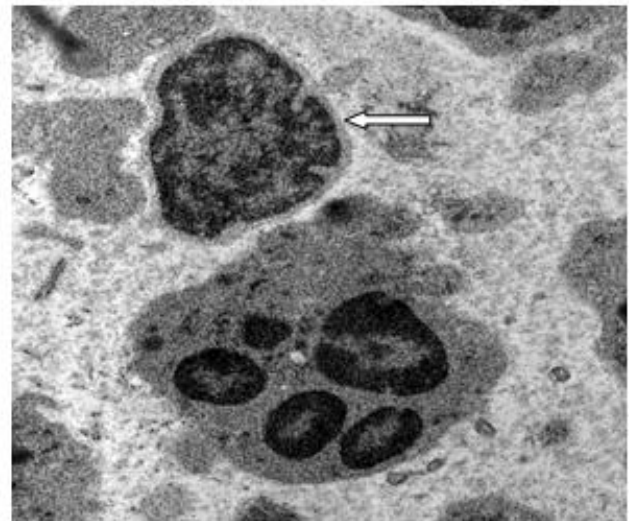
**Fig.15** Electron micrograph of radicular pulp tissue of subgroup IIb showing condensation of organized multinucleated cells.



**Fig.16** Electron micrograph of subgroup IIb showing a multinucleated cell with irregular nuclear membrane and vacuolated cytoplasm.



**Fig.17** Electron micrograph of subgroup IIb showing nuclear constriction (arrow).



**Fig.18** Electron micrograph of subgroup IIb showing a multinucleated cell in close association with monocyte (arrow).

### Conclusions:-

Intrusive orthodontic force for three weeks interval can evoke serious ultra-structural changes in odontoblastic cells. Heavy intrusive have greater impact on odontoblastic cells than light force. Generally, radicular cells are more affected than coronal cells by the same intrusive force magnitude. Both coronal and radicular odontoblastic cells can transform into multinucleated cells under the influence of heavy intrusive orthodontic force. Even light intrusive force could induce few multi-nucleation of radicular odontoblastic cells.

**Recommendations:-**

1. Further investigations are needed using different techniques such as immunohistochemical and decalcified tooth sections to confirm the phenotype of the multinucleated cells and their effect on dentin.
2. Further studies are recommended using different periods of force application to investigate whether the force impact is transient or permanent on odontoblastic cells which might help in case prognosis.
3. Orthodontic intrusion must be performed with ultimate caution and full awareness of the applied force.

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### RESEARCH ARTICLE

#### THE ROLE OF BANKING SUPERVISION IN ACHIEVING THE OBJECTIVES OF MONETARY POLICY

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monetary policy, banking supervision, the exchange rate, the interest rate, the reserve requirement

#### Abstract

The safety of the national economy and the effectiveness of monetary policy of any country depend on the safety of the financial system and in particular the safety of banks as, it is one of the main pillars in the financial system for its compilation of national saving and its re-employment in the service of all the economic activities.

Hence this study comes to identify the importance of the supervision of the banking sector in order to keep the stability and efficiency of the banking system. This is to reach to safe and stable banking sector that keeps the rights of depositors and investors and ensures the safety of executing the monetary policy for the country and achieving its objectives

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#### Introduction:-

Macroeconomic variables constitute the general framework of economic policies that achieve their goals through harmonious and consistent monetary and financial policies package. The transfer channels of the impact of monetary policy activation requires the completion of effective supervision of the banking sector respond to the latest international standards in the field of banking supervision, so as to ensure the central bank to exercise its role effectively in controlling the banking system and activating its role so as to ensure readiness to play its role in the transfer of the impact of monetary policy to the real economy sector, the banking sector in response to lower interest rates to expand their lending to secure the necessary funding for the investment sector is the basic and necessary and sufficient condition to achieve monetary policy to activate investment and increase employment and achieve economic growth and development.

#### Research problem:-

The banking system in Syria suffer of weakness supervision of the Central Bank on public and private banks due to the absence of a flexible legislative framework is able to intervene and compel the banks to oblige with the procedures intended to do, from this point should stand on concrete facts showing that the impact of supervision of the banks in achieving the objectives of monetary policy In Syria.

#### Research importance:-

The transfer channels of the impact of monetary policy in Syria activation requires the completion of effective supervision of the banks respond to the latest international standards in the field of banking supervision, so as to ensure the central bank to exercise its role effectively in the banking system, and activating its role so as to ensure it is ready to play its role in the transfer of the impact of monetary policy to the real economy sector.

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**Research objectives:-**

This research aims to know the reality of banking supervision in Syria, and the supervision of the Central Bank of Syria, to determine the requirements that must be met to achieve the objectives of monetary policy and the transfer of its impact to the real economy sector. Moreover, this research aims to build financial and statistical models that help in measuring the impact of banking supervision in the economic variables.

**Research hypotheses:-**

The study deals in the period (2001 - 2010) is the stage of the Central Bank of Syria of adopting a policy of banking supervision, according to the latest international banking standards (the application of Basel), and thus will be testing a number of hypotheses which is:

1. There is no impact on Banking Supervision in Syria in the exchange rate.
2. There is no impact on Banking Supervision in Syria in the interest rate.
3. There is no impact on Banking Supervision in Syria in the development of reserve requirement.

**Research Methodology:-**

We will be relying of this research on the descriptive and analytical approach, as will study the relationship between banking supervision vocabulary and variables of monetary policy through the use of the software package statistical (SPSS) to analyze the results, depending on the method of least squares (OLS) in estimates different models.

**First: The role of the monetary authority in the banking regulation and supervision on him:-**

Most historical studies refer to the evolution of the monetary and banking systems, there are two main reasons for the establishment of central banks, the first regulate of monetary issuance process and control of money supply, and the second banking regulation and supervision, and contributes both to provide for the banking sector with stable environment, which ensures the safety of its operations.

And therefore can determine the role of the monetary authority in the banking regulation and ensure the safety and stability of the banking sector through two perspectives are perspective drawing of monetary policy and banking supervision perspective.

**The monetary function of monetary authority:-**

The central bank seeks to draw a clear-cut monetary policy contributes to increased GDP, and then raise the economic growth rate in coordination and cooperation with the government in order to maintain macroeconomic stability (Hankel, Holtkemper, 2008: p15), where it is considered an effective monetary policy regarding for adjust the changes in rates of economic growth (Bernank, Mishkin, 2001: p2), with the aim of influencing in the macroeconomic variables and achieve monetary and banking stability, which contributes to the achievement of the following general economic objectives (John B, 2000: p45):

- ❖ High growth rates.
- ❖ Complete use of resources.
- ❖ Stability of exchange rate.
- ❖ Equiponderate of payment balance.

As well as these goals are targets final have the intermediate objectives of three is the money supply, the interest rate, and the exchange rate, and through these intermediate objectives that, if it was used of monetary policy instruments, consistent with the requirements of the national economy can contribute to achieving the target goals of monetary policy (Bank of Japan, 1995: June)

In practice, it has become the responsibility of monetary policy primarily focused on achieving monetary stability, which contributes to the achievement of other objectives (Burdekin, Lorey, 1988: p41).

In this day's most of the economic trends focused on that price stability is the most important targets objectives of monetary policy (La monnaie, 1992: p21), so the trend today revolves around the concentration of the objectives of monetary policy on the prime objective is achieving price stability, particularly in the event of a conflict in the short term among other goals of monetary policy which confuses the monetary authorities (Fredric, 2004: P 414), It can be classified the instruments of monetary policy as follows:

**Direct instruments:-**

A direct instruments of monetary policy include decisions issued by the monetary authorities in the context of managing monetary policy and supervision of banks.

**Indirect instruments:-**

The indirect instruments of monetary policy in three main instruments are:

**The development of the reserve requirements:-**

Reserve requirements are one of the instruments used by the central bank to protect depositors' accounts in the event that the bank's risk on the one hand, as well as its importance to control the liquidity of the banks on the other.

**The discount rate:-**

The discount rate as the rate of interest charged by the central bank to meet the re-discount at commercial banks from securities and treasury bills or meet it by the loans (Weaver, 2009: 158). And the consequent change the discount rate change in market interest rates, which affect on the credit and thus on the money supply.

**Open market operations:-**

the open market operations have a significant impact on the players behavior within the financial market through the channel of expectations, where they are used as an indicator to predict the movements of interest rates in the short and medium term and predict of the changes of government bond prices and their impact on other securities prices, also plays a role predicting the direction of monetary policy and forecasting inflation or recession (Stanley, McConell, 2008: p261) and therefore can be said that open-market operations generate three types of effects in the money markets and capital, the first is the effect of bank reserves and the growth of the monetary base and money supply, and the second issue is to influence the security prices and interest rates the short-term at least, and the third is represented the impact of the economic expectations (Thomas, 1997, P.400).

**The supervisory function of monetary authority:-**

The goal of the banking stability is as important as monetary stability as monetary and banking stability are two sides of the same coin, central bank will not be able to achieve monetary stability if the banking sector is not stable. Often the central bank as a empowered with the function of supervision of the banking sector, where the competent authority at the central bank (Crocket, 2005, P2) to follow up the functions of banks and lay the standards that regulate banking operations and ensure the safety and efficiency of its work and maintain depositors' account and protect the banking system from falling into a crisis.

**The monetary authority between the monetary and supervisory functions:-**

There are many views about determine of the head of banking supervision authority, In this framework, the countries were divided into three main groups (Daniel, William, 1993, 1997):

**The first group:-**

The group of countries for which the central bank's on banking supervision, which is called the model of the Central Bank

**The second group:-**

The group of countries that are the supervisory bodies and specialized on Banking Supervision in cooperation with the Central Bank and Ministry of Finance.

**The third group:** the Group of countries that the Ministry of Finance or bodies and specialized only on Banking Supervision, and called on the second and third groups are the alternative model of Banking Supervision.

**Second:- The descriptive analysis of the impact of banking supervision in achieving the objectives of monetary policy in Syria:-**

The monetary policy in Syria has seen a remarkable development after decades of stagnation through their quest to move from the neutral point, to lay the foundations of an effective monetary policy stage meets the needs of a market economy, through the activation of supply and demand forces in the pricing process, and the pursuit of full competition as a necessary condition to achieve of a market economy system. Hence monetary authorities sought with the beginning of 2005 to establish a strong foundation for monetary policy to take an active role in

macroeconomic policies. Thus, in front of these arrangements and the foundations laid by the monetary authorities in Syria, we have to ask the following question:

### Is achieved monetary policy in Syria objectives aimed to?

We will depend on the answer to this question on the review of the key elements of business strategy of the monetary policy adopted by the Central Bank of Syria after the issuance of the Basic monetary Law, and through the study of intermediate objectives for monetary policy / exchange rate /, the study of monetary policy instruments used on a practical level / interest rate and reserve requirements /, and the effectiveness of each of them in achieving the target goal of monetary policy / inflation control and the stability of the general level of prices /.

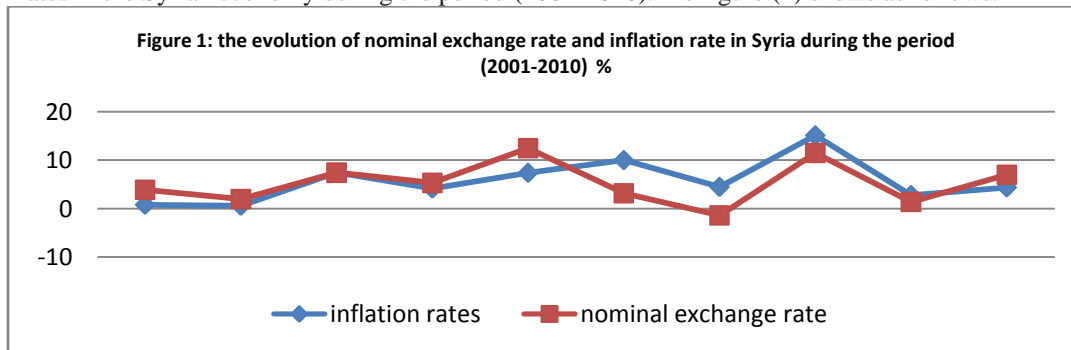
**Table :-** The evolution of the elements of monetary policy in Syria during the period (2001-2010) %

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
inflation rates	0.81	0.6	7.45	4.17	7.41	10	4.5	15.15	2.8	4.4
nominal exchange rate	3.1	1.38	0	1.16	5.08	-6.84	-5.87	-3.62	-1.4	2.63
money supply M2 rates	1.35	19.9	8.15	13.4	11.8	9.16	12.4	12.46	9.2	12.4
real interest rates (time deposits)	6.69	6.9	-1	1.58	0.89	-2.08	3.33	-8.17	3.48	1.71
real interest rates (saving deposits)	7.19	7.4	-0.5	0.83	-3.41	-5.03	0.31	-10.4	1.87	-0.1
reserve requirements rates	61	33	14	51	-21	173	51	116	9	16

Reference: Quarterly statistics, central bank of Syria (2001-2010)

### The impact of banking supervision in the exchange rate:-

The Figure (1) shows the evolution of each of the nominal exchange rate (Syrian pounds to the US dollar) and the inflation rates in the Syrian economy during the period (2001-2010).The figure (1) shows as follows:



This period knew relatively stable in the Syrian pound exchange rate against the US dollar, as the track the evolution of the exchange rate during this period refers to keep the exchange rate stable with a gradual rise in the value of the Syrian pound since the beginning of 2006 against the US dollar, we see from the figure Previous (1) a rise in the value of the Syrian pound against the US dollar (the exchange L / d of 50.90 L / d in 2001, the price fell to 46.90 L / d in 2010, to reach an average of 49.9 L / d), with reference to the Syrian pound has seen in previous years for 2010 gradually successive rises in value against the US dollar at a rate of (6.8%, 5.9%, 3.6%, 1.4%) during the years (2006.2007, 2008.2009), respectively, We explain the stability in the exchange rate during this period as a result of procedures taken by the Syrian government during this period, which was mutually made an emergency landing in response to emergency conditions, others were focus on the strategy of the monetary policy of the Central Bank of Syria of targeting the Syrian pound exchange rate in the medium term in order to achieve price the target goal of monetary policy adopted by Syria in the long-term work on price stability and control inflation.

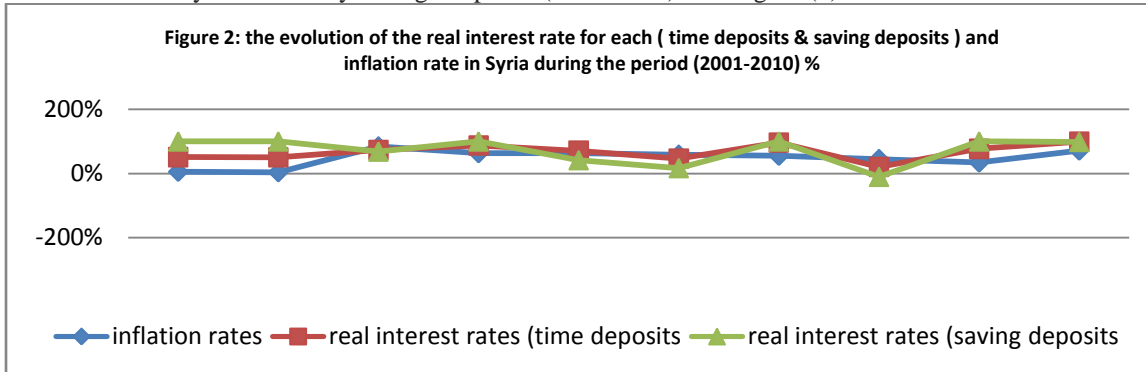
In contrast, we see a down the rate of inflation in Syria from 10.03% in 2006 to reach 4.4% in 2010.



As can be seen from the figure (1) that there are relatively very weak consensus in the general direction of both inflation and exchange rate growth during this period, reflecting weak relationship between them, which is not shows importance of the exchange rate to control inflation.

**The Impact of banking supervision in the interest rate:-**

The Figure (2) shows the develop of each of the real interest rates (time deposits, and savings deposits) and the inflation rates in the Syrian economy during the period(2001-2010). The figure (2) shows as follows:



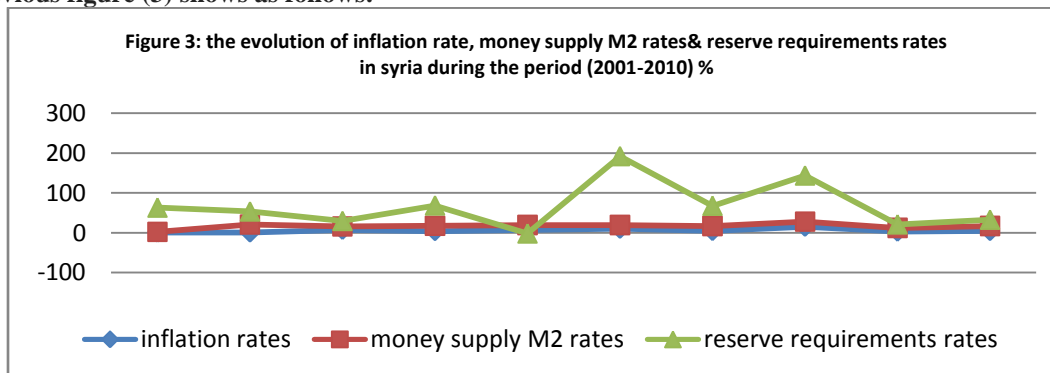
we observe the evolution of the real interest rate on time deposits it is clear that it was negative in the years (2003, 2006.2008) amounted respectively (-0.95%, -2.08%, -8.17%), while the evolution of the real interest rate on savings deposits it is clear that it was negative during the years (2003, 2005.2006, 2008.2010) amounted respectively (-0.45% -3.41% -5.03% -10.36% -0.05%), we can explain that as a result of irregular rises in inflation during this period.

here is a defect in the performance of monetary policy in Syria, and the weakness in their ability to use interest rates as a monetary policy instruments in achieving the objectives of monetary policy, but it used the interest rates as a instrument to achieve a general economic policy objectives, from during their quest to restructure deposits in favor of long-term deposits in order to increase the financing capacity of the banking sector in Syria in the long term, but these deposits become piling up at banks without hiring a result of the weakness of investment channels necessary to employ this surplus liquidity in banks.

**The Impact of banking supervision in the development of reserve requirements:-**

The Figure (3) shows the evolution of both the reserve requirements rates of growth, and the evolution of the money supply M2 growth rates, and the evolution of inflation rates in the Syrian economy during the period (2001-2010).

The previous figure (3) shows as follows:-



By tracking the evolution of the growth rates of the reserve requirement in Syrian pounds and foreign currency at the Central Bank of Syria, it is clear that it has seen a remarkable increase during the period studied were on average about 50%, equivalent to five times the average growth of the reserve requirement rate, as the growth of reserve requirements rate rose from 51% in 2004 to up to 173% -116% during the years 2006 to 2008 respectively, we can interpret that as a result of decisions taken by the monetary authorities in Syria during this stage that, Reflecting to a large extent the success of the decisions taken by the monetary authorities to raise the reserve requirement growth rates, but in return we observe the inability of monetary authorities in controlling the money supply growth rates

through the use of the reserve requirement policy, where the relationship is completely separate from the reserve requirement growth rates and the growth of the money supply during the period (2004-2008) as shown by Figure(3) in despite of previous decisions taken by the monetary authorities, and therefore the reserve requirement policy has not affected during the period(2004-2008)in controlling the money supply growth rates, which confirms the ineffectiveness of using this tool in controlling the money supply growth rates during the period of study.

Then the reserve requirement rate of growth returned to decline very significantly reduced during the years 2009-2010 to reach (9%, 16%), respectively, we can explain that as a result of decisions taken by the monetary authorities in Syria during these two years, which largely reflects the success of this decision to reduce the reserve requirement rates of growth, but in return we also observe that the monetary authorities were able to control rates money supply growth to some extent through the use of the policy of reserve requirement.

In contrast, inflation rates have witnessed a remarkable increase during this period to reach 10.3%, 15.15% respectively 2006-2008, then returned to decrease again during 2009-2010 also to reach 2.8%, 4.4%, respectively. As can be seen from Figure No. (3) earlier that there is a clear separate in the relationship between inflation and growth rates of reserve requirements in the period (2004-2008), having noted that with the rise in reserve requirements growth rates over the years 2006 to 2008 as mentioned previously, there was a contrast rise in inflation rates during the years 2006-2008, and then did not affect reserve requirements followed a policy at this stage in controlling high inflation.

As can be seen from Figure No. (3) that there is a clear break in the relationship between the inflation and the rates of the reserve requirements growth during 2009-2010, so that with low inflation rates in parallel with the decline in the growth of requirement reserve rates, however, this decline in inflation was caused by factors related to the economic policy of the government, it was not caused by monetary factors.

### **Third: The Empirical Result and hypotheses testing:-**

After that study, the analytical side of the impact of banking supervision in achieving the objectives of monetary policy in Syria, which has shown that there is a weak effect of the impact of banking supervision policy in the various components of monetary policy that contributes to achieving the target goals of it, remain these effects known to use some standard methods, so through the use of statistical software package (SPSS) to analyze the results, depending on the method of ordinary least squares (OLS) to estimate the coefficients of various models.

### **The first hypothesis: There is no impact on Banking Supervision in Syria in the exchange rate:-**

In order to measure the impact of banking supervision in Syria on the exchange rate will be depending on the model consists of the inflation rate as the dependent variable and the exchange rate growth as an independent variable in the period of study (2001-2010), and therefore the model is as follows:  $INF = \alpha + a EXCH + \epsilon$

INF: inflation, EXCH: exchange rate growth rate,  $\alpha$ : constant,  $\epsilon$ : random error.

a: model coefficient represents the partial regression coefficient of the independent variable (the exchange rate growth rate).

When applying the model on the Syrian economy during the period of study (2001-2010) the results were as follows:  $INF = 5.514 - 0.507 EXCH$

The model indicates that the value of coefficient of Pearson correlation between the inflation rate and exchange rate growth during the period of study (2001-2010) amounted to  $R = - 0.450$ , which is not significant and does not reflect statistical significance, because the  $SIG = P-VALUE = 0.192$ , which is greater than the level significance adopted in this study as  $\alpha = 0.05$ , though the value of the coefficient of determination  $R SQUARE = 0.203$ , so if exchange rate growth rate explains only 20.3% of the variation or difference in the rate of inflation.

The P-VALUE corresponding statistical coefficient t to the constant and variable coefficients was respectively:  $SIG = P-VALUE = 0.003$  for constant  $SIG = P-VALUE = 0.192$  for the variable exchange rate growth rate

It is smaller than the significance level  $\alpha = 0.05$  for constant coefficient, and for this we reject null hypothesis of this model since that at least one of regression coefficients /a/ and /b/ differ significantly from zero, indicating a moral calculated values and the quality of the estimated equation, shows importance of price growth rate exchange in effect at the rate of inflation.

The test F amounted to 2.031 at the level of 0.05 when compared to the spreadsheet value, we find that the calculated value is greater than the spreadsheet value, which shows that the moral estimated whole model, and the significant coefficient of determination, and then we find that the independent variable had a significant impact on the regression.

The Regression coefficient shows that the exchange rate growth rate higher by one unit will lead to a decline in the inflation rate by 0.507 units, these contrasts with economic theory, where he was supposed to raise in the exchange rate leads to higher inflation, not falling.

The explanation of this is a result of emergency conditions and political pressures experienced by Syria during this stage, although enable the monetary authorities to secure the stability of the Syrian pound exchange rate against the US dollar through the intervention of the Central Bank of Syria buy and sell foreign exchange, which explains why the contradiction above between the exchange rate and inflation.

**The second hypothesis: There is no impact on Banking Supervision in Syria in the interest rate:-**

In order to measure the impact of banking supervision in Syria on the interest rate will be relying on the model consists of the inflation rate as the dependent variable, and the real interest rate on time deposits and the real interest rate on savings deposits as independent variables during the period of study (2001-2010), and therefore the model is as follows:  $INF = \alpha + a \text{ INTERR-L} + b \text{ INTERR-S} + \epsilon$

INF: inflation. INTERR-L: the real interest rates on time deposits. INTERR-S: the real interest rate on savings deposits.

A and b: model coefficients and represent a coefficient of partial regression for independent variables (the real interest rate on time deposits, the real interest rate on savings deposits).  $\alpha$ : constant.  $\epsilon$ : random error.

When applying the model on the Syrian economy during the period of study (2001-2010) the results were as follows:  $INF = 6.548 - 0.647 \text{ INTERR-L} - 0.294 \text{ INTERR-S}$

The model indicates that the value of Pearson correlation coefficient between the rate of inflation and the real interest rate on time deposits, and savings deposits during the period of study (2001-2010) amounted to  $R = -0.981$ ,  $R = -0.968$ , respectively, a moral and reflect statistically significant because the value of  $SIG = P\text{-value} = 0.00$  for each, which is smaller than the significance level adopted in this study as  $\alpha = 0.05$ , though the value of the coefficient of determination of the model  $R \text{ SQUARE} = 0.972$ , so that the real rate of interest on both time deposits and savings deposits explains 97.2% of the variation or difference in the rate of inflation.

The P-VALUE corresponding statistical t to the constant and variable coefficients was respectively:

$SIG = P\text{-VALUE} = 0.000$  for constant  $SIG = P\text{-VALUE} = 0.022$  to the variable of the real interest rate on time deposits for

It is less than the significance level  $\alpha = 0.05$  for fixed coefficient, and the variable coefficient is real interest rate on time deposits, and for this we reject the null hypothesis for each of these coefficients, so they differ from zero, suggesting moral calculated values and the quality of the estimated equation, shows the importance of the real interest rate on time deposits in order to influence in the inflation rate.

While the P-VALUE corresponding statistical t to the variable coefficient is the real interest rate on savings deposits rate was  $SIG = P\text{-VALUE} = 0.152$ , which is greater than the significance level  $\alpha = 0.05$  For that accept null hypothesis for this coefficient, that is equal zero, indicating not the moral values calculated and not the quality of the equation, which is not shows importance of the real interest rate on savings deposits for influencing in the inflation rate. The test F value amounted to 121.471 at the level of 0.05 when compared to the spreadsheet value, we find that the calculated value is greater than the spreadsheet value, which is appropriate indicate that the regression is moral or that at least one of regression coefficients /a/ and /b/ differ significantly from zero.

The Partial regression coefficients show that the rise in real interest rates on time deposits increased by one unit price will lead to a decline in the inflation rate by 0.647 units, and the same applies if the real interest rate on savings deposits rose by one unit will lead to a decline less in the inflation rate by 0.294 units and this compatible with

economic theory which is supposed to result in higher real interest leads to decrease inflation. It compatible perfectly with the economic reality in Syria during the period (2001-2010), which saw the monetary authorities in Syria by moving the interest rate after stability for about two decades, and track the evolution of each of the real interest rate on time deposits and savings deposits and the evolution of inflation in Syria It will be seen that during the years in which the inflation rate knew a high rise reflected the negative real interest rates on time deposits and savings deposits rates up to a maximum of 2008 to \$ (-8.17%, -10.36%), respectively.

**The third hypothesis: There is no impact on Banking Supervision in Syria in the development of the reserve requirements:-**

In order to measure the impact of banking supervision in Syria on the evolution of the reserve requirement will be depending on the model consists of the inflation rate as the dependent variable and the rate of reserve requirement growth as an independent variable in the period of study (2001-2010), and therefore the model is as follows:  $INF = \alpha + a RESE + \epsilon$

INF: inflation. RESE: the growth of reserve requirements in Syrian pound and foreign exchange growth.  $\alpha$ : constant.  $\epsilon$ : random error.

a: model coefficient represents the partial regression coefficient of the independent variable (the reserve requirement rate of growth).

When applying the model on the Syrian economy during the period of study (2001-2010) the results were as follows:  $INF = 3.738 + 0.033 FORASS$

The model indicates that the value of Pearson correlation coefficient between the inflation rate and the rate of growth of reserve requirements during the period of study (2001-2010) amounted to  $R = 0.438$ , which is not significant and does not reflect statistically significant because the  $SIG = P-VALUE = 0.205$ , which is greater than the level of significance approved in this study, where  $\alpha = 0.05$ , though the value of the coefficient of determination  $R SQUARE = 0.192$ , so the growth of reserve requirement rate explains 19.2% of the variation or difference in the rate of inflation.

The P-VALUE corresponding statistical t to the constant and variable coefficients was respectively:  $SIG = P-VALUE = 0.095$  for fixed  $SIG = P-VALUE = 0.205$  for variable reserve requirement rate of growth

It is the largest of the significance level  $\alpha = 0.05$  For that accept null hypothesis for this coefficient, that is equal to zero, which shows not of moral values calculated and not the quality of the estimated equation, shows not importance of the growth of reserve requirements in effect in the inflation rate.

The test F amounted to 1.899 at the significance level of 0.05 when compared to the value spreadsheet, we find that the calculated value is greater than the spreadsheet value, which is explain that the moral estimated whole model, and the significant coefficient of determination, and then we find that the independent variable had a significant impact on the regression.

The Regression coefficient shows that an increase in the reserve requirements growth rates by one unit will lead to an increase in the inflation rate by 0.033 units, and this above to not proceed with economic theory, where it was supposed to rise in reserve requirements leads to control the money supply growth rates, which helps in reducing the rate of inflation and not increase it. We can explain this contrasts as a result enable the monetary authorities in Syria to control the money supply growth rates in some years of this period and through the use of the reserve requirement policy, which has seen many decisions during this period contributed to achieve the objectives of monetary policy in Syria in the short term to control money supply growth rates, but they did not contribute to enable the monetary authorities to achieve the objectives of monetary policy in Syria in the long term by controlling the inflation rates during this period, and it is also mainly due to the causes of inflation during this period not related mainly to monetary reasons, but to other factors relating to the economic policy of the government in addition to general economic conditions experienced by Syria during this period.

**Conclusions:-**

1. The creation of an efficient banking system, is capable of achieving the objectives of monetary policy and to ensure the stability of the banking, requires a regulatory system effective oversight and effective procedures on the banking sector, it aims to achieve the efficiency of the banking system.
2. There is no impact of Banking Supervision in Syria (the exchange rate, interest rate, and reserve requirements) during the period (2001-2010) according to:

The inability of monetary authorities during the period of study to control inflation and price stability as target goal in the long term, with the ability to achieve stability in the exchange rate as an intermediate objective of monetary policy as a result of central bank intervention to buy or sell, which contributes to control the rates of inflation in the Syrian economy, which has been unable to achieve the desired position because of the crises and emergency conditions experienced by Syria during this period, as well as government procedures aimed at liberalizing the exchange rate by shock and not gradually.

In despite of the policy of movement of interest rate by the monetary authorities during the period of study, but they were completely separate from changes in inflation rates during this period, which shows a deficit flaw in the performance of monetary policy in Syria during this period, and the inability to use the interest rate as a instrument to achieve objectives of monetary policy, but the use of interest rates to achieve a general economic policy of the government's objectives.

The inability of monetary authorities in Syria using the reserve requirement policy in controlling inflation during the period of study.

**Recommendations:-**

1. The supervisory authorities must carry out the review of decisions, and to ensure the continuing effectiveness of these decisions, and ensures application optimally, helping to strengthen the banking sector in Syria and increase its competitiveness.
2. the exchange rate unify policy requires the cancellation of controls on the exchange rate system gradually rather than liberation by shocked, and so by going to the flexibility in dealing in the foreign exchange market through the flotation system's reliance on a small scale in order to avoid the risks of sudden liberalization of the exchange market, this procedure corresponds to a thoughtful and conscious intervention of the Central Bank in the currency market to achieve the full liberalization of the exchange market, to meet the needs of the Syrian market of foreign exchange away from the intervention of the monetary authorities.
3. the policy of liberalization of interest rate must be gradually and consistent data Syrian economy, and in particular the structure of deposits and loans within the economy, especially that the liberalization of interest rates on loans along with the absence of open market operations will reflect negatively on the effectiveness of monetary market in Syria, as well as non-banking sector in Syria's ability to transfer the desirable impact of policy interest rate to influence the macro-economic variables because of the large value of the surplus liquidity has without financing.
4. We must follow up the development of the banking supervision process through the Central Bank of Syria's commitment to the principles of effective banking supervision, all the way to fully implement to ensure the preservation of a sound efficient system.
5. The strengthen of the independence of the Central Bank of Syria and resolve the entanglements between financial and monetary policies.

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### RESEARCH ARTICLE

#### ACHILLES TENDON INJURIES AND REPAIR: AN OVERVIEW.

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#### Abstract

The Achilles tendon (AT) is the strongest and thickest tendon in the body. It serves a fundamental function of linking the soleus and gastrocnemius muscles to the calcaneus bone to enable plantar flexion about the ankle joint. We aimed by this recent study to overview the Achilles tendon injuries in different aspects, we intended to examine the causes and risk factors and diagnosis of this condition, However the main purpose of this study was to evaluate the treatment repair approaches to Achilles tendon injuries. Computerized search of the literature in the MEDLINE, CINAHL, and EMBASE databases was conducted December, 2016. The MESH search terms for MEDLINE are: "Achilles tendon" AND "tendon injuries OR tendinopathy" Combined with "treatment OR repair", with limits for English language and humans. Safe tendon repair work fixation is necessary to avoid gapping and permit a sped up rehab. Selection of the stitch material and knotting method is likewise important to prevent tendon repair separation.

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#### Introduction:-

The Achilles tendon (AT) is the strongest and thickest tendon in the body. It serves a fundamental function of linking the soleus and gastrocnemius muscles to the calcaneus bone to enable plantar flexion about the ankle joint. By virtue of its biomechanical homes, the AT affects the capability of numerous human motions<sup>(1)</sup>. An Achilles tendon injury results from a stretch, tear, or inflammation to the tendon connecting the calf muscle to the back of the heel<sup>(1)</sup>. These injuries can be painful and so abrupt that they have actually been understood to reduce charging expert football players in shocking style<sup>(1,2)</sup>. The most typical cause of Achilles tendon tears is a problem called tendinitis, a degenerative condition brought on by aging or overuse. When a tendon is weakened, trauma can cause it to burst<sup>(1,2)</sup>. Achilles tendon injuries are common in middle-aged who may not exercise regularly or take time to stretch effectively prior to an activity<sup>(3)</sup>.

Biopsies recovered at surgery have demonstrated degenerative changes in the majority of ruptured Achilles tendons<sup>(4)</sup>, suggesting that Achilles tendon ruptures could be defined as intense injury of chronically degenerated tendons. Rotator cuff disorders are the most common reasons for shoulder disability and are very common in the aging population<sup>(5)</sup>. Full-thickness rotator cuff tears exist in around 13% of people in their 50s<sup>(6)</sup>, 25% of people in their 60s and 50% of individuals in their 80s<sup>(5)</sup>. The etiology of rotator cuff tearing is likely and multifactorial a mix of age-related degenerative modifications<sup>(7)</sup> and micro/macrotrauma. Age, smoking cigarettes, family, and hypercholesterolemia history have actually been revealed to incline individuals to rotator cuff tearing<sup>(5)</sup>. Several

treatment and repairs options for Achilles tendon injuries, however in cases of postponed medical diagnosis the likely success of conservative management may be restricted by an absence of consistency of the tendon ends due to scarring and retraction. Surgical repair work is promoted <sup>(8)</sup>. Cases of chronic rupture of the tendoachilles by their very nature will not react to conservative treatment and for that reason will require repair making use of graft <sup>(9)</sup>.

### Objectives:-

We aimed by this recent study to overview the Achilles tendon injuries in different aspects, we intended to examine the causes and risk factors and diagnosis of this condition, However the main purpose of this study was to evaluate the treatment repair approaches to Achilles tendon injuries.

### Methodology:-

Computerized search of the literature in the MEDLINE, CINAHL, and EMBASE databases was conducted December, 2016. The MESH search terms for MEDLINE are: “Achilles tendon” AND “*tendon injuries OR tendinopathy*” Combined with “treatment OR repair”, with limits for English language and humans. the reference lists of all selected publications were inspected to obtain pertinent publications that were not identified in the electronic search. The gray literature, that included publications, posters, abstracts, and conference proceedings, was likewise hand browsed. Full-text short articles were retrieved if the abstract offered inadequate details to develop eligibility or if the short article passed the very first eligibility screening.

### Results:-

#### Clinical presentation of tendon injured patients:-

The patient usually presents with pain, failure to weight bear and a clear popping feeling or sound after an episode of activity during which they sustain a forced dorsiflexion of the ankle. The injury can also be sustained throughout eccentric contraction. The patient frequently describes the sensation of being kicked, shot or perhaps bitten on the back of the heel<sup>(10,11)</sup>. Intense Achilles tendon rupture can readily be discovered on health examination. Plantarflexion of the foot is naturally weak <sup>(11)</sup>. The Achilles tendon is best analyzed with the patient kneeling and the feet hanging over the edge of the chair. In this position soft tissues hang off the Achilles tendon like a tent pole and problems can be readily visualised (**Figure 1**)<sup>(10)</sup>. There is regularly a visible problem in the Achilles tendon. This is accompanied by swelling due to peritendinous haemotoma.

The flaw in the Achilles tendon is typically palpable with a level of sensitivity of 0.71 and specificity of 0.89. Maffulli compared the sensitivity and uniqueness of the principal medical tests developed to identify Achilles tendon rupture <sup>(12)</sup>. Particular tests consist of Simmonds or Thompsons' test with sensitivity of 0.98 and uniqueness of 0.93. Lesser recognized are the O'Brien and Copeland tests both with a sensitivity of 0.8. Early reports suggest that approximately 20% of Achilles tendon injuries can be missed by medical assessment alone <sup>(13)</sup>.



**Figure 1:-** View of the right and left Achilles tendon with the patient prone. The left is ruptured. The right Achilles tendon is well defined and soft tissues hang off it like a tent. The suspension of the soft tissues off the Achilles tendon is not visible on the left side as the tendon is ruptured. <sup>(10)</sup>



**Diagnosis of an Achilles tendon injury:-**

The accurate diagnosis of an Achilles tendon injury, such as Achilles tendinopathy and, to a lesser degree, Achilles tendon tear, is not always clear and uncomplicated<sup>(14,15,16)</sup>. The differential medical diagnosis of an Achilles tendon injury consists of but is not restricted to retrocalcaneal bursitis, ostrigonum, tarsal tunnel syndrome, posterior tibialis tendon rupture, arthritic conditions, plantar fasciitis, and stress fracture<sup>(16)</sup>.

Diagnostic ultrasound and magnetic resonance imaging (MRI) have actually traditionally been considered the requirement reference requirements to identify Achilles tendon injuries<sup>(14,15,16)</sup>. However, this screening can be pricey and might not lead to accurate medical diagnosis<sup>(17,18,19)</sup>. Because of restricted proof assistance, the American Academy of Orthopaedic Surgeons' scientific practice guidelines recommendation was undetermined relating to the regular use of MRI for identifying intense Achilles tendon tears<sup>(19,20,21)</sup>.

**Treatment (repair)of Achilles tendon injuries:-**

Although non-operative treatment can give satisfying results, current research studies have recommended that operative repair work of the AT may have advantages such as reduced ankle stiffness and calf atrophy, fewer cutaneous adhesions, and lower risk of trombophlebitis. For the purpose of this evaluation, it is important to highlight that non-operative treatment cannot avoid tendon lengthening<sup>(22)</sup>. In a meta-analysis conducted by Khan et al., including 12 randomized control trials and 800 patients, open surgery was related to lower risk of re-rupture than non-operative treatment however higher risk of other issues, particularly wound problems<sup>(23)</sup>. Surgical treatment appears to be the technique of option for youths, professional athletes, and delayed ruptures. There is no single, evenly accepted surgical method, and the choices include open repair, with or without enhancement, and percutaneous techniques. Minimally invasive and percutaneous techniques have actually been pointed out as valid healing options for AT ruptures. Khan et al. found that percutaneous surgical treatment was related to lower risk of complications than open surgery<sup>(23)</sup>. That strategy does not permit the surgeon to imagine the ruptured tendon ends and accomplish suitable tendon tensioning<sup>(24)</sup>. In addition, imaging research studies have reported that 100 percent of AT repaired by percutaneous strategy showed residual gap on MRI at 4 weeks postoperative<sup>(26)</sup>. New minimally invasive methods for AT repair may permit direct visualization of the two ends and have actually been reported satisfactory clinical results<sup>(24)</sup>.

**Surgical Factors Influencing Tendon Tension Repair:-**

Secure soft-tissue fixation is essential to numerous clinical applications, from direct tendon repair to tendon transfers to ligament and tendon reconstructions. It allows for early rehabilitation prior to biological recovery, which is vital to numerous procedures. Due to the fact that elongation of the graft might be associated with functional construct failure<sup>(26)</sup>, minimizing elongation of the sutured tendon construct is a vital element of soft tissue fixation.

Biomechanical characteristics of the tendon repair depend mainly on three factors: the quality of the tissue, the strength of the knot, and the strength of the stitch material itself. The quality of the tissue impacts the "coefficient of friction," which is the holding capacity of the suture within the tendon. This is an important idea due to the fact that the failure of the tendon repair work usually occurs due to pull-out of the suture material within the tendon; knot failing was also observed, while suture damage is unusual<sup>(27)</sup>. Suggestions to reduce tendon extending throughout Achilles tendon repair are summed up in (**Table 1**)<sup>(28)</sup>.

**Table 1:-** Summary of recommendations to reduce tendon lengthening during Achilles tendon repair<sup>(28)</sup>

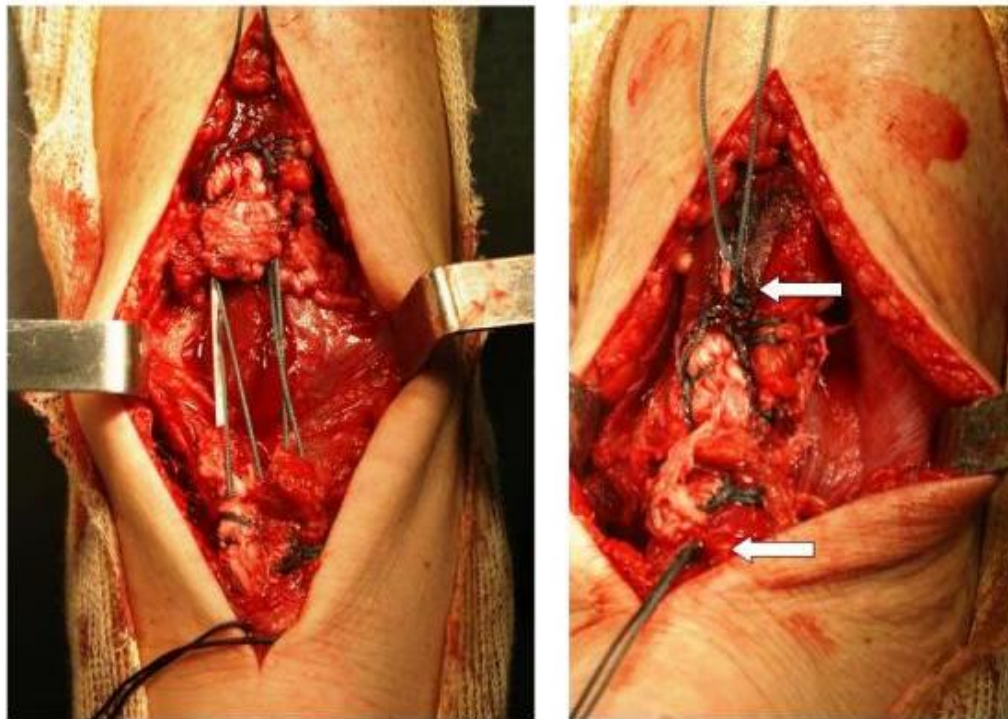
1. Free proximal and distal adhesions
2. Use large caliber ( $\geq$ #2) non-absorbable braided suture materials (i.e. polyblend)
3. Use locking suture techniques (i.e. Krackow)
4. Sutures should be place at approximately 2.5 cm from the rupture site
5. Knots should be tied away from the rupture site (i.e. "gift-box technique")
6. Ependinous suture augmentation is recommended

**Suture Technique to better influence the tendon healing:-**

There are a variety of stitch methods described for grasping and holding soft tissues. When repairing tendons, the Kessler and Bunnell stitches are well-known for their holding power and are frequently used. In 1986, Krackow et al.<sup>(29)</sup> described a new locking stitch for fixing tendons and ligaments. The traditional Krackow stitch includes three or more locking loops put along each side of the tendon. Watson et al.<sup>(30)</sup> demonstrated that the Krackow locking repair is stronger than Bunnell and Kessler strategy, developing that the Krackow technique is the benchmark

biomechanically. Extra studies confirmed the exceptional pull-out strength of locking loop methods. McKeon et al.<sup>(31)</sup> found that load to failure is significantly increased by including a 2nd interlocking Krackow stitch positioned 90° to the first. They likewise reported that including more than 2 locking loops did not increase load to failure or regularly alter elongation. Using only 2 locking loops not only conserves important operative time however also avoids potential necrosis and injury of the tendon restricted by the loops of the stitch. Extra unnecessary stitch loops will add more links in the chain, more nonlinear sutures, and maybe increase the risk of extending through slippage.

The site where the knot is tied is also of value when thinking about tension restoration. When the knot is connected away from the rupture site, 2 different research studies have reported higher repair work strength. Jaakkola et al.<sup>(32)</sup> discovered that the triple bundle is almost three-fold stronger in tension than the Krackow locking loop; this distinction is generally due to the increased number of strands crossing the rupture site. Another consideration is that the knot was tied far from the rupture site in the triple bundle method, whereas in the Krackow strategy, the knot is connected at the rupture site. Having the knot at the rupture site might establish a tension riser on the stitch at the rupture site, and subsequent stress on the suture might lead to early failure at the knot. More recently, Labib et al.<sup>(33)</sup> tested a modification of the Krackow technique in which the knots of the stitch were tied over the cross-limb of the counter stitch ("gift-box" method) (**Figure 2**) and discovered that the load to failure increases more than two-fold. The authors thought about that the "gift-box" method is a simple a relatively fast method without constricting additional tissue during the repair work as reported in the "triple package strategy."<sup>(28)</sup>



**Figure 2:-** The "Gift-box" technique for Achilles tendon repair. Sutures are tied away from the rupture site (arrows).<sup>(28)</sup>

### Conclusion:-

Achilles tendon rupture is a serious injury for which the best treatment is still questionable. The surgeon needs to examine a patient's practical requirements thoroughly and treatment need to attempt an optimum restoration of tendon length, tightness, and tension. For that reason, in attempting to avoid excessive elongation of the tendon, which is related to a poor clinical outcome, there is consensus that personnel treatment is the preferred healing alternative for most of patients, specifically young athletes. Safe tendon repair work fixation is necessary to avoid gapping and permit a sped up rehab. Selection of the stitch material and knotting method is likewise important to prevent tendon repair separation.

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### RESEARCH ARTICLE

## LIVER INVOLVEMENT IN SICKLE CELL TRAIT: A CASE CONTROL STUDY AMONG NEPALESE INDIGENOUS THARU COMMUNITY

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Sickle cell trait, liver function, total protein, AST, ALT, LDH, bilirubin

#### Abstract

**Background:** Sickle cell trait is not usually regarded as a disease state because it may present several types of health complications that are either uncommon or mild and have not been thoroughly investigated. This article aims to describe the relationship between sickle cell trait (SCT) and liver function test (LFT) parameters in tharu community of western tarai region of Nepal.

**Method:** Sixty two (62) subjects divided into control subjects (n = 31) and heterozygous sickle cell patients (n = 31) were recruited for the study and were investigated for a liver function tests including the measurement of total protein, albumin, globulin, total bilirubin, direct bilirubin, indirect bilirubin, aspartate transaminase (AST), alanine transaminase (ALT) and lactate dehydrogenase (LDH) in both groups. Mean, Standard deviation, Students T test analysis were used for analysis of results.

**Result:** The serum total protein, globulin, total bilirubin, indirect bilirubin, aspartate transaminase (AST), alanine transaminase (ALT) and lactate dehydrogenase (LDH) were significantly higher in SCT patients than in controls, with P values of 0.014, <0.001, 0.003, 0.006, <0.001, <0.001 and <0.001 respectively. However, there were no significant difference in the mean value of albumin and direct bilirubin. There was strong correlation noticed between AST and LDH in the test group.

**Conclusion:** It appears that abnormal liver function tests in patients with sickle cell trait poses an uncertain threat for liver disease. The liver functions of the SCT patients were significantly compromised as compared to controls. Studies at molecular level are needed to understand the pathophysiology and progression of liver disease in sickle cell anemia. It is advisable that liver function tests be interpreted with caution in these patients.

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**Introduction:-**

Sickle cell disease is stand out amongst the most common autosomal hereditary disorders, described by the presence of hemoglobin S (HbS). It is the most regular sort of hemoglobinopathy. The SCD can bring about various disorders that differ with respect to degree of anemia, recurrence of emergencies and in terms of survival [1]. So, the inconstancy in clinical seriousness from the virtually symptomless sickle cell trait to the conceivably lethal state of sickle cell anemia. Patients with SCD present with a broad range of phenotypic hemoglobin structures; they vary clinically from mild vaso-occlusive crises to severe clinical manifestations [2]. According to WHO data and statistics, SCD affects millions of people throughout the world. It is suggested that SCD is prevalent in malaria endemic areas because the sickle cell provides its carrier with resistance against malaria. It is most common among people whose ancestors come from Africa, Mediterranean countries such as Greece, Turkey, and Italy, the Arabian Peninsula, India and Spanish-speaking regions in South America, Central America, and parts of the Caribbean.

As with sickle cell disease, sickle cell trait is characterized by the inheritance of a single abnormal  $\beta$ -globin gene. Unlike sickle cell disease, however, the other  $\beta$ -globin chain is unaffected, enabling that chain to retain its functional and phenotypic properties. As such, those with sickle cell trait are generally mildly anemic or asymptomatic, reducing the likelihood of skeletal manifestation of the disease [3,4]. Traditionally, SCT has been viewed as a benign condition, a non-disease status, without any painful episodes that are characteristic of homozygous SCD. On a population basis, SCT has no discernible impact on life expectancy. There are more than 300 million carriers of sickle cell trait worldwide [5], with the highest prevalence of approximately 30% to 40% in sub-Saharan Africa. In Nepal, Tharu people are one of the oldest ethnic group indigenous to the Terai region. In 1990, WHO has reported that most of the Tharu communities in western region of Nepal are living with different hemoglobinopathies, SCD being commonest inherited disorder in this population.

Patients with sickle cell anemia/trait may experience the ill effects of an assortment of hepatic changes. The changes in the shape of red blood cells favors intravascular hemolysis and in this way impediment of the liver vascular bed, driving at last to tissue damage, yet more generally turns out as a result of the numerous transfusions that the patients require in their lifetime. Furthermore, hemolysis induces deposition of bilirubin causing intrahepatic cholestasis and cholelithiasis [6]. The incidence of liver disease in sickle cell disorders is difficult to ascertain despite being a component of the multiorgan failure that occurs in sickle cell disease [7]. This is because dysfunction of the liver in sickle cell disease is multifactorial [6] and the complications of hepatic dysfunctions are prominent and fatal in most of the cases [8].

Evidence of liver disease in sickle cell disease is obtained either from abnormal biochemical tests or postmortem liver biopsy specimen rarely an antemortem liver specimen. Abnormal liver function tests are noticed in patients with SCA, even in the absence of liver disease. So, this study therefore attempts to disclose the pattern of liver function tests (LFTs) in sickle cell trait patients in Tharu community of western tarai region of Nepal.

**Material and Methods:-**

Samples from 31 adult patients and 31 healthy controls of same age groups were taken from the tharu population of Phattepur, Baijapur and Binauna VDCs of Banke district were included in this study. The laboratory investigations were performed in the Laboratory at Bheri Zonal Hospital, Nepalgunj, Banke, and Swastika referral laboratory, Ramghat, Pokhara, Nepal. This study was carried out during 13 March to 18 March 2016. The study protocol was approved by the Institutional Ethical Committee. An informed written consent was obtained from all the study subjects who were enrolled in the study. Venous blood samples (5 ml) were subjected to complete blood count (CBC), hemoglobin electrophoresis and liver function test profile. SCT was confirmed by hemoglobin electrophoresis pattern. The estimation of biochemical parameters such as total protein, albumin, AST, ALT, ALP, total bilirubin and direct and indirect bilirubin in serum was done by Human laboratory test kits in a semiautomated (Biolab) analyzer with dedicated reagents.

**Statistical Analysis:-**

The study data was analyzed by using SPSS program to compute descriptive parameters including mean and frequencies, and inferential statistics was used including student's t test to test the significance of the differences between the mean values of two continuous variables and Chi-square test ( $X^2$ ) test the difference in proportions

categorical variables between two groups. The level of confidence ( $P < 0.05$ ) was considered as cutoff value for significance.

### Results:-

Total protein, bilirubin and some enzymes were selected as biochemical parameters to shed light on the liver functions tests in patients with sickle cell disease. Comparison of the biochemical parameters means were computed for study and control groups.

Table 1 shows the statistics of biochemical parameters computed for study and control groups which point out that (total proteins, albumin and globulins) results were found to be ( $7.6 \pm 0.7$  and  $7.3 \pm 0.5$ ,  $P = 0.014$ ), ( $4.1 \pm 0.5$  and  $4.3 \pm 0.3$ ,  $P = 0.085$ ) and ( $3.5 \pm 0.6$  and  $2.9 \pm 0.4$ ,  $P < 0.001$ ) respectively.

At the same time (total bilirubin, direct and indirect bilirubin) results were ( $0.9 \pm 0.2$  and  $0.7 \pm 0.3$ ,  $P = 0.003$ ), ( $0.2 \pm 0.1$  and  $0.2 \pm 0.1$ ,  $P = 0.161$ ) and ( $0.6 \pm 0.2$  and  $0.5 \pm 0.2$ ,  $P = 0.006$ ) respectively.

Also, enzymes results were AST ( $61 \pm 28.2$  and  $29 \pm 6.3$ ,  $P < 0.001$ ), ALT ( $62.9 \pm 40.4$  and  $32 \pm 6.3$ ,  $P < 0.001$ ) and LDH ( $790.3 \pm 291.4$  and  $303 \pm 57.9$ ,  $P < 0.001$ ).

Table 2 shows the abnormal results of biochemical tests which indicate that two biochemical tests out of nine tests performed within study and control groups (albumin and direct bilirubin) shows normal result, on the other hand, the statistically insignificant abnormality of result shown by total protein and total bilirubin with percent of (3.2%) and ( $P = 0.116$ ,  $P = 0.311$ ) respectively.

Conversely, statistically significant abnormality of results in study and control groups shown by globulin and indirect bilirubin (55% and 6.4%,  $P < 0.001$ ) and (39% and 3.2%,  $P < 0.001$ ) respectively.

Enzymes results also, show statistically significant abnormality which were AST (68% and 3.2%,  $P < 0.001$ ), ALT (71% and 6.4%,  $P < 0.001$ ) and LDH (100% and 68%,  $P < 0.001$ ). Statistically significant association of 5 abnormal biochemical tests with sickle cell disease is depicted in (figure 1).

Correlation was run to determine the relationship between LDH and other liver functions tests. There was only a positive correlation between LDH and AST, which was statistically significant ( $r = .378$ ,  $n = 31$ ,  $p = .031$ ). This correlation is depicted in (figure 2).

**Table 1:-** Statistics of biochemical parameters in study and control groups

Biochemical parameters	Study group (n= 31 )	Control group (n=31)	P- value
	Mean $\pm$ STD	Mean $\pm$ STD	
Total protein	7.6 $\pm$ 0.7	7.3 $\pm$ 0.5	0.014
Albumin	4.1 $\pm$ 0.5	4.3 $\pm$ 0.3	0.085
Globulin	3.5 $\pm$ 0.6	2.9 $\pm$ 0.4	0.000
Total bilirubin	0.9 $\pm$ 0.2	0.7 $\pm$ 0.3	0.003
Direct bilirubin	0.2 $\pm$ 0.1	0.2 $\pm$ 0.1	0.161
Indirect bilirubin	0.6 $\pm$ 0.2	0.5 $\pm$ 0.2	0.006
AST	61 $\pm$ 28.2	29 $\pm$ 6.3	0.000
ALT	62.9 $\pm$ 40.4	32 $\pm$ 6.3	0.000
LDH	790.3 $\pm$ 291.4	303 $\pm$ 57.9	0.000

**Table 2:-** Percentage of abnormal liver biochemical function tests and association between groups

Biochemical parameters	Study group		Control group		X2	P
	Normal	Abnormal	Normal	Abnormal		
Total protein	23	8(26%)	30	1(3.2%)	6.37	0.116
Globulin	14	17(55%)	29	2(6.4%)	17.07	0.000
Total bilirubin	28	3(10%)	30	1(3.2%)	1.07	0.311
Indirect bilirubin	19	12(39%)	30	1(3.2%)	11.77	0.000
AST	10	21(68%)	30	1(3.2%)	28.18	0.000
ALT	9	22(71%)	29	2(6.4%)	27.19	0.000
LDH	0	31(100%)	10	21(68%)	11.92	0.000
<i>P value based on chi square test (p &lt; 0.05) significant</i>						

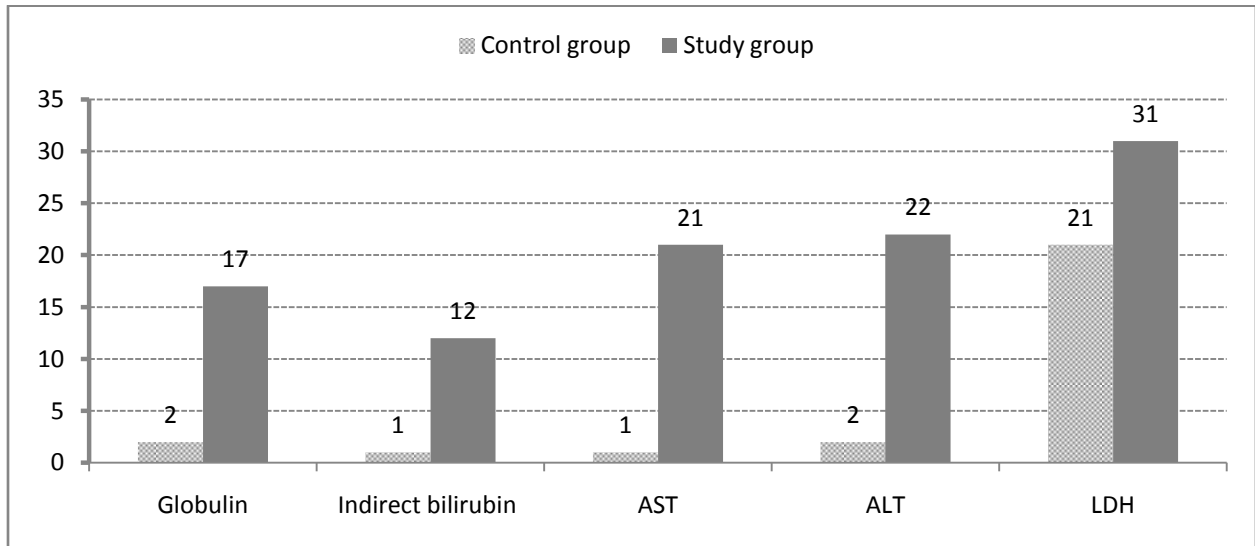


Figure 1:- Association of 5 abnormal biochemical tests with sickle cell disease.

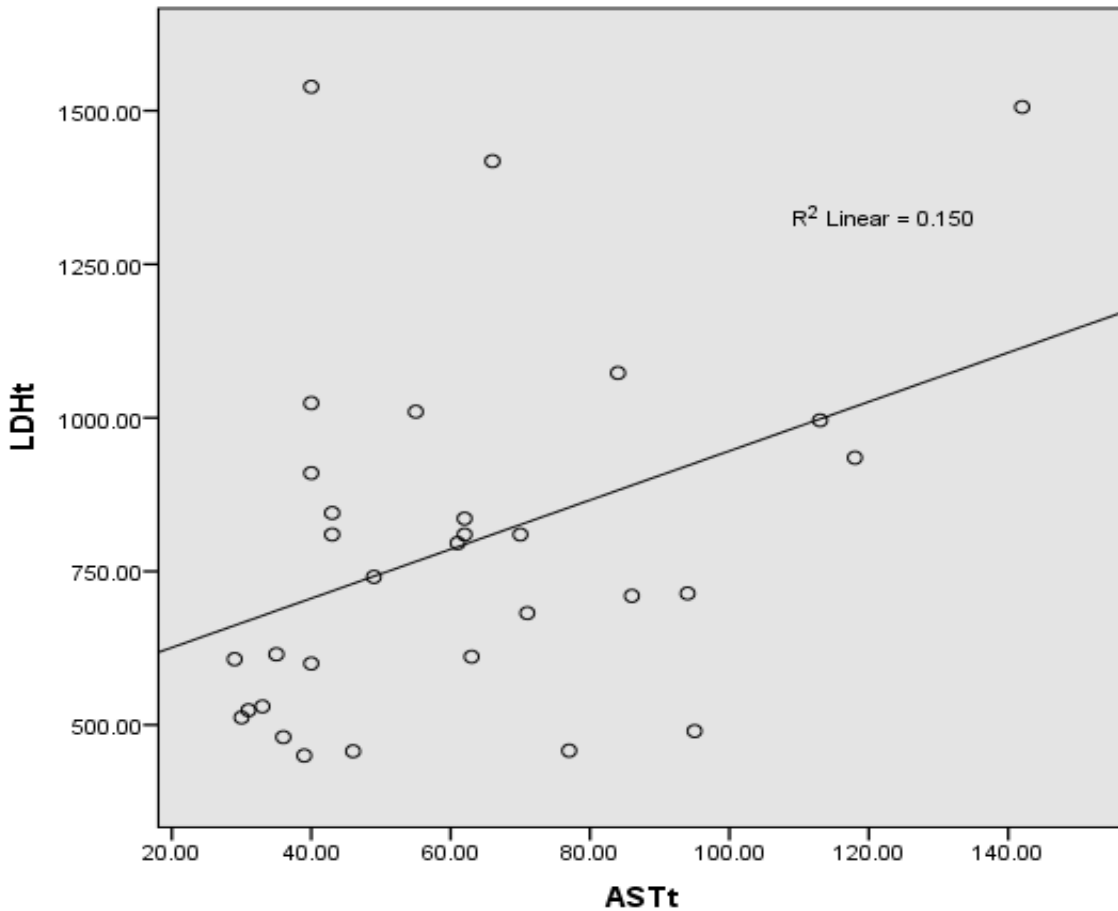


Figure 2:- Correlation between LDH and AST within study group



**Discussion:-**

This study was designed to evaluate liver function tests (Total protein, albumin, globulin, total bilirubin, direct bilirubin, indirect bilirubin, AST, ALT and Lactate Dehydrogenase (LDH)) in patients with sickle cell trait. To achieve this aim, 31 patient's samples and 31 controls were analyzed. The findings of this study demonstrates a significant association of serum total protein, globulin, total bilirubin, indirect bilirubin, AST, ALT and LDH between sickle cell trait patients and controls groups. However, serum albumin and direct bilirubin showed no statistically significant difference. So, our study shares similar findings with Gardner K *et al.* 2014 and Mahera MM *et al.* 2009 [9,10]. These findings suggest that a multifactorial etiology can exist for occurrence of liver disease in SCA patients

In this study, out of 31 patients 71% were having increased alanine transaminase (ALT) level as compared to levels with control group. The increased ALT levels observed in this study confirms by the results of a number of studies [11,12]. On the other hand, out of the 31 cases 68% of the patients have aspartate transaminase level above normal value and only 32% patients have serum AST value within normal range. So, our study is comparable with studies by Johnson *et al.* 1985 [13]. Taiwo Kotila *et al.* 2005 reported that 50% of the patients have aspartate transaminase level above normal limit [14].

It is well known that AST and ALT levels are commonly associated with 'Liver Function Test' (LFT) panel, but rather than assessing functions of the liver, the release of ALT and AST from liver cells to the bloodstream represents hepatocellular damage or death. The reason for deranged liver function appears to be the consequence of repeated vaso-occlusive episodes in sickle cell anemia or either due to widespread sickling within the sinusoid or due to extreme hemolysis [6]. Intrahepatic cholestasis is one of the fatal complications of sickle cell anemia. Sickling of red blood cells in hepatic sinusoids and their stasis may also cause serious damage to hepatocytes and Kupffer cells.

Another finding of this study was the higher LDH concentration observed in SCT patients. Our study revealed that 100% of the test groups were found the abnormal LDH value. Increased LDH have been reported in several previous studies of Sickle cell patients [15,16]. There is increasing evidence that lactate dehydrogenase (LDH) is a useful marker of intravascular haemolysis in adults with sickle cell anemia. It has emerged as the most useful marker of haemolysis-related complications of SCD. During vaso-occlusive episodes, LDH rises at least in part due to lysis of red cells but the increased LDH level is also due to lysis of cells from other organs.

Out of 31 cases total bilirubin and indirect bilirubin value above reference range were 10% and 39% of the test groups, which was statistically significant when compare with control groups. Gurkan E, *et al.* 2005 also reported hyperbilirubinemia in 13% of the patient [12]. Few studies report the elevation of bilirubin in sickle cell patients [17,18]. However, there was no significant association observed in direct bilirubin between the test and control groups. The difference in direct bilirubin levels is small and has been noted previously [13] and may represent haemoglobin load. Although there were no statistically significant differences, the levels are probably not of clinical relevance as the vast majority still fell within normal range. Derangement in concentration of bilirubin metabolizing enzymes in liver causes defective bilirubin metabolism that in turn result in increased serum bilirubin level. Hemolysis occurring in sickle cell disease is another reason for increased bilirubin level.

All the three patterns of proteins are altered in this study. A comparison of the serum protein values shows definite evidence of relative hyperproteinaemia as well as hyperglobulinaemia in test group. The total protein and globulin values in SCT were significantly greater than in normal, showing that the globulin fraction is largely accountable for the high total protein. The elevated gamma globulin is due to the extent of antigenic stimulation coming from the environment [19]. Whereas the albumin levels were not statistically promising in the test and control groups. This is in agreement with the work of Tripathi *et al.* 2011, who observed the low level of albumin in sickle cell disease patients [20] but in contrast with Famodu *et al.* 1987 who observed high level of serum albumin in sickle cell disease [21].

**Conclusions:-**

From above data and findings it could be concluded that liver functions of sickle cell trait patients is impaired. The most of the biochemical parameters of liver functions vary significantly from the normal subjects. So, sickle cell trait (SCT) patients are under the threat of hepatic dysfunction. On the basis of different biochemical parameters in

the SCT patients it could be concluded that the liver of such patients are under risk and suffering from various complications and indicating that prevention and treatment of liver related disorders should approaches for Sickle cell disease. Further studies in a large patient population across multiple institutions and countries are needed to confirm the results of our study and to better understand the exact factors involved in liver function that contribute to the increased risk of Sickle cell disease and how the effects are mediated at a molecular level.

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### RESEARCH ARTICLE

#### COMPARISON OF sEMG SIGNAL OF CTS SUFFERERS AND NON CTS SUFFERERS

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Repetitive strain injury, CTS, surface-electromyography Signal, APB muscle

#### Abstract

Repetitive strain injuries (RSI) are the nation's most common and costly occupational health problem, affecting hundreds of thousands of American workers, and costing more than \$20 billion a year in workers compensation. The common musculoskeletal disorders are associated with Abductor Pollicis Brevis (APB), often included in the list of the Repetitive Strain Injury (RSI), affecting as much as 5% of adult population. But in the majority of cases, the condition is idiopathic. In this paper, the health surveillance has been conducted on 66 Non-CTS Sufferers and 37 CTS Sufferers connecting rod manufacturing works. A study of the signals of the Abductor Pollicis Brevis (APB), muscle with different conditions such as rest position and different movements of hand has been carried out using surface-electromyography (sEMG). Experiments were performed on BIOPAC MP-45 instrument and independent two sample t-test outputs from SPSS analysis using sEMG signals obtained were analyzed for severity of the problem. So, Results reveal that non-CTS sufferers worker have better sEMG signal than CTS sufferers worker and are less prone to carpal tunnel syndrome.

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#### Introduction:-

Repetitive Strain Injury (RSI) is a generic term and often used to describe work-related musculoskeletal disorders (Kemp et al., 2002). RSI is an umbrella term used to describe a number of specific musculoskeletal conditions, i.e. Carpal Tunnel syndrome (CTS), as well as 'diffuse RSI', which is more difficult to define. These conditions are often occupational in origin. Lack of adequate diagnosis or access to appropriate treatment can bring the conditions and sometimes leads to job loss and economic hardship (Gagne et al., 2010). RSI is the more commonly known term for a set of disorders called Work Related Upper Limb Disorders (WRULD'S). RSI covers a wide range of injuries to muscles, tendons and nerves. Usually hands, wrists, elbows or shoulders are affected but knees and feet may also suffers especially if a job involves a lot of kneeling or operating foot pedals on equipment.

The highest percentage of work injuries resulting from repetitive motion occurs in the manufacturing sector, where assembly-line works are common (Keller et al., 1998) RSI's must be treated at an early stage or a permanent disability could be caused which can cause a loss in term of compensation, productivity and number of working hours/days. Signs and symptoms vary, depending on type of jobs and which part of the body is affected. Initially,

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symptoms may only occur when the individual is doing the repetitive task - they will slowly go away when the person rests. Eventually, though, symptoms may be present all the time, if left untreated. The most common RSI signs and symptoms include: Tenderness in the affected muscle or joint, Pain in the affected muscle or joint, A throbbing (pulsating) sensation in the affected area, Pins and needles (tingling) in the affected area, especially the hand or arm, Loss of sensation in the hand, Loss of strength in the hand, Weakness, lack of endurance (Gagne et al., 2010). RSI is caused, by continuous repetitive and forceful work, hand or arm movements, i.e. hammering pushing, pulling, lifting or reaching movements, too fast or extreme workloads, long hours, lack of variety or breaks, awkward grips or positions, imperfectly designed equipment and/or poor working environments. Other synonyms for RSI include: Cumulative Trauma Disorder (CTD), Occupational Overuse Syndrome (OOS) and Repetitive Motion Syndrome (RMS). The more specific disorders are CTS, Tendonitis, and Tenosynovitis, Dupuytren's contracture, Epicondylitis or 'tennis elbow', Bursitis and a host of others. Of course, CTS is the most common problem brought on by repetitive hand motion.

### **Experimentation:-**

The study subjects were recruited from connecting rod manufacturing unit of a manufacturing industry. The population included all the unit workers irrespective of age, gender or ethnic group. All full-time workers with at least 6 months on the job were invited to participate in the study. Of the 113 eligible workers, 103 agreed to participate (91%) in the study. So a sample size of 103 workers was used (N = 103).

### **Surface electromyography:-**

The terms carpal tunnel syndrome, cumulative trauma disorders, ergonomic disorders, repetitive strain injuries and repetitive motion injuries all refer to the same disorder of the wrist and hand (Kumar et al., 2010). CTS is brought on by over-worked, over-strained muscles of arms and hands, resulting in a loss of nerve conductivity and possibly leading to muscle strength problems (Montgomery, 1995). Human skeletal muscle consists of hundreds of individual cylindrically shaped cells (called fibers) bounded together by connective tissue. In the body, skeletal muscles are stimulated to approach motor nerves that carry signals in the form of nerve impulses from the brain. The combination of a single motor neuron and all of the muscle fibers it controls is called a motor unit. When an increase in the strength of a muscle's contraction is necessary to perform a task, the brain increases the number of active motor units within the muscle (Okada et al., 2000).

Although the electrical impulse generated and conducted by each fiber is very weak (less than 100 micro volts), many fibers conducting simultaneously induce voltage differences in the overlying skin that are large enough to be detected by surface electrodes. The detection, amplification and recording of changes in skin voltage produced by underlying skeletal muscle contraction are called electromyography. The recording thus obtained is called Electromyogram. The APB (Abductor Pollicis Brevis) is a member of the thenar muscles and is often affected by muscle atrophy associated with CTS (Wunderlich, 1993). EMG signal means a collective electrical signal from musculoskeletal system, skeletal muscles which represent the electrical activity of muscles during contraction. In recent years, there has been a tremendous interest in introducing intuitive interfaces that can recognize the user's body movements and translate them in to machine commands. The EMG signal is stochastic in nature and it becomes difficult to quantify and interpret the processed signal. Nerves and muscles create electrical signals that deliver messages to and from the brain. Injuries and diseases can affect nerves and muscles, which can slow down the movements of these electrical signals. The two tests that are done more often to measure the speed and degree of electrical activity in muscles and nerves are EMG and Nerve Conduction Study (NCS). NCS is often done along with EMG. In NCS electrodes are taped to the skin along the nerve pathway. Then the nerve is stimulated with electric current. The electrodes will record how fast the signal is travelling. This test helps to determine the specific site of the injury to the nerves.

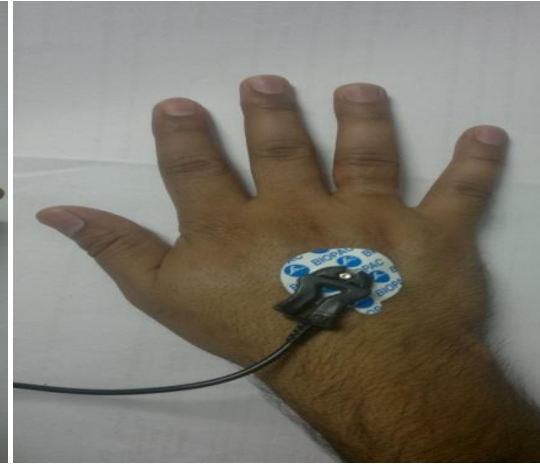
### **Analysis based on EMG signal:-**

Myoelectric signal represents the electrical activity of muscles and signal value is represented in micro volts obtained by surface electromyography (sEMG) technique. sEMG signals have been taken by BIOPAC MP-45 data acquisition unit. The MP unit is an electrically isolated data acquisition unit, designed for biophysical measurements. The MP45 receives power from the computer (USB port). The MP Unit has an internal microprocessor to control data acquisition and communication with the computer. The MP Unit takes incoming signals and converts them into digital signals that can be processed with the computer. There are analog input channels (two on MP45), one of which can be used as a trigger input.

In the present study, workers have been examined by the BIOPAC MP45 instrument. To take readings from the muscles of a subject three electrodes are used. Positions of three electrodes during sEMG data collection are shown in the Figure 1 and Figure 2.



**Fig. 1:-** Position of negative (white)



**Fig. 2:-** Position of ground electrode and positive (red) electrode

The negative electrode (white) is placed on APB muscle and positive electrode (red) is placed 6 to 10 cm away from negative electrode. The third electrode (black) is grounded. An EMG reading of APB muscle of dominant hand is recorded for 3 minutes (180 sec.) for a series of clenching first as hard as possible, and then followed by release. For analysis, the sEMG signals readings are taken from 140 seconds to 160 seconds from each worker. From the EMG data the values of Raw-EMG, Integrated-EMG and Root-mean square EMG are obtained. Raw-EMG i.e. the unprocessed signal of amplitude between 0-6 mV is measured from peak to peak and represents the amount of muscle energy measured. Raw-EMG signal i.e. the signals which is unprocessed form of the sEMG signals helps mostly in qualitative analysis. Integrated-EMG is calculation of area under the rectified signal. Values are summed over the specified time then divided by the total number of values. Values will increase continuously over time. It quantifies the muscle activity means it tells about the movement of hand through the electrical signal by which one can identify how well the APB muscle is working. Root-mean square EMG (EMG-RMS) values are calculated by squaring each data point, summing the squares, dividing the sum of squares by number of observations, and taking the square root and it represent the quantification of muscle activity.

The abductor pollicis brevis (APB) is a member of the thenar muscles and is often affected by muscle atrophy associated with carpal tunnel syndrome (CTS). The electrophysiological properties of the APB muscle are still not well understood. Reliable information about the physiological fatigue behavior of the APB muscle could be valuable to recognize changes in a pathologically altered muscle, as for instance in the case of CTS. However, to apply this information in a clinical setting it is essential to work with non-invasive diagnostic techniques whenever possible. Fortunately, considerable progress has been made in the past decades to develop non-invasive techniques to evaluate the performance of a muscle by recording and processing surface electromyograms (sEMG).

Based on literature it is clear that sEMG is a technique, which is used to check the performance of the APB muscle with the help of electrical signals. In this study, a comparison was done with the help of mean of sEMG signals between the CTS sufferers and non CTS sufferer workers in the manufacturing industry. The average root mean square values of the electromyogram signals were taken (Appendix 1).

The independent two sample t-test is used to check the statistical significance. The independent sample t-test is used because there are two separate samples of people which are to be compared. First sample is people who don't have CTS and second is who have CTS. There is no overlapping between the two samples.

The total number of workers is divided into two groups depending on the presence of CTS. Those who don't have CTS symptoms are assigned label '0' and those who have CTS symptoms are assigned label '1'.

Group 1 ('0' in the datasheet) has NO CTS.

Group 2 ('1' in the datasheet) has CTS.

The hypothesis assumed in the analysis is as follows:

- Null Hypothesis  $H_0$ : Mean RMS sEMG value for Group1 = Mean RMS sEMG value for Group 2.
- Alternative Hypothesis  $H_A$ : Mean RMS sEMG value for Group1  $\neq$  Mean RMS sEMG value for Group 2.

In the analysis, CTS is grouping variable and sEMG value is test variable. The group statistics for CTS sufferers and non CTS sufferers is shown in the Table 1.

**Table 1:-** Group statistics from SPSS

Group Statistics					
	CTS	N	Mean	Std. Deviation	Std. Error Mean
sEMG	Non CTS Sufferers	66	.07005718	.151573803	.018657445
	CTS Sufferers	37	.03012817	.038046400	.006254790

It can be concluded from Table 1 that mean RMS sEMG value for non CTS sufferers is more than mean RMS sEMG value for CTS sufferers. Now, it has to be checked whether there is any significant difference between the two values. Final results for independent sample test are shown in the Table 2.

**Table 2:-** Independent two samples t-test output from SPSS

Independent Samples Test											
		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
										Lower	Upper
sEMG	Equal variances assumed	7.284	.008	1.572	101	.119	.0399	.0254	-.0104	.0903	
	Equal variances not assumed			2.029	78.638	.046	.0399	.0196	.0007	.0790	

### Result:-

From the result of F-test, it is clear that sig. (p-value) is found to be 0.08 which is less than 0.05. So the variances are not assumed to be equal and bottom row of the t-test will be used for analysis. As p-value (0.46) is less than 0.05, null hypothesis can be rejected and alternative hypothesis can be accepted.

Therefore it can be concluded that there is significant difference between the sEMG values of two groups of workers. Accepting alternative hypothesis means having CTS does affect the sEMG value of the workers. So Healthy workers have better sEMG signal and are less prone to carpal tunnel syndrome.

### Conclusion:-

In the present analysis it has been demonstrated that the people with a particular occupations, can identify their problem of CTS, deciphered by sEMG signals analysis. Comparison of sEMG signals (during expansion and contraction of APB muscle of different subjects) give indication of changes, not well understood so far. sEMG signals seem to have good repeatability but average validity in the analysis of some concrete relationships, due to lack of availability of standard data. So, this analysis it has been found that independent two sample t-test was used to analyze the sEMG signals of APB muscle which shows that non CTS sufferers have better sEMG signal than that of CTS sufferers and are more prone to potential CTS symptoms. Further there is scope of extending the work in different occupation, age groups, environmental conditions, and postures to analyze muscles conditions and identify the problems related to that.

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(APPENDIX 1)					
RMS-MEAN sEMG data of healthy and non- healthy workers					
Non healthy workers			Healthy workers		
S. NO.	RMS MEAN sEMG value	S.NO	RMS MEAN sEMG value	S.NO.	RMS MEAN sEMG value
1	0.003561	1	0.229242	38	0.047049
2	0.011972	2	0.035071	39	0.416252
3	0.002914	3	0.008166	40	0.002916
4	0.021027	4	0.026601	41	0.014034
5	0.066239	5	0.006011	42	0.006975
6	0.023969	6	0.023985	43	0.022483
7	0.045408	7	0.00624	44	0.021614
8	0.053379	8	0.031775	45	0.033068
9	0.0117973	9	0.009782	46	0.014407
10	0.02293	10	0.056974	47	0.035906
11	0.23347	11	0.036557	48	0.035078
12	0.036593	12	0.035497	49	0.036234
13	0.015189	13	0.001964	50	0.0266
14	0.019167	14	0.003561	51	0.035062
15	0.044312	15	0.022034	52	0.036339
16	0.015734	16	0.014067	53	0.022962
17	0.001964	17	0.025286	54	0.051191
18	0.0185	18	0.281626	55	0.066274
19	0.00978	19	0.04429	56	0.00951
20	0.036601	20	0.044323	57	0.021052
21	0.020038	21	0.004225	58	0.010771
22	0.019175	22	0.007265	59	0.009762
23	0.009786	23	0.022483	60	0.181913
24	0.066042	24	0.025662	61	0.181948
25	0.001964	25	0.033041	62	0.036315
26	0.026136	26	0.03267	63	0.006207
27	0.036595	27	0.75911	64	0.053461
28	0.021598	28	0.014071	65	0.056931
29	0.011331	29	0.006072	66	0.020041
30	0.022958	30	0.066294		
31	0.012796	31	0.011328		
32	0.024772	32	0.018996		
33	0.004504	33	0.035915		
34	0.006014	34	0.187508		
35	0.025663	35	0.878964		
36	0.015374	36	0.03591		
37	0.015747	37	0.108596		





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### RESEARCH ARTICLE

#### EVALUATION OF PREPAREDNESS FOR MEDICAL EMERGENCIES AT DENTAL OFFICES IN CHENNAI – A cross-sectional study.

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Radiotherapy, Collagenase gene, cancer and Swiss mice.

#### Abstract

**Background:** Medical emergencies in dental offices poses a serious threat to the patient. Under these conditions it is paramount for the practising dentists to possess adequate knowledge regarding the diagnosis and management of the condition.

**Aim:** To evaluate the preparedness for medical emergencies at dental offices in chennai.

**Objective:** This study is done to assess the availability of the medical drugs and knowledge of medical emergencies among the dentists to handle a medical emergency .

**Materials And Methods:** A simple random sampling involving 150 dental graduates in chennai will be done. Self administered questionnaires will be issued to them and the data will be extracted using the SPSS software.

**Result:** It was found that about 99% enquired about the medical history of the patients, 34% conducted the required tests for vital signs assessment , 15% attended seminars and workshops , 65% could manage a medical emergency, 30% had adequate drugs and medicines , 30% could administer an intramuscular injection and 5% could administer and intravenous injection.

**Conclusion:** The results of this study show that the knowledge and attitude of dentists on medical emergencies in chennai is less .

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#### Introduction:-

The quality of medical service plays an important role in improving the life expectancy of people by providing better health care. Dentists also play a very important role in this. As per a study which was conducted, half the people treated had a chronic illness. Hence, adequate knowledge on medical emergencies and their management is essential. [1]

At first, medical emergencies may panic the dentists but with sufficient knowledge and precautions, they become less alarming. Such incidents may not occur often, but the dentists should be trained for efficient use of equipments and management of the patient. [2]

The most common medical emergency faced by a dentist is the syncope after the administration of local anaesthesia during tooth extraction and endodontic treatment. According to a study, it was found that 60% of the medical

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emergencies were syncope and the next being hyperventilation at 7%. [3] Preparation, prevention and management are the most important aspects for a dentist during treatments. Alterations on the treatment to be provided can be made when a dentist has a thorough look on the medical reports of the patient in case of any systemic health problems. This can prevent medical emergencies. [4]

### Materials and methods:-

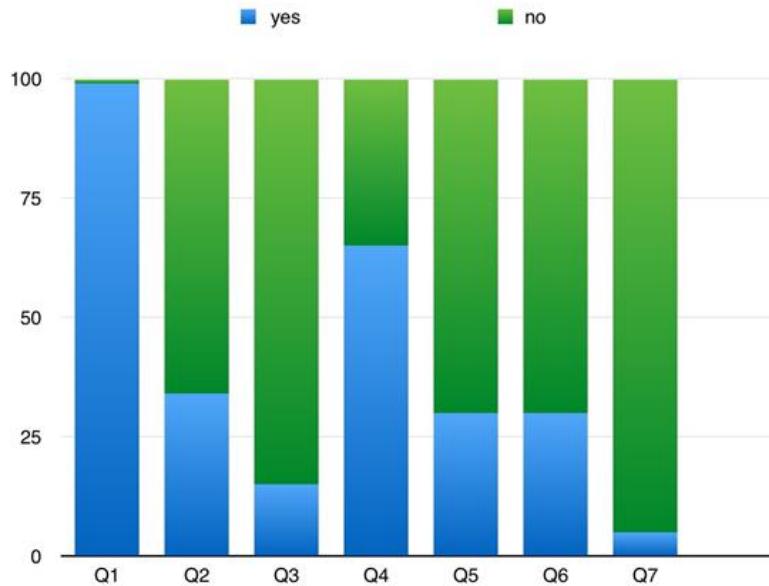
A descriptive cross-sectional study was conducted involving 150 dental graduates in Chennai to evaluate the knowledge possessed and the ability to manage a medical emergency at the dental office. It also included the study of the availability of the necessary drugs during a medical emergency at the premises. The self-administered questionnaire consisted mainly of closed ended questions requiring a simple yes or no answer. An informed consent was taken from the participants of the study. The data was later extracted using the SPSS software.

### Questionnaire:-

1. Is the medical history of the patient enquired and recorded prior treatment ? Yes/No
2. Do you conduct the required medical tests for vital signs (Blood pressure, pulse, temperature etc ) prior to the commencement of the treatment ? Yes/No
3. Have you attended any seminar or workshop on the management and treatment of medical emergencies? Yes/ No
4. Can you manage a medical emergency at your dental office ? Yes/No
5. Are there adequate equipments and drugs for medical emergencies? Yes/No
6. Can you administer an intramuscular injection? Yes/No
7. Can you administer an intravenous injection? Yes /No

### Results:-

Questions	% of response
Is the medical history of the patient enquired and recorded prior treatment ? Yes / No	Yes-99% No-1%
Do you conduct the required medical tests for vital signs (Blood pressure, pulse, temperature etc ) prior to the commencement of the treatment ? Yes/No	Yes-34% No- 66%
Have you attended any seminar or workshop on the management and treatment of medical emergencies? Yes/ No	Yes-15% No- 85%
Can you manage a medical emergency at your dental office ? Yes/ No	Yes-65% No-35%
Are there adequate equipments and drugs for medical emergencies? Yes/ No	Yes- 30% No- 70%
Can you administer an intramuscular injection? Yes / No	Yes-30% No- 70%
Can you administer an intravenous injection? Yes / No	Yes- 5% No- 95%



*Response*

**Graph 1:-** Responses from the participants

It was found that almost all the dentists enquired about the medical history of the patient and had a record of it . When it comes to checking for the vital signs , only about a little more than one fourth did it. Most of the dentists believe in what the patients tell them regarding this. Only about 6% of the dentists had attended the workshops that were held on medical emergencies . About 95% of the dentists in the survey, were confident that they could manage a medical emergency if occurred at their dental office but only 30% had the necessary equipments . Administration of intramuscular injection could be done only by 30% and a very meagre number of dentists of about 5% could administer an intravenous injection.

### **Discussion:-**

At a dental office, the probability for the occurrence of a medical emergency is pretty less, but when there is an emergency , it could be nearly fatal also. Dentists should have the adequate knowledge to identify the patients who might be at risk to avoid a medical emergency situation. Dentists should be aware of the fact of that even during a dental treatment they might encounter a medical emergency if measures aren't taken at prior. [5]

The goal of the study was to evaluate the number of people who take measures such as recoding the medical history of the patient and checking for the vital signs in the patient to prevent medical emergencies during a dental treatment . This study showed that almost all the dentists enquired about the medical history of the patient and many of them also had it maintained as a record. The percentage of dentists who checked for the vital signs such as blood pressure, blood glucose temperature etc were quite less which accounted to only about 34% . Assessment of these vital signs is of utmost importance as they provide an indication such as during an infection, there might be an increase in the body temperature and also an increase in the oral temperature might be due to bacterial or viral infection. Hence, it is necessary to record them for the prevention of medical emergencies at the dental offices. [6] It is important that the medical signs be checked once at the dental office prior treatment and recorded and also updated on subsequent appointments .The patient's physician should be consulted in case the patient has medical complexities. Blood glucose level should be recorded in patients with diabetes. [1]

In a study conducted by sweta kumarasami et al., it was found that only 7.6% of the dentists had attended a workshop on handling medical emergencies but in our study it was almost double the population who had. In a study by Gupta et al., it was found that about 42.1% had attended. [7,8] The number of people who could handle a medical emergency in the present were more than half the population surveyed which accounted to about 65% which was comparatively lesser compared to the study by sweta kumarasami et al., which was about 85%. The others who

couldn't handle the situation call for emergency as they lack hands on experience but have adequate theoretical knowledge. [8]

The necessary equipments and drugs were available only at few dental offices , about 30%.

Most of the dental offices didn't have the proper aids which may be due to carelessness and ignorance about medical emergencies. In a study conducted by Gbotolorun et al., in Lagos also stated that the availability of medical emergency kits in dental offices was only in about 91.1% . [9] In the present study, the percentage of people who had attended a seminar or a workshop was only about 15% . Although , in a study conducted by Muller et al., it started that about 92% took part in a training programme for medical emergencies . [10]

Regarding the drugs available at the dental office for medical emergencies in a study by Gupta et al., showed that oral glucose was the medicament which was most frequently used followed by adrenaline. Diazepam and glyceryl trinitrate was available in less than 25% of the people surveyed.[7]

The basic life support among medical ,dental , nursing students and doctors were concluded to be very poor and had to be improved in a study conducted by Chandrasekaran et al., [11]

The knowledge on medical emergencies among dentists should be enhanced so that the dental office becomes a safer place for treatments . [12] Apart from the knowledge being gained, it is also important to know about the accepted and legalised treatments in the county. [13]

Although there is adequate theoretical knowledge among dentists, there isn't enough practise for them to handle a medical emergency which is the cause of lack of confidence among them. It's the duty of the dentist to manage a medical emergency at his office.

### **Conclusion:-**

From this study it can be concluded that the preparedness for medical emergencies in dental offices has been poor . Measures should be taken to improve the knowledge and attitude on medical emergencies. Dentists , being health care providers should take care of the necessary precautions to prevent emergencies.

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### RESEARCH ARTICLE

#### EFFECT OF EMS AND SA ON SURVIVAL OF PLANTS AT MATURITY IN M<sub>1</sub> GENERATION OF *PSOPHOCARPUS TETRAGONOLOBUS* (L.) DC.

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Mutation breeding, EMS, SA, Mutagens, Winged bean.

#### Abstract

Winged bean (*Psophocarpus tetragonolobus* (L.) DC.) has been described as a wonder legume in the sense that virtually every part of the plant is edible and comprises a rich source of good quality of protein. However it possesses few drawbacks which obstruct the wide scale popularization among the farmers. In the present investigation, the seeds of winged bean of variety II-EC-178313 and 2I-EC-38825 were treated with two chemical mutagens namely Ethyl methane sulfonate (EMS) and Sodium azide (SA) to induce mutations. These treated seeds were sown in field to raise M<sub>1</sub> generation and the effects of EMS and SA on plant survival were observed. The survival of plants at maturity expressed as percent of control showed a gradual decrease with an increase in concentration of the two mutagens. The main objective of this study is to develop the improved varieties of winged bean by using the novel approach of mutation breeding.

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#### Introduction:-

The winged bean (*Psophocarpus tetragonolobus* (L.) DC.) is the member of legume family i.e. fabaceae. It is also popularly known as Goa bean, four angled bean, four-cornered bean, Manila bean, Mauritius bean and Dragon bean and mainly cultivated in Papua New Guinea and Southeast Asia. It is considered to be a potentially important crop because of its high protein and oil contents. With the realization that this crop could be as important as a soya bean, particularly in the humid and tropical regions NAS (1981). Winged bean is a twining, perennial herbaceous plant that is characterized by its tuberous roots and its winged pod. Although the winged bean is perennial, it is most usually cultivated as an annual, because for pod and seed production. The chemical composition and the protein quality of the winged bean seeds which have increasing importance through out the world as a protein and energy-rich food crop. It contains all amino acids in sufficient quantity, with the exception of the sulphur containing amino acid. It is widely recognized by farmers and consumers particularly in Southern Asia for its variety of uses and disease resistance. It is nutrient rich and all parts of the plant are edible. Leaves can be eaten like spinach, flowers can be used in salads, and tubers can be eaten raw or cooked. It possesses excellent potential to become a major multiuse food crop in each and every part of the world. The other nutrients like vitamin A, vitamin C, calcium and iron were recorded from all parts of the winged bean, Hettiarachchy and Sri Kantha (1982).

The winged bean seeds are rich not only in protein, but in tocopherols which acts a antioxidants that facilitate vitamin A utilization in the body. In Malaya, winged beans are used as an effective remedy for Smallpox and as a cure for Vertigo. It is a potential food source for ruminants, poultry, fish and other livestock, Khan (1982). Though it

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possesses several positive attributes, unfortunately it is neglected all over the world due to presence of antinutritional factors, long duration of crop, twining nature of crop and absence of market demands. Thus in the present work, the attempts have made to develop improved varieties of winged bean through the approach of mutation breeding.

### **Material and Methods:-**

The seed material of winged bean (*Psophocarpus tetragonolobus* (L.) DC.) variety namely II-EC-178313 and 2I-EC-38825 procured from National Bureau of Plant Genetic Resources (NBPGR), Regional Station, PKV, Akola (M.S.) was used in the present study.

### **Mutagens Used:-**

In the present work, the two chemical mutagens such as Ethyl methane sulfonate (EMS) and Sodium azide (SA) were used.

### **Details of Mutagenic Treatments:-**

The pilot experiments were conducted for determining the suitable concentration for further studies. Prior to mutagenic treatment seeds were immersed in distilled water for 6 hours. The presoaking enhances the rate of uptake of the mutagen through increase in cell permeability and also initiates metabolism in the seeds for treatment. Such presoaked seeds were later on immersed in the mutagenic solution for 6 hours with an intermittent shaking. Seeds soaked in distilled water for 12 hours served as control. The different concentrations used for the chemical mutagenic treatments were 0.05%, 0.10% and 0.15% for EMS and 0.01% , 0.02% and 0.03% for SA respectively. Immediately after the completion of treatment the seeds were washed thoroughly under running tap water. Later on they were kept for post soaking in distilled water for 2 hours. Further these treated seeds were sown in the field to raise M<sub>1</sub> generation, and this M<sub>1</sub> population was observed carefully to check the effect of EMS and SA on plant survival in both the varieties of winged bean. The number of plants reaching maturity in the field was noted and expressed as percentage of control.

### **Results and Discussion:-**

The survival of plants at maturity expressed as percent of control showed a gradual decrease with an increase in concentration of the two mutagens. In variety II-EC-178313 the survival ranged from 96.46% to 84.00% in EMS and 93.96% to 82.35% in SA treatments. As compared with this in variety 2I-EC-38825 the survival ranged from 95.00% to 90.51% in EMS and 92.24% to 81.90% after the SA treatments. (**Table-1 and 2**).

The highest survival values (96.46% and 95.00%) could be seen at 0.05% of EMS in variety II-EC-178313 and variety 2I-EC-38825 of winged bean respectively. The lowest survival values ( 82.35% and 81.90% ) were noticeable at 0.03% SA treatments in case of both the varieties of winged bean.

The extent of survival of plants is considered as one of the most reliable indices in evaluating the effect of any mutagen. In the present investigation, an inverse correlation was observed between concentration of EMS and SA survival in both II-EC-178313 and 2I-EC-38825 varieties of winged bean.

The researchers such as Sree Ramulu (1971) in Sorghum, Kaul and Bhan (1971) in rice, More (1992) in *Medicago sativa* and Giriraj and Deshpande (1996) in sunflower have reported reduced survival after mutagenic treatments, resulting in higher rates of lethality. Gaul (1964) proposed that the positive correlation between increasing mutagen dose and M<sub>1</sub> plant survival may be due to alterations at the physiological and cytological levels which leads to chromosomal and extra chromosomal injury.

According to Ashri and Levy (1974), the DA variety of peanut was more sensitive to chemical mutagens than TBR and Congo. They suggested that there were some factors within the embryo of Congo which enabled it to withstand the physiological injuries caused by DES. Hakande (1992) in winged bean reported intervarietal difference pertaining to survival of plants after mutagenic treatments. He further stated that it may be due to differential genotypic make up of the varieties.

In the present studies, an inverse correlation was observed between the survival of plants at maturity and the mutagenic treatments indicating the alterations caused at the physiological and cytological level by the latter.

**Table 1:-** Effect of EMS on survival of plants at maturity in  $M_1$  generation of *Psophocarpus tetragonolobus* (L.) DC.

Variety	Concentration	Survival of plants at maturity (% of control)	± S.E.
II-EC-178313	Control	-	-
	0.05%	96.46	1.20
	0.10%	93.51	0.88
	0.15%	84.00	1.15
2I-EC-38825	Control	-	-
	0.05%	95.00	2.64
	0.10%	93.27	0.57
	0.15%	90.51	1.15

± S.E. = Standard Error

**Table 2:-** Effect of SA on survival of plants at maturity in  $M_1$  generation of *Psophocarpus tetragonolobus* (L.) DC.

Variety	Concentration	Survival of plants at maturity (% of control)	± S.E.
II-EC-178313	Control	-	-
	0.01%	93.96	0.88
	0.02%	89.09	1.45
	0.03%	82.35	2.30
2I-EC-38825	Control	-	-
	0.01%	92.24	1.45
	0.02%	87.61	1.52
	0.03%	81.90	1.76

± S.E.= Standard Error

**Conclusion:-**

The survival of plants at maturity revealed reduced values with the enhancing concentration of both EMS and SA in II-EC-178313 and 2I-EC-38825 varieties of winged bean.

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### **RESEARCH ARTICLE**

#### **USERS EXPERIENCES AND PERCEPTIONS ON MATERNAL HEALTHCARE SERVICES IN SIAYA COUNTY, WESTERN KENYA: A QUALITATIVE STUDY.**

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Skilled maternal healthcare services, community maternal healthcare, continuum of care, utilization, suggestions.

#### **Abstract**

**Background:** Proper utilization of maternal healthcare services greatly reduces maternal and newborn morbidity and mortality. However, utilization of such care is poor in Siaya County western Kenya. This study explored the user's experiences and perception of maternal healthcare services, and gathered suggestions for optimizing utilization of maternal healthcare services in Siaya County.

**Methods:** We conducted a cross sectional qualitative study from January to March 2015 in 8 selected community health units. Eight focus group discussions and 14 in depth interviews were carried out involving a total of 98 respondents.

**Results:** Our results determined that the major barriers affecting utilization of maternal healthcare services included inadequate awareness of availability of the services and their importance, limited availability of skilled maternal healthcare services, negative provider's attitude, maternal fears, weak facility-community linkage and no evidence of maternal healthcare continuum.

**Conclusion:** To bridge these gaps there is need to intensify awareness creation on available of skilled maternal healthcare services and their importance, avail 24 hours skilled delivery services, provide incentives to mothers and promotion of positive attitude amongst skilled providers. Important is also empowerment of community health volunteers (CHVs) to be able to identify pregnant mothers early through pregnancy testing at community and enhancing maternal healthcare continuum by providing evidence based community maternal health services.

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#### **Introduction:-**

Utilization of skilled maternal healthcare services (during pregnancy, childbirth and post partum period) are amongst the major interventions aimed at reducing maternal and newborn mortality worldwide [1, 2]. Although since 1990, the world has seen a 44% decline in the maternal death ratio, still, 800 women die from preventable causes related to pregnancy and childbirth every day, with most of the deaths occurring among women of reproductive age in the

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developing countries of the world [3, 4]. Previous studies have shown that a woman's lifetime risk of dying in pregnancy or childbirth in developed countries is 1 in 3700, the risk of dying in sub Saharan Africa is 1 in 38 which is about 1 (one) woman every two minutes[3] and for every woman who dies 20 or 30 encounter complications with serious or long-lasting consequences. These deaths and injuries are partly due to inadequate utilization and poor-quality maternal health care, -antenatal care, -skilled attendance at birth and postnatal care [5, 6] and are entirely preventable through increased utilization of skilled maternal healthcare services [3]. In addition these mortality have been associated with maternal education, maternal age and autonomy of the mother [7-9]. Several studies have shown that skilled birth attendants during labour, delivery and the early postpartum period can reduce significant number of maternal and newborn deaths through provision of timely obstetric and newborn care [10]. Owing to the central role of professional care at birth, skilled attendance was chosen as an indicator for monitoring progress towards maternal health MDG-5 of reducing maternal mortality ratio by three quarters between 1990 and 2015 [7].

Kenya was among the top ten countries that contributed to 58% of the global maternal deaths reported in 2013 [3]. Maternal mortality levels in Kenya have remained high (495 per 100,000 live births) [11] with slightly over 6,000 women dying every year due to pregnancy related conditions despite the launch of Safe Motherhood campaigns twenty years ago [12]. According to KDHS, 2014; the proportion of women attending antenatal clinic at least once in Kenya are 95%, four times as per WHO recommendation are 58% and postnatal care within two days of delivery at 51%. Moreover, unskilled persons attend to about 50% of deliveries by Kenyan women [12]. The low utilization of skilled maternal healthcare services has been attributed to cost of service, distance, quality of service, culture, birth order, living conditions of the mother, type of place or residence, level of education, wealth and weak healthcare infrastructure [10, 12-14]. Siaya County is one of the counties in Kenya with high maternal mortality ratio (MMR) that is above the national average of 495 deaths for every 100,000 live births, with most of these deaths being attributed to home deliveries and low utilization of skilled maternal healthcare services [11]. The high maternal mortality ratio in Siaya County has been mainly attributed to low use of maternal healthcare services [15]. Data from District Health Information Software (DHIS) 2014 indicate that the proportion of women attending at least one ANC visit are 85%, those attending four ANC visits are 45%, 52% receive skilled care during delivery while only 30% receive postnatal care within two days after delivery [11]. Consensus is now that the continuum of care for reproductive maternal and child health (RMNCH) includes the seamless and integrated service delivery for women and children throughout the life cycle-from pregnancy to delivery and the immediate postnatal and childhood period, and across all places of care [16]. In an effort to enhance maternal healthcare continuum and create demand for utilization of skilled healthcare services, Siaya County scaled up community health services in the whole County. However, despite massive investments in the strategy, some health indicators including maternal and child health have not yielded positive results due to low uptake of maternal healthcare services.

Although previous studies done in Siaya County associated low uptake of maternal healthcare with the following factors; Poor communication between health workers and women, cultural and religious beliefs, uncertainty about pregnancy, distance to health facilities and quality of ANC services among others [17, 18]. The 100% scale up of community health workers and services in Siaya County ought to have addressed most of issues mentioned above through regular interaction between CHWs and pregnant women at the household level and regular engagement with skilled health providers during review and dialogue meetings. However DHIS, 2014 shows that utilization of skilled maternal healthcare services in the county is still low, suggesting that there may be context-specific factors leading to low uptake of these services. Together these data indicate that there is need to identify barriers, understand the perception of service users and providers regarding those barriers and their suggestions for optimizing utilization of skilled maternal healthcare services, and to develop strategies to improve women's access to and utilization of delivery care services. Therefore, the present study aimed to explore how service users (mothers) and providers (health workers and members of health facility management committee) perceive barriers to skilled birth care and their suggestions on strategies for optimizing utilization skilled maternal healthcare services.

## **Methods:-**

### **Study site:-**

Siaya County is amongst the top ten Counties with the largest number of maternal deaths (691/100,000 live births) in Kenya which surpass the country maternal mortality rate (488/100,000 live births)[19, 20]. These deaths are due to causes directly related to pregnancy and childbirth. Although Siaya County has made efforts to implement many policies and strategies to increase utilization of skilled maternal healthcare services and reduce maternal deaths from preventable conditions the progress has remained slow[15]. The slow progress has been attributed to poor communication between health workers and women, cultural and religious beliefs, uncertainty about pregnancy,

distance to health facilities, quality of ANC services with low uptake of maternal health care services, and breaks in the continuity of care from preconception through antenatal, intra-partum and postnatal periods [21-23]. The County has 6 sub-counties, 179 sub-locations, 198 Community Units and 30 administrative wards. It has a total population of ~ 955,000 with inhabitants being predominantly of Luo ethnic extraction.

**Sampling strategy:-**

This study used a multi-stage simple random sampling method to select respondents. First 8 health facilities were selected from a sampling frame of all the health facilities (128) in the six sub-counties. Names of the health facilities per Sub County were drafted on pieces of folded paper and put in six boxes and thoroughly churned with each box having the names of all government health facilities per Sub County. One health facility was then randomly picked from each box. The health facility picked included Chianda Dispensary in Rarieda Sub County, Ligala Dispensary in Ugenya Sub County, Bondo Hospital in Bondo Sub County, Sikalame Health Center in Ugunja Sub County, Umalla Dispensary in Alego Sub County and Akalla Health center in Gem Sub County. Secondly, having had a target of 50 pregnant mothers per link health facility, it meant that for the study to achieve the recommended target of 400, an additional of 2 more health facilities had to be included. We thus placed all the remaining health facilities from the six boxes were placed in one box and thoroughly churned then two health facilities were randomly selected to add to the already selected six to make eight (8). The health facilities picked this time were Midhine and Gongo Dispensary all from Gem Sub County. The third stage involved identifying the community units linked to the selected health facilities. Those identified included; West Katweng'a Community Unit (CU) linked to Chianda Dispensary, Gongo CU linked to Gongo Dispensary, Ligala CU linked to Ligala Dispensary, Nyawita CU linked to Bondo Hospital, Umalla CU linked to Umalla Dispensary, Ndori CU linked to Akalla Health center, Midhine CU linked to Midhine Dispensary and Yiro West CU linked to Sikalame Health Center. It happened that Umalla Dispensary had two CUs linked to the facility (Umalla and Ulafu CUs) and thus Ulafu CU was also included in the study. Stage four involved identification of all the Community Health Volunteers (CHWs) from the selected Community Units to be key informant respondents to the study. Each CU has an average of 10 Community Health Volunteers (CHWs) and all accepted to participate in the study.

**Study population:-**

Study participants comprised service users and service providers. Specifically, a representative sample of 9 to 12 mothers within the reproductive age group in every selected community unit participated in the focus group discussions. Others included in the study as key informants were 14 skilled health providers working at the link health facilities, the health managers and the leaders in the community.

**Data collection:-**

We recruited eight field researchers to conduct FGDs in the community units (CUs). We developed separate guidelines for FGDs with health service providers and users, and all field researchers attended a two-day training session. To explore the social context, cultural issues, and concerns related to SBA utilization, we conducted eight focus group discussions (FGDs) and 14 in depth interviews involving a total of 98 respondents between from January to March 2015 in 8 selected community health units. During data collection, a focus group discussion guide and semi-structured key informant interview guide were used. Face to face in depth interviews were also conducted both at the health facilities and the communities. Each focus group consisted of 9 to 12 people which represent the ideal size of a focus group. The focus group discussions (FGD) were run by a facilitator with the responsibility to apply the appropriate working group techniques. The facilitator was required to provide equal opportunities for communication to all subgroups of patients and professionals. There were 8 target focus groups in total: one in each of the six sub counties in Siaya County. The women were asked to describe their perception of skilled maternal healthcare services. The women were asked about maternal healthcare services offered at the link health facility and the community. They were also asked about maternal healthcare continuum and utilization situation; suggestions for enhancing maternal healthcare continuum and suggest for optimizing utilization of skilled maternal healthcare services. The interviews were conducted in both the local language -Luo and English, using semi structured interview guide. During the interview follow up questions using probes were asked in order to acquire a deeper understanding when an explanation was unclear. The interviews lasted on average, 1 hour. All interviews were recorded, translated and transcribed verbatim in English.

**Table 1:-** Themes and categories of data analysis

themes	categories
1. Knowledge on maternal health	<ul style="list-style-type: none"> <li>• Awareness of availability of skilled maternal healthcare services</li> <li>• Awareness of importance of skilled maternal healthcare services</li> </ul>
2. Perception of barriers to utilization of skilled maternal healthcare services	Supply side barriers <ul style="list-style-type: none"> <li>• Availability of skilled maternal healthcare services</li> <li>• Access to skilled maternal healthcare services</li> <li>• Providers attitude</li> </ul> Demand side <ul style="list-style-type: none"> <li>• Availability of Community maternal healthcare services</li> <li>• Access to community maternal healthcare services</li> <li>• Status of maternal healthcare continuum</li> <li>• Mothers fears</li> <li>• Confirmation of pregnancy, labour and delivery time</li> <li>• Transport and cost</li> <li>• Availability of traditional birth attendants</li> </ul>
4. Perceived strategies to enhance continuum of maternal healthcare services	<ul style="list-style-type: none"> <li>• Improving health promotion/ education</li> <li>• Intensifying household visitations / follow up by CHWs (evidence based)</li> <li>• Improving physical access to services</li> <li>• Improving access to early pregnancy confirmation services</li> </ul>
5. Perceived strategies to optimize utilization of skilled maternal healthcare services	<ul style="list-style-type: none"> <li>• Improving awareness on importance of skilled maternal healthcare services</li> <li>• Improving availability of skilled maternal healthcare services</li> <li>• Improving access to skilled maternal healthcare services</li> <li>• Improving provider attitude</li> <li>• Improving health infrastructure and supplies</li> <li>• Provision of incentives to women (Nets, Mother baby packs etc)</li> </ul>

The key informant in depth interviews were also conducted to 14 health providers who were working at the link health facilities. The providers were asked about the maternal healthcare services that they provide at the health facility, the available innovations to increase utilization of skilled delivery services, suggestions for enhancing care continuum and optimizing utilization of skilled delivery services. The interviews were conducted in English. During the interviews, follow up information using probes in order to acquire deeper understanding when an explanation was unclear. The interviews lasted on average, 30 minutes.

#### **Data analysis:-**

The facilitators took note of the respondent characteristics; influence by other participants; context within which the comments were made; internal consistency – for example changes in opinion of influence by other participants; frequency and extensiveness; specificity of comments, such as personal experience or hypothetical situation; intensity of comments, like depth of feeling; relationship with other criteria. Therefore in the analysis of individual opinions, the opinions that changed due to group dynamics, as well as opinion of groups expressed on the basis of consensus, were identified. All recorded discussions were transcribed verbatim in full. The data analysis focused on developing coding categories where narrative information was organized according to emerging themes using thematic analysis [24]. During content analysis [25, 26], the researcher used a deductive approach to identify users and providers perception on accessing care according to the three delay models of 1) seeking care, 2) reaching and 3) receiving care. A fourth theme was also added based on the supply demand interface to describe perceived strategies to increase utilization of skilled maternal healthcare services (Table 1). We then added the content of the FGD notes according to the themes of analysis. Finally all data was organized thematically and summarized according to pattern of findings.

**Ethical considerations:-**

Before conducting each FGD, we explained the nature of the study, its rationale, and the extent of involvement expected from the participants. All respondents signed a written focus group consent form before participating in the FGD. A witness read the informed consent form to illiterate individuals, and those who consented to participate placed their thumbprint on the form, which was signed by the witness. The University of East Africa at Baraton Ethical Review Committee gave approval for this study (REC: UEAB/05/02/2015)

**Results:-****Knowledge on maternal health:-****Awareness of availability of skilled maternal healthcare services:-**

Women's awareness of the importance of skilled maternal health services during pregnancy, delivery and after child birth is important to enable them make informed decisions. Women need to understand that complications may occur without warning anytime during pregnancy, labour and even after having a normal delivery; hence it is safer to be in a setup where emergencies can be handled effectively. Information from the key informants revealed that antenatal care, skilled delivery services and postnatal care services were being offered in all the selected link health facilities. The findings showed that many women were aware that antenatal and skilled delivery services were available at their link health facility. However, very few knew that there were services being offered to women after deliver (Postnatal care).

Further probing as to whether they received any services after delivery revealed that apart from a few who could recall having been asked how they were fairing on after delivery, the majority knew that the services belonged to the baby. In six out of the eight focus groups, maternal healthcare services were reported to be irregular. In Ndori and Nyawita skilled maternal healthcare services were reported to be offered 24 hours a day, while in Ligala, West Katweng'a, and Yiro West, the participants reported that the skilled maternal healthcare services were being offered only during the day from Monday to Friday (8am to 5pm). The findings also revealed that in Marenyo and Gongo the services were not available during the weekends and nights. One 23 year old service user at Marenyo FGD said *"In our health facility, delivery services are offered only during the day but at night, there is no staff. The worst is over the weekend when the facility is closed"*. Further clarity from the health providers confirmed these findings and attributed them to shortage of staff and lack of staff houses within the health facility. One service provider said *"We are sometimes not able to give adequate information to the mothers because of staff shortage and too much work load"*

**Awareness of importance of skilled maternal healthcare services and risks in pregnancy:-**

Interestingly, though the majority knew about the availability of antenatal and skilled delivery services, the majority were unable to articulate the importance of the skilled services. In most of the focus groups, the participants were able to mention health education, weighing, checking of blood pressure, abdominal examination, checking of blood level (*signs of anaemia*) and treating the sick women. It was interesting to note that when asked to spell put the importance of specific services offered, most respondents were quite and did not want to explain, an indication of not being sure. Even when asked to explain why weighing was being carried out, the majority shared that it was done to check whether the baby was growing well.

Another finding was that many women knew the samples that were being tested during pregnancy like blood and urine. However, the majority were not sure about the key investigations that were being carried out. One 39 years old service user from Ligala focus group said *"To be frank, I am not sure of what is checked in the blood"*. However some indicated that it was done to check if they had enough blood, or for HIV test, or Malaria testing, with only two groups mentioning testing gonnorrhoea and sexually transmitted infections. In addition although participant mentioned that height was also being taken but they did not know the reasons why it was being taken. One 32 year old service user from Umalla Focus group said *"I don't know why it is done"* and the rest of the discussant were in agreement and were nodding.

In the opinion of key informants, awareness of skilled maternal healthcare services is usually emphasized during health education at the antenatal clinics and during household visitations by community health workers. The above findings showed that the women had inadequate knowledge on maternal health. The findings also revealed that there were hiccups in quality of user - provider interaction which was evident when women were unable to explain the exact care provided to them.

With regard to the knowledge on risks in pregnancy, Women are expected to have knowledge of the risks to enable them make informed decisions. The discussants were therefore asked to mention the danger signs to observe during pregnancy and after child birth. The findings revealed that the majority of the discussants were able to mention only a few danger signs in pregnancy. The responses were varied in all the discussion groups as no group was able to mention all the key danger signs. Those mentioned included: bleeding, headache, palpitations, lack of foetal movement and dizziness. It was noted that danger signs such as epigastric pain and drainage of liquor were not known to the women even though they are also life threatening. Although the majority knew that bleeding during pregnancy was a danger sign, there were varied responses on the amount of bleeding that was considered to be dangerous. Further probing showed that some participants thought that only severe bleeding was dangerous. One 30 year old service user from Gongo focus group said *"When you see bleeding that flows to the ground, know that you are in danger"*. These findings indicate that women understanding of danger signs were inadequate. The service providers revealed that this may be partly due to lack of proper education about danger signs by community health workers. One service provider from Bondo Hospital said *"I think the skilled providers do assume that CHWs have educated the mothers when this is actually not the case. Even the CHWs themselves need the education"*. These data indicate that there is a need to retrain the community health workers and women of reproductive age on pregnancy danger signs.

#### **Perception of barriers to utilization of skilled maternal healthcare services:-**

The study revealed that though the government had made several strides to address barriers to utilization of skilled maternal healthcare services, there were still many supply and demand side barriers that were effecting utilization of these services. Some of the barriers included:

#### **Supply side barriers:-**

##### **Service availability and access:-**

Availability of services was translated to mean that services were being offered 24 hours a day. The women identified the consistent service availability as the enabling factor for utilization of skilled maternal healthcare services. The study found out that service availability and access was a key issue in most of the discussion groups particularly shortage of skilled providers, and lack of night and weekend services which was cutting across in six (6) out of the eight (8) health facilities. Some participants shared that they could go to the health facility at night only to find the place closed. One 20 year old from Umala focus group said *"One day I went to the hospital at 2pm on Saturday after hiring a motorcycle and I was feeling headache but only to reach the facility and I found the gate closed. I had to request the motorcycle operator to take me to Siaya district hospital and when I reached there; my blood pressure was found to be very high. I was very frustrated and it was too expensive for me"*. Similarly, health service providers from Umala, Sikalame, Ligala and Chianda mentioned lack of 24 hours maternal healthcare services, lack of staff houses/ call rooms and negative provider attitude were the major barriers to skilled maternal healthcare services.

##### **Attitude of Providers:-**

In all the FGDs carried out, negative service providers' attitude was cited as a hindrance to utilization of skilled maternal healthcare services. Service availability depends on health workers attitude. An example of the poor attitude is illustrated by the following quote by an 18 year old service user from Nyawita focus group who said *"If you are unlucky to find those harsh ones, you will regret why you found yourself there"* and probed further to state why they she would regret she said *"Heh....Heh...., you can really be shouted at!"*. Contrary to the views of many discussants that the health staff had negative attitude, in Ligala focus group, a previous user of skilled health services was quick to tell her fellow discussants to stop generalizing that health staff have negative staff attitude because she had not had such experience despite having delivered her two children at the health facility.

#### **Demand side barriers:-**

##### **Awareness of availability of community maternal healthcare services:-**

Although the majority of participants reported being aware of some of the services being provided by community health volunteers (CHWs), further probing showed that they could not distinguish between services offered to all the general populace and those that are specific to maternal health. In seven (7) out of eight (8) focus groups, the discussants shared that the following services were being offered: health education on nutrition, hygiene and breastfeeding, testing for Malaria, treatment of malaria, testing for HIV and treatment of diarrhea were services being offered by community health volunteers. Some participants mentioned massaging of the abdomen and changing of the baby's position as also being done by traditional birth attendants (TBAs). Contrary to the views of

other discussants, in Yiro focus group, four participants were surprised to hear that there were maternal healthcare services being offered at the community. They said that they had never received any maternal healthcare services from the community health volunteers. Some women from Ligala focus group commented that *“May be some have been receiving these services, as we have never received any maternal healthcare services from CHWs”*

#### **Access to community maternal healthcare services:-**

Most of the discussants had not received any maternal healthcare services from the community health volunteers while for the few who acknowledged having received such services, they generally mentioned health education on importance of utilizing skilled maternal healthcare services but were not specific to issues such as education on danger signs in pregnancy, individual birth plan, nutrition of the mother and exercises among others which fall within the mandate of the community health volunteers. Moreover our study found out that for those who had received some form of community maternal healthcare services, none had records of the services provided at the household. All indicated that the records were with the community health volunteers. Differences in opinion between the providers and the mothers were found regarding the perception of community maternal healthcare services. Whereas in five focus groups mothers shared that they had never received any such services, the providers mentioned that the community maternal healthcare services were available.

#### **Status of maternal healthcare continuum:-**

With regard to continuum of care as described in *PNMCH, 2010 “Saving lives depends not only on high coverage but also on the quality of care delivered through the continuum”*. In order to establish the status of maternal healthcare continuum, discussants and interviewees were asked to share their experience in service continuity at the household level. Findings from the study showed that there was no evidence of networking between the skilled providers and the Community Health Workers (CHWs). The findings showed that there were no instances where a discussant was referred to the CHWs by skilled health providers for maternal healthcare continuum. Similarly, when key informants (*health providers*) were asked whether there are occasions where they referred women who need follow up to the respective CHWs, the majority said that they had not referred any case.

In trying to find out whether there was mechanism of knowing which health services had been given at the household level, it was established that there was no tool or booklet for documentation of health services provided at the household level for purposes of continuum of healthcare. One 24 year old service user from Yiro west focus group commented that *“What normally happens is that everyone who visits the household offer services they feel is appropriate without reference to what the other person did. In fact sometimes you even find two providers visiting you in a day with the same health information or services. Like one day a CHW came and gave me a net, after about 3 hours, another health provider working with CDC also came and gave me a net after sharing with me information on prevention of malaria in pregnancy. I had to take both because I had other people to give.”*

#### **Mother’s fears:-**

Fear of embarrassment, fear of being despised by the providers or being left alone among others. In one FGD it was revealed that being left alone during labour is one reason why women prefer to deliver at the traditional birth attendants (TBAs) place. The focus group discussions revealed that sometimes women end up delivering at home if they do not have the basic requirements needed because they fear being embarrassed. One 36 year old user at Gongo focus group said *“Imagine when you are wrapping your baby with rags and others are having new clothes? That’s why me I fear hospital delivery since at the TBAs place, nobody looks at you”*. Another 34 year old user at Ndori focus group said *“Sometimes you don’t have cotton wool and you plan to use pieces of clothes, you can’t carry them to the hospital, you fear embarrassment by the health providers and other women”*. Consistent with the above finding; a key informant (skilled health provider) from Akala health center confirmed that they do inform pregnant women to have individual birth plans which includes ; having at least two body wrappers, cotton wool or pads, a pair of gloves, warm baby wrappers, a cap and pair of socks, finances for upkeep, transport and Identifying Birth Companion.

Some of the women preferred home deliveries for fear of being left alone in labour ward. One 23 year old user at Yiro West focus group said *“My friend delivered alone in the health facility and the nurse came to assist after the baby was already out. The reason was that she was still attending to the outpatients”*. Although various negative experiences were shared in various focus groups, In Ligala focus group, one 33 year old women from Nyawita FGD said *“I have never experienced any negative experience shared above; I think some are just hearsay and we should*

not generalize. Skilled maternal healthcare services are what will save most women from complications or even dying”.

#### **Uncertainty about pregnancy:-**

Analysis of discussions from various focus groups revealed that the reason why women receive the recommended four (4) antenatal care visits is that they start antenatal visits when it is too late after being sure that they are pregnant. The discussants in most focus groups highlighted the need to have pregnancy tests kits availed to CHWs so that the services can be accessible for confirmation of pregnancy once periods are missed. One 19 year old service user at Marenyo focus group said *“I suggest that the CHWs are even given those pregnancy test kits to help women confirm pregnancy at home”*. A key informant at Bondo hospital also echoed similar sentiments that availing pregnancy testing services at the community would help in confirmation of pregnancy early and early initiation of ANC visits.

#### **Uncertainty about labour and time of delivery:-**

Some discussants shared that sometimes it’s about not knowing the expected time of delivery especially in the first pregnancy or when a one has not been attending the antenatal clinic. Some persevere and by the time they realize that they are in labour, the baby is out. An incident was shared in Ndori focus group that an adolescent who did not attend antenatal clinic and did not know that she was in labour ended up delivering at home alone and then bled to death. It is important that women should be encouraged to utilize skilled maternal healthcare services and CHWs trained on pregnancy danger signs. One 39 years old user in Ndori focus group said *“I think the CHWs should be trained on the signs of pregnancy so that they can identify the young girls who are pregnant and refer for confirmation”*

#### **Transport and cost:-**

In all the FGDs, it was mentioned that pregnant women rely on motorcycle as the main means of transport. However, a majority of the discussants indicated that at night the fares were comparatively high. One 28 year old user in Umala focus group said *“In our community, of late motorcyclists fear moving out at night as they risk being robbed of their motorcycles and since most of the deliveries occur at night, women end up delivering at home”*. While another 30 year old service user from Marenyo focus group said *“The use of motorcycles at night is also expensive because they overcharge and it is therefore not affordable”*. These data indicate that transport is a major barrier to utilization of maternal health services especially in rural communities.

#### **Availability of Traditional birth attendant’s:-**

Another barrier to utilization of maternal health services was the presence of TBAs also in the communities. This was found to be contributing to increased number of home deliveries in the study area. One 29 year old from Marenyo focus group commented that *“The fact that women have an alternative person within reach whom they know can conduct deliveries also make them to be opt for home deliveries”* The above findings show that various barriers still exist and they affect utilization of skilled maternal healthcare services

#### **Perceived strategies for enhancing maternal healthcare continuum:-**

For purposes of designing strategies which are evidence based, effective and acceptable to both the women and the providers; the participants were asked to give their suggestions on the interventions that would enhance care continuum and increase utilization of skilled maternal healthcare services. The findings show that the majority of the participants felt that the key interventions that could enhance maternal healthcare continuum and optimize utilization of skilled maternal healthcare services were health facilities to offer 24 hours skilled delivery services and providers to have positive attitude. Others in order of their strength included: 1) CHWs to intensify awareness creation on maternal healthcare and importance 2) Helping women to confirm pregnancy early to avoid delays due to uncertainty, 3) Provision of incentives to women who complete 4<sup>th</sup> antenatal care visits (Nets, Mother baby packs etc), 4) Developing ways of reminding women when clinic days are due and 5) Women to have birth companions (CHWs, TBAs or relatives).

#### **Perceived strategies for optimizing utilization of skilled maternal healthcare services:-**

Service providers suggested that in order to increase utilization of skilled maternal healthcare services. The followings need to be in place: Consistent availability of maternal healthcare services for 24 hours. The other suggestions which were cited in six focus groups and above included; Strengthen community-facility linkage and demand creation; Develop mechanisms for monitoring CHVs performance to ensure households information on

maternal health; Provision of incentives to mothers who perform well and early identification of pregnant mothers by carrying out household pregnancy testing for suspected cases. Others included building of staff houses to accommodate health providers within the health facility and staff to stay at the facility, recruitment of additional health providers to provide skilled maternal health services, Positive attitude from healthcare providers, Reorient TBAs on new roles and Renovation/ Construction of maternity units at the facility.

### **Discussion:-**

Increased utilization of skilled maternal healthcare services greatly reduced maternal morbidity and mortality [2, 27, 28]. This can be greatly improved through increased knowledge on maternal health services provided by skilled care providers [29]. However, one of the major barriers to utilization of skilled maternal healthcare service is lack of awareness of the importance of skilled maternal health services [30-33]. More importantly data reveals that although antenatal care, skilled delivery services and postnatal care services were being offered in all the link health facilities and many women were aware about these services, puzzling was that very few women knew about services being offered to women after delivery (Postnatal care). These data indicate there is a need to educate women about the importance of both antenatal and postnatal services provided in health facilities to increase the uptake of these services.

Lack of awareness about the importance of skilled maternal health services is another important barrier to utilization of these services [34]. A study in Tanzania revealed that the low utilization of skilled maternal health services was partly due to women not aware of the services available and the risk involved in traditional birth practices [35]. In Indonesia women use skilled maternal health services mainly due to childbirth complications [36]. This study shows although women knew that health education, weighing, checking of blood pressure, abdominal examination, checking of blood level and treating the sick women were some of the services provided as a component of skilled maternal health services, a majority thought that post-natal care services were for the baby. More importantly although a majority knew about the availability of antenatal and skilled delivery services they were not able to articulate the importance of the skilled services. These data indicate that women still do not understand the importance skilled maternal health services provided during antenatal and postnatal period despite importance of skilled maternal healthcare services being emphasized during health education at the antenatal clinics or during household visitations by community health workers. Overall these data indicate that there are challenges in the quality of user-provider interaction and there is a need to develop a more focused and interactive strategies to improve women literacy about the importance of skilled maternal health services. Indeed utilization of skilled maternal health services can be improved through a focused and sustained health education [37]. In Kenya, it was revealed that women who were exposed to media were more likely to uptake this services [38], suggesting that apart from skilled health providers and CHWs there is need for health education and promotion on skilled maternal health services through the media. In addition it has been shown that providing both males and their pregnant women with health education improve health behavior than educating women alone [39]. Women should therefore be empowered with detailed information of all available maternal healthcare services for them to make informed decisions [34]. It is also critical that information on benefits of skilled maternal healthcare service and the risks of not using these services should be propagated using all the available communication channels (during first interaction at the maternal healthcare clinic, during household visitations by CHWs and through community dialogue meetings). As recommended in [36]; the home visitations for postnatal care services will greatly benefit women and it should be emphasized to women that postnatal period is a crucial period where mother need specialized care to prevent unnecessary deaths [5, 40].

Inadequate availability of skilled birth attendants was found to be a major barrier to utilization of skilled maternal healthcare services in Siaya County [34, 41]. Although the findings showed that the availability of maternal healthcare services varied from facility to facility with six out of the eight selected health facilities offering limited maternal healthcare (either no night services or weekend services). The key informants attributed the lack of 24 hrs services to the shortage of staff houses within the healthcare facilities and shortage of skilled staff. Therefore, there is a need to invest in recruitment of more staff and building of staff houses within the health facility compound. Consistent with previous findings, negative provider attitude was identified as one of the barriers affecting utilization of skilled maternal healthcare services in the study area [16, 17]. Therefore, to increase utilization of skilled maternal healthcare services, health workers must be sensitized to be sensitive to women's situation and needs, so as to provide client friendly services to all women regardless of their status. Additionally, health workers must strive to provide quality skilled delivery services to women when who choose to deliver at the health facility as self deliveries deter women from using health facility in subsequent pregnancies [13, 42, 43]. As recommended by



[13], comprehensive health promotion through awareness-raising, appropriate education of healthcare workers and regular support supervision should be scheduled to improve provider communication and address burnout during service delivery to resolve critical issues that are likely to trigger negative responses from health providers [13]. Where necessary, women should be encouraged to come with supportive birth companions to address women's concern of being left alone during labour in some health facilities [44]. Other major barriers included fear of embarrassment of not having presentable clothing for the baby and self, uncertainty about pregnancy and uncertainty about labour, and high cost of transport at night. As suggested by users and providers in this study; these later issues could be addressed by increasing access to community maternal healthcare services, early identification of pregnancy mothers by use of pregnancy testing at the community and referring for initiation of 1<sup>st</sup> ANC and educating the mothers on the early signs of labour. Further exploration should be made on developing an application for motorcycle drivers to transport mothers for delivery with possible modification of their seats to make them more comfortable.

Continuum of care is needed throughout pregnancy, childbirth and the postnatal period in order to improve maternal and newborn health and reduce morbidity and mortality [45, 46]. Our data reveal that there is a weak health facility-community linkage with no evidence of maternal healthcare continuum which could be attributing to low utilization of skilled maternal healthcare services. The findings also showed that there were no evidence or records at the household level to show that there were maternal healthcare services provided at the household by community health volunteers. Therefore, to enhance maternal healthcare continuum, there is a need to develop the following: (1) A tool (household health visitors log book) for recording all healthcare services provided at the houses hold and for reference purposes (2) Strengthen the use of referral tools for forward and backwards referrals to enhance informational and management continuity (3) Provide files for individual CHWs at the link health facility where records of all CHWs activities and referral will be kept for reference and performance tracking. Of importance is also to develop and distribute maternal health education protocols/ counseling cards with key messages for CHWs reference during household visitations and intensify supervision [47-49].

As suggested by previous studies instead of investing in supply-increasing interventions only, policies aiming at increasing access and utilization should take on both a supply- and demand side approach [50-52]. As Kerber et al. 2007 put it; strengthened linkage between the community and health facility is important in increasing utilization of skilled health services [53]. Of interest is that most suggestions proposed by the maternal healthcare service users and providers as measures to increase utilization of skilled maternal healthcare services could be used to address most of the barriers discussed in the focus groups. The key strategies proposed included: Developing mechanism for follow up of women from conception until post delivery, Provision of incentives to women who complete 4<sup>th</sup> antenatal care visits (Nets, Mother baby packs), CHWs to be provided with tools/ maternal healthcare reference materials for health education, CHWs to be empowered to carryout pregnancy tests at the household for early identification of pregnant women, positive provider attitude and strengthening community-facility linkage. These suggestions could be used to address context specific causes of variable use of maternal healthcare if safe motherhood is to become a reality.

#### **Strengths and Limitations:-**

This study provides data on user's perception of skilled maternal healthcare services and suggestions for optimizing utilization which could inform policy makers to develop frameworks for optimizing utilization of skilled maternal health services. The sample selection methodology, the sample size and the inclusion of all samples from all the six sub counties in the County allows generalization of the results of this study [54]. The use of different of respondents increases the validity of the study [55].

Having one focus group in each sub county was limited by budget constraints and that could have influenced the number of established criteria. This limitation was offset by conducting a literature research with the aim of including all known important aspects. The number of participants in each focus group discussion was 9 to 12 participants this could have limited the confidentiality and anonymity of study participants because they all listened and interacted together. A large group would have limited the detail of some responses because participants feel a pressure to share airtime with others. Conversely, participants in a smaller group could feel an uncomfortable pressure to talk more than they would otherwise to cover up [56, 57]. However, this limitation was explained to the study participants before informed consent was obtained. Moreover, we reserved rooms in the link facilities to maintaining FGD confidentiality and enable study participants to talk freely and privately without others listening in.

**Conclusion:-**

This study found out that users perception influence utilization of skilled maternal healthcare services. Consistent with previous studies, inadequate awareness of availability of maternal healthcare services and importance, limited availability of skilled maternal healthcare services, negative provider attitude, and weak facility-community linkage negatively influence utilization of maternal healthcare services. Our results suggest the need to have programs understand the perspectives of service users and providers for evidence based context specific interventions. Concerted efforts should be geared towards intensifying awareness creation on available of skilled maternal healthcare services and importance, availing 24 hours skilled delivery services and promotion of positive attitude amongst skilled providers. Critical is also the empowerment of community health volunteers to identify of pregnant mothers early and refer, provide basic maternal education and healthcare services at the community and instituting mechanisms for regular mentorship of CHWs and performance tracking. This study also highlights the views and suggestions from insiders (users and providers) which are explicable and should be considered in designing context specific evidence based interventions.

**What is already known on this topic**

Many developed countries including Kenya are still struggling to meet the set millennium development goal 5 on improving maternal health by increasing utilization of skilled maternal health care services especially 4<sup>th</sup> antenatal care, skilled delivery and postnatal care services within 48 hours of birth. Experience over the past decade has shown that no single intervention is by itself sufficient to improve maternal and newborn health and reduce morbidity and mortality. What is needed is a continuum of care throughout pregnancy, childbirth and the postnatal period [58, 59]. Context specific, evidence based interventions are therefore needed to increase utilization of skilled maternal healthcare services.

**What this study adds**

The findings reveal that most women in Siaya County do not know about the availability and importance of postnatal care services, and that the majority also do not have access to community maternal healthcare services. Concerted efforts should therefore be geared towards intensifying awareness creation on postnatal care services and importance, availing 24 hours skilled delivery services, provision of incentives to mothers and promotion of positive attitude amongst skilled providers in order to increase uptake of skilled maternal healthcare services. Important is also empowerment of community health volunteers (CHVs) ) to be able to identify pregnant mothers early through pregnancy testing at community and enhancing maternal healthcare continuum by providing evidence based community maternal health services.

**List of abbreviations:-**

WHO: World health organization; FGD: Focus Group Discussion; CHWs: Community Health Workers; TBAs: Traditional Birth Attendants CU: Community Units; ANC: Antenatal Clinic; MDG: Millenium Development Goals; PNMCH: Partnership for Newborn, Maternal and Child Health; KNBS: Kenya National Bureau of Statistics; UEAB: University of Eastern Africa Baraton; ANC: Ante Natal Care; MOH: Ministry Of Health; RMNCH: Reproductive Newborn, Maternal and Child Health

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**Ethical considerations:-**

Ethical clearance was obtained from Research Ethics Committee of University of Eastern Africa, Baraton, Eldoret (REC: UEAB /05/02/2015). The research assistants were trained on research ethics. Informed written consent from the study participants was obtained and the objective of the study was explained to them. Privacy and confidentiality of collected information was ensured at all levels.

**Consent to publish:-**

Consent to publish was obtained from Research Ethics Committee of University of Eastern Africa, Baraton, Eldoret (REC: UEAB /05/02/2015).

**Competing interests:-**

The authors declare that there are no competing interests.

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**Author Contributions:-**

OEO conceptualized the paper, searched literature, and wrote the manuscript draft. ASO contributed to the design of the study and provided advice regarding data interpretation. FAA helped develop the data analysis framework and also helped train field researchers for data collection. OEO and ASO analyzed the qualitative data. AK made critical revisions to the paper and provided advice regarding data interpretation. OSO participated in data collection and helped write the results and discussion sections. All authors read and approved the final manuscript.

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### RESEARCH ARTICLE

#### COMMUNITY HEALTH WORKERS PROFILE, KNOWLEDGE AND EXPERIENCE TOWARDS DEMAND CREATION FOR SKILLED MATERNAL HEALTHCARE SERVICES IN SIAYA COUNTY.

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#### *Abstract*

**Background:** Community health workers (CHWs) are increasingly identified as a potential vehicle for creating demand and expanding access to maternal health care services. However, despite their engagement to create demand for skilled maternal healthcare services in Siaya County, utilization has remained low while mothers continue to die from preventable maternal conditions. The aim of this study was to assess the CHWs profile, knowledge and perception towards demand creation for skilled maternal healthcare services in Siaya County.

**Methods:** The study was a descriptive cross sectional study involving 123 community health workers. The study used both quantitative and qualitative data collection methods. Statistical tests including independent sample t-test, chi-square test, bivariate and multivariate logistic regression analysis were used to test the association between research variables.

**Results:** The results revealed that Married CHWs; (aOR=1.16, 95% CI: 3.21–3.27), Widowed (aOR=1.37, 95% CI: 4.32–2.74), those with secondary (aOR 1.12 CI: 4.33-4.58), Tertiary education (aOR 1.43 CI: 2.87-4.63), and those with  $\leq 100$  households (aOR 1.65 CI: 1.27-2.60) were more likely to create demand for skilled maternal healthcare services that their other counterparts. The majority of CHWs had inadequate knowledge on maternal health and danger signs.

**Conclusion:** Empowering Community health workers (CHWs) with adequate knowledge on maternal health would enhance their competency in maternal health while assigning fewer households would enable them intensify demand creation for skilled maternal healthcare services in Siaya County.

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**Introduction:-**

Evidence has shown that utilization of skilled maternal healthcare during pregnancy, during delivery and postnatal period are key factors in reducing the risk of maternal death in both developed and developing countries (Graham, Moodley, & Selipsky, 2012; Wang et al., 2010; WHO, ICM, & FIGO, 2004), particularly in sub-Saharan Africa, where 99% of maternal deaths occur (WHO, UNICEF, UNFPA, & WB, 2012). Sadly, the use of maternal health services antenatal care, skilled care at delivery and postpartum is limited especially in Kenya where maternal mortality ratio (MMR) has remained high at about 365 per 100 000 live births (KDHS, 2014) with variations existing amongst Counties. As enshrined in the Kampala declaration and the Agenda for Global Action (Bhutta et al., 2010), Scaling up community health workers is one of the strategies for increasing access to healthcare services. Mounting evidence from previous studies and reviews have demonstrated the positive potential of community health workers in improving equitable access to care and that the services offered by CHWs have helped in the decline of maternal and child mortality rates (Bhutta et al., 2010; Lewin et al., 2010).

Health systems in many African and Asian countries currently utilize community health workers (CHWs) to deliver community healthcare services and create demand for skilled healthcare services at the health facilities; (Beam & Tessaro, 1994; Bhutta, Lassi, Pariyo, & Huicho, 2010; Haines et al., 2007). Previous findings revealed that knowledge is crucial in service delivery at community level and that coverage of home visits are positively correlated with knowledge levels of lay health workers (Agrawal, 2012). According to WHO 2006, Community health workers (CHWs) have the potential to be part of the solution to the human resource crisis affecting many countries. A study by (Crispin et al., 2012) found out that community health strategy is an effective approach to delivering community-based interventions.

In Kenya, the National Health Sector Strategic Plan 2 (KNHSSP 11) outlined interventions for improving the health indicators in Kenya including community health strategy whose aim was to deliver Kenya essential package of health (KEPH) to the Kenyan population with the community health workers (CHWs) as the main services providers at the community. Although the use of community health workers in Siaya County began after the Alma Ata declaration in 1970s, the engagement was further intensified in 2006 in line with the Kenya National Health Sector Strategic Plan 11 to reverse the poor health indicators in the Country (Ministry of Health Kenya, 2005; Ministry of Health Kenya, 2006). Siaya County being one of the top ten Counties in Kenya with the largest number of maternal deaths (691/100,000 live births) which surpass the Country (KDHS, 2014; MICS4, 2011), has made efforts to invest in community health services as a means to create demand and increase uptake of skilled maternal healthcare services. Moreover, due to shortage of skilled healthcare providers in Siaya County (C. G. o. Siaya, 2013), CHWs are central in mobilizing communities to engage in health prevention and promotion activities.

Owing to the shortage of skilled health care personnel in Siaya County and the desire to increase access to skilled healthcare services, the County Government invested in scaling up community health services in the whole county with a view to increasing access to healthcare services and intensifying demand creation for skilled healthcare services (M. o. H. Siaya, 2013). However, although some indicators have shown some improvement, utilization of skilled maternal healthcare services have remained low (Department, 2014; UNICEF, 2011). The proportion of mothers attending antenatal visits four times as per WHO recommendation still remain as low as 45% and postnatal care within two days of delivery at 30%. Moreover, unskilled persons attend to about 52% of deliveries by Siaya women (Software, 2014). Therefore as recommended by previous scholars, understanding how socio demographic factors affect CHWs effectiveness is of importance (Lehmann U, 2007).

The use of community health works in Siaya County began after the Alama ata declaration in 1978. However, after devolution of health services in 2013, the County government of Siaya has invested massively in community health services including payment of honoraria to all the community health workers (Department, 2014) in the county with an aim of enhancing their retention and motivation as recommended in previous reports (Bhattacharyya, Winch, Leban, & Tien, 2001; Glenton et al., 2010; Singh, Negin, Otim, Orach, & Cumming, 2015). It was envisioned that with the provision of the honoraria, the community health workers (CHWs) would be motivated to intensify demand creation for skilled healthcare services, refer pregnant mothers for skilled services and ultimately contribute to reduction of maternal mortality which has not been the case. However, although several trials have shown the efficacy of community health workers (CHWs) in reducing maternal and newborn morbidity and mortality (Bang, Bang, Reddy, Deshmukh, & Baitule, 2005; Tomlinson, 2014), this has not been the case in Siaya County (Software, 2014). The low uptake of skilled maternal healthcare services in Siaya County raises concerns about the implications of CHW efforts to increase demand for skilled maternal healthcare services. Taken together the above observations

and the need to identify the bottlenecks hindering the success of demand creation for skilled maternal healthcare services, it was necessary to carry out a study to unveil the dynamics affecting demand creation for skilled maternal health care services in Siaya County. Hence this study aimed at assessing the community health volunteer's profile, knowledge and perception towards demand creation for skilled maternal healthcare services in Siaya County.

#### **Community health services in Kenya**

In Kenya, the lay health workers hereby referred to as Community Health Workers (CHWs) are assigned to serve approximately 100 households (approximately 5000 people). They are members of the community identified by the community and trained on basic community health services module to serve the same communities they come from. After the initial training, they are also trained on technical modules based on the context of the intervention that they are assigned to undertake (MOH, 2006). With regard to demand creation for skilled maternal healthcare services, the CHWs are tasked to disseminate key messages to support safe pregnancy & delivery of a healthy new born, advocate for community leadership support for safe pregnancy and delivery of a healthy newborn, promote safe delivery through pregnancy monitoring and timely referral (Ministry of Health , 2006)

#### **Statement of the problem:-**

Studies have shown that community health workers (CHWs) referred to in this study as community health workers (CHWs) are a potential vehicle for creating demand and expanding access to maternal health care services (Lewin et al., 2010), and With the limited budget allocation for healthcare services in Siaya County, the personnel to serve the health care needs of the population cannot be met and thus it is critical that more cost effective delivery strategies are identified to optimize the use of the available health care services especially skilled maternal healthcare.

Even though Siaya county government has invested in community health workers (CHWs) as a measure to create demand for skilled healthcare services, very minimal gains have been realized with regard to demand creation for skilled maternal health services. It was envisioned that with the provision of the stipend to the CHWs would motivate them to further intensify demand creation for skilled healthcare and ultimately contribute to the reduction of maternal mortality. However, the uptake of skilled maternal healthcare services is still low in Siaya County (Siaya County Annual Performance Report and Plan 2015/16) thus calling for a study to identify the dynamics in demand creation for skilled maternal healthcare services in the county.

#### **Justification of the study:-**

Given the shortage of skilled providers in Siaya County, establishing the bottleneck affecting CHWs performance and identification of context specific evidence based strategies to intensify demand creation for skilled maternal healthcare services would go a long way in increasing uptake of maternal healthcare services which will lead to reduction of maternal mortality in Siaya County.

The findings of this study will equip policy makers, stakeholders and program managers with information for designing context specific evidence based intervention to increase utilization of skilled maternal healthcare services in Siaya County.

#### **Research Questions:-**

In order to achieve the objectives of this study, the following questions were formulated:

1. What are the effects of CHWs profile on demand creation for skilled maternal healthcare in Siaya County?
2. What the effects of knowledge of CHWs on demand creation for skilled maternal healthcare in Siaya County?
3. What are the effects of CHWs experience on demand creation for skilled maternal healthcare in Siaya County?
4. What are the context specific interventions for increasing demand for skilled maternal healthcare services in Siaya County?

#### **Research Objectives:-**

**General objective:** To determine the CHWs profile , knowledge and experience towards demand creation for maternal healthcare services in Siaya County.

#### **Specific objectives:-**

1. To find out the effects of CHWs profile on demand creation for skilled maternal healthcare in Siaya County
2. To determine the effects of knowledge of CHWs on demand creation for skilled maternal healthcare in Siaya County
3. To assess the effects of CHWs experience on demand creation for skilled maternal healthcare in Siaya County



4. To identify context specific evidence based interventions for increasing demand for skilled maternal healthcare services in Siaya County

## **Methods:-**

### **Study site:-**

The cross sectional study was conducted in Siaya County in selected community Units. Siaya County is one of the 47 counties that make the Republic of Kenya. It has 6 sub-counties, 179 sub-locations, 198 Community Units and 30 administrative wards. It has a total population of ~ 955,000. The predominant inhabitants are Luo speaking River Lake Nilotes. The study focused on assessment of CHWs knowledge and perception towards demand creation for skilled maternal healthcare within Siaya County.

### **Sample size Determination:-**

The sample size was determined using purposive sampling methodology whereby all the 123 CHWs serving within the community units linked to the selected health facility were given chance to participate.

### **Sampling procedure:-**

The study used a multi-stage simple random sampling method to select 123 respondents. The study was part of the baseline survey that was carried out to establish the status of utilization of skilled maternal healthcare services in Siaya County. As such, from a sampling frame of all health facilities per Sub County, the health facilities to be included in the study had been selected. The Community units were then selected on the basis of their link to the eight (8) selected health facilities followed by selection of community health workers (CHWs) from all the selected community units. At least one health provider drawn from the health facilities where the selected community units were linked participated as key informant.

### **Data Analysis:-**

Data was cleaned and entered into SPSS version 18 software for analysis. Descriptive statistics were computed and relationships and significant tests determined using Chi square and Odds Ratios (ORs). Statistical tests including independent sample t-test, chi-square test, bivariate and multivariate logistic regression analysis were used to test the association between research variables. Finally, multiple regression analysis was done to identify independent variables that were useful to demand creation for skilled maternal healthcare services. Qualitative data was analyzed using themes and used to back the quantitative data.

### **Ethical approval:-**

The study received approval from Baraton University of Eastern and Central Africa Research and Ethics committee. Another letter allowing the researcher to proceed with the field work was also received from Siaya County Health Research Committee.

## **Results:-**

The data used in this study was drawn from the population of 123 CHWs drawn from 8 community health units linked to 8 public health facilities in Siaya County. 14 Health providers of each facility also formed part of the study population. The sampled respondents were 123 CHWs (n=123) and 14 Health providers (n=14). The return rate from the 14 Health providers' respondents was 100%. Given that the questionnaires were administered personally by the researcher, it was noted that 100% of the questionnaires were appropriately filled while qualitative data were also obtained from the 14 key informants.

### **Profile of the respondents:-**

The first objective of the study was to assess the influence of CHWs profile on demand creation skilled maternal healthcare services in Siaya County. The findings are summarized below. Table 1 shows the percentage distribution of the CHWs respondents.

### **Age of the CHWs:-**

The results showed that the majority of the CHWs totaling to (74.8 %) were aged between 30-49 years each, while only 3.2% of them were aged below 30 years and the rest (10.57%) aged 50 years and above. The above results

revealed highly significant ( $p < 0.05$ ) positive relationship between age of the respondents and the maternal health services provision in Siaya County.

*“I think the mature age may be attributed to the fact that younger people still want income to develop themselves and they do shy away from this responsibility and they therefore leave the work to the adults population” (nurse – Akalla health centre)*

#### **Sex of the CHWs:-**

The exploratory data analysis revealed that more female CHWs (85.37%) took part in the study than their male counterparts (14.63%) giving a gender distribution ratio of about 1:3.

*“The majority of the CHWs are females because most people in the community view the role of CHWs to be mostly suitable for women” (Nurse at Sikalame dispensary).*

*“Most males engage in jobs that give them money because, in the community unit linked to the facility where I work, for several years the majority of the CHWs were females until the time when Millennium villages project came and the CHWs were being paid allowances of Ksh. 5000. Many young people especially the men got engaged in the CHWs work so as to earn money” (nurse – Midhine dispensary)*

#### **Marital status of CHWs:-**

The descriptive statistics on cross tabulations indicated that the majority of the CHWs in Siaya County are married at 88.62% while 1.63% and 9.76% of the respondents are single and widowed respectively. None of the respondents were separated. The results also indicated that female respondents were either married or widow at 85.37% whereas male respondents were either married or single at 14.63%. None of the female CHWs were single. Similarly, none of the male respondents were widow. The results revealed highly significant ( $p < 0.05$ ) positive relationship between marital status and the maternal health services provision in Siaya County.

*“The community members prefer selecting married women or widows who are grounded in the community to volunteer as CHWs because they are rooted in the community” (nurse – Umalla dispensary)”*

#### **CHWs level of Education:-**

The findings presented in table 4.1 established that most of the respondents (CHWs) at 54.5% were at secondary school level of education, followed by those with primary level of education (41.5%), those with tertiary level of education accounted for 4.1%. Moreover, the results revealed highly significant ( $p < 0.05$ ) positive relationship between level of education and the demand creation for skilled maternal health services in Siaya County.

*Sometimes it is difficult to teach the CHWs with education below secondary because most of the training materials are written in English and also the reporting tools are also in English” (nurse – Bondo hospital)*

The study also sought to establish the number of households covered by the CHWs. This was necessary since it showed the workload experienced by the CHWs in the community. The results showed that majority of the CHWs respondents at 69.92% covered between 101-150 households each followed by 29.27% of the CHWs respondents who covered less than 100 households. Moreover, 0.81% of the CHWs respondents only covered 100 households. The study established whether there is association between household covered and packages delivered to the mothers. The analysis revealed highly significant ( $p < 0.05$ ) positive relationship between household covered and packages delivered to the mothers.

*“Some of our CHWs have too many households that they cannot cover especially on monthly basis and they therefore sometimes avoid households visitations and so they are unable to know when a woman is pregnant until very late” (nurse – Ligala dispensary)*

*“Apart from having too many households to visit, they also have too many tasks to perform in those household making it too difficult for the CHV to manage even though they are willing to do the work” (nurse- Gongo dispensary)*

**Table 1:-** Summary of Socio – Demographic characteristics of respondents (N = 123) in Siaya County.

<b>Respondent Category</b>	<b>Total, n (%)</b>		<b>P value</b>
<b>Age of the respondents at interview</b>	<b>Female, (n %)</b>	<b>Male, n (%)</b>	<b>0.002</b>
20-24	2 (1.6%)	1 (0.01%)	
25-29	2 (1.6%)	2 (1.6%)	
30-34	27 (22.0%)	2 (1.6%)	
35-39	17 (13.8%)	1 (0.01%)	
40-44	30 (24.4%)	5 (4.1%)	
45-49	18 (14.6%)	3 (2.4%)	
50-54	2 (1.6%)	1 (0.01%)	
55-59	3 (2.4%)	1 (0.01%)	
60-64	3 (2.4%)	1 (0.01%)	
65+	1 (0.01%)	1 (0.01%)	
<b>Total</b>	<b>105 (85.37%)</b>	<b>18 (14.63%)</b>	
<b>Gender</b>			<b>0.005</b>
Male	18 (14.63%)		
Female	105 (85.37%)		
<b>Households covered by CHWs</b>			<b>0.001</b>
100	1 (0.81%)		
101 to 150	86 (69.92%)		
Less than 100	36 (29.27%)		
<b>Marital status</b>	<b>Female, (n %)</b>	<b>Male, n (%)</b>	<b>0.003</b>
Married	93 (75.6%)	16 (13.0%)	
Single	0	2 (1.6%)	
Widow	12 (9.8%)	0	
<b>Level of education</b>	<b>Female, (n %)</b>	<b>Male, n (%)</b>	<b>0.0001</b>
Primary	45 (36.6)	6 (4.9)	
Secondary	56 (45.5)	11 (8.9)	
Tertiary	4 (3.2)	1 (0.01)	

aValues in parentheses indicate % of total (n = 123). B Indicates row percentage. C Indicates Chi-square test of association between maternal health services provision and other group. Bold font indicates “significantly associated at  $p < 0.05$ ”.

**Table 1.2:-** Multivariate logistic regression of Socio- Demographic Characteristics and creating demand for the utilization of Maternal Health care Services

<b>Variables</b>	<b>Yes, n (%)</b>	<b>Unadjusted odds ratio (95%CI)</b>	<b>Adjusted odds ratio (95%CI)</b>
<b>Gender</b>			
Male	18 (14.63%)	1.00	1.00
Female	105 (85.37%)	1.24 (0.37–6.12)*	1.21 (0.42–7.63)*
<b>Marital status</b>			
Married	109 (88.60%)	1.21 (3.25–2.50)**	1.16 (3.21–3.27)**
Single	2 (1.6%)	1.00	1.00
Widow	12 (9.8%)	2.23 (5.41–8.13)**	1.37 (4.32–2.74)**
<b>Level of education</b>			
Primary	51 (41.5)	1.00	1.00
Secondary	67 (54.4)	1.23 (3.15–6.51)**	1.12 (4.33–4.58)**
Tertiary	5 (3.21)	2.05 (3.25–4.50)**	1.43 (2.87–4.63)**
<b>Number of Households covered by CHWs</b>			
100	1 (0.81%)	1.00	1.00
101 to 150	86 (69.92%)	1.00	1.00
Less than 100	36 (29.27%)	2.19 (2.99–2.61)*	1.65 (1.27–2.60)*

Findings of multivariate analysis of CHWs profile in table 2 above also showed that; female respondents (AOR=1.21, 95% CI: 0.42– 7.63) were 1.21 times more likely to create demand for the utilization of maternal healthcare services in Siaya County as compared to male respondents. The study further established how gender differences influence CHVs' MHS in Siaya County.

**Table 1.2.1:-** Descriptive statistics

	Gender	n	mean	std. deviation	std. error mean
MHS	Male	18	14.6	10.6759	1.1253
	Female	105	85.4	13.1855	1.4835

**Table 1.2.2:-** Independent t samples test

		MHS	
		equal variances assumed	equal variances not assumed
levene's test for equality of variances	f sig.	3.374 0.021	
t-test for equality of means	t	.104	.111
	df.	119	97.262
	sig.(2-tailed)	.002	.002
	mean difference	.027	.027
	std. error difference	.264	.246
	95% confidence interval of the difference	upper lower	.550 -.495

The above independent sample t-test in table 1.2.2 was done to compare demand creation for MHS between the genders of the CHWs. As shown in the table 1.2.1 findings were that the female CHWs had a higher mean of MHS score of 85.4, with a standard deviation of 13.1855 and standard error of 1.4835 than the male CHVs who had a mean of 14.6, with a standard deviation of 10.6759 and standard error of 1.125. Given that the Levene's Test for Equality of Variances was significant ( $p = .021 < .05$ ) we did not assume equal variances, this mean that the variances were significantly different; the assumption of homogeneity of variances was violated. Hence the readings of test statistics was taken from the row labeled Equal variance not assumed, indicating P Value  $< .05$ . Therefore the findings of the study indicate that on average the female MHS score ( $M=85.4$ ,  $SE=1.4835$ ), was significantly higher than the male MHS score ( $M= 14.6$ ,  $SE=1.125$ ),  $t(119) = 97.262$ ,  $p = .002$ . Hence from the results of the study, it was credible to conclude that gender has significant influence on demand creation for MHS in Siaya County.

The married respondents and widowed; (AOR=1.16, 95% CI: 3.21–3.27) and (AOR=1.37, 95% CI: 4.32–2.74) were 1.16 and 1.37 times respectively more likely to create demand for the utilization of maternal healthcare services in Siaya County as compared to the respondents who were single. In addition, the findings established that the respondents whose highest level of education was secondary (AOR=1.12, 95% CI: 4.33–4.58) and those with tertiary level of education (AOR=1.43, 95% CI: 2.87–4.63) were 1.12 and 1.43 times more likely to create demand for the utilization of maternal healthcare services in Siaya County as compared to those respondents whose level of education is primary. Moreover, the findings indicated that the CHWs respondents who covered less than 100 households (AOR=1.65, 95% CI: 1.27-2.60) were 1.65 times more likely to create demand for the utilization of maternal healthcare than those with more households.

#### **Effect of CHWs knowledge on demand creation for skilled maternal health care:-**

The second objective of the study was to establish the effect of knowledge on demand creation for skilled maternal healthcare. To address this research objective, questions were carefully developed; the first group were the questions seeking the knowledge of the CHWs and the second were the questions seeking to establish the effect of knowledge on demand creation for skilled maternal healthcare services.

**Knowledge on antenatal, postnatal care and maternal health danger signs;-**

On the knowledge on maternal health danger signs, the researcher designed questions to collect respondents view on the same. The Knowledge on danger signs was assessed using a question with 9 key danger signs on maternal healthcare. Knowledge scores for individuals were then categorised into adequate if it was equal to or above five, while anything below the five was rated as inadequate.

**Table 2:-** Knowledge on maternal healthcare services

Statements	Frequencies	Percentages
<b>When should a pregnant mother start receiving ANC</b>		
1= <16 weeks	37	30.6
2= 16-28 weeks	54	24.4
3= 28-32 weeks	23	18.7
4= 32-40 weeks	9	7.3
<b>When should a woman be visited after delivery</b>		
After:		
1=48 hours	82	66.7
2= 1 week	14	11.4
3= 1 month	11	8.9
4= 6 weeks +	16	13.0
<b>When did you last offer service to a pregnant mother or Postpartum mother at the HH</b>		
1= Last one month	85	69.1
2= 1-2 months ago	20	16.3
3= 3months +	18	14.6
<b>Knowledge of maternal health danger signs</b>		
Yes	39	31.7
No	84	68.3

Table 2 shows that only 30.6% of the CHWs knew when a pregnant mother should start receiving ANC (less than 16 weeks) while the remaining 69.4% did not know the correct timing. Furthermore, the CHWs who knew the exact time (within 48 hours) when a woman should be visited after delivery were 66.7% while the remaining 33.3% were on the opinion of one week and above. Moreover only 30.6% of the CHWs knew when a pregnant mother should start receiving ANC (less than 16 weeks) while the remaining 69.4% did not know the correct timing. Interestingly, the study also revealed that only 31.7% of the CHWs had adequate knowledge of the maternal health danger signs while 68.3% had inadequate knowledge of the danger signs.

*“The CHWs do not have adequate knowledge on maternal health although when they come to the health facility we do try to teach them” (nurse – Umala dispensary)*

**Trainings attended by CHVs:-**

All CHWs are required to undergo a basic training on community health strategy before being engaged in demand creation activities. The findings of this study however established that even though all the CHVs were expected to create demand for skilled maternal healthcare services, only 101 out of 123 had undergone the training. In order to establish whether the basic community health strategy has influence on demand creation for skilled maternal healthcare services, a multivariate analysis was done.

**Table 3:-** Trainings attended by CHVs

CHV's attendance of trainings	Yes, n (%)	No, n (%)	<b>0.003</b>
Community Health Strategy (CHS)	101 (82.1)	22 (17.9)	
Community Maternal Health Services (MHS)	58 (47.2)	65 (52.8)	
Community Case Management (CCM)	91 (74.0)	32 (26.0)	
Integrated Community Case Management (ICCM)	115 (93.5)	8 (6.5)	
Family Planning (FP)	58 (47.2)	65 (52.8)	

AValues in parentheses indicate % of total (n = 123). BIndicates row percentage. CIndicates Chi-square test of association between maternal health services provision and other group. Bold font indicates “significantly associated at  $p < 0.05$ ”.

According to the findings in table 3 above, majority of the CHWs at 93.5% have attended trainings on Integrated Community case management (ICCM) followed by 82.1% who had attended trainings on Community Health Strategy (CHS). In addition, trainings on Community Case Management (CCM) had been attended by 74.0% of the CHWs respondents while only 47.2% had attended trainings on Community Maternal healthcare services (MHS). The results revealed highly significant ( $p < 0.05$ ) between the CHV’s attendance of trainings and demand creation for skilled maternal health services in Siaya County.

#### Effect of training attended on demand creation for skilled maternal healthcare services:-

**Table 3.1:-** Multivariate logistic regression of trainings attended and demand creation for skilled maternal healthcare services

Variables	Yes, n (%)	Unadjusted odds ratio (95%CI)	Adjusted odds ratio (95%CI)
<b>Received Basic training on community health strategy</b>			
Yes	101 (82.01)	3.16 (4.21–2.87)**	2.24 (3.97–1.82)**
No	22 (17.91)	1.00	1.00

Furthermore, the findings of multivariate analysis above indicated that the CHWs had been trained on community health strategy (AOR=2.24, 95% CI: 3.97–1.82) were 2.24 times more likely to create demand for skilled maternal healthcare services in Siaya County as compared to those CHWs respondents who had not attended the training.

*“CHWs are trying their best although for effective mobilization of mothers for skilled maternal healthcare services, the CHWs should be trained on the maternal health module” (clinician – Akala dispensary)*

*“These CHWs have not been trained on the community maternal healthcare technical module and they are only relying on the scanty knowledge they received during the basic community strategy training” (clinician – Sikalame dispensary).*

Consistent with previous studies, the above findings also showed that for CHWs to be effective, they need to be properly trained in whatever intervention they are to implement, (Ashworth, 2006; Gallos et al., 2011; Senarath, Fernando, & Rodrigo, 2007)

#### CHWs experience in demand creation for skilled maternal healthcare services:-

The third objective of the study was to establish the CHWs experience on demand creation for skilled maternal healthcare.

**Table 4:-** CHWs experience in demand creation for skilled maternal healthcare services among the CHWs

Variables	Total, n (%)	P value
<b>Time serving as a CHV</b>		<b>0.0001</b>
Less than 1 year	9 (7.3)	
More than a year	114 (92.7)	
<b>Demand creation activities carried out by CHWs</b>		<b>0.0001</b>
Refer of women for skilled maternal health care	119 (96.7)	
Follow up of clients	90 (73.2)	
Community dialogue	31 (25.2)	
Action days	15 (12.2)	
<b>Frequency of visits to the health facility</b>		<b>0.002</b>
Weekly	71 (57.7)	
Monthly	10 (8.1)	
Whenever necessary	39 (31.7)	
Quarterly	3 (2.4)	

<b>Challenges faced by CHWs</b>		<b>0.005</b>
Negative staff attitude	95(77.2)	
Lack of Recognition	78 (63.4)	
Inadequate staff	98 (79.7)	
Lack of Technical support	81 (65.9)	
Inadequate meetings	61 (49.6)	
Inadequate resources (commodities)	101 (82.1)	
<b>Referral mechanisms for maternal health care services</b>		<b>0.0001</b>
Use referral notes	13 (10.6)	
Accompany the client	84 (68.3)	
Verbal referral	108 (87.8)	

AValues in parentheses indicate % of total (n = 123). BIndicates row percentage. CIndicates Chi-square test of association between maternal health services provision and other group. Bold font indicates “significantly associated at  $p < 0.05$ ”.

Experience contributes and enhances knowledge on demand creation. The study found that majority of the respondents at 92.7% cumulatively had taken more than a year offering demand creation services. The results revealed highly significant ( $p < 0.05$ ) positive relationship between the number of years that the respondents have taken to be CHWs and demand creation for skilled maternal health services in Siaya County.

*“One thing about most of our CHWs is that they have adequate experience. Some have been CHWs since I started working in this facility and I have worked for 8 years now” (nurse – Bondo hospital)*

With regard to demand creation services provided by CHWs, the findings showed that the services offered by CHWs at the community included; making referrals to the health facility, follow up of clients, community dialogue and action days which were accounted to by 96.7%, 73.2%, 25.2% and 12.2% respectively. The analysis revealed highly significant ( $p < 0.05$ ) positive relationship in the CHWs practice and demand creation for skilled maternal health services in Siaya County.

#### **Effect of CHWs experience on demand creation for skilled maternal healthcare services:-**

Multivariate analysis in table 4.1 below shows that, CHWs respondents who had taken more than one year serving as a CHV (AOR=1.79, 95% CI: 4.39–2.41) were 1.79 times more likely to provide maternal healthcare services in Siaya County as compared to those CHWs respondents who had taken less than a year serving as a CHV

**Table 4.1:-** Multivariate logistic regression of CHWs years of experience and demand creation for skilled maternal healthcare services

<b>Variables</b>	<b>Yes, n (%)</b>	<b>Unadjusted odds ratio (95%CI)</b>	<b>Adjusted odds ratio (95%CI)</b>
<b>Time serving as a CHV</b>			
Less than 1 year	9 (7.3)	1.00	1.00
More than a year	114 (92.7)	2.41 (2.51–3.41)**	1.79 (4.39–2.41)**

Similar to findings in other studies, the findings revealed a strong relationship between the challenges facing CHWs and their performance in demand creation for skilled maternal healthcare services (Iyer, 2013; Sanghvi et al., 2010). The findings above also concur with other findings which showed that shortages of commodities and necessary supplies affect CHWs performance (Beltman, 2013; Gebrehiwot, San Sebastian, Edin, & Goicolea, 2014; Javanparast, Baum, Labonte, & Sanders, 2011; Ndou, Van Zyl, Hlahane, & Goudge, 2013; Scott & Shanker, 2010).

#### **Discussions:-**

##### **CHWs Socio- Demographic Characteristics and demand creation for Maternal Health care Services:-**

The above findings are closely similar to findings of a previous studies which showed that the optimal age range of CHWs was 30 to 40years and that age, gender, marital status and education of CHWs had influence on performance (Crispin et al., 2012; Kok et al., 2015). Whereas the selection criterion for selection of CHWs in Kenya does not favour a particular gender, consistent with previous findings, this study also revealed that female community health workers are more engaged in the demand creation work than the males (Crispin et al., 2012; Viswanathan et al.,

2012). The results of this study are also in concurrence with previous studies which found out that females dominated the work of CHWs (Bang et al., 2005; Briend, Hasan, Aziz, & Hoque, 1989; Brown, R., Zumaran, & Miranda, 2006; Fauveau, Stewart, Khan, & Chakraborty, 1991; Hailu & Kebede, 1994).

Contrary to findings by (Crispin et al., 2012) that CHWs with lower literacy levels were able to satisfy and enable their clients effectively ; this study found out that compared to CHWs with lower literacy levels, those with higher level of education performed better. The findings on influence of workload on demand creation also conform to previous studies which indicated that for CHWs to be effective, they should cover certain optimal population size with an optimal range of services (Heunis et al., 2011; Kalyango et al., 2012; Prasad & Muraleedharan, 2007; Vichayanrat, Steckler, & Tanasugarn, 2013; Yan, Liu, Gruber, He, & Congdon, 2012)

#### **Effect of CHWs knowledge on demand creation for skilled maternal health care:-**

Knowledge of CHWs on maternal health was found to be varying greatly regarding different aspects of maternal health. Contrary to the recommendations from previous studies that CHWs should possess some basic knowledge with certain core skills to enable them execute their roles effectively (Haq, Iqbal, & Rahman, 2008; WHO, 2007), the findings showed that although the CHWs in Siaya County were expected to create demand for skilled maternal healthcare services, the majority had not been trained on maternal healthcare module. Consistent with previous findings, the low uptake of skilled maternal healthcare in Siaya County could be attributed to the knowledge gap amongst CHWs which could be compromising their ability to create demand for the skilled maternal healthcare services (Agrawal, 2012; Butawa, Tukur, Idris, Adiri, & Taylor, 2010; Chattopadhyay, 2004; Haq et al., 2008; Kok et al., 2015; Prata, Weirdert, Fraser, & Gessesew, 2013; WHO, 2007). As noted in (Kasl & Cobb, 2002), exposure to factors that prompt action and confidence in their ability to successfully perform an action influences peoples decisions and therefore the fact that the majority of the CHWs had inadequate knowledge on maternal health clearly indicates that they are also unable to coerce women to take up some important decisions on why skilled maternal health care is important.

#### **CHWs experience in demand creation for skilled maternal healthcare services:-**

The above findings also established that there were no schedules for facility visits and therefore each CHV decided individually on when to make a visit. Although 57.7% and 8.1% visited the health facility weekly and monthly respectively, the remaining 31.7% and 2.4% visited the health facility whenever necessary or quarterly respectively. The results on frequency of contact with the facility have revealed highly significant ( $p < 0.05$ ) positive relationship between frequency of facility visits and demand creation for skilled maternal health care services.

According to the above findings, it emerged that inadequate resource such as commodities is the greatest challenge faced by CHWs working with health providers at the link health facility. This was backed up by 82.1% of the CHWs respondents. Moreover, inadequate staff (79.7%) and negative staff attitude (77.2%) were also challenges faced by CHWs. Furthermore, lack of technical support was cited by 65.9% of the respondents while lack of recognition was cited by 63.4% of the CHWs. However, inadequate meetings was the least cited by 49.6% of the respondents. In addition, the results has established significant ( $p < 0.05$ ) positive relationship between the challenges faced by CHWs working with health providers at the link health facility and demand creation for skilled maternal health care services.

Although it is well stated in the community health services manual that CHWs should use referral notes, the findings of this study showed that there was no uniformity in ways in which CHWS do referrals for maternal health care services with only a small percentage using the recommended referral notes (10.6%) while the rest either accompanying the client (68.3%) or using verbal referral (87.8%). Moreover, there was a significant ( $p < 0.05$ ) positive relationship between the ways in which CHWS make referrals for maternal health care services and demand creation for skilled maternal health care services.

#### **Conclusion:-**

The findings of this study have shown very strong positive association between Knowledge, households covered (workload), CHWs practice and demand creation for skilled maternal healthcare services in Siaya County. In view of the above findings, strategies to increase demand creation for skilled maternal healthcare services are a priority for Siaya County. While initial basic training of CHWs on community health strategy may address the anticipated demand creation activities, over time the increasing scope of activities and tasks assigned to CHWs may lead to gaps in knowledge and incompetency in delivering specified tasks such as demand creation for skilled maternal



healthcare services. Therefore investment in ongoing training of CHWs in maternal health coupled with periodic mentorship and evidence based performance monitoring both at the health facility and the community would go along way in ensuring that CHWs have adequate knowledge and conform to set standards of practice while creating demand for skilled maternal healthcare services in Siaya County.

The evidence gathered by this study also suggests that individual work load has implication on performance and therefore reviewing the nature and workload of CHWs and instituting evidence based mechanisms for monitoring CHWs performance at household level would enhance their effectiveness in demand creation for skilled maternal healthcare services. The findings have implications on context specific evidence based programming for maternal health care in Siaya County and highlight the need for adopting multiple context specific interventions if utilization of skilled maternal healthcare services is to be optimized in Siaya County.

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**Ethical considerations:-**

Ethical clearance was obtained from Research Ethics Committee of University of Eastern Africa, Baraton, Eldoret (REC: UEAB /05/02/2015). The research assistants were trained on research ethics. Informed written consent from the study participants was obtained and the objective of the study was explained to them. Privacy and confidentiality of collected information was ensured at all levels.

**Consent to publish:-**

Consent to publish was obtained from Research Ethics Committee of University of Eastern Africa, Baraton, Eldoret (REC: UEAB /05/02/2015).

**Competing interests:-**

The authors declare that there are no competing interests.

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**Author Contributions:-**

OEO conceptualized the paper, searched literature, and wrote the manuscript draft. ASO contributed to the design of the study and provided advice regarding data interpretation. FAA helped develop the data analysis framework and also helped train field researchers for data collection. OEO and ASO analyzed the qualitative data. AK made critical revisions to the paper and provided advice regarding data interpretation. OSO participated in data collection and helped write the results and discussion sections. All authors read and approved the final manuscript.

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### RESEARCH ARTICLE

#### DNA Barcoding and Phylogenetic analysis of South Indian *Curcuma* species using chloroplast *matK* gene.

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#### Abstract

The interspecific relationship between twenty one different *Curcuma* species was studied using MaturaseK gene (*matK*). Various *Curcuma* species are widely exploited for its medicinal, ornamental and other purpose. Floral plasticity in vegetative characters and developmental portion of inflorescence is widely utilized in morphology based classification which leads to erroneous conclusions makes DNA barcoding an essential tool for deciphering the correct identify and polylogenetic relationship between the species. The sequence of *matK* gene of *Curcuma* sp with no barcode gaps were cloned, sequenced and submitted in the Genbank and used for the phylogenetic study. The intra and interspecific divergence between the species assessed by using K2P of MEGA 6.0. The sequence alignments were performed using Clustal W, transition/transversion rates were predicted and phylogenetic tree was constructed using MEGA 6. Phylogenetic tree was designed to identify the ideal regions of *Curcuma* species for defining inter and intra-species relationships. The phylogenetic analysis using MEGA 6.0 provided two groups with the second group having two subclades. The study revealed the potential of *matK* gene as a good candidate gene for phylogenetic analysis of the genus *Curcuma*.

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#### Introduction:-

The genus *Curcuma* L. (Zingiberaceae) comprises of 120 species, widely used is spices, medicines, dyes and as ornamental plants (Skornickova et al., 2007). It is distributed in Asia, Australia and South Pacific (Larsen, et al., 1998; Wu and Larsen, 2000; Ye, et al., 2008; Chen and Xia, 2010). Twenty species and one variety have been reported from South India (Sabu 2006). The taxonomic identification of the genus is difficult and displays certain systematic problems due to morphological variation at the intraspecific level. The flowering season of *Curcuma* species is short and the floral morphology has higher similarity among the species, but differs in colors and inflorescence positions (Bakhuizen van den Brink, Jr 1968; Burt, 1972). Phenotypic plasticity of the species can lead to wrong taxonomic treatment and identification of individuals. According to Kress et al., (2002), nuclear and plastid (ITS & *matK*) genes can be used for phylogenetic analysis of *Curcuma* (Zingiberaceae) species.

The constructed phylogenetic trees can be used to study the evolutionary history of living organism and also provide the evidence of climatic and geological history of the earth. A phylogenetic tree displays the relationship of taxonomic groups in a hierarchical order (Futuyma, 2005). Molecular phylogenetic methods are mainly used in the perspectives of biological systematics, and are used for a wide variety of application, such as community ecology

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(Webb et al., 2002) proteomics, as well as inference of protein–protein interactions (Pazos and Valencia, 2001). Zheng and Xia (2010) used two sequences of ITS and *matK* to study the phylogenetic evolution of the tribe Zingiberaceae. Phylogenetic relationships between *Curcuma* species was studied using the cytological data (Chen et al., 1984) and RAPD fingerprinting (Xiao et al., 2000, Rajeshkumar et al., 2016). Ngambriabsakul et al., (2004) observed that *Curcuma* is a paraphyletic genus in which infrageneric relationships are more complicated.

For the identification of species variation DNA barcodes are being utilized (Hebert et al., 2003). They are small size DNA of the organelle or nuclear genome with high discriminatory power among the organisms. DNA barcodes have multifarious role in the identification of the plants having problematic taxonomic identity for biodiversity investigation, the identification of cryptic or polymorphic plant species, food adulterants and forensic sample etc .

The *matK* gene is one of the protein coding regions of plastid which is widely used to decipher the coding regions of DNA (Wolfe, 1991). This chloroplast gene is 1500 bp long, located within the intron of the *trnK* and codes for maturase like protein (Wolfe et al., 1992). This gene has high substitution rates within the same species and is a potential candidate to study plant systematics and evolution (Notredame, 2000). The polymorphism of chloroplast DNA regions comprising *trnK*, *matK* and intergenic *trnL-trnF* have been used to study the phylogenetic evolution of various plants species (Wolfe, 1987). Studies using *matK* gene are used to resolve intergeneric or interspecific relations among flowering plants, like Malpighiaceae (Cameron et al., 2001), Poaceae (Liang and Hilu, 1996), Cornaceae (Xiang et al., 1998), Nicotiana (Aoki and Ito 2000), Orchidaceae (Goldman et al., 2001; Salazar et al., 2003) and in many other angiosperms (Hiluet al., 2003).

This paper reports the elucidation phylogenetic relationships between 21 different species of *curcuma* by using the chloroplast *matK* gene sequence.

## Materials and Method:-

### Collection of Samples:-

Twenty one different *Curcuma* species including one variety were collected from different regions of South India. These plants were maintained in Department of Botany, University of Calicut, and the leaf samples were used for DNA extraction.

### DNA Isolation and Purification:-

Genomic DNA was isolated from fresh *Curcuma* leaves using modified CTAB method (Doyle and Doyle, 1987). Extraction buffer contained 2 % (w/v) CTAB, 1M Tris–HCl (pH 8), .5M EDTA (pH 8) and 5 M NaCl. The samples were powdered in liquid N<sub>2</sub> and the powder was transferred to pre-heated (65° C) CTAB buffer. 2% (w/v) of PVP was added at the time of homogenization. Proteinase K (10 mg/ml) and 2 % (w/v) β-mercaptoethanol were added to the extract and mixed well. Samples were incubated at 60°C for 60 min with frequent mixing. The extract was centrifuged at 4°C for 12 min at 12,000 rpm and the supernatant was collected in a new Eppendorf tube. Added equal volume of chloroform: isoamyl alcohol (24:1) to the supernatant and centrifuged at 4°C for 12 min at 12,000 rpm. The supernatant was extracted twice with equal volume of phenol: chloroform: isoamyl alcohol (25:24:1), followed by extraction with chloroform: isoamyl alcohol (24:1), and centrifuged at 12,000 rpm 4°C for 12 min. The supernatant was transferred to a fresh Eppendorf tube and one by third volume of chilled isopropyl alcohol was added, and incubated for one hour at -80°C. The sample was centrifuged at 4°C for 12 min. at 12,000 rpm and the pellet was dissolved in TE. 10µl of RNase was added to dissolve DNA sample. Incubated at 40°C for 30 min and added equal volume of chloroform: isoamyl alcohol (24:1) mixed well and centrifuged at 4°C for 12,000 rpm. The upper layer was transferred to a fresh Eppendorf tube and added chilled isopropyl alcohol and mixed well. The samples were incubated at -80°C for one and half hours and centrifuged at 4° C for 12 min at 12,000 rpm to pellet the DNA. DNA pellet was washed with 70 % (v/v) chilled ethanol and air dried at room temperature and re-dissolved in 20 µl TE buffer. This purified DNA was stored at -80°C.

### Quantitative and qualitative assessment of DNA samples:-

Quality and quantity of DNA samples were assessed using a nanodrop spectrophotometer (Thermo, USA). The samples were run on 1 % (w/v) agarose gel and visualized to assess the DNA quality using a gel documentation system.

### PCR amplification:-

The PCR reactions were conducted in a final volume of 25 µl containing 10x Buffer 2.5µl, Taq DNA Polymerase (1µl), dNTP mix (10mmol), MgCl<sub>2</sub>(50mmol), Forward primer (88.4nmol), Reverse primer (72.4nmol), Template

DNA (0.5µl) and the volume was adjusted to 25 µl ddH<sub>2</sub>O. The amplification condition consisted of an initial denaturation at 94°C for 2 min, denaturation at 94°C for 15 sec, annealing gradient at 53 to 57°C for 30 sec, extension at 72°C for 1 min. and final extension at 72°C for 10 min. After amplification the PCR product was checked using electrophoresis on a 1% (w/v) agarose gel and the band was eluted and purified by Minigel purification kit (Takara, Japan). Sequencing was done from Scigenom Lab Pvt, Ltd (Cochin, Kerala), on a charge basis.

#### matK data analysis:-

The Twenty one DNA sequences of the all samples were minimally edited and manually aligned using BioEdit software. The analysis of DNA sequences was conducted by Neighbour-joining to assess topology with MEGA 6.0. All the regions containing gaps and missing data were eliminated. The species identification and homology between the sequences was identified using BLAST method. The phylogenetic tree was developed using Neighbour-joining (NJ) method which was tested with Kimura 2-parameter for evolutionary distances in MEGA6.0 and node support was assessed on 1000 bootstrap replicates.

#### Results:-

The annealing temperature 55.6°C was found to be ideal to develop a high intensity molecular size band for *matK*. PCR and sequencing success rate was very high for all the twenty one species in the *matK* region (99.0% of individuals, 100% species) with a PCR product size of 800 bp (Fig1). The coding region of *matK* obtained from the 21 species was sequenced and the sequence was submitted to the Genbank of NCBI and the accession numbers were provided by NCBI; KU934093, KU736742, KX170829, KX455852, KX455853, KX455854, KX455855, KX148521, KX418654, KX650813, KX650814, KX650815, KX650816, KX650817, KX650818, KX650819, KX650820, KX650811, KX650809, KX650810 and KX650812. The sequences were used to construct the phylogenetic tree, having twenty one informative sites and the overall mean distance of all sequences was 0.108. The transition/transversion range between the species was 1.27. Tajima's Neutrality Test was conducted for all twenty one sequences to compare the number of segregating sites per site with the nucleotide diversity (Tajima, 1989) (Table 1).

The phylogenetic tree comprised of two groups in NJ-analysis; **Group I** contained *Curcuma raktakanta* and *Curcuma aromatica* showed no variation as they were represented with a 100% bootstrap value (Fig2). **Group II** has two branches and two monoclade, branch I has two clade A & B and two monoclade *Curcuma kudagensis* and *curcuma neilgherrensis* which comes under clade A with 41% similarity and *curcuma mutabilis* and *Curcuma oligantha var. lutea* comes under the clade B showed similarity with 51% *Curcuma karnatakensis*, *Curcuma oligantha var. oligantha* and *Curcuma coriacea* exist as a monoclade. Branch II has two clade C and D, Clade C has one subclade and two monoclade *Curcuma haritha* and *Curcuma aeruginosa* comes under same clade and *Curcuma vamana* and *Curcuma zanthorrhiza* which existed as a monoclade. Clade D has three subclade D<sub>1</sub>, D<sub>2</sub> & D<sub>3</sub>, *Curcuma longa* and *curcuma pseudomontana* which comes under the same clade. Similarly *Curcuma amada* and *Curcuma decipiens* represent the same. *Curcuma Montana* and *Curcuma ecalcarata* which comes under subclade D<sub>1</sub> with 46% similarity. *Curcuma inodora* and *Curcuma bhatii* existed as a monoclade.

Maximum Composite Likelihood Estimate pattern of nucleotide substitution was obtained where each entry showed the probability of substitution (r) from one base (row) to another base (column) (Table 2). For simplicity, the sum of r values is made equal to 100. Rates of different transitional substitutions are shown in bold and those of transversional substitutions are shown in italics (Table 2). The nucleotide frequency was 32.16% (A), 39.91% (T/U), 15.47% (C), and 12.46% (G). The transition/transversion rate ratios was  $k_1 = 5.744$  (purines) and  $k_2 = 2.54$  (pyrimidines). The overall transition/transversion ratio was  $R = 1.566$ , where  $R = [A * G * k_1 + T * C * k_2] / [(A + G) * (T + C)]$ .

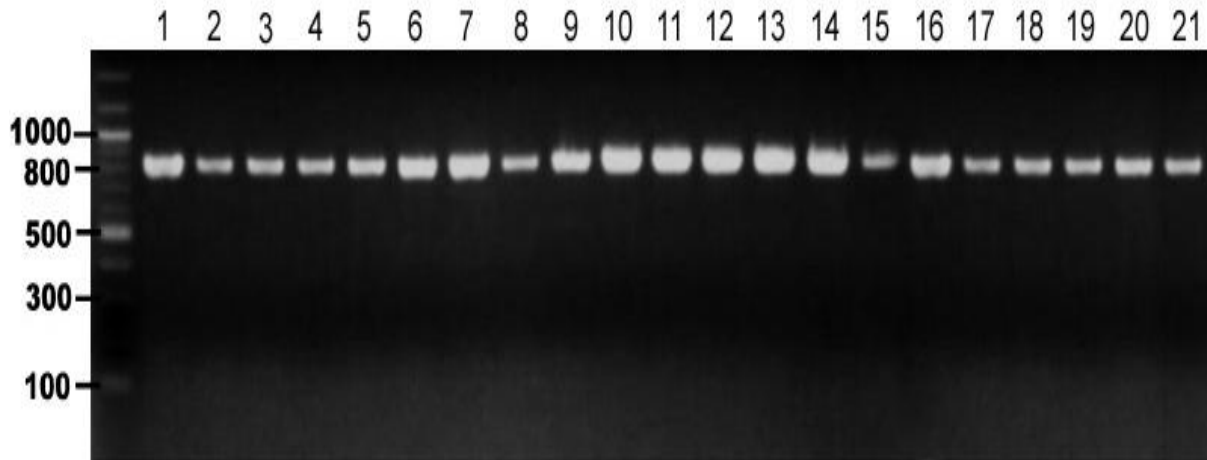
**Table 1:-** Results from Tajima's Neutrality Test

<i>m</i>	<i>S</i>	<i>p<sub>s</sub></i>	$\Theta$	$\pi$	<i>D</i>
21	362	0.44691	0.124221	0.071099	-1.767785

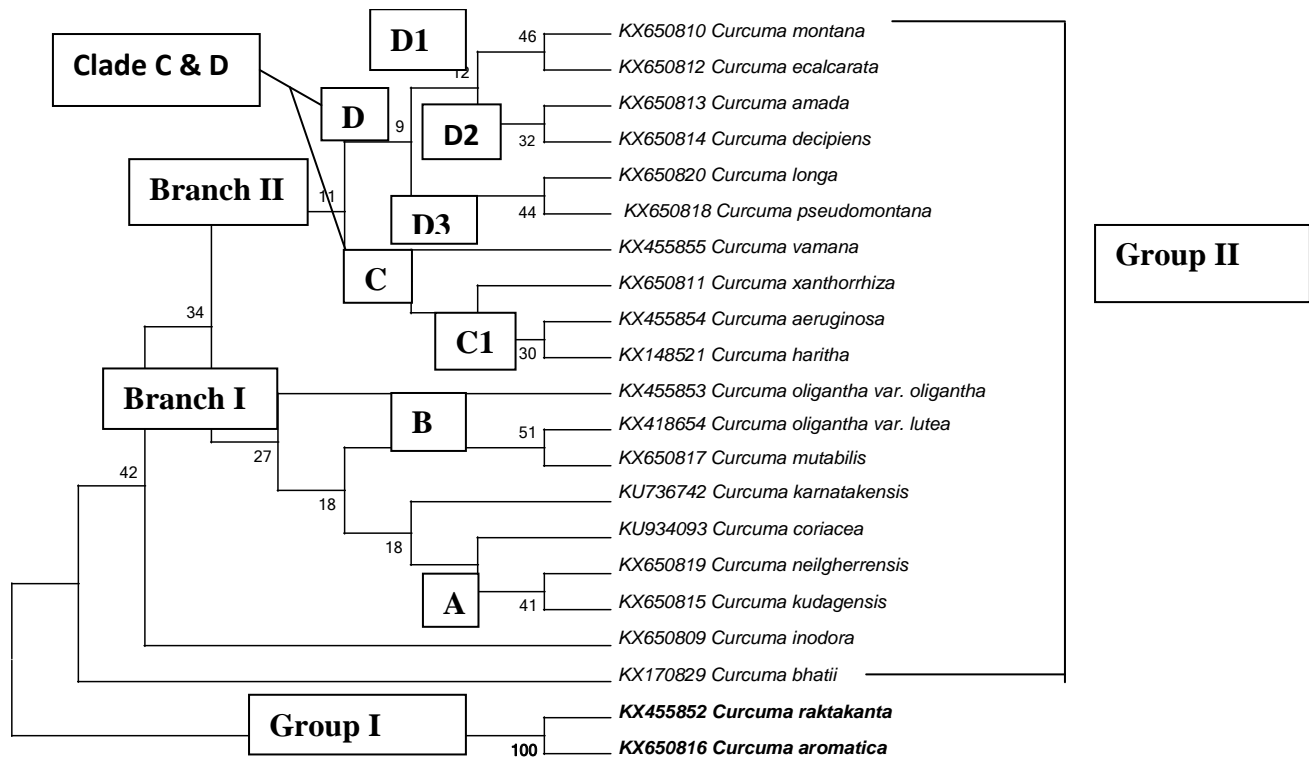
*m* = number of sequences, *n* = total number of sites, *S* = Number of segregating sites,  $p_s = S/n$ ,  $\Theta = p_s/a_1$ ,  $\pi$  = nucleotide diversity, and *D* is the Tajima test statistics

**Table 2.**Maximum Composite Likelihood Estimate of the Pattern of Nucleotide Substitution

	A	T	C	G
A	-	6.69	2.59	<b>11.99</b>
T	5.39	-	<b>6.58</b>	2.09
C	5.39	<b>16.98</b>	-	2.09
G	<b>30.94</b>	6.69	2.59	-



**Fig1.**Gel-electrophoresis of PCR product of *Curcuma* species shows a band of *matK* with 800bp.



**Fig 2:-** Phylogenetic tree showing Evolutionary relationship between 21 *Curcuma* species inferred using the Neighbour joining method

**Discussion:-**

Chloroplast *matK* gene is considered as one of the most rapidly evolving gene (Vijayan and Tsou, 2010).PCR and sequencing problems have been reported for *matK* gene (Sass, et al., 2007; Fazekas,et al., 2008; Ford,et al., 2009;



Hollingsworth et al., 2009). PCR and sequence amplification success rate are important criteria for developing a DNA barcode (Kress and Erickson, 2007; Ford, et al., 2009; Hollingsworth et al., 2009). However, in the present study the results showed PCR and sequencing success rate of *matK* as high as 99%. Transversions are considered illegitimate mutations in constructing phylogenies (Lake, 1987; Quicke, 1993). In recently diverged sequences the observed Transition/ transversion ratios were high. Transitions are higher than transversions for highly diverged sequences and low for less diverged sequences due to rate of higher transversions than transitions (Holmquist, 1983). Here, the observed low transition to transversion (Ts/Tv) ratio (1.27) indicates comparatively high proportion of transversions in the gene. The evolutionary rate of *matK* gene makes phylogenetically resolving intergeneric and interspecific relationships of many angiosperms (Johnson and Soltis, 1995; Soltis & Soltis, 1998). According to Savolainen et al., (2000a) the relationships revealed using *matK* data are more robust than those derived from combining *rbcL* and *atpB* sequences.

Earlier intrageneric classifications of *Curcuma* were based on morphological characters using the position of the inflorescence that are confusing for many species (Škorničková, 2007). Molecular phylogenetic studies showed that *Curcuma* is a paraphyletic genus (Kress, et al., 2002; Ngamriabsakul, et al., 2004; Závieská et al., 2012). Based on the morphological classification of the species *C. haritha* showed close relationship with *C. aromatica* and share a few characters with *C. raktakanta*, however *C. raktakanta* closely resembles *C. aeruginosa* in morphological character (Sabu, 2006). Based on the molecular character related phylogenetic analysis, *C. aromatica* and *C. raktakanta* are close to each other. The present study showed the paraphyletic origin of these two species is moderate with (100 %) bootstrap value; however *C. raktakanta* did not show any relationship with *C. aeruginosa*. On morphological character, close relationship was established between *C. karnatakensis* and *C. oligantha* (Amalraj et al., 1999) that is incongruent with our work where these two species are grouped with different clade based on *matK* sequence data. However based on *matK* sequence both were placed in different clades.

### Conclusion:-

The genus *Curcuma* of the family Zingiberaceae is complicated to differentiate using traditional morphological parameters because the morphological differences developed due to wide species hybridization. Then a Molecular marker based identification and phylogenetic analysis is required for these medicinal and economically important species. The current study suggests the effectiveness of *matK* gene sequences data to resolve phylogenetic relationship in the genus *Curcuma*. This study reveals the sequence variation, mean evolutionary rates, patterns and transition/transversion rate in nucleotide sequence, nucleotide diversity of *matK* gene can be used for the interpretation of evolutionary relationship within inter species level of genus *Curcuma*. The *matK* sequence successfully discriminated the closely related *Curcuma* species. So these sequences can be used as a DNA barcode for the genus *Curcuma*.

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### RESEARCH ARTICLE

#### COMPUTED TOMOGRAPHIC EVALUATION OF ANATOMICAL VARIANTS OF PARANASAL SINUSES IN SINUSITIS.

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#### *Abstract*

**Background and objectives:** The study was done to evaluate the role of computed tomography (CT) of Paranasal sinuses to determine the background prevalence of bony anatomical variations and mucosal abnormalities of paranasal sinuses in clinically suspected cases of sinusitis. The information provided by the preoperative CT Scan paranasal sinus (PNS) coronal view acts as a road map for the patients undergoing for functional endoscopic sinus surgery (FESS) to reduce the complications during surgeries and thus reducing morbidity and mortality of patients. The study was conducted on 60 cases attending CT section of Radiodiagnosis Department of Rajindra Hospital, Patiala.

**Materials And Methods:** The study was conducted on 60 cases over a period 3 years from 2010 to 2013 irrespective of gender and age group. Selection of patients were based on clinical features like nasal or post nasal discharge, nasal obstruction, headache, anosmia, cough and hoarseness of voice. Relevant history, clinical examination and non-contrast CT Scan of paranasal sinuses (PNS) was performed of every patient in Coronal view complemented by Axial view.

**Results:** It was observed that multi anatomical variations were more as compared to single anatomical variations. In our study deviated nasal septum was the most common finding seen in 46% of cases followed by concha bullosa, uncinata process variations, onodi cells, hallers cells and agger nasi cells.

**Conclusion:** Evaluation of CT Scan PNS concluded that deviated nasal septum and anatomical variations at lateral wall of nose causes narrowing of osteomeatal complex area which predisposes to sinusitis in the patients.

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**Introduction:-**

Acute rhinosinusitis is a clinical condition lasting less than 4 weeks, and subacute rhinosinusitis is present for more than 4 weeks but less than 12 weeks. Chronic sinusitis is a clinical diagnosis and is defined as a rhinosinusitis lasting >12 weeks that includes two or more major sinus symptoms or at least one major and two minor sinus symptoms with or without findings on physical examination[1]. Chronic rhinosinusitis is the most common disease for which ENT consultation is required. The characteristic findings of sinus disease include air–fluid levels, mucosal thickening, and opacification of the normally aerated sinus lumen. The single distinguishing feature of acute sinusitis is the air–fluid level as an isolated finding, whereas the only characteristic finding in chronic sinusitis is sclerotic, thickened bone of the sinus wall[2].

Drainage and ventilation of paranasal sinuses are important for the normal function which in turn depends on effective mucociliary clearance. Drainage of secretions in paranasal sinuses follows definite course. The frontal and maxillary sinuses communicate with middle meatus through prechambers. Mucosa of prechambers are closely opposed and clearance of it is through ciliary action. These narrow prechambers are blocked by mucosal inflammation which affects ciliary clearance. It establishes a vicious cycle of infection and stasis causing chronic sinusitis[1-3]. The key region for these changes is that part of the lateral nasal wall that encloses the sinus ostia and their adjacent mucosa and prechambers. There is considerable anatomical variation in this area that may interfere with normal nasal function and predispose to recurrent or chronic sinusitis[3].

The anatomical variation of osteomeatal complex causes obstruction to OMC Complex and prevent mucous drainage and predispose to chronic sinusitis. Obstruction of the osteomeatal complex causes a vicious cycle of events that leads to sinusitis. Its obstruction leads to mucosal congestion that decreases airflow. These anatomical variations may lead to OMC obstruction.

Surgical clearance of these chronically infected sinuses while maintaining their ventilation and drainage is the treatment of choice.

Imaging of PNS has progressed from the realm of conventional radiograph almost exclusively into realms of computed tomography and magnetic resonance imaging. Both these two technological advances in imaging modalities provide greater detail and about the anatomic extent of disease. Plain radiography has limited value for imaging paranasal sinuses, especially the ethmoid sinuses and the ostiomeatal complex and its use is not indicated [4-5].

CT is the technique of choice in the preoperative evaluation of the nose and paranasal sinuses and is the gold standard for delineation of inflammatory sinus disease resulting from obstruction [6].

The two primary diagnostic imaging techniques for evaluating the paranasal sinuses are CT and MRI. CT PNS plays an important role in the preoperative evaluation of patients considered for FESS called SSCT (Screening Sinus CT). It is now mandatory and medico-legal requirement to evaluate the PNS and nose before FESS. CT is superior to MRI for the delineation of the fine bone structures of the infundibular complex, orbital lamina, orbital floor, and cribriform lamina. Thus, CT is superior to MRI in planning FESS. With MRI, these bone structures have low signal intensity, making them difficult to completely assess [7-8].

**Material and Methods:-**

The present study was a hospital based prospective study conducted in Rajindra Hospital Patiala in patients who presented with clinical symptoms of chronic sinusitis. The study sample was limited to 60 patients and was done over a period of three years from 2010-2013. Institutional review board approval for conducting this study was obtained and informed consent of study patients was taken.

CT scan was performed with Siemens-Somatom Emotion 6 slice third generation spiral CT. Slices of 5 mm were taken in axial and coronal planes. Coronal scan was done with patient lying prone with chin hyperextended and gantry tilted to the approximate plane at right angle to the orbitomeatal line. Scanning was done from anterior wall of frontal sinus to posterior wall of sphenoid sinus. In all the patients FESS was done under local anaesthesia 2% lignocaine with 1:1,00,000 adrenaline was used for mucosal infiltration for anaesthesia and vasoconstriction. Patients were placed in supine position with head turned towards examiner. Endoscope was fixed just above the

nostril with thumb and forefinger of left hand while it was gently introduced with right hand, care was taken not to cause mucosal damage. Endoscope was introduced initially along the floor of nose till nasopharynx was seen and then withdrawn slowly to look for disease pathology. It was then removed and reintroduced below the middle turbinate to examine middle meatus and sphenoidal recess. When endoscope was in middle meatus, the uncinate process, bulla ethmoidalis, hiatus semilunaris, infundibular opening and maxillary sinus opening were inspected. The endoscope was passed posteriorly after viewing the middle meatus area to examine sphenoidal area. Depending upon disease appropriate endoscopic sinus surgery was done which could be uncinectomy, middle meatus antrostomy, anterior ethmoidectomy, posterior ethmoidectomy, sphenotomy, resection of middle turbinate.

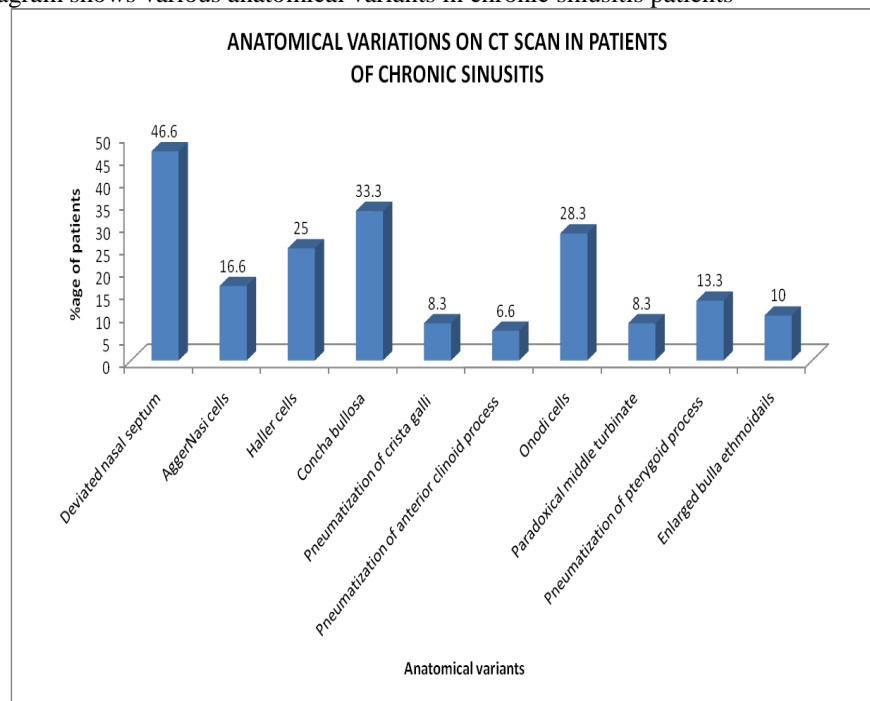
### Results:-

In present study, there were 35 males and 25 females in the study group. The disease frequency was found to be maximum in age group 21-30 years (31.66%). The common presenting symptoms were nasal obstruction in 70% cases and headache in 66.6%. On anterior rhinoscopy examination, deviated nasal septum (46.6%) was the most common sign followed by inferior turbinate hypertrophy (31.6%). Maxillary sinus was most frequently involved (80%).

**Table 1:-**Anatomical variations on CT scan in patients of chronic sinusitis.

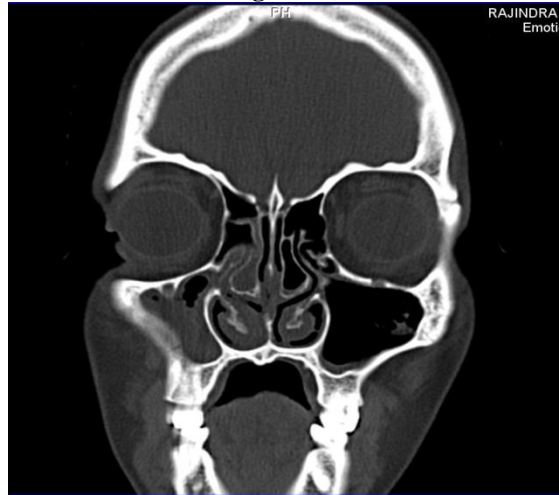
Anatomical Variants	No. of cases	%age
Deviated nasal septum	28	46.6
Concha bullosa	20	33.3
Uncinate process variations	18	30
Agger Nasi cells	10	16.6
Haller cells	15	25
Pneumatization of crista galli (PCG)	5	8.3
Pneumatization of anterior clinoid process (PAC)	4	6.6
Onodi cells	17	28.3
Paradoxical middle turbinate(PMT)	5	8.3
Pneumatization of pterygoid process (PTG)	8	13.3
Enlarged bulla ethmoidalis	6	10

**Table 2:-** Bar diagram shows various anatomical variants in chronic sinusitis patients



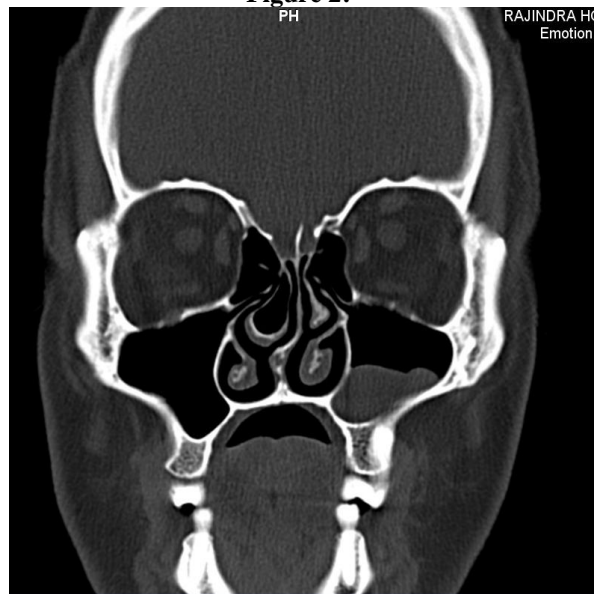
DNS, Concha bullosa, uncinate process variations, Haller cells and onodi cells were the common anatomic variants noted in 46.6%, 33.3%, 30%, 25% and 28.3% cases respectively. The other less common variants noted were Pneumatization of pterygoid process, Agger nasi cells, Pneumatization of anterior clinoid process, enlarged bulla ethmoidalis, Paradoxical middle turbinate and Pneumatization of crista galli.

**Figure 1:-**

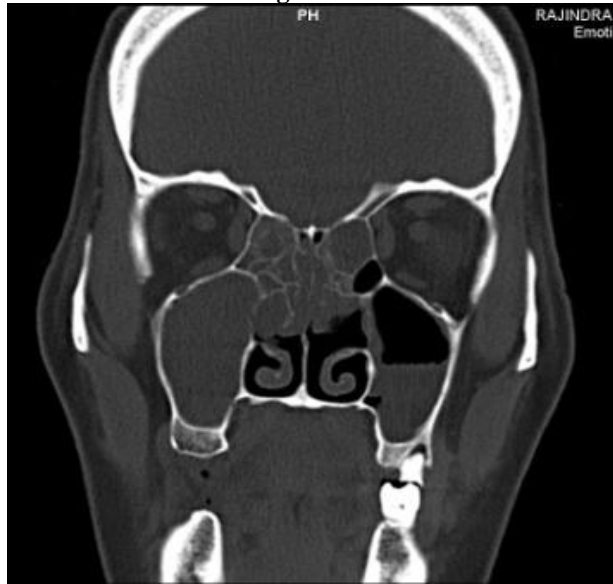


Coronal CT image shows bilateral concha bullosae with maxillary sinusitis

**Figure 2:-**



Coronal CT image shows right concha bullosa with S-shaped DNS and left maxillary sinusitis

**Figure 3:-**

Coronal CT image shows pansinusitis with left Haller cell.

### **Discussion:-**

The complex regional anatomy of the paranasal sinuses has only recently been elucidated through the use of modern imaging techniques. The advent of computerized tomography in the delineation of sinonasal pathology and anatomic variations has proven invaluable to the otolaryngologist in preoperative planning for functional endoscopic sinus surgery. Stammberger et al<sup>[9]</sup> proposed that stenosis of the osteomeatal complex, from either the anatomical configuration or hypertrophied mucosa, can cause obstruction and stagnation of secretions that may become infected or perpetuate infection.

### **Mucosal abnormality of sinuses on CT scan:-**

Mucosal abnormality percentage of various paranasal sinuses noted on CT scan in present study were compared with other studies. In the present study, maxillary sinus was most frequently involved in 80% cases followed by anterior ethmoid, posterior ethmoid, sphenoid & frontal sinuses respectively.

### **Patterns of sinonasal Disease:-**

Five recognizable patterns of inflammatory sinonasal disease were seen on CT in present study. In the present study OMU pattern was the most common pattern observed in 35% cases.

### **Anatomic variations in region to paranasal sinuses noted on CT scan:-**

Anatomic variations are important for that they may narrow normal drainage channels, thereby predispose to chronic recurrent sinusitis. They increase operative risk and surgeon should be forewarned about these. Different investigators report different prevalence rates. Though variations may be encountered in the normal population (without sinusitis) their prevalence rates are significantly higher in patients with chronic sinusitis. In our study we observed that DNS, Concha Bullosa,uncinate process, Haller cells, Onodi cells & Pneumatization of pterygoid process were the common anatomic variants in 46.6%, 33.3%,30%, 25%, 28.3%, 13.3% of patients.

### **Deviated nasal septum:-**

Nasal septum is fundamental in the development of the nose and paranasal sinuses. It is the epiphyseal platform for the development of the facial skeleton. 46.6% of the patients in our study presented with nasal septal deviation. Deviated nasal septum (Figure 2) causes a decrease in the critical area of the osteomeatal unit predisposing to obstruction and related complications. Similar finding were observed by Mamatha et al<sup>[10]</sup> (65%) And Dutra et al<sup>[11]</sup> (14.1%).



**Concha bullosa:-**

Concha bullosa (pneumatized middle turbinate) (Figure 1,2) has been implicated as a possible aetiological factor in the causation of recurrent chronic sinusitis. It is due to its negative influence on paranasal sinus ventilation and mucociliary clearance in the middle meatus region as quoted by Tonai et al<sup>[12]</sup>. The incidence of concha bullosa was 33% which is less as compared to the reported incidence of 53.6% by Bolger et al<sup>[15]</sup>, 42.6% by Maru et al<sup>[14]</sup>, 34.1% by Wanamaker et al<sup>[13]</sup>.

**Uncinate process variation:-**

Uncinate process may be curved or bent. Hypertrophied uncinate process causes narrowing of hiatus semilunaris and the ethmoid infundibulum. It has also been suggested as a predisposing factor for impaired ventilation of the inferior group of sinuses and frontal sinuses. In our study hypertrophy of uncinate process was seen in 30% of cases. Results were compared with study by Bolger et al<sup>[15]</sup> in which reported incidence was 2% and Asruddin et al<sup>[16]</sup> and 9.8% by Maru et al<sup>[14]</sup>.

**Agger nasi cells:-**

Agger nasi cells lie just anterior to the anterosuperior attachment of the middle turbinate and frontal recess. These can invade the lacrimal bone or the ascending process of maxilla. These cells were present in 16.6% of cases. The incidence is less as compared to 98.5% by Bolger et al<sup>[15]</sup>, 88.5% by Maru et al<sup>[14]</sup> and 96% by Wanamaker et al<sup>[13]</sup>. But Asruddin et al<sup>[16]</sup> reported an almost similar incidence of 48%.

**Haller cells:-**

Haller's cells (Figure 3) are ethmoid air cells that project beyond the limits of the ethmoid labyrinth into the maxillary sinus. They are considered as ethmoid cells that grow into the floor of orbit and may narrow the adjacent ostium of the maxillary sinus especially if they become infected. The incidence of Haller's cells in our study was 25%. Llyod et al<sup>[17]</sup> reported 15%, Tonai et al<sup>[12]</sup> reported 20%.

**Onodi cell:-**

Onodi cells are posterior ethmoid cells that extend posteriorly, laterally and sometimes superior to sphenoid sinus, lying medial to the optic nerve. The chances of injury of optic nerve are increased when the bony canal of the nerve is lying dehiscient. The surgeon must pay close attention to the occasional onodi cell in the preoperative evaluation to avoid potential complication of FESS. It was found in 3.5% of cases in our study. A similar incidence was found by Jones et al<sup>[18]</sup> in 8/200 patients.

**Paradoxical middle turbinate:-**

Stammberger et al<sup>[9]</sup> accepted paradoxical curvature of middle turbinate as an etiological factor for chronic rhinosinusitis because it may cause obliteration or alteration in nasal airflow dynamic. Incidence of paradoxical middle turbinate in our study was observed to be 8.3%. Incidence of paradoxical middle turbinate was <10% according to Yousem et al<sup>[19]</sup>, 27% by Bolger et al<sup>[15]</sup>, 15% according to Zinreich et al<sup>[20]</sup>, 12% according to Asruddin et al<sup>[16]</sup>.

**Pneumatization of crista galli, anterior clinoid process & pneumatization of pterygoid process:-**

In present study pneumatization of crista galli was seen in 8.3% cases and anterior clinoid process in 6.6% cases, pterygoid process pneumatization was seen in 13.3%. According to Bolger et al<sup>[15]</sup> any degree of pneumatization of the anterior clinoid process was considered significant and noted incidence of crista galli pneumatization in 83.7% cases of anterior clinoid process pneumatization in 13.3% and of pterygoid process in 43.6% of cases.

**Infundibular opacification and ipsilateral maxillary sinus disease:-**

In present study when infundibulum was opacified 94.4% of ipsilateral maxillary sinuses showed mucosal abnormality on CT scan, when infundibulum was normal, only 4.1% of the ipsilateral maxillary sinuses were abnormal. So, there was significant association between infundibular opacification and ipsilateral maxillary sinus disease. Our results are comparable to Bolger et al<sup>[15]</sup>, who found that when disease was present in infundibulum, 98% of cases had mucosal thickening of ipsilateral maxillary sinuses. When infundibulum was normal, ipsilateral maxillary sinuses were normal in 95.8% of cases.

**Conclusion:-**

CT may reveal an anatomic abnormality that predisposes to sinusitis, however, the treatment (medical or surgical) should be based on combined information extracted from clinical evaluation, CT and endoscopy findings. In present study, maxillary sinus was most commonly involved. DNS and Concha bullosa were the most common anatomic variants that lead to chronic sinusitis. CT is the imaging modality of choice to reveal mucosal changes deeper in osteomeatal complex which are not visible endoscopically and to identify extent of paranasal sinus disease.

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### RESEARCH ARTICLE

## ELEVATED SERUM URIC ACID LEVELS- A RISK FACTOR IN ACUTE NON-EMBOLIC ISCHEMIC STROKE.

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##### Key words:-

Serum uric acid levels, non-embolic stroke, risk factor

#### Abstract

Serum uric acid (SUA) levels were estimated in a total of 100 acute non-embolic ischemic stroke cases comprising of 50 males and 50 females having mean age of  $59.10 \pm 10.20$  and  $60.50 \pm 11.10$  years respectively. Mean SUA levels were found to be  $5.41 \pm 1.88$  in males and  $5.47 \pm 1.53$  mg/dL in females. Frequencies of additional risk factors in these patients like hypertension, Diabetes mellitus, smoking, age above 65 years, and coronary artery disease (CAD) were also determined. The cases were divided into those with SUA levels less than and more than 7mg/dL to relate with the risk factors. A statistically significant ( $p < 0.001$ ) relationship was demonstrated between CAD and age  $> 65$  years with increased SUA levels. It is concluded that elevated SUA levels (in the upper normal range) are an important risk factor for acute non-embolic ischemic stroke.

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#### Introduction:-

Stroke is defined as a rapid onset of focal neurological deficit, resulting from diseases of cerebral vasculature and its content. Stroke cases constitute nearly 20% of total neurological cases [1]. The mortality rate due to stroke in acute phase is as high as 20% [2]. Stroke is also an important cause of morbidity and long term disability [3]. Consequently early identification of individuals at high risk is likely to help in primary prevention strategies [4]. With this objective most of the epidemiological studies have been carried out to identify high risk factors that predispose to this debilitating condition. One such risk factor is hyperuricemia. Millions et al 2005 reported that the serum uric acid (SUA) levels are independent risk factor for acute non-embolic ischemic stroke [5]. The authors also suggested that treatments with hypouricemic action have a favourable effect on cardio-vascular event prevention. Hence the objective of the present study was to estimate SUA levels in cases with acute non-embolic ischemic stroke as a risk factor.

#### Materials and Methods:-

##### Selection of cases:

Patients with first ever in life time acute ischemic non-embolic stroke with computerized tomography scan (CT) evidence of infarction within 24 hours of onset of stroke were selected. These patients were admitted in the Princess Esra Hospital and research centre (Hyderabad).

The following categories of cases were excluded: i) Patients with previous history of Transient ischemic attack (TIA)/ Cerebrovascular accident, ii) those who are on thiazide diuretics, and iii) known cases of gout and patients with chronic renal failure. A total of 100 patients (50 males and 50 females) with acute stroke who met the selection

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criteria were included in the study. All subjects gave informed consent and the study protocol was approved by institutional ethical committee.

#### Collection of Blood samples and Biochemical analysis:-

Blood samples were collected within 24 hours of onset of stroke and biochemical tests were performed in a standard analyzer. The patients were further evaluated for the presence of additional risk factors using the following mentioned parameters: i) Hypertension: Known cases of hypertension having a systolic blood pressure of >140 mmHg and a diastolic of more than 90 mm Hg, ii) Known cases of diabetes mellitus with a fasting blood sugar of more than 126 mg/dL, and iii) Cases with a history of CAD, smoking and hyperlipidemia.

#### Results:-

Details of mean uric acid levels, and mean age of the patients are shown in Table 1. Out of a total of 100 acute non-embolic ischemic stroke cases 50 each were males and females. The mean age of male patients was  $59.10 \pm 10.20$  while that of females was  $60.50 \pm 11.10$  years. In both males and females the age range was 41 to 84 years. As for the mean serum uric acid levels are concerned, they were  $5.41 \pm 1.88$  and  $5.47 \pm 1.53$  mg/dL respectively in male and female cases respectively.

Mean serum uric acid levels in patients with and without additional risk factors are given in Table II. There was no significant difference between mean SUA levels in patients with and without hypertension. Similar observations were recorded for the risk factors hyperlipidemia and smoking. However, a significant ( $p < 0.001$ ) difference was recorded between the mean SUA levels in patients with and without diabetes mellitus and CAD.

Further analysis was carried out to see if a relationship exists between uric acid levels less than and more than 7mg/dL and the risk factors (Table-III). This analysis revealed that age more than 65 years and CAD have statistically significant ( $p < 0.01$ ) relationship with uric acid levels.

#### Discussion:-

Stroke is defined as rapid onset of focal neurological deficit, resulting from disease of cerebral vasculature and its content. Stroke cases constitute about 20% of total neurological cases in hospital admissions (6). Long term disability due to stroke is an important cause of morbidity and warrants further studies on identifying risk factor so that proper preventive measures can be suggested.

SUA is a major anti-oxidant and about 2/3<sup>rd</sup> of total plasma free radical scavenging activity is by SUA and hence thought to have a protective role in stroke. Ironically it has been shown that under certain circumstances like reduced levels of other antioxidants like ascorbic acid, SUA can function as a pro-oxidant [7]. Further evidence for a role of uric acid in the pathogenesis of stroke comes from the observations that elevated SUA levels are an important predictor of hypertension in 25% of patients with recent onset untreated hypertension [8]. Moreover, decreased renal blood flow that generally accompanies the hypertension condition also causes increase in SUA levels. Experimental studies provided additional evidence for a role of increased SUA levels in the pathogenesis of stroke which demonstrated that experimentally induced hyperuricemia also increased blood pressure in rats by a renal mechanism linked to inhibition of nitric oxide (NO), activation of rennin-angiotensin system and development of renal arteriosclerosis [9] It is known that cerebral infarction initiates a series of metabolic events in the surrounding tissues and free radical mediated oxidative damage appears to play an important role in the pathogenesis of cerebral ischemia [10]. The role of SUA in predisposition to non-embolic stroke is further supported by a study carried out in Chinese cohort which demonstrated that SUA levels as an independent risk factor for all cause cardiovascular and ischemic stroke mortality. [10].

**Table I:** Mean uric acid levels and Mean ages in male and female stroke patients

Gender	No	Mean Uric acid levels (mg/dL)	Mean Age (in years)
Males	50	$5.41 \pm 1.88$	$59.1 \pm 10.20$
Females	50	$5.47 \pm 1.53$	$60.50 \pm 11.10$

\*Normal values 2-7mg/dL

**Table II:** Mean Uric acid levels in stroke patients with and without risk factors

Risk Factor		Number	Mean uric Acid mg/DL	P value
Hypertension	Present	65	5.64 ± 1.7	N.S
	Absent	35	5.06 ± 1.68	
Diabetes Mellitus	Present	51	5.98 ± 1.66	P<0.001
	Absent	49	4.88 ± 1.59	
CAD	Present	32	6.46 ± 1.87	P<0.001
	Absent	68	4.96 ± 1.40	
Hyperlipidemia	Present	34	5.75 ± 1.90	NS
	Absent	66	5.28 ± 1.59	
Smoking	Present	34	5.14 ± 1.8	NS
	Absent	16	5.96 1.98	

\*Only in male cases

**Table III:** Risk factors and uric acid levels <7/ or >7mg/dL in stroke patients

Risk Factor		<7mg/dL		>7mg		P value
		No	%	No	%	
Hypertension	Present	45	60	20	80	N.S
	Absent	30	40	5	20	
Diabetes Mellitus	Present	34	45.3	17	68	N.S
	Absent	41	54.7	8	32	
CAD	Present	15	20	17	68	0.001
	Absent	60	80	8	32	
Hyperlipidemia	Present	22	29.3	12	48	N.S
	Absent	53	70.7	13	52	
Alcoholism	Alcoholic	15	39.5	4	33.3	N.S
	Non-alcoholic	23	60.5	8	66.7	
Smoking	Present	27	71.1	7	58.3	N.S
	Absent	11	28.9	5	41.7	
	No risk factor	7	9.3	2	8	N.S
	Atleast one risk factor	8	90.7	23	13.7	
Age	>65 years	11	42.3	15	57.7	<0.01
	<65 years	64	86.5	10	13.7	

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### RESEARCH ARTICLE

#### PREVENTING DISABILITY AND MORTALITY RELATED TODIABETES IN THE PRIMARY CARE SETTING.

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##### Key words:-

Diabetes, Saudi Arabia, Prevention

#### Abstract

Diabetes mellitus is a leading cause of disability and death world-wide. However, many governments and public health planners remain largely unaware of the current prevalence of diabetes and prediabetes, the potential for a future rise in prevalence and the serious complications associated with this disease.

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#### Introduction:-

Diabetes mellitus is a leading cause of disability and death world-wide. However, many governments and public health planners remain largely unaware of the current prevalence of diabetes and prediabetes, the potential for a future rise in prevalence and the serious complications associated with this disease. knowledge of the prevalence of diabetes and prediabetes related to risk factors could raise awareness of the disease and lead to new policy managements. There is a now abundant evidence that type 2 diabetes, which counts for greater than 90% of diabetes world-wide, is preventable ,therefore, Primary Health Care (PHC) is taken into account to be a good strategy to boost accessibility and usage of services, address the social determinants of health inequities and improve health outcomes through the implementation of comprehensive interventions through sectoral and intersectoral collaboration, direction of people, community participation and social mobilization. This study was to the contribution extent of primary health care in preventing diabetes prevalence. Therefore, this article proposes a study that will relay on the descriptive and analytical approach, also will be viewing on the literature and previous studies related to the subject of study. Questionnaires will be conducted among Health workers (Doctors, Nurses and Pharmacists) in Saudi Arabia to collect data on the causes of diabetes Prevalence , and the factors that lead to diabetes prevalence, goal setting; focus on Investigating the contribution of primary health care in preventing diabetes prevalence and examine whether the relationship between primary health care and the spread of diabetes.

#### Methods:-

This study depends on the descriptive and analytical approach, also will be viewing on the literature and previous studies related to the subject of study. For examining the contribution of primary health care in preventing diabetes prevalence

For this purpose the researcher will distribute questionnaires for preliminary information for analysis. The study will be conducted among Health workers (Doctors, Nurses and Pharmacists) in al Alaha hospitalsSaudi Arabia.

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Questionnaires will be delivered to Doctors, Nurses and Pharmacists working in health sector to collect data on the causes of diabetes injury, and the factors that lead to diabetes prevalence. Statistical methods will be used by the statistical program for Social Sciences (SPSS) to handle the data obtained.

### **Results:-**

Diabetes is a chronic condition related to multiple late complications, reduced life, and a marked limitation within the quality of life. The malady, its complications and late-onset consequences cause a dramatic burden for health systems.

Primary Health Care (PHC) is taken into account to be a good strategy to boost accessibility and usage of services, address the social determinants of health inequities and improve health outcomes through the implementation of comprehensive interventions through sectoral and intersectoral collaboration, direction of people, community participation and social mobilisation.

This study was to the contribution extent of primary health care in preventing diabetes prevalence.

### **Discussion:-**

Stellefson et al (2013) created a study that looked at the Chronic Care Model and Diabetes Management in US Primary Care Settings: A Systematic Review, The Chronic Care Model (CCM) uses a systematic approach to restructuring medical care to create partnerships between health systems and communities. The objective of this study was to describe how researchers have applied CCM in US primary care settings to provide care for people who have diabetes and to describe outcomes of CCM implementation. To achieve the goal of the study, the researchers conducted a literature review by using the Cochrane database of systematic reviews, CINAHL, and Health Source: Nursing/Academic Edition and the following search terms: "chronic care model" (and) "diabet\*.", also included articles published between January 1999 and October 2011. We summarized details on CCM application and health outcomes for 16 studies, The 16 studies included various study designs, including 9 randomized controlled trials, and settings, including academic-affiliated primary care practices and private practices. Results of the study showed that CCM approaches have been effective in managing diabetes in US primary care settings. Organizational leaders in health care systems initiated system-level reorganizations that improved the coordination of diabetes care. Disease registries and electronic medical records were used to establish patient-centered goals, monitor patient progress, and identify lapses in care. Primary care physicians (PCPs) were trained to deliver evidence-based care, and PCP office-based diabetes self-management education improved patient outcomes. Only 7 studies described strategies for addressing community resources and policies. The researchers recommended that future research about integration of CCM into primary care settings for diabetes management should measure diabetes process indicators, such as self-efficacy for disease management and clinical decision making.

Additionally, Green et al (2012) also created a study about "Primary prevention of type 2 diabetes: integrative public health and primary care opportunities, challenges and strategies", Type 2 diabetes imposes a large and growing burden on the public's health. This burden, combined with the growing evidence for primary prevention from randomized controlled trials of structured lifestyle programs leads to recommendations to include caloric reduction, increased physical activity and specific assistance to patients in problemsolving to achieve modest weight loss as well as pharmacotherapy. These recommendations demand exploration of new ways to implement such primary prevention strategies through more integrated community organization, medical practice and policy. The US experience with control of tobacco use and high blood pressure offers valuable lessons for policy, such as taxation on products, and for practice in a variety of settings, such as coordination of referrals for lifestyle supports. We acknowledge also some notable exceptions to their generalizability. This paper presents possible actions proposed by an expert panel, summarized in Table 1 as recommendations for immediate action, strategic action and research. The collaboration of primary care and public health systems will be required to make many of these recommendations a reality. This paper also provides information on the progress made in recent years by the Division of Diabetes Translation at the US Centers for Disease Control and Prevention (CDC) to implement or facilitate such integration of primary care and public health for primary prevention.

Furthermore, Harris(2008), titled "The role of primary health care in preventing the onset of chronic disease, with a particular focus on the lifestyle risk factors of obesity, tobacco and alcohol", the potential impact of primary health care in assessing and managing smoking, hazardous drinking, poor diet and physical inactivity has been



demonstrated among patients who are at higher risk. Effective interventions based around the 5As approach include the assessment of risk and readiness to change, brief motivational interventions and referral of suitable patients for more intensive interventions. Health checks have been demonstrated to improve the frequency of preventive care and support for behavior change. However their impact on health outcomes is uncertain. Expansion of the current complexity of different Medicare items is undesirable. Health checks should focus on specific evidence based preventive actions and involves the use standardized resources such as Life scripts and integrated health risk assessment tools. Other performance based incentives may be useful in targeting the needs of specific groups and encouraging primary health care to provide more outreach and culturally appropriate preventive care for disadvantaged groups. General practice referral of patients needing more intensive lifestyle interventions is infrequent due to a number of factors including cost and availability of providers and services and the integration between these services and primary health care. A major role of primary health care organisations is to coordinate and broker a network of referral services to support behavior change based on standards and quality assurance. Other key roles of primary care include the support of practices to monitor and improve their performance in providing preventive care. Structural reform of primary health care may provide opportunities for more integrated approaches to management of the lifestyle risk factors across private and public and national and state funded services.

### Conclusion:-

Diabetes: is a serious, chronic disease that occurs either when the pancreas does not produce enough insulin (a hormone that regulates blood glucose), or when the body cannot effectively use the insulin it produces.

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**RESEARCH ARTICLE**

**LEGAL ASPECT OF ENVIRONMENTAL HEALTH ON SANITATION HYGIENE OF REFILL  
 DRINKING WATER DEPOT.**

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**Abstract**

The lack of quality guarantee of drinking water produced then the community should be protected from the risk of water-borne diseases due to consumption of drinking water comes from refill drinking water depot that does not meet quality standards and sanitation hygiene requirements. The study aimed to how the legal provisions governing the sanitation hygiene of refill drinking water depot and how requirements and control of the use of refill drinking water depot in the perspective of environmental health laws. To achieve the objectives then author using a normative research method. The result of study about the development of refill drinking water depot has the potential to cause negative impacts on public health, if the lack of effective regulation. Every effort of drinking water depot must through acceptance tests because if not met the acceptance it will cause uncertainty of license of refill drinking water depot. The lack of water quality appears as caused by the low quality of controlling and it indicates by the amount of refill drinking water depot that does not meet health requirements. It becomes a factor for people who consume the water to be careful. The Decree of Health Ministry No. 43 of 2014 on sanitation hygiene of refill drinking water depot in standardization is less clear in determining refill drinking water depot as their existence. This is a problem and a shared responsibility between manufacturers of drinking water, consumers and government. To ensures the feasibility and safety of refill drinking water depot.

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**Introduction:-**

In everyday life, water as a component that closest to human and become a basic need for quality and sustainability of human life, therefore it should be available in sufficient quantity and quality. This is not independent with the need of drinking water for humans. The fulfillment of drinking water for communities today is very varied. There are people who get drinking water from source water, river water, and groundwater either by using shallow and deep wells or in piping water that produced by the Local Company of Drinking Water, which is cooked before consumed. And also includes through drinking water depots. Drinking water depot is a business that process raw water into drinking water in bulk and sell directly to consumers.

Sanitation hygiene is a health effort to reduce or to eliminate factors that become the cause of contamination of drinking water and the means used for processing, storage, and distribution of drinking water at drinking water depots. The purpose of hygiene sanitation is the protection of communities from bad influence due to the consumption of drinking water comes from drinking water depots.<sup>1</sup>

Thus, the community will be protected from the exposure to risk of water-borne. The activities of industrial, domestic and other in drinking water depot impacted negatively to water resources, including water quality degradation. This condition can cause interference damage and danger for living organisms that depend on the water. It should be in accordance with Government Regulation No. 66 of 2014 on environmental health in article 13:

“The requirements of water health for hygiene and sanitation at least consist of: (a) the water in a protected state from sources of pollution, disease-carrying animals, and vector breeding; and (b) safe from possible contamination.”

The decree of Health Minister No. 43 of 2014 in article 17:

“Every owner of a drinking water depot must supervise or control the fulfillment of the requirements.”

The problem of water quality degradation arises due to the low quality of supervision is the amount of refill drinking water depots that do not meet health requirements. It found empirical facts in North Sumatra, the killing of people related to the poisoning after consuming a refill drinking water suspected to be contaminated by *Escherichia coli*. And *Coliform Coli*, it indicates contamination of feces (human). While, *Coliform* indicates unhygienic handling of the drinking water production process. Throughout in 2014, cases of diarrhea were found in the province of North Sumatra as many 215.651 cases, with the highest number is found in Medan city. Based on data obtained from the Health Office of North Sumatra Province, the prevalence of diarrhea in Medan throughout in 2015 as many as 29.769 cases.<sup>2</sup>

The development of refill drinking water depot potentially causes negative impact for public health, if the lack of effective regulation. Unclear license owned by refill drinking water depot is also a concern for users to be careful. Its standard is less clear to determine the refill drinking water as the existence is not in accordance with the Regulation of the Health Minister No. 907/ Menkes/SK/VII/2002 on requirement and supervision of drinking water quality.<sup>3</sup> Depot that fulfill requirement have a guarantee letter of raw water supply from the Drinking Water Company or the company has a license to get water from the competent authority.<sup>4</sup>

The company is also required to have a test result report of drinking water from water quality analysis laboratories that appointed by district or city governments. Not all refill depots have such requirements. Even some person use water from the water replenishment as a raw material. Depot is not according to the rules outlined by the Health Minister. Because they do not brush gallon when washed. Drinking water depot is usually just simply rinse gallon and do not turn on the Ultra Violet (UV) light for sterilization. Moreover, depot looked slovenly and did not pay attention to sanitation.<sup>5</sup>

Issue raised today is the lack of guarantee of quality to resulting drinking water. The peoples need to be protected from the risk of water-borne diseases due to consumption of drinking water that comes from drinking water depot does not fulfill the quality standards of hygiene sanitation and requirements.<sup>6</sup>

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<sup>1</sup>Muhammad Navis Mirza.(2014).Hygiene sanitasi dan jumlah coliform air minum *Jurnal kesehatan masyarakat*. 9 (2): 167 -173

<sup>2</sup>Yudha Manggala P Putra.(2014).BBPOM Manado Find Air Refills Contain *E.coli*.See:<http://www.republika.co.id/berita/nasional/daerah/14/11/13/neyph5-bbpom-manado-temukan-air-isi-ulang-mengandung-ecoli>.

<sup>3</sup>Meithyra Melviana Simatupang, surya dharma, evi naria.(2014).Hubungan Sanitasi Jamban Dan Air Bersih Dengan Kejadian Diare Pada Balita Di Kelurahan Terjun Kecamatan Medan Marelan Kota Medan. *Jurnal kesehatan Lingkungan dan keselamatan* , 3 (3).31-36

<sup>4</sup>Perisai D. Rumondor, Jhon Porota'o,Olivia Waworuntu.(2014) Identifikasi Bakteri Pada Depot Air Minum Isi Ulang Di Kota Manado.*Jurnal Ebiomedik*,2(2):41-50

<sup>5</sup>*ibid*

<sup>6</sup>FikriFaqih.2016.Cheating depot refillwater.available.from,<http://www.merdeka.com/khasmaincurang-depot-air-isi-ulang-bisnis-depotair-isi-ulang-2.html>.

In relation it, this paper aimed to how the legal provision of sanitation hygiene of drinking water depot, and how the requirements and control of the use of drinking water depot in the perspective of environmental health laws.

### **Method:-**

The method of study was library-research as a process to find the rule of law, principles of law, and legal doctrines in order to address the legal issues faced. This is consistent with the prescriptive character of jurisprudence at this writing. It can be seen that the prescriptive character of jurisprudence is a normative research that trying to assess what should be on every issue.<sup>7</sup> Then, as analysis materials includes primary legal materials which are materials that are authoritative in the form of legislation. With a statute approach is done by examining all laws and regulations pertaining to the legal issues that are being addressed.

### **Discussion and Analysis:-**

Drinking water depot and then refers to a business that process raw water into drinking water in bulk and sell directly to consumers.<sup>8</sup> This can be carried out continuously using a fixed gallon. Hygiene and sanitation are inseparable things because it is very closely related. The principles of hygiene and sanitation for both food and drinks is about knowledge, attitudes, and human behavior in obey the principles of health, hygiene, and safety in the handling of food products and beverages.

According to the authors based on the principle of State's responsibility that the State guarantees the utilization of natural resources will benefit as much as possible for the welfare and quality of life of the people of both present and future generations, the State guarantees the rights of citizens on the environment is good and healthy. So, based on that the legislation related to the obligations of State and the government provides the publics' right to obtain monitoring the national drinking water quality in high health standard, by providing a healthy environment in the form of drinking water that meets the health requirements based on the results of monitoring the quality of drinking water, so that the community that consume drinking water free of health problems.<sup>9</sup>

### **Government Regulation No. 66 of 2014 concerning environmental health:-**

1. Article 39 paragraph 1 on Quality Standard of Environmental Health and health requirements set out in the medium of environment that includes: a. water;
2. Article 8, paragraph 1 the medium of environmental set out quality standards of Environmental Health and Health Requirements as referred to in paragraph (1) is an environmental media relating to or drinking water depot impacted directly to public health.
3. Article 9 on Quality Standards of Environmental Health and Health Requirements for water referred to in Article 8 paragraph 1 letter (a) consist of: a. Quality standards and health requirements for drinking water; b. Quality standards and health requirements of water for hygiene and sanitation;
4. Article 11 on health requirements of drinking water as referred to in Article 9 letter a at least consist of: a. Water in a protected state; and b. Processing, storage, and the serving must meet the principles of hygiene and sanitation.

The regulation of Health Minister No. 416/Permenkes/IX/1990 on the requirements and water quality control by issuing the regulation of Health Minister No. 736/Permenkes/VI/2010, then the regulation of Health Minister No. 416/Permenkes/IX/1990 along concerns drinking water, this regulation does not apply again. But to the requirement and controlling of clean water is still apply. Similarly, the regulation of Health Minister No. 492/Permenkes/IV/2010 on the requirements of Drinking Water Quality.

All drinking water facilities should be fulfilling the requirements as set out in this regulation. Furthermore, the regulation of Health Minister No. 736/Permenkes/VI/2010 on Procedures for Drinking Water Quality Monitoring. This regulation becomes main reference in conducting surveillance of drinking water quality. The regulation of

<sup>7</sup>Peter Mahmud Marzuki. 2011, *Penelitian Hukum*, cetakan ke-11, Jakarta: Kencana. Page.35

<sup>8</sup> Regulation of Health Minister No. 43 year 2014 article 1 point 1 concerning sanitation hygiene of drinking water depot

<sup>9</sup>Ridho Adiputra Tambunan. (2014). Peran PDAM Dalam Pengelolaan Bahan Air Baku. Air Minum Di Kota Yogyakarta *Jurnal Ilmiah Hukum Pertanahan Dan Lingkungan Hidup*. See: <https://ejournal.uajy.ac.id/5020/.../Jurnal%20ridho%20adiputra%20tambunan>.

health of drinking water depot as the Regulation of Health Minister of the Republic of Indonesia No. 736/Permenkes/IV/2010 concerning the requirements of physical, chemical, biological and radioactive to refill drinking water products that must be obeyed.

Supervisory activities were conducted on the quality of refill drinking water by the Health Office both municipal/district. For the examination of bacteriological quality, the raw water is checked at least one sample of three months once, as well as bottled water in at least two samples of at least once a month. Drinking water supply and sanitation are still experiencing difficulties, resulting in access to drinking water and sanitation is still weak.<sup>10</sup>

Based on the Regulation of Government No. 122 of 2015 on the development of Water Supply System in common explanation among others argued that:

“The development of water supply system is the responsibility of the government and the local government was organized in the framework of people welfare by ensuring the basic needs of community in drinking water that meets quality, quantity and continuity.”

That to realize the implementation of a supplying means optimally the people have access to drinking water and good sanitation requires cooperation in coordination, synergy and integration between government, public, and private or corporate, so that in its period all people both urban and rural areas can access drinking water that meets the requirements through the development of water supply system. The purpose of environmental quality improvement is the percentage in monitoring of drinking water facilities were carried out by 50% in line with efforts to achieve access to drinking water and sanitation, the percentage in monitoring of drinking water quality is an integral part in the achievement of universal access to drinking water.<sup>11</sup> Referring to the Regulation of Government No. 122 of 2015, stated that:

“Drinking water that produced from water supply system used by the public.”

Consumers must qualify based on the regulation of minister that implementation to be carried out through Drinking Water Quality Monitoring. This is an effort to provide guarantee to the public to use water from the water supply system whose quality meets health standards so that safe from disease or other health disorders. Supplying of safe drinking water includes the supply of water through piping network.<sup>12</sup>

Development of Drinking Water Supply System and Control of Drinking Water Quality requires coordination, integration, synchronization for implementation so that the people get the services such as access to drinking water optimally.<sup>13</sup>

The Regulation of Health Minister No. 416/Permenkes/IX/1990 concerning the requirements and water quality monitoring, its activity includes field monitoring and water sampling, water sample testing, analysis of test results, formulation of suggestions and ways of solving the problem and result monitoring and follow-up.

The Regulation of Health Minister No. 736/Permenkes/VI/2010 mandates the drinking water depots must conduct internal and external supervision. The process of Drinking Water Quality Monitoring must follow the regulation. In relation to the drinking water depot in which its existence is not yet clear in terms of licensing and registered, the main steps that need to be taken is to manage drinking water depot database with an inventory of existing drinking water depot, which has been monitoring the quality of drinking water both internally and externally.<sup>14</sup> In terms of trade in drinking water depot based on the decree of industry and trade minister No. 651/MPP/K/10/2004, drinking water depots must have an operating license, drinking water depots are prohibited from taking raw water source coming from the Local Water Company and should come from mountain springs that are free from contamination.

<sup>10</sup> Ronny, Dedi Mahyudin Syam. (2016) Studi Kondisi Sanitasi Dengan Kualitas Bakteriologis Depot Air Minum Isi Ulang di Kecamatan Panakkukang Kota Makassar. *Journal. Uinalauddin* ,2.(2).

<sup>11</sup> Effendi, H. 2003. *Telaah Kualitas Air Bagi Pengelolaan Sumber Daya dan Lingkungan Perairan*. Kanisius. Yogyakarta. Page 55

<sup>12</sup> Suripin. 2002. *Pelestarian Sumberdaya Tanah dan Air*. ANDI. Yogyakarta. Page.32

<sup>13</sup> Effendi, H. *Op.cit*. page.56

<sup>14</sup> See detail review in each supervision objects in the Regulation of Health Minister No. 43 of 2014 concerning sanitation hygiene of drinking water depot.

Safe and healthy guarantees to consume drinking water depot based on laboratory testing by the National Agency of Medicine and Food, the steps that need to be done on drinking water depot addressed to related parties includes:

1. Before drinking water depot allowed to produce and sells produced drinking water, should the treatment system of drinking water must obtain certification from an agency that has the competence.<sup>15</sup>
2. At least once every six months are required to refill drinking water depot to check their products to laboratories that have been accredited and report the results to relevant agencies.

As the regulation of Health Minister No.736 of 2010 concerning the procedure of drinking water quality, mandates that as a target of external monitoring and retrieval as well as sample tests for physical and bacteria should be performed on drinking water depot.

#### **Acceptance Test of Sanitation Hygiene:-**

Acceptance test of sanitation hygiene is an assessment of the efforts of drinking water depot to control the factors of food or drinks, people, places and its equipment that may lead to illness or health disturbance or not, as well as the technical provisions of health are assigned to drinking water products, personnel, and its equipment that include requirements of biological, chemical and physical.<sup>16</sup>

Acceptance test of sanitation hygiene is conducted by the Municipal Health Office/district to drinking water depots are located in each region. Based on the regulation of Health Ministry No. 43 of 2014 concerning sanitation hygiene of drinking water depot.<sup>17</sup> To test the acceptance or not a sanitation hygiene is characterized by the Certificate of Sanitation Hygiene which is written evidence issued by the Health Office both district/municipal or the Port Health Office stating that drinking water depots have met quality standards or requirements of drinking water quality and requirements of Sanitation Hygiene. Drinking water depot is said to be accepted when the value obtained from the assessment of acceptance test at least 70% of sanitary hygiene including laboratory results qualified.

In conduct a business of refill drinking water depot, there are several requirements that must be met by businesses, includes about business license and locations of refill drinking water depot.

- a. Refill drinking water depot shall have:<sup>18</sup>
- b. Industrial business license or registration certificate of industrial and trading license;

<sup>15</sup> Article 19 (1) in order to improve the knowledge and skills of sanitation hygiene the owners and workers of drinking water depot must attend training/courses about sanitation hygiene. (2) Training/courses about Sanitation Hygiene referred to in paragraph (1) may be organized by the Ministry of Health, Provincial Health Office, District/Municipal Health Office, port health office or another agency/institution in accordance with laws and regulations. (3) Participant of training/courses that have passed can be given a certificate signed by the Head of Health Office both district/municipal or the Head of Port Health Office and the organizer of the training/courses. Sanitation hygiene is continuously; (4) the material of training/courses refers to the curriculum and training modules are issued by the Ministry of Health.

<sup>16</sup>Ender Budi Sasangko, Endang Widyastuti, Rawuh Edy Priyono.(2014).Kajian Kualitas Air Dan Penggunaan Sumur Gali Oleh Masyarakat Disekitar Sungai Kaliyasa Kabupaten Cilacap. *Jurnal Ilmu Lingkungan*.12(2):72-82.

<sup>17</sup>Article 2 (1) Each water depots must: a. ensure produced drinking water meet the standard quality or requirements of the quality of drinking water in accordance with laws and regulations; and b. meet the requirement of sanitation hygiene in the management of drinking water. (2) to ensure drinking water meets standards quality or requirements of drinking water quality as referred to in paragraph (1) letter *a*, water depots must follow the procedure of drinking water quality supervision in accordance the legislation.”

“Article 4 paragraph (1) each water depots must have a business license in accordance with laws and regulations. (2) to issue a business license of drinking water depots as referred to in paragraph (1), the local government both district/municipal should require the Certificate for Acceptance of Sanitation Hygiene.”

“Article 5 (1) The Certificate for Acceptance as referred to in Article 4 paragraph (2) was issued by the Head of Health Office both district/municipal. (2) Excepted from the provisions referred to in paragraph (1), the Certificate for Acceptance of sanitation hygiene for drinking water depots in the area of ports, airports, land cross post or issued by the Head of Port Health Office”

“Article 6 the Certificate for Acceptance of sanitation hygiene is valid for 1 (one) business place of Drinking Water Depot”

<sup>18</sup>.Decisionsof industry and trade minister. No.. 651/MPP /K/10/2004, drinking water depots must have an operating permit

1. License to get water or guarantee letter for raw water supply or other companies that have license to get water from the relevant authorities.
  2. Test result certification for drinking water products produced from the laboratory which has been accredited or designated by the minister.
- c. Refill drinking water depot should be in locations permitted by the local government both district and municipal.

Raw water is water that meets the requirements of water quality as stipulated in the decision of health minister No.416/Menkes/PER/IX/1990. As source of raw materials of refill drinking water depot, at least there are 3 (three) sources that come from mountain springs or tap water that ready to drink, ground water and tap water as clean water category.

Raw water used by refill drinking water depot must meet the standard quality of health minister. The attention of raw material source is substantially influences the tools that will be used for the production of drinking water sold in the drinking water depot. While the process of production of refill drinking water depot conducted themselves in the home industry with the production process using simple tools, such as the following:<sup>19</sup>

1. In principle, the treatment process of refill drinking water include raw water reservoirs, filtration, disinfection (ultraviolet light and ozone for sterilization) for heating and fill.
2. Refill drinking water depot must comply with the technical guidelines for good production.

### Conclusions:-

Legal Aspects of environmental health on sanitation and hygiene of drinking water depot in its implementation should be appropriate and referring to the Regulation of Government No. 122 of 2015 concerning Drinking Water Supplying System, the Regulation of Government No. 66 of 2014 concerning Environmental Health, Presidential Decree No. 185 of 2014 concerning the Accelerating of Drinking Water Supply and Sanitation the Regulation of Health Minister No. 43 of 2014 concerning sanitation hygiene of water depot.

The regulation of Health Minister of the Republic of Indonesia No.907/Menkes/SK/VII/2002, concerning the requirements and Water Quality Monitoring, Health Minister No. 492 of 2010 concerning the Requirements of Drinking Water Quality, the Regulation of Health Minister No. 736 of 2010 concerning the Procedures for Monitoring Drinking Water. Products of refill drinking water depot must have quality and healthy water qualities are clear, odorless, colorless and free from all kinds of harmful bacteria.

Each water depots must:<sup>20</sup>

- a. Ensure the produced drinking water meets the standard quality or requirements of drinking water quality in accordance with laws and regulations; and
- b. Meet the requirement of sanitation hygiene in the processing of drinking water.

As well as food safety in general, it is basically a question of the feasibility and safety of drinking water is a problem and a shared responsibility between producer of drinking water, consumers and government. In this case, drinking water producer should be able to control the process so that it generates decent drinking water and safe to drink. Consumers are entitled to obtain suitable drinking water and safe to drink and has right to refuse that does not comply with the requirements and raise objections. While, the task of government is to regulate and supervise in order circulating drinking water guarantee the feasibility and safety. The role of government (in this case the Ministry of Industry and Trade) for the supervision of deviations that occur, providing sanctions and brave issued a production ban for the creation of a quality refill drinking water depots and provide safety and comfort to its customers. The government is expected to play a role in terms of guidance and supervision of refill drinking water depots are proper safe for consumption.

<sup>19</sup> *Op.cit.* Muhammad Navis Mirza. 2014.

<sup>20</sup> Regulation of Health Minister No. 43 year 2014 article 2 point 1 concerning sanitation hygiene of drinking water depot

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### RESEARCH ARTICLE

## THE MODERNIZATION OF MOWING-MACHINES USING THE SEGMENTED SHARP EQUIPMENT MOVING RECTILINEARLY.

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#### Key words:-

Equipment, segment, trap.

### Abstract

The experimental sample of rectilinearly moving segmented mowing-machine of new construction and of minor power is represented, which can be used in small contour as well as medium type plots and mining terms for preparing food for neat horned cattle. Mowing-machine has 3-7 kvt power engine, sharp machine, new construction equipment of adherence set between engine and sharp equipment necessary for mowing work process, safe and economic manufacturing.

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### Introduction:-

Nowadays mowing-machines are equipped with basically segmented and rotationally sharp machines [3]. Segmented sharp machines work at comparatively low speed and have constructional complexity and relatively big weight and as for the mowing-machines having rotation sharp machines, they have big speed of working but as a result of practical research test in terms of mining field it was found out that they do not fully meet the requirements related to the harvesting without any loss but segmented machine which works on the principles of scissors through inter-action of segments dealt with the harvesting without any loss under the terms of mining field but with less productivity on the plot of one and the same area.

As you may know, considering the world practice experience the small and medium power mowing-machines are: manually mechanically transferrable, manually motorized, hanging or relocation wheeled mowing-machines. Among mechanic mowing-machines following are remarkable: Husqvarna 540 9649440-01 ([www.husqvarna.com](http://www.husqvarna.com)) manufactured in Switzerland, rill Razorcut Premium 33 manufactured in Germany (<http://www.reelmowerguide.com/brill-razorcut-premium-38-reel-lawnmower>) and other which are operated directly by operator with relocation without engine. The manual minor powered rotation mowing-machines are divided in mowing-machines which operate on electric as well as in-house combustion engines, and from them following electric mowing-machines are remarkable: MTD ET 700 41AC175G678 manufactured in Germany (<http://www.heise.de/preisvergleich/eu/mtd-et700-elektro-rasentrimmer>), Oleo-Mac TR92E 6002-9002 manufactured in Italy (<http://www.oleo-mac.co.uk>) and other, and in-house combustion working mowing-machines are: Stihl ES 38414000112377 manufactured in Germany (<http://www.stihl.de>), MTD 790 M AST manufactured in Mexico, Caiman VS 256W LUXE – manufactured in (<http://electromenagers.org/en/trimmer/2115-caiman-vs256w-tu26-luxe.html>) and other. From the wheeled relocation small powered mowing-machines following area remarkable: Swisher SST 22 625 NA –manufactured in Usa (<http://www.homedepot.com/p/Swisher-6-75-Gross-Torque-163cc-Gas-Walk-Behind-String-Trimmer-ST67522BS>), Triunfo – manufactured in Portugal

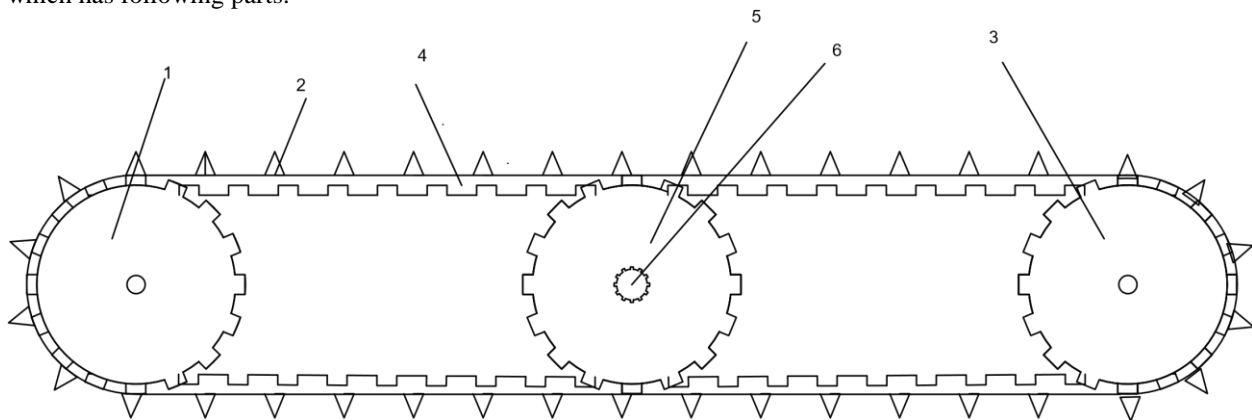
(<http://www.triunfo.com/>), Briggs and strattion –manufactured in France (<https://www.briggsandstratton.com>), Billy Coat BC2403JC –manufactured in USA and other.

As you may know the presented mowing-machines basically work on rotation sharp machines having high work speed but during the rotation manual mowing-machine test process several times were the herb cultures cut to their stems and in case of field food making the process of cutting clean at comparatively low level which caused certain difficulties while harvesting. But in case of using segmented mowing-machine НеваKH -1.1 which is manufactured in Russia (<http://machinspec.ru/kommunalnaya/kosilka/dlja-motobloka-neva.html>) comparing to rotation type this process is excluded but in case of work low work speed terms we received the low productivity of machine. The aim of our research is to process machine for cutting without support, being rectilinearly relocating segmented one of new construction, which will solve mentioned problem.

Aim and methods of research. The aim of the scientific work research is to process the construction of rectilinearly relocating segmented sharp machine on the base of minor powered energetic means in terms of field for the alternative of using the mentioned in preparing raw food, namely, the forms of segments of sharp machine are processed, the mechanism for transmission, machine construction and safety transmitting mechanism. The basic parameters of machine will be calculated and relevant methods of optimization of its construction will be determined.

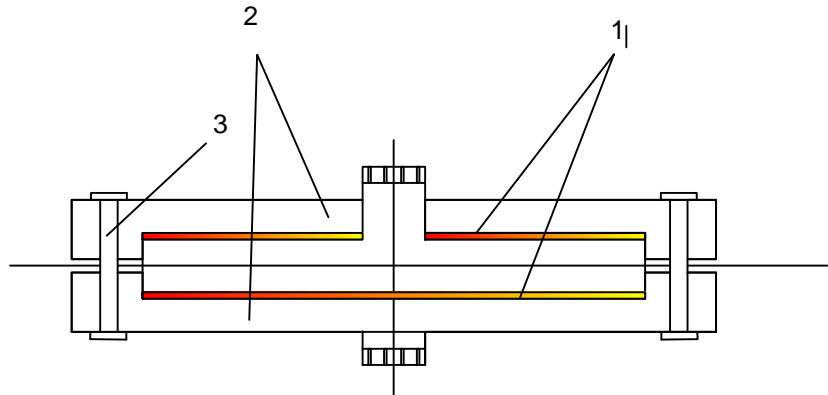
Review of research results. The stable food base of animal-breeding is the term for further development of important field of agriculture. In the process of working on the construction of sharp mechanism of mowing-machines we considered the basic events of agri-technique of mowing like: obtaining maximally good food, mowing down at the height of 4-4.5cm, the stem should be cut without extra parceling and tearing off, it should be well adjusted to relief and the grass mow should be set up in rows without touching motoblocks to wheels.

Considering the above mentioned gaps the rectilinearly relocating segmented sharp machine has been processed which has following parts:



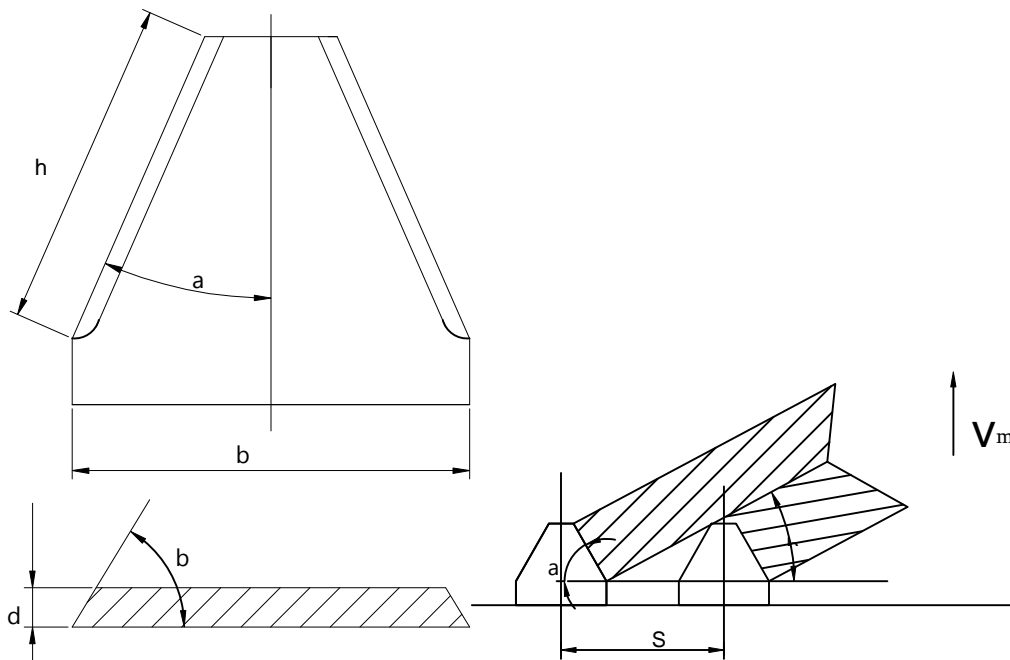
**Npic.** Rectilinearly relocating segmented sharp machine

Escalating stars 1, 3, sharp segments 2, toothed trap 4, driving star 5, driving tooth wheel 6. Sharp machine of mowing relocates through electric or in-hous combustion engine driving star, which moves toothed trap, on which there are triangular sharp segments and sharp segments relocating rectilinearly which accomplished the work process of mowing. For the purpose of safe work of trap the leading star of sharp machine drives from mechanism of adherence which has the ability to protect when touching solid bodies or big resistance. It comprises: clipping mechanisms 3, plural stocks 1 and overlapping 2 when sharp machine works exceedingly  $\sigma_p = 0,4 \times 10^8$  n/sq.m. resistance, overlapping 1 stops at sharp machine, and through plural stocks engine makes unoccupied relocation. After resistance is taken off machine gets back to the work process of mowing.



**Pic. 2.** Mechanism of adherence

Cutting the stem of herbs is determined by many factors which are directly related to the stem consistency and sizes and the basic requirement of technologic process is the secrecy of machine, energy volume, taking good and quick harvest. Meeting this criteria depends on the efficiency of sharp machine sharp segment which is determined by following factors:



**Pic. 3.** Basic parameters of sharp segment.

Cutting speed  $V$ , segment sharpening angle ( $\beta$ ), segment inclination angle ( $\alpha$ ), segment knife thickness ( $\delta$ ), segment thickness ( $\delta_0$ ) [Phillip c. Jonson, 2012].

The relative speed of sharp machine cutting edge is determined from the version [Trubilin E.I., Ablikov, 2008]

$$V_{relativ} \geq \sqrt{V_{cr}^2 - V_m^2}$$

Where  $V_{cr}$ -is the critical speed of edge,  $V_m$ - speed of machine relocation.

The distance between sharp segments is determined by following equation:

$$S = hctg\alpha + hctg\beta$$

Where  $\alpha$  is the segment inclination angle and  $\beta$  is the absolute speed vector inclination corner of cutting edge. The coefficient of using sharp edge is calculated under equation

$$K = \frac{V_m}{V_{relativ}} \left( \frac{S}{h} - ctg\alpha \right)$$

E

Experimentally it is found out that following forces act on the cutting segment (pic. 4): material resistance  $P_1$ , stem de-formation resistance force -  $P_2$ ,  $\varphi_2$ - friction force, friction resistance force on the edge at inclination  $\varphi_3$ -angle and normal - $P_3$ , and  $P_2$  is related to  $P_3$  in following way:

$$P_3 = P_2 \frac{\cos(\varphi_2 + \beta')}{\cos \varphi_3}$$

Where  $\beta'$  is the projection of sharpening angle

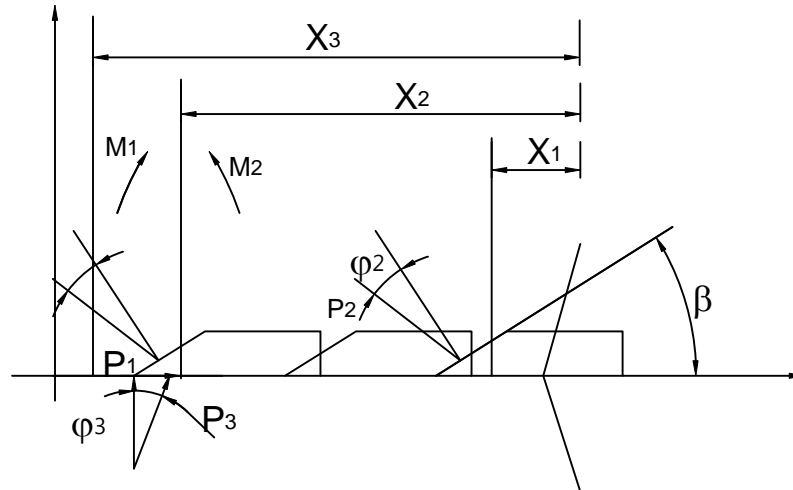


Fig. 4, forces acting on segment when relocating

The relocation of towards X axis divide in four stages  $X_1, X_2, X_3$  where relevantly the forces of cutting resistance are  $P_{X_1}, P_{X_2}, P_{X_3}$  [Makharoblidze R.M., Tedoradze O.M, 1995] where

$$P_{X_1} = \frac{E_1 Z_0}{E_1 + E_2} \left[ E_2 \frac{x}{x_y} + \frac{\eta V_x}{x_y} \left( \frac{E_2}{E_1 + E_2} - 1 \right) \left( \exp \left( -\frac{E_1 - E_2}{\eta V_x} x \right) - 1 \right) \right] dy$$

$$P_{X_2} = 0,2 + 0,2(\sin(\varphi_2 + \beta) + \cos(\varphi_2 + \beta) tg \varphi_3)$$

$$P_{X_3} = 0,2 + 0,4(\sin(\varphi_2 + \beta) + \cos(\varphi_2 + \beta) tg \varphi_3)$$

The stem consistency will be taken into consideration having following arguments :

$$E_1 = 9,98 \cdot 10^8 \text{ n/m}^2, E_2 = 6,40 \cdot 10^8 \text{ n/m}^2, \eta = 3,5 \cdot 10^6 \text{ n.sm/m}^2, n=0,3, \xi = 5,2, \sigma_p = 0,4 \cdot 10^8 \text{ n/m}^2, \varphi_{min} = 8,1^\circ, \varphi_{max} = 34^\circ. [2].$$

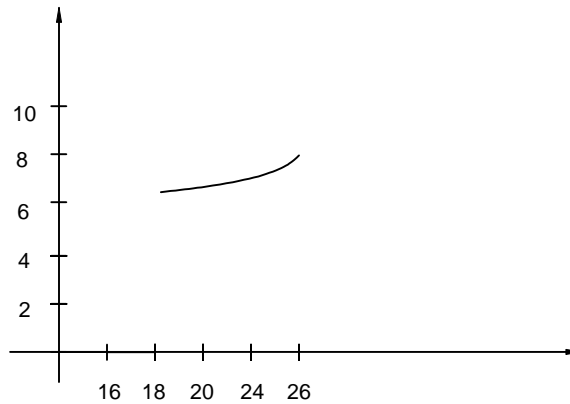
Based on the calculation we got :  $P_{X_1} = 1,8, P_{X_2} = 1,9, P_{X_3} = 3,8$ .

And the force of entire resistance is  $P_x = 7,5 \text{ n.m}^2$

And the segment relocation energy in case of edge speed  $V = 17, 19, 21, 23 \text{ m/sec}$  when  $\varphi = 9$  relevantly receive:

$$A_{cat} = \cos(\alpha - \varphi_1) P_x = \cos(27^\circ - 12^\circ) \cdot 7,5 = 6,7 \text{ j. } A_{cat} = 6,9 \text{ j. } A_{cat} = 7,1 \text{ j. } A_{cat} = 7,5 \text{ j.}$$

Let's draw the graph of speed and circle energy volume:



In cases of sharp segment  $\alpha=47^{\circ}$   $h=0,04\text{m}$   $V_{cr}=20\text{m/sec}$   $V_m=0,2\text{m/sec}$   $\beta=27^{\circ}$  you will get :

$$V_{relativ} \geq \sqrt{V_{cr}^2 - V_m^2} = \sqrt{20^2 - 0,2^2} = 19 \text{ m/sec}$$

And

$$S = 0,4(\text{tg } 47^{\circ} + \text{ctg } 27^{\circ}) = 0,1 \text{ m}$$

$$DdaK_{uss} = 0,8$$

D

### Conclusion:-

Presented cutting machine in comparison with the rotation machine is characterized with whole range of advantages, for example :

1. Such type of machine provides the constant speed, when the speed of circle in rotation machine is changeable according to the height of segment and location.
2. The inclination of such type machine's cutting edge in the period of whole phase of circle which has positive impact on the quality of circle.
3. The cutting edge of such machine is equally charged during the entire phase of circle which creates the conditions available for machine to operate.
4. The coefficient of using the sharp segment of cutting machine of such type reaches rate 1 which in rotation cutting machines is impossible.

On the basis of mentioned conclusions we may presume that new model of rectilinearly relocating segmented mowing-machine among minor and medium powered mowing-machines provides the process of taking harvest efficiently, with quality and no loss.

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**RESEARCH ARTICLE**

**RACE IN *THE BLUESTEYE* BY TONI MORRISON**

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**Abstract**

The *Bluest Eye*, a novel by Toni Morrison, uncovers the deplorability of excellence in the public arena. Living in Lorain, Ohio in 1939, a 11 year old African American young lady Pecola Breedlove longs for the 'bluest eye', which she connects with a superior life where grown-ups wouldn't take a gander at her with a withdrew look and youngsters wouldn't taunt her. Drinking milk from a Shirley Temple container and picking 'Mary Jane' confections for the traditionally wonderful young lady enriching the wrapper, Pecola demonstrates her yearning to one day have her family turn into the encapsulation of the "Dick and Jane" family. A long way from her optimal, Pecola's family battles to have any feeling of affection live in their home. Both Mr. what's more, Mrs. Breedlove physically mishandle each other, and later on, Pecola is sexually manhandled by her dad, the peak of the story. At the point when her dad is in prison for an alternate wrongdoing, her family is part up. She then goes to the MacTeers' more steady home where Pecola turns out to be practically similar to a sister to the MacTeer young ladies, Frieda and Claudia. In the long run, Pecola's implausible wish gets the best of her, and she goes crazy, trusting she has the bluest eyes. Since she doesn't have blue eyes (she was deceived by malevolence Elihue, or Soaphead Church), individuals are not ready to see them, so she closes they are quite recently jealous.

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**Introduction:**

The *Bluest Eye* is Toni Morrison's first novel, a book proclaimed for its fruitfulness of dialect and boldness of creative energy. African-American writing is created by the authors of African plummet living in the United States. It bargains chiefly with subjection, disparity, bigotry, sexism, classism, social conflict, and so forth. It takes after the old stories custom of narrating and incorporates oral structures like spirituals, sermons, gospel music, and so forth. Rigging up in the creator's girlhood main residence of Lorain, Ohio, it portrays the tale of dark, eleven-year-old Pecola Breedlove. Pecola appeals to God for her eyes to turn blue with the goal that she will be just as lovely and dearest as all the blondie, blue-peered toward children in America. In the harvest time of 1941, the year the marigolds in the Breedloves' greenery enclosure don't blossom. Pecola's life does change- in excruciating, decimating ways. The *Bluest Eye* stays one of Tony Morrisons' most intense, exceptional books and a critical work of American manufacture

The *Bluest Eye* is a harst warning about the old consciousness of black folks attempts to emulate the slave master. Piccolos request for more money and better house or even for more sensible parents; her request for blue eyes

something she never wins. Morrison does not have to recite the tale of three hundred years of black dominance by white culture for us to be mindful of this history of American Blacks, who have been victims in his calamity. The self-hatred that is at the core of Pecola's character affects, in one stage or another. Here we explore and analyze Toni Morrison's novels, in terms of the way to show the variability of Black feminism as characterized by the novelist who responds to the common sexist and racist context. Toni Morrison is a literary giant of the 1980s and 1990s and over all famous for being both a woman and an Afro-American. In her works, she has explored the experience and roles of black women in a racist in a male dominated society. In the center of her complex and multilayered narratives, there is the unique cultural inheritance of Afro-Americans. Her works also express the influence of Afro-American folklore, songs and women's gossip. In her endeavors to map these oral art forms into literary modes of theatrical performance, Morrison has created a body of work informed by a distinctly black sensibility while drawing a reading audience from across racial boundaries.

American Racism, ethnic American writers show their shared concern in their composition. The first body of ethnic writing to emerge. African American literature presents some of the most revealing investigations of racial discrimination. Early in the 19<sup>th</sup> century, slave narratives recount the dehumanizing effect of slavery. In probability, the period most famous African American text, *The Narrative of Frederick Douglass, an American Slave*, written by himself (1845). Frederick Douglass, born into slavery in Maryland details his own experience of slavery and articulates his dignity as a man. Refusing details his own experiences in slavery and articulates his dignity as a human being. Refusing to submit himself to his master, he declares, "You have seen how a man, was made a slave, you shall see how a slave was made a man." Although by a century later slavery is no longer present, racial discrimination still intrudes upon every aspect of the lives of African Americans and positions them as "Invisible Men". Ralph Waldo Ellison's *Invisible Man* (1952) portrays a quest for individuality within the organization of American racialism. Ellison's unnamed black narrator's search for self-definition begins with an indictment of racial favoritism. To invisible, understand, simply because people refuse to look me." Morrison also writes from a feminist perspective describes how racism defines standard of beauty that militate against blacks, women especially and leads to tragic outcomes. That black is not beautiful has been regulated by European standards of blond, blue-eyed stunner. In Morrison's novel the child Pecola's obsession with Shirley Temple and a desire to deliver "the bluest eyes" cause her to fall into madness. Her tragic story, Morrison illustrates another kind of soul-killing impact of American racism on African Americans. Founded on the same instance, John Okada's *No No Boy* (1957) here Neglect by the American dominant public and unwelcome in the Japanese American community for nearly two decades after publishing. The disfiguring effect of racial discrimination on the individual soul, the family, the Japanese American community, and other ethnic Americans prevails throughout the novel. This novel shows that blacks, Japanese, Chinese, Mexicans, Filipinos, and goes all strive for recognition as complete beings, namely as Americans, but so far few are able to cross the unseen walls constructed by racism. (Emanuel, 400-443)

The Black female body is the hottest thing. White men secretly revel in it, not only buying, trading, and wrapping it, but also assuaging the need and desire for mother's milk with it. Historically relegated to the auction block instead of the plinth, the black female body has been built at the ugly end of wearisome western dialectic; not frightened, but profane, not angelic but demonic, not fair lady but ugly dark. Only with her male counterpart, the black woman has belonged to one of those races "perceived as more animal like, and less godlike". One of the most potent and successful reappropriators of black representation is Toni Morrison,

In the *Bluest Eye*, this culturally mandated fracture is the impetus for what Pecola experiences as disintegration or self-erasure:

"Please God," she whispered to the palm of her hired man. "Please make me disappear." She pinched her eyes close. Little parts of her body faded away. Now slowly, now with a rush. Slowly begin again. Her fingers went, one by one; then her arms went out all the way to the elbow. Her feet now, Yes that was decent. Her legs were restless and tired all at once. It was the hardest above the second joints. She bore to be really still and pull. Her stomach would not exist. But finally it, likewise, died out. Then her chest, her neck. The facial expression was hard, too. Almost done, almost only her tight, tight eyes were set aside. They are always on the left.

The pain tightened eyes remain witness to the horror – a company in which the white female body gives more prominence than a black woman. Already "a minority in both caste and class. Piccolo can't even take pride in, the

main thing she can take her physical structure. For with few limited fonts, others affirm the undesirability of her life. Henceforth the reason Yacobowski did not see neither her body, nor the face, when Pecola had come to buy treats. At the point when Yacobowski had come to America, he adapted not to appear at the textual mode, nor the variety of dark masses. Morrison herself remarked in the thereafter to the novel, by the "Disguise of suspicions of unchanging inadequacy beginning with an outer expression. (Michiel, Vennessa, 195-200)

In *The Bluest Eye*, Pecola Breedlove is dealt with gravely both by the white people and dim cloned individuals. Indeed, her mom, Pauline Breedlove detests her for being dim, filthy, and dismaying. Her dad Cholly Breedlove is a drunkard. He misuses Pauline and Pecola physically, rationally, and inwardly. Pecola begrudges the white young ladies with blue eyes who are dealt with mercifully by the universe. She begs God to give blue eyes. She believes that the itinerary in which the world sees her will change on the off chance that she gets blue eyes like white young ladies. Towards the end of the novel, she gets blue eyes, yet at the expense of losing her brain. Frieda MacTeer, Claudia MacTeer, and Pecola Breedlove are all closely knit friends and all go to the same school. Piccolo goes to Frieda's home, and Frieda issues her bread rolls and milk. Pecola is not inspired by the milk, however the 'blue-and-white Shirley Temple mug'. She drinks three or some milk just to understand and grasp the Shirley Temple glass. Mrs. master reprimands Pecola in a roundabout way for drinking an excessive quantity of milk. Pecola and Frieda talk about how "adorable" Shirley Temple is. Claudia doesn't care for the discussion in light of the fact that she loathes Shirley. She doesn't begrudge her white skin and blue eyes. Yet she had feelings her for hitting the dance floor with Bojangles, who is her most loved uncle.

The entire Breedlov clan has their troubles as Morrison tells us. Cholly Breedlove deserves attention for the special way he channels his double consciousness. Unlike his daughter Pecola, Cholly seems to be largely unaware of the forces shaping him. We see several instances where Pecola longs to be free of the white ideologies oppressing her, but Cholly and the rest of the clan "took the ugliness in their hands...and went about the world with it". Morrison tells us at the outset that Cholly's particular way of giving way "about the world" is in a state of inebriety, and we can read his drunkenness on both the literal level and the degree of his awareness. Most interaction that Cholly has with other characters occurs when he is lifted up. The first time we meet Mr. Breedlove, he "had come home drunk". We quickly find out that Cholly's alcoholism "relieved the tiresomeness of poverty... gave them the stuff they need to get their lives tolerable". The numbing properties of Whiskey are metonymies drunkenness numbs Cholly's violent outburst as well as his awareness of his own dual-consciousness. Morrison arrives at his clear when she composes. "Nothing Nothing... interesting him now. Not himself, not other people. Only in the drink was there some break, some floodlight, and when the closed, there was oblivion".(Michele, 25,26)

Unlike the dark girls like Pecola, Claudia harts the black individuals' admiring and patronizing the white girls. Thus, she hates white young ladies and white dolls. At the point when black young girls appreciate and White Dolls with blue eyes and blonde hair, Claudia looks at the white doll's nose, blue eyeballs, and yellow hair to figure out 'what it is in them at all the world said is adorable'. Being unbiased and reasonable, she doesn't discover anything other than 'a mere metal roundness' in the white dolls. Claudia destroys white girls and ill-uses white young ladies. She needs to realize what makes individuals appreciate white young ladies and say "Awwwww" and overlook dark young ladies in the city. She unequivocally accepts that dim young ladies are as wonderful as white young ladies.

At the point when everyone had hatred and hate against Pecola for her darkness, Frieda and Claudia adore her and give her great fellowship and enthusiastic backing. Their white neighbor Rosemary Villanucci spies the young ladies and make incessant grumbings about them to their mom. Frieda and Claudia figure out how to reprimand or beat the white lady to take revenge. Claudia has a ton of sensitivity for the Breedloves who experience the ill effects of self-loathing and twofold consciousness. She illuminates that they live in a storefront not in the perspective of their dejection, yet since they feel that they are revolting. "Their dejection is standard and stultifying; it is not intriguing. Yet their unpleasantness is surprising." She needs to find where their revolting lies however couldn't find the source. She further says, "It begins from conviction, their conviction. It is generally as a all knowing master master had given everybody a cover of abnormality to wear, and they had each recognized it without request."

Whiteness as the quantity of beauty had become so entrenched in American club that many African Americans were negatively influenced by these measures of physical attractiveness based on skin color, which they could never reach. The community in the novel values light skin over dark skin, as typified by the "dream child" Maureen Peal. Morrison depicts the self-hatred that had become deeply rooted in many of the community members and reveals the way African-American women have been taught to hate or devalue their own bodies or physical properties. The



reference in the novel often takes this hatred out on their kids. Geraldine, ashamed of her blackness, calls Pecola a "nasty little black bitch," and Pecola's mother exhibits more love for the white daughter of her employer than for her own children. (Amy, 36)

Pecola Breedlove has an inner urge for people to love her as they tend to love white girls. She goes to the candy shop, seeing Pecola the business person looks at her furiously and this makes her beautiful. She feels seeing her darkness the business person hates him. "It has an edge; some place in the base top is the abhorrence. She has seen it prowling according to all white individuals. So. The dislike must be for her, her blackness." She buys Mary Janes confectionery and appreciates the excellence of the white young lady imprinted on the wrapper. She eats the confectionery as though she is eating her eyes. She needs to be as delightful as Mary Jane. Her enthusiasm for blue eyes and white skin is depicted indecently by the storyteller: "Three pennies had purchased her nine dazzling climaxes with Mary Jane. Beautiful Mary Jane, for whom a treat is named."

The Theme involving the ingestion of whiteness is too clear in Pecola's selection of candy from Yacobowski's store. She buys Mary Janes. Even the innocent act of buying candy becomes an opportunity for racial self-bitterness and self-deprecation. Something as presumably benign as a candy wrapper functions as a site of white cultural semiosis. Even as Pecolas is rejected and denigrated by the power embedded within Yacobowski's gaze, whose eyes, equally I have noted are blue, she seeks the power of Mary Jane's blue eyes through a procedure of "Symbolic Cannibalism." Blue eyes are menacing and still they also stand for safety and comfort. Blue eyes constitute a metonymy for white hegemony as this is expressed through White cultural aesthetic ideals. GunillaTheanderKester argues that "blue eyes" stand as a Pars pro toto, a Synecdoche for a clean little girl whom a racist culture would consider beautiful. Like the innocence of the milk, the slice of candy is believed to deliver power to bring about a true state of ontological change in Pecola, a change from Black to White from a state of "racialized somatophobia" to a state of clean somatic comfort and "normalcy"(George, 183-227)

At the point when dark young ladies are disfavored, lightly-cleaned rich young lady Maureen Peal is viewed as prevalent in the school. Frieda and Claudia despise her and attempt to discover errors in her. All the others in the school appear to regard her in her light-shaded skin. "At the point when Teachers approached her, they grinned encouragingly. Black young men didn't trip her in the lobbies; white young men didn't stone her, white young ladies didn't suck their teeth when she was allocated to be their work accomplices; dark young ladies moved to one side when she needed to utilize the sink as a part of the young ladies' can, and their eyes kneeled under sliding lids"

Maureen Peal saves Frieda, Claudia, and Pecola from the abuse of school boys who feel contempt and disgrace for their own particular darkness. Pecola is pulled in towards her while Frieda and Claudia get to be furious at her remark that they are dark - "Dark? Who you calling dark?" "You!" "You think you so adorable!" They attempt to hit Maureen and yell her epithet "Six finger-canine tooth-meringue-pie!" They abhor her for being light-cleaned, talking about obscurity to them, and discussing exposure to Pecola.

Geraldine's is a rich, slick dark lady who adores just her Cat for its 'cleanliness'. She educates her child Junior to play just with white children and not niggers. "She had disclosed to him the contrast between minorities, individuals and niggers. They were effectively identifiable. Minorities individuals were flawless and calm; niggers were messy and uproarious." According to her, she and her family fit in with the first gathering as they are rich and slick. Despite the fact that Junior needs to play 'Ruler of Mountains' with his dark companions and feel the soil while moving down on the dirt, he abstains from everything for the purpose of 'cleanliness'. At first he prefers Bay Boy and P. L. Gradually he persuades himself that Ralph Nisensky is beneficial for him and stays doing nothing. Junior needs to be a nigger, however, he is forced to carry on like a white kid. He yearns for genuine friendship from his mom and despises her feline. Getting baffled, he adds to the propensity for mishandling defenseless dark youngsters. He calls Pecolato his home and tosses his mom's feline on her. He appreciates a considerable measure by tormenting her. He giggles generously on seeing her getting alarmed and crying. At the point when his mom Geraldine goes into the house, he advises her that Pecola tries to murder her feline. She gets appallingly irate and yells, "You dreadful minimal dark bitch. Escape from my home." Pecola is profoundly insulted by the physical and verbal misuse in the rich dark family unit of Geraldine.

Frieda and Claudia go to see Pecola in the white family unit where Pauline Breedlove acts as a cleaning specialist. Pecola gets to be dismal while listening to a white kid calling her mom 'Polly', actually when Pecola calls her mom Mrs. Breedlove. Out of resentment or anxiety, she drops the silver dish with bubbling berry shoemaker on her feet.

As opposed to applying solution on her blaaze or supporting her, Pauline beats her and cautions her to leave the room quickly. She reveals her for making her "clean" room "filthy" with berry shoemaker. "Insane blockhead... my floor, a mess... look what you... work get on out now out insane... my floor, my floor... my floor." A little young white girl in the white family cries and Pauline persuades her by saying that she will make crisp berry shoemaker for her. She expresses "honey" words to the white kid in the wake of tossing words like 'spoiled bits of pieces of fruit's all alone dark kid and her dark companions. Pecola's mom, Pauline Breedlove herself is a casualty of twofold cognizance. Her feeling of excellence is broken by her twisted foot and a broken tooth. At the point when Cholly has intercourse with her, she feels youthful, really, solid, and capable. After marriage, they go to an inaccessible spot for work. She becomes frustrated with Cholly's darkness and conduct. She builds up the enthusiasm for purchasing unreasonable garments to look for consistent consideration from her neighbors. She loves white individuals actually when she recollects that her conveyance involvement in a hospital where a white specialist clarifies his youngsters that dark ladies 'convey immediately and with no torment... much the same as horses.'

She clarifies that it doesn't imply that dark ladies don't have torment as they don't 'hoop or holler' in agony as the white ladies. Being pulled in towards whiteness, she turns into a servant, dismisses her home, youngsters, and spouse, and discovers 'excellence, arrange, cleanliness, and applause' in her white expert's family. Pecola's dad Cholly Breedlove is a vagrant raised by Aunt Jimmy. He is constrained to have intercourse with his better half Darlene before two white men who come looking for their pooch amid chasing. He accepts that the white men are solid and outfitted, and his displeasure with them may crush him until the end of time. So he redirects his annoyance towards the dark young lady Darlene. Later he looks for honest nation cherish in Pauline. Pauline, who venerates magnificence and cleanliness cherishes Cholly as she feels lovely, solid, and effective in Cholly's vicinity. Gradually she loathes him for his unclean conduct. Being pulled in towards 'whiteness and cleanliness', she couldn't love the 'dim and messy' Cholly completely and turns into a housekeeper in a white family. Cholly turns into a boozier and torments Pauline and Pecola.

'Dirty Black' Cholly, father of Pecola rapes her, while the 'clean old man' Soaphead Church abuses young ladies who go to the congregation. Soaphead Church is a 'cinnamon-peered toward West Indian with gently seared skin' from a blended set of relatives. His unique name is Elihue Micah Whitcomb. He is a cynic, however he acts as a minister and pronounces himself as the 'Peruser, Adviser, and Interpreter of Dreams'. He despises 'tissue on substance'. He does not have the bravery to turn into a 'gay person'. He loathes "savagery" and 'homosexuality'. "His considerations slowly settled on those people whose bodies were minimum hostile kids... Since young men were offending, terrifying, and resolved, he further restricted his diversions to young ladies. They were generally reasonable and often enchanting." Seeing the activities young girls don't regret for, rather, he defends his activities by saying that the young girls appreciate the same. With young ladies it is all clean and great and neighborly."

The Bluest Eye depicts not only the wounds caused by inter- and interracial shamming but also the horrors of the father-daughter incest. But although "The Bluest Eye" depicts the shameful family secret of an incestuous rape, it also is caught up in a form of denial. Indeed, Morrison has described the rape as "almost irrelevant," insisting that she wants readers to "look at" Cholly and "see his love for his daughter and his powerlessness to help her pain." Cholly's "embrace, the rape," in Morrison's words, "is all the gift he has left. If Morrison, in writing the novel, found herself thinking the "unthinkable as she worked out the incest secret that lies buried at the heart of "The Bluest Eye", she also ran into difficulties as she felt the need to provoke the reader sympathy for Cholly, despite what he does to his daughter. By insisting that the "pieces of Cholly's life" can be rendered "coherent only in the head of a musician" who can connect together the various fragments of Cholly's life, the narrative invites the readers to focus on the connection between Cholly's fragmented trauma narrative and his rape of Pecola: that is, to understand Cholly's rape of Pecola, the reader must understand Cholly's traumatic sexual initiation as an adolescent. The fact that Morrison chose to tell the rape from Cholly's point of view and that Morrison's narrative, in part, endorses Cholly – for he is, in Morrison's own description, one of her "salt tasters," a "fearless" and "lawless" character suggests the hidden way in which the novel positions readers not only with the humiliated victim but also with the humiliator, the shamed, engaged father who projects his own shame onto his daughter and thus acts as an unwitting agent in the white society's humiliation of the vulnerable Pecola. Although Morrison wants to elicit reader sympathy for Cholly, she also invokes the pernicious – and shaming – racist image of the black man as rapist in this scene. And she risks shaming her readers as she breaks the taboo on looking and positions her readers as voyeurs of the incest scene.

**Race in Toni Morrison's Novel:**

Through her book, *The Bluest Eye*, Toni Morrison demonstrates a great sample, to the dark group and to the world, how social orders supremacist and false convictions on magnificence and self worth can do genuine damage if accepted and taken to heart. What more honorable case to demonstrate these repercussions than Pecola Breedlove, a detached and susceptible little girl who, lacking self regard and parental guidance, gets tied up with everything without a second thought and trusts herself to be one of the blackest ugliest young ladies of all time. Morrison utilizes Pecola and the theatrical roles as a part of Pecola's life to investigate the risks included in the dark group and all groups alike to get linked up with the thought that white, and just white had been splendid. These social measures created by the media and white people groups saw at the time were idiotic and one-sided, yet were genuinely widespread in America just about then. These social norms were unnecessarily harming individuals, and Morrison needed to demonstrate the agony that can emerge from getting tied up with those beliefs. Morrison tells that she got the innovative motivation for *The Bluest Eye* from a colleague she had in elementary school. The young lady longed for blue eyes, and Morrison saw that in longing for blue eyes, she was longing for an alternate character other than grim. She was bothered with who she was and it made Morrison consider excellence and how this new lady had come to feel sub-equation. She asked to dig into the internal workings of how somebody could come to accept that their race of individuals were not lovely, or just delightful on the off chance that they took after whites, on the reason that only whites were excellent. She needed to stick to reality, about beauty, our general public and our reality. She asked to draw down to the reasons why individuals could get linked up with a lie that they are not lovely in the effect that they are not clean. To come to the reasons why individuals would take a part in abusing themselves. The report is based on a young lady named Pecola Breedlove, who arises from a poor, grieved home. She and her family are pathetic and they seem to regard themselves as appalling. The story compasses the course of a year and is divided off into four seasons, Autumn, Winter, Spring, Summer. Pecola's Mother treats her own family ineffectively while being a phenomenal servant to a white family, and her dad, Cholly is a savage, furious inebriated. The larger portion of the Breedloves are viewed as dire and they have entirely grown to acknowledge themselves as out and out monstrous individuals. The overture to the story recounts how Pecola will be saturated.

Pecola goes to Soaphead Church with the wish of getting blue eyes. He guides her to kill a powerless, filthy puppy in his proprietor's home. Pecola runs with the fulfillment that God will allow her wish as she has done what the minister has requested that she do. In the interim, she is impregnated by Cholly. As opposed to sympathizing her, the entire neighborhood reviles her. "Can't resist the opportunity to be. Should be a law: two monstrous individuals bending over like that to make all the more appalling. Be in an ideal situation in the ground." Frieda and Claudia can not completely comprehend the circumstance. Anyway, they feel sorry for Pecola and petition God for her tyke. 'More firmly than her affection for Pecola', Claudia needs the child to survive "just to balance the widespread adoration for white infant dolls, Shirley Temples, and Maureen Peals". Amid her pregnancy, Pecola gets to be rationally shaky. She accepts that God has allowed her blue eyes through Soaphead Church. She continues conversing with her fanciful companion about her blue eyes. In view of her unlawful pregnancy, her mom and neighbors don't take a gander at her or converse with her. Yet she believes that they dodge her as they are envious of her blue eyes. She doubts whether her nonexistent companion is likewise envious of her blue eyes. *The Bluest Eye* presents a disturbing account of Cholly's rape of Pecola and then partially denies what he has described by insisting in the closure that Cholly loved Pecola even though his "touch was fatal" for the "love of free man is never safe." (Bouson, 39,42)

She asks whether her eyes are bluer than those of Joanna, Michelena, and other white women. In spite of Frieda and Claudia's prayer and sacrifice, Pecola's still-born child dies. Pauline Breedlove moves to the edge of the town. She keeps doing housework. The dirty, dark Cholly dies in the workhouse. Claudia remarks that Cholly adores Pecola a great deal. In any case his affection is lethal. "He, at any rate, was the person who adored her enough to touch her, conceal her, give something of himself to her. Yet his touch was deadly, and the something he issued her filled the grid of her distress with death." She includes that "Affection is never any better than the significant other."

*The Bluest Eye* begins with a black girl's entry into the procreative cycle; when Pecola first begins menstruating, Frieda reverentially informs her that she can now have a baby. Pecola's reproductive capacity, however, does not enable her to sustain the continuity of the natural cycle. We have already noted the disjunction between the movement of Pecola's story and the movement of natural cycle: Pecola begins menstruating in autumn, is raped in spring, and gives birth a stillborn baby in summer. Nowhere in the novel are black women celebrated as biological embodiments of the natural continuum; rather the reproductive function of the black woman character consistently goes awry, as with Pauline's rejection of her own daughter in favor of her mistress's daughter, Geraldine's transference

of maternal love from her son to her cat. Gubar says that Pecola is rejected by her mother and remains a victim as well as a symbol of the dying land. (Madhu, 43)

Evil individuals adore mischievously, rough individuals love roughly, frail individuals cherish pitifully, blockheads love moronically, yet the adoration for a liberated person is never protected." She says that the darling alone appreciates and the adored one endures. "The significant other alone has his endowment of adoration. The adored one is shorn, killed, solidified in the glare of the beau's internal eye." After all these episodes, Frieda and Claudia never see Pecola. They feel miserable that they wish and penance has turned into a waste and misgiving that 'its much, much, much past the point of no return'. Claudia mirrors that the minimal, dark, monstrous young lady has made the area look excellent.

Morrison's selection of the name "Breedlove" in "The Bluest Eye" is significant in various ways. Breedlove is the figure of the Madame C.J. Walker, the foremost African American millionaire, who had built her fortune inventing hair straighteners and skin Lighteners for blacks in the late nineteenth century. The Breedloves' acceptance of an outward evaluation of themselves breeds, in fact, a self hatred that manifests in diverse ways, from Pecola's desire for blue eyes, to Pauline's preference for the little white daughter of her employer, to Cholly's rape of his own daughter. There is yet, another sense in which Morrison's employs the name "Breedlove" as a signifies of the slave-breeding culture with its short-circuited desire and the desire for consensual sexual intimacy tat drives both Pauline and ChollyBreedlov. Pauline's desire appears at the conclusion of her first person stream-of-consciousness narrative in the cast of "musing, idle thoughts, sometimes full of old dreaminess":

His face is next to mine. The bed springs sounds like them crickets used to back home. He puts his fingers in mine, and we stretch our arms out wide like Jesus on the cross. I hold on tight....I know he wants to come first. But I can't. Not only he does. Not Until I feel him loving me, just me. Sinking into me. Not until I know that my flesh is all that be on his mind. That he couldn't stop if he had to. That he would die rather than take his thing out of me. Of me. Not until he has let go of all he has and gave it to me. To me.To me. When he does I feel powerless. I be strong I be pretty, I be young.

The erotic equation of sexual desire with the power to be desired reenacts the erotic circuit of the Song of songs. Rather than position women as an object of male desire, the woman here rewrites herself as the subject of her own narrative. Yet Pauline cannot bring this narrative moment into the cultural symbolic to the novel, and it si this failure that opens the space for Cholly Breedlove's rape of his own daughter Pecola. Indeed the novel begins with the realization of the transgression of the incest taboo, the original fall that drives desire in the novel.(Adrienne, Justine, 159)

"The greater part of our waste which we dumped on her and which she consumed. What's more, the majority of our magnificence, which was hers first and which she provided for us. Every one of us- -all who knew her- -felt so wholesome after we cleaned ourselves on her. We were so lovely when we stood on the back of her offensiveness. Her effortlessness adorned us, her blame purified us, her agony made us gleam with wellbeing, her cumbersomeness made us think we had a comical inclination. Her incoherence made us accept we were smooth. Her neediness kept us liberal. Indeed, her waking dreams we utilized -to quiet our own bad dreams. What's more, she let us, and in this manner merited our disdain." Claudia remarks that the entire neighborhood feels content and calmed on seeing the sufferings of Pecola. Twofold cognizance offends , contemplations, and conduct of the dark individuals. They create self-loathing and start to ache for whiteness. They love white individuals despite the fact that they are mishandled or offended by them. Pecola is loathed by white individuals, detested by her own mom, assaulted by her own dad, tormented by dark kids, and reviled by her dark neighborhood. She is left by Frieda and Claudia as well. The minimal dark young lady who is a casualty of twofold awareness needs to get blue eyes just to be dealt with merciful like the white young ladies. She is sold out by the white individuals, as well as by her dull cleaned folks and neighbors who themselves experience the ill effects of twofold awareness. Rationally unhinged, she lives alone with the fulfillment that she has got the blue eyes. "Nobody else will see her blue eyes. Anyway, she will. What's more, she will live cheerfully ever after."

Pecola's experience in Toni Morrison's *The Bluest Eye* exemplifies the multiple oppression of black women on the bases of gender, race and class. Charged with their slave heritage at the background, humiliated as members of a subjugated minority class and customized due to their race, black feminity causes Pecola's life to culminate in

obsessive self and race-hate. Raised up in a highly consumer-based capitalist society, Pecola becomes a victim of the Body Politics of the dominant Western Ideology, which has standardized the norms of feminine beauty in the gloomy-eyed slenderness of the white woman.; Regarding Blue-eyed beauty as the only norm of acceptability in American society, she is bewitched in a trap of eating disorder proceeding from several psychological and sexual frustrations. While her outcast-ness gains further psychological and familial forms with her victimization in her own father, ensuring in her pregnancy, her yearning for for blue eyes leads Pecola to be cooked by a child abuser spiritualist in still another sort of exploitation. Made to believe by him she is condemned to live out all alone in her home turned up outside the town as a physical mark of her outsidersness.(Yasmin, 469)

### **Conclusion:**

Toni Morrison is an amazing women's lobbyist figure in American Advanced Literature. Her capability lies in the photograph of dim society in America. Her female characters can be onlookers in supporting her work. Morrison shows her circumlocutory stun at having sexist and supremacist considerations in relationship with white social occasion. She focuses on a moral, social view as a bunch for the entire dull get-together; a get-together which needs societal sponsorship and imperativeness.

As the parts of race, social class, enslavement, and sex are therefore essential in Toni Morrison's books, social realists and faultfinders enthused about social issues examine her books from a few reasons for appraisal. Abusing the beforehand specified events in her fiction, Morrison has made perusers mindful of the catastrophes that African Americans face in their lifetime. Morrison has punctured into the brains of her cases, uncovering their considerations brilliantly. Her works can be an exceptional organization to impact the place of blacks and particularly diminish females from edge to center. Also, the imperativeness of Morrison's fiction falls on its vitality to consolidation issues of race, sexual introduction, sex, and social class meanwhile. The tip around her books is that paying little heed to the way that issues of predisposition and enslavement are focal, she has not expelled diverse subjects. That is, Morrison's books indicate general truths about the human condition and that is the reason her fiction is attracting both white and dull social gatherings of the giant unwashed.

In *The Bluest Eye* Morrison has shown the impacts of white culture on Dark individuals. In this novel Pecola is a photograph of out and out disintegrating as she faces both between inclination also, intra-predisposition. Other than she is kept from securing her mom's family relationship, is trapped by her father, and holds out a desperate rootless proximity. She is instigated that there is develop way out of each one of these matters – that is to have light blue eyes. Nevertheless, before the target she is left basically with an irreversible conclusion a hardship.

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### RESEARCH ARTICLE

#### CLASSROOM ACTION RESEARCH MANAGEMENT TRAINING MODEL FOR SENIOR HIGH SCHOOL TEACHERS AIDED BY E-MODULE.

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#### Abstract

This research is aimed at analyzing the factual model of classroom action research management training for Senior High School teachers which has been being used so far, and analyzing hypotactic model of classroom action research training aided by of E-Module for Senior High School teachers. Research and development were employed to pursue the early-mentioned problems. Meanwhile, the data collecting technique was done by interviews, documentation, observation, questionnaire, and test. Further, the result of the study showed that the final model of the classroom action research training aided by E-Module was highly effective. The expanded trial results showed that the training model of Classroom Action Research with help of E-Module was able to properly facilitate teachers to implement and compile Classroom Action Research reports independently and easily. Moreover, the E-Module of the Classroom Action Research helped teachers to understand the classroom action research. At last, the conclusion of this study shows that the Classroom Action Research training model aided E-module gives ease for teachers to conduct classroom action research since any participants can access the E-Module via the browser.

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#### Introduction:-

Classroom Action Research is one of ways which is beneficial for teachers to understand what happens to their class as well as possible solutions for it.

Asrori (2007:6) states that classroom action research is a reflective study which is done by doing particular treatments to improve the teaching and learning process in class to be better so that students could have good achievement in learning.

Hamdani (2011: 326), action research is essentially a scientific activity that is able to reflect learning activities in the classroom through scientific research that can be accounted to the procedures and requirements, which can be done without reducing teachers' attention in the classroom and student achievement. Furthermore, Agung (2012: 64) says that action research is a research conducted by educators, and also is a type of research that aims to give teachers

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opportunity to resolve the problems of teaching and non-teaching in the classroom carefully, systematically by using the existed rules.

**Gwynn Mettetal (2001:7) defines classroom action research as follows:-**

Classroom Action Research is a method of finding out what works best in your own classroom so that you can improve student learning. Meanwhile, Jean Mc Niff et al (2006:7) argues : Action research is a form of enquiry that enables practitioners everywhere to investigate and evaluate their work. They ask, 'What am I doing? What do I need to improve? How do I improve it? 'Their accounts of practice show how they are trying to improve their own learning, and influence the learning of others.

In fact, there are many teachers who have not implemented independently the classroom action research in order to improve the quality of learning and to the promotion of teachers. It was proven by the preliminary research which showed that teachers' competence in the understanding the classroom action research is still low. There are various possible causes for the low learning process conducted by the teacher. These possibilities include (1) lack of competence of teachers in the areas of classroom action research, (2) poor understanding of teachers to the benefits of classroom action research, (3) lack of competence of teachers in classroom action research, (4) there were only few products of Class Action Research produced by the teachers, (5) only few teachers promoted within the last 3 years.

In improving the quality of teaching and learning process at schools, it takes the ability of teachers to conduct classroom action research. Classroom action research is simple research that teachers do in analyzing the potential and weaknesses of the learning process. Ironically, the motivation of many high school teachers in Brebes to conduct classroom action research is still weak. This is due to ignorance of the teachers in conducting the research.

Since there are some lacks of classroom action research understanding, it is necessary to create any training model of classroom action research that can provide direct experience and real and not only emphasize the theoretical aspects, but also provide the opportunity for teachers to have applicative competence that will be able to produce competent and professional teachers. Therefore, it is necessary to develop a way of solving the problem by creating a training model of classroom action research aided by E-module, so the high school teachers' professionalism in Brebes can be improved and the promotion of teachers can be regularly implemented.

The problem in this research is how is the realization of the factual models of Class Action Research trainings that have been organized for high school teachers, how is the design of hypothetical model of classroom action research training aided by E-Module for high school teachers, how is the final models of classroom action research training using E-Module for high school teachers.

The purpose of this study is to analyze the factual models of classroom action research training for high school teachers that have been implemented over the years, analyzing the hypothetical model of classroom action research training aided by E-Module for high school teachers, analyzing the final model of classroom action research training aided by E-Module for high school teachers.

The Classroom Action Research Training aided by E-Module is done as part of efforts to facilitate teachers to improve the quality of learning and write proposals and classroom action research reports with hope that they can do it easily and independently. This training will provide convenience for teachers in preparing proposals and reports of classroom action research. The teachers will have the knowledge and skills in preparing proposals and reports of classroom action research. Moreover, the teachers will also have positive attitude (motivation) to implement innovation in teaching. Thus, the training of classroom action research aided by E-module is a training model that has high efficacy to facilitate the teachers effectively in preparing proposals and reports of classroom action research. This is in accordance with the opinion of Sharma (2013: 16) that the effectiveness of the training is the extent to which participants can learn and apply knowledge and skills acquired during the program. This is influenced by attitudes, interests, values and expectations of trainees and training environments. It is said to since the advantages of online learning resources as learning media have been demonstrated convincingly by several studies.

For the purposes of the implementation of learning, the government through relevant educational institutions has provided teachers with classroom action research training to improve the quality of learning. The training is learning



that is set to improve the current working performance. Meanwhile, training, according to the concept of state administrative agencies, gives more emphasis on the process of improving the ability of an individual in carrying out his duties (Admodiwirio, 2002: 35).

Training according to Nadler (1982), is a learning process that is prepared to improve the performance of a job in hand. Nadler emphasizes on human resource development. Meanwhile, training according to Rothwell (2003: 352) is an organized learning activities aimed at improving individual performance through changes in knowledge, skills, or attitudes. In a broad sense, the training is intended to meet the essential job requirements, update skills, to prepare people to improve career, improve knowledge and skills, as well as generate new insight or even create new knowledge.

According to Sulistiyani (2009: 219) training is a systematic process of changing the behavior of the employees in a direction to improve organizational goals. According to Mendoza (2009: 2) the purpose of training in a work situation, is to enable individuals to acquire the ability (competence), so that he can perform a given task or job adequately.

As according Meldona (2009: 238) the benefits of holding the training are: (1) To assist the development of skills a person, (2) To help improving the efficiency, effectiveness, productivity and quality of work, (3) Meet the personal needs of participants, (4) Improving working knowledge and expertise at all levels, (5) Transfer of knowledge and new knowledge.

Research conducted by Alomari (2009) showed that the online-based learning resources can support students' ability to gather information as a source of learning materials. The use of online learning resources is therefore not only beneficial for interactivity and accessibility, but also can enhance the independence of the students actively in learning.

Arani (2004) found that the use of online learning resources is more effective than traditional methods by delivering a lecture in front of the class. In addition, the development of e-book technology encourages the blend of print technology with computer technology in learning activities. Various printed instructional media, one of which is module, can be transformed into electronic form, hence that's the history of the electronic module or known as the e-module. There is no definite definition of the electronic module so far. With reference to the various terms associated with the electronic module, it can be defined that the electronic module is the incorporation of the term module which takes the form of electronic learning (e-book).

The results of this study are expected to provide benefits such as: product with the construction of a training model of classroom action research aided by E-Module for high school teachers. The successful training model developed is expected to be used as reference material in similar studies in the future. Thus, there will be any development of other types of products such as E-Module that provides convenience facilities for teachers in writing proposals and reports of classroom action research easily and independently, produces training packages in the form of: training, training manuals, guidebooks trainer, instructor guide books, e-training modules. Those training packages are expected to be a guide for the organization of training.

### **Research Method:-**

This study used research and development (Research and Development). According to Borg and Gall (2007: 590), R & D has the following characteristics: (1) conduct preliminary research to find relevant facts regarding the products to developed; (2) develop products based on the findings of the research; (3) do field test in the settings or actual situations where these products will be used; (4) do revision to correct the weaknesses found in the stages of field testing.

The selection of Research and Development design (R & D) in this study was based on research objectives, namely to produce a training model of classroom action research aided by E-Module. The model of the development of this study consists of four stages, namely: (1) a preliminary study to obtain information on training model of classroom action research ever conducted, followed by an analysis of the strengths and weaknesses of the model; (2) development of a model training classroom action research aided by E-Module; (3) validation of the Class Action Research training model aided by E-Module by experts and practitioners; (4) test the training model aided by E-Module.

The subjects in this study were high school teachers in Brebes. In this case the sampling for the study subjects was performed through cluster sampling and quota sampling. In this study, for the purposes of FGD, the researchers involved 15 high school teachers in Brebes district. For the testing purposes, the researchers limited the subject of the study to 10 high school teachers who come from high schools in Brebes district. To the expand the test, there were 25 teachers from various high schools in Brebes district.

The data collecting technique in this training is by having interviews, questionnaires, documentation, testing, and observation. Thus, the instruments used to collect research data is the questionnaire, documentation questionnaire, test, and observation sheet.

## **Results and Discussion:-**

### **Results:-**

In order to be able to develop a training model according to the needs of participants, it is necessary to analyze the quality of the previous trainings and do need analysis on the training from the teachers or participants of the training.

From the preliminary study on the quality of the previous training of Classroom Action Research, the teachers gave the following feedback: (1) 63.31% for the design of the training; (2) 64.90% for the training program; (3) 63.08% training materials; (4) 67.98% for training instructors; and (5) 64.20% for facilities and infrastructures.

Further, there is a need to develop training model of the Classroom Action Research aided by E-Module. Moreover, the results of the preliminary study which were aimed at uncovering the needs of teachers to classroom action research training gained average percentage of responses as follows: (1) the design of the training achieved 89.07% responses; (2) the training program achieved 86.79% responses; (3) training teaching material achieved 86.86% responses; (4) Training instructors achieved 88.78% responses; and (5) facilities and infrastructures achieved 86.80% responses.

By consideration the results of the field studies and the results of teacher responses towards the quality of the previous trainings and the training needs, it is necessary to develop a training model of Classroom Action Research aided by E-Module.

The current factual model of Class Action Research training used for the previous trainings is considered lack of sufficient competence for participants to develop proposals and Classroom Action Research reports independently. Therefore, the findings of the preliminary study can be seen in Figure 1.

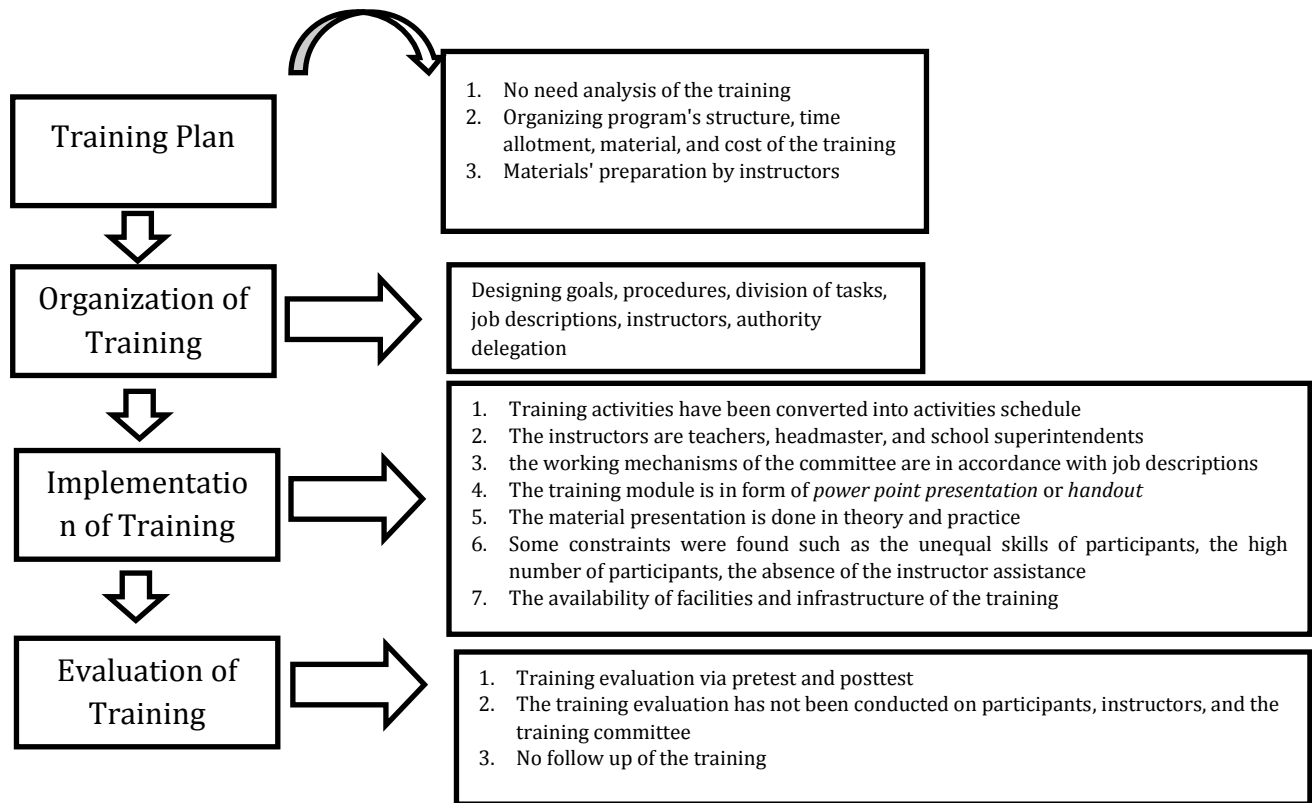
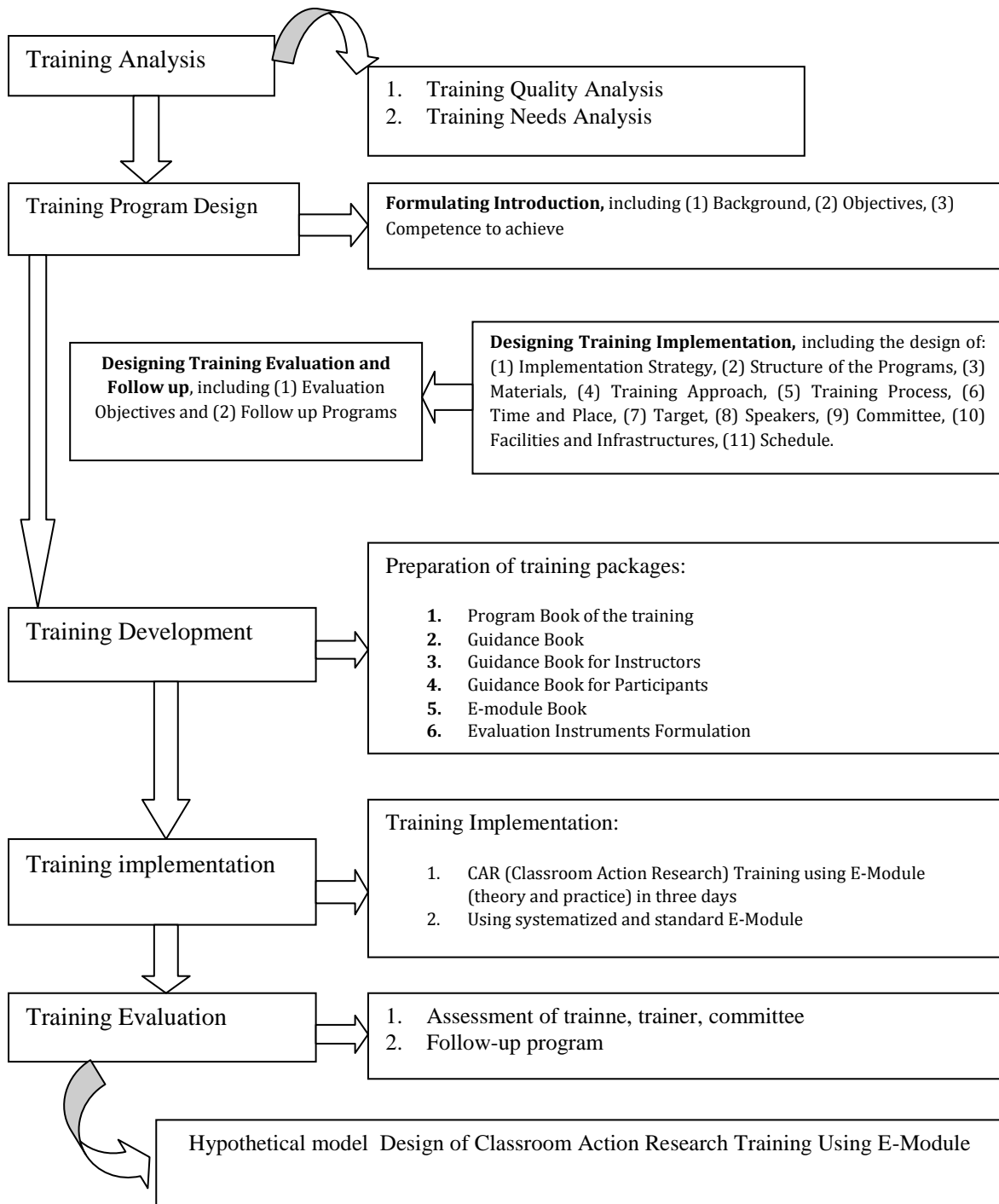


Figure 1:- The Factual Model's Scheme of Classroom Action Research Training

By taking into consideration the results of field studies and the results of teacher responses regarding the quality of previous trainings and the training needs, it is necessary to develop a training model of Class Action Research aided by E-Module by creating hypothetical model. The development hypothetical model of classroom action research aided by E-module training consists of three major parts: (1) introduction; (2) Design Classroom Action Research training model aided by E-Module; and (3) The closing section. Therefore, the Hypothetical model of classroom action research training aided by E-Module can be seen in Figure 2.



**Figure 2:-** The Hypothetical Model's Scheme of Classroom Action Research Training Using E-Module

To get the expected final training model, then, there was a trial on the hypothetical model. This trial was conducted with a limited field testing in the form of model implementation training for high school teachers. Again, this trial began with a test on a small group. In this case the small group trial was done once by the aim to simulate the application of the model and got an overview of the implementation of the limited field testing. The trial test was conducted on a small group of teachers who had never received training of classroom action research and were seen to have basic knowledge of classroom action research aided by E-Module. The aim of this trial was to obtain

feedback from teachers on the level of readability and feasibility of the training of Class Action Research aided by E-Module. Further, the responses of teachers of this trial were as follows.

The result of the trial treatment achieved 86.33% for the responses to the development of the Classroom Action Research aided by E-Module. This percentage of responses means that the development of the Classroom Action Research E-Module was considerably good. Meanwhile, the previous average percentage was derived from responses to the aspect, of page display which amounted to 88.50%, in response to the introduction which amounted to 84.17%, in response to the core aspects of the module by 85%, in response to aspects of the closing matter by 85%, and responses to aspects of bibliography of 90%.

The researchers also got inputs from the above-mentioned trial, namely the need of the availability of alternative answer to the exercise so that any wrong answers can be corrected and replaced by other alternative answers, the need of E-Module manuals, instructional videos and examples of proposals. Thus, there is a need to complete the E-Module.

After going through the stages of small group trial, the trial was continued to the limited field test. This limited field test was intended to determine the extent of the effectiveness of the training model of Classroom Action Research aided by E-Modules being developed. The indicators of the effectiveness were seen from the increase in teachers' knowledge, skills in writing proposals of Classroom Action Research, and positive attitudes towards the implementation of the Class Action Research training aided by E-Module.

As explained earlier, the extended field tests were carried out in the form of classroom action research training aided by E-Module for high school teachers in Brebes district. In this implementation, there were 25 teachers involved. The teachers were the representatives of various high schools in the district Brebes derived from state Senior High School. In addition, the venue of training was at SMAN 2 Brebes.

In the expanded field test, there was an activity conducted namely the practice of classroom action research proposal writing aided by E-Module. In this training, teachers were given an understanding on how to prepare proposals and reports of Classroom Action Research Action Research aided by E-Module. Through the E-Module, the teachers could write and organize the proposals and reports of classroom action research with ease and independence.

During the implementation of the Class Action Research Training aided by E-module, the teachers were given a briefing in the form of how to install and use the E-Module with the existing guidance. After the briefing, the teachers were mentored and guided to the practice and the implementation of the Classroom Action Research and proposal drafting aided by E-Module. Meanwhile, the training activities were guided by an instructor using an LCD projector. Further, the training approach used was an interactive discussion that created a conducive training environment.

In an effort of knowing the effectiveness of the training model of Classroom Action Research aided by E-Module, pre-test and post-test were given to the trainees. On the one hand, for the purposes of pre-test and post-test there had been set up 25 test items. The test items had been through the stages of expert validation and FGD as well as the validity and reliability test items as described in the early section. Meanwhile, to describe the skills of the teachers in the training, then the observations on the ability of teachers in preparing classroom action research proposal were done. Alternatively, to determine the attitudes of the teachers towards the training, the data collection was done through questionnaires attitude. The limited field trial activities were also done to determine the response of the teachers to the implementation of the training in general and the response to training packages developed through the questionnaire.

Data obtained from the pre-test and post-test were then analyzed with the help of SPSS.16 program. Meanwhile, the observation data of the skills and attitudes of the teachers on the implementation of the training and the training packages were analyzed with the help of MS Office Excel 2010 program.

The average value of pre -test was 15.28 with the percentage of achievement was 61.12%. Meanwhile, the highest score was 20 and the lowest score was 10. The number of participants who were able to achieve 50% percentage were 21 participants and participants who reached the percentage of achievement above 75% were as much as 3 people.

The average score of post-test was 20.04 with the achievement percentage of 80.16%. Meanwhile, the highest score was 24 and the lowest score was 17. Again, the number of participants who were able to achieve the results 50% were 25 participants and percentage of achievement which resulted above 75% were a total of 17 participants, or 68% of all participants who amounted 25 people.

Based on the results of the pre-test, it is known that the teacher's knowledge of classroom action research before training was generally good that is with an average of 15.28 or the average percentage score of 61.12%. However, not all participants could understand Classroom Action Research well. Meanwhile, the post-test result illustrated that there was an increase of teacher knowledge of classroom action research. It is proven by the average scores achieved namely 20.04 or with an average percentage of 80.16% of the achievement results. This post-test results indicate that there is an increased knowledge of teachers in the classroom action research after the classroom action research training aided by E-Module.

In order to determine the effectiveness of the training model, so the derived data and pre-test and post-test results were calculated using t-test in SPSS.16 program. However, before the t-test was carried out, the researchers did homogeneity test first. Homogeneity test is intended to determine whether the obtained data are derived from a homogeneous sample. After the homogeneity test was done, it resulted value of significance amounted to 0.209. The sig-hit value of the homogeneity test was greater 0.05 than the significant level which is 5%. The results of this analysis prove the data of pre-test and post-test obtained came from homogeneous sample. Furthermore, the t-test with SPSS.16 program could be conducted.

By using SPSS, the t-test results were as follows: (1) the average test scores (mean) got improvement before and after the training, namely from 15.28 into 20.04. From the mean value, it can be seen that the teachers' competencies increased having the training by using the training model of classroom action research aided by E-Module; (2) The standard deviation showed that the heterogeneity occurred in the data before and after the training were 2.76164 and 2.05102; and (3) the standard error of the mean before and after training were 0.55233 and 0.41020. Further, the standard error of the mean describes the distribution of the sample average of the average of the average of all possible samples.

After the data being tested using t-test with paired samples correlations models, the results of sig-hit of 0.00 and a correlation value of 0.675. Meanwhile, the analysis of paired samples with correlations is an analysis aimed at showing the relationship between the average value of pre-test before training and the value of post-test after the training sessions for the teachers. Based on the results of t-test with of paired samples model, the result showed that the correlations of Sig.count was smaller than  $\alpha$ , that was Sig. count (0.000)  $< \alpha$  (0.05). Therefore, it can be concluded that there was a significant relationship of the teacher competence before the training and after the holding of the training. Again, the strength of the correlation could also be seen in the amount of 0.675 which indicates that the data of the pre-test and post-test had a very strong correlation.

Based on t-test results, it is known that the training given to teachers by using classroom action research training model aided by E-Module provided a significant effect on improving the competence of the teachers in implementing classroom action research. This illustrates that the training model of classroom action research aided by E-Module is a training model that suits the teachers in doing and preparing classroom action research report.

Based on the t-test with a model of paired samples t-test, the t-count was obtained by -11.627 and sig.count as many as 0,000. The t-test model with paired samples test is intended to determine whether there are differences between the data derived from the pre-test with data derived from the post-test. Further, the results of the analysis using t-test were then compared with t-table value. The t-table value was derived from number of participants which were as many as 25 participants and further can be seen in the t-table which showed value of 2.064. By comparing the value of t-count and t-table, it is seen that t-count  $<$  t-table. It also appears that Sig.count had a significant difference between the pre-test and post-test scores and the participants.

The existence of significant differences between the pre-test and the post-test scores in training activities of Classroom Action Research aided by E-Module indicates that the training model of classroom action research aided by E-Modules being developed is capable of providing improvement on the knowledge of the teachers in implementing and compiling reports of classroom action research. Moreover, by looking at the differences in mean

of the pre-test and post-test, it can be seen that the model of classroom action research aided by E-Modules provides great impact for the improvement of the teachers' competence in the understanding of classroom action research.

The results of observations of the skills of teachers in preparing classroom action research proposal resulted the average percentage of 82%. These results came from the observation of the aspects of the writing skills of the title of 83%, observations of the introduction aspects of writing skills by 84%, observation of the aspects of the writing skills of the theoretical framework of 80%, and the observation of the aspects of the writing skills of research methods by 81%.

Based on the observation of the skills, it showed that most trainees already had skills in preparing the proposals of Classroom Action Research. The capability achieved by the participants came as the result of the application of the Class Action Research training model aided by E-Module. Thus, the Class Action Research training model aided by E-Module effectively provides knowledge and skills to the teachers in implementing and developing a proposal of Classroom Action Research.

These results are in accordance with the opinion of Sharma (2013) who states that the effectiveness of the training is the extent to which participants can learn and apply knowledge and skills acquired during the training program. The increase in knowledge and skills of the teachers in preparing classroom action research proposal is expected to have an impact on teacher professionalism so as to manage an active and interactive learning as well as to be able to foster learners to achieve optimal success.

This is in accordance with the opinion of Orlich (2010), who states that the functional level the teaching profession in learning is largely determined by the attitude showed by teachers towards students whether they could create any interactions or not. Therefore, the highest level of teachers' professionalism are showed by deliberately creating, and placing the top priority on the success of learners.

### **Discussion:-**

The expanded trial results showed that the training model of Class Action Research aided by E-Module is able to properly facilitate the teachers to organize proposals and reports of Classroom Action Research independently and easily. As a matter of fact, the E-Module of Classroom Action Research helped the teachers in understanding Classroom Action Research. This is understandable because the E-Module of Classroom Action Research is accessible anywhere and anytime via the Internet.

The results of this study illustrate that the training model of Class Action Research aided by E-Module had a high important effectiveness. This model will be able to assist teachers in implementing and compiling the reports of classroom action research. It is certainly very helpful for those who do not have sufficient ability to carry out classroom action research, thereby inhibiting teachers in improving the quality of learning.

The high effectiveness of the training model of Class Action Research aided by E-Module was reflected in the high percentage of achievement of the teachers' skills in preparing proposals of Classroom Action Research, the mean difference better between pre and post-test happened for the training model of Class Action Research aided by E-Module was capable of bridging between the teachers' needs and the limited ability of teachers in implementing classroom action research. In this case the teachers had the ease of preparing the report of Classroom Action Research independently with help of the E-Module.

The attitudes' survey towards training teachers obtained an average percentage of 85.17%. Besides, the participants' responses which amounted to 85.17% illustrates that the attitude of the participants towards the training of classroom action research aided by E-Module was very good. Additionally, the results achieved was derived from observation of the aspects of honesty by 82.3%, from the observation of the aspects of the discipline of 83%, observation of the aspect of responsibility by 83%, observation of the aspects of tolerance of 92% observations on aspects of cooperation by 80%, observations of the politeness amounted to 95.80%, and observations on aspects of confidence of 80.1%.

The attitude's observation illustrates that participants strongly agree on the development of the training model of Classroom Action Research aided by E-Module. It should also be understood that the training model of Classroom Action Research aided by E-Module has been able to provide facilities for the teachers in implementing classroom

action research so that the teachers were able to compile the reports of classroom action research independently and easily. Actually, the high percentage of the response of the trainees' attitudes towards the training model also illustrates that the training model of Classroom Action Research aided by E-Module was developed according to the needs of teachers.

These results are in accordance with the opinion of Sharma who states that training's effectiveness is influenced by attitudes, interests, values and expectations of trainees and training environments. The training program will likely be more effective if participants have strong desire to learn, engage optimally in their work and have a career plan.

Based on the analysis and discussion of the score of the pre-test and post-test, analysis of the results of the observation skills of the trainees, and the observation of the attitude of the trainees towards the implementation of the training, it can be concluded that the training model of Classroom Action Research aided by E-Module has very high level of effectiveness. In other words, the model training of classroom action research aided by E-Module is very effective to provide skills for the teachers in preparing classroom action research report independently.

The magnitude of the effectiveness of the training model of Classroom Action Research aided by E-Module is also reflected from the participants' responses to the implementation of the training which was of 88.40% or achieved very good predicate. The participants' responses came from the responses to the aspects of the development of the training model by 88%, response to aspects of training administration by 87%, in response to the trainers of 87.10%, and the response to the training's supporting facilities and infrastructures as well as the consumption amounted to 88.40%.

The high response to the development of the training model of Classroom Action Research aided by E-Module shows that the training program was developed according to the needs of the teachers. Moreover, the training model of Classroom Action Research aided by E-Module was designed in form of activity practices of Classroom Action Research's proposal preparation with the time allocation of 80% of the total time available in the training. Also, the training model of Classroom Action Research aided by E-Module is supported with training packages in the form of a training guide books. At last, the implementation of the training model of Classroom Action Research aided by E-Module for high school teachers was in accordance to the design being developed, namely with 80% in the form of the practice of classroom action research's proposal preparation.

The validation of the developed training model came in a bundle with the training packages. This validation was in the form of teachers' feedback through questionnaires.

The results of teacher responses to the training program achieved the average percentage of 89%. This results indicates that the early part of the program was designed with interesting title, contains a preface which is in accordance with program's contents, and contain the table of contents which correspond to the program's contents. The introductory part of the program has compatibility between the background to the training objectives, has a description of conformity with the goals of training, and has suitable texts which explain the competencies to achieve in the training.

The teachers' responses to the development of the participant guide books provided average percentage of 85.84% or got a very good response. The high response of the teachers to guide books of participants suggests that the development of the guidebooks have systematical suitability in accordance with the training programs.

The response of the teachers to the training modules provided an average percentage of 85.84% response, which means that it got very good feedback. This illustrates that the development of the training manuals got a good response.

The trainee teachers' responses to the E-Module of Classroom Action Research provided information on average of the percentage of responses for 85.84%, which means it got very good feedback. The high response indicates that the development of the E-Module of Classroom Action Research was in accordance with the needs of participants in the training.

Based on the discussion of the results and analysis of the pre-test and post-test, observation on the skills and attitudes survey of the teachers and the teachers' responses to the development of the training packages, it can be



concluded that the development of the training model of Classroom Action Research aided by E-Module has a very high effectiveness.

This is in accordance with the opinion of Sharma (2013) who states that the effectiveness of the training is the extent to which participants can learn and apply knowledge and skills acquired during the training program. In this case, the teachers who joined the training model of Classroom Action Research aided by E-Module have gained good knowledge and skills so as to be able to carry out Classroom Action Research and compile its reports. Therefore, the final model of the training model of Classroom Action Research aided by E-Module can be seen in Figure 3.

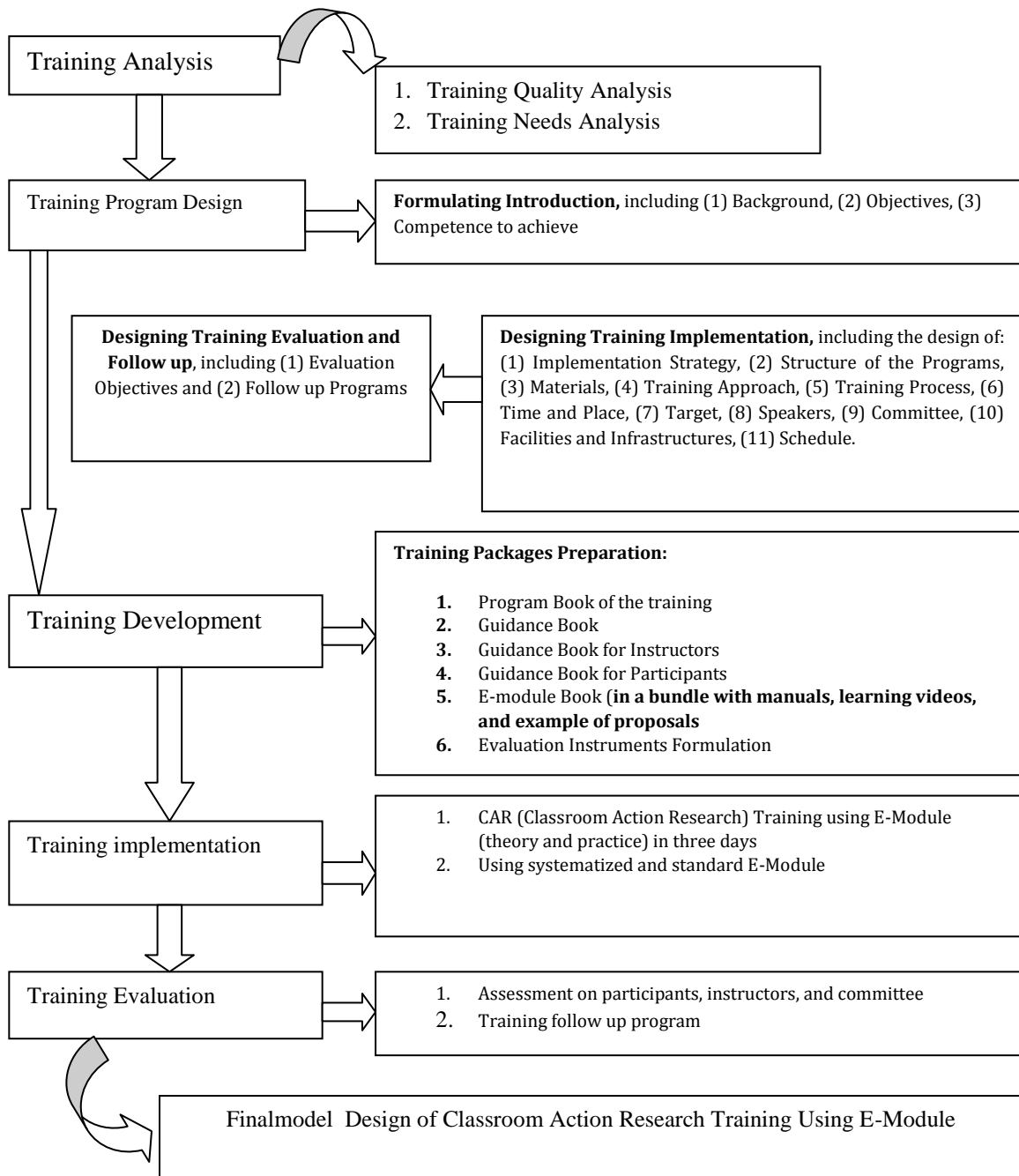


Figure 3:- The Final Model's Scheme of Classroom Action Research Training Using E-Module

### Conclusions:-

The training model of Classroom Action Research aided by E-Module is a training model that makes it easy for teachers to conduct classroom action research since the module are accessible for the participants via browser.

The training model of Classroom Action Research aided by E-Module is proved to have a high level of effectiveness. It is seen from (1) t-test results which showed significant difference between pre-test and post-test, the scores of the pre-test and post-test illustrates the increased knowledge of teachers about classroom action research, and the results correlation counting which presented that there was a significant relationship between pre-test and post-test; (2) The results of observations showed that the training model of Classroom Action Research aided by E-Module has provided an improvement on the skills of the teachers in preparing classroom action research proposal; (3) The results of the observations of the attitudes of teachers showed that teachers have very good attitude towards the training model of Classroom Action Research aided by E-Module; (4) The results of the teachers' responses to the implementation of the training are generally known that the teachers responded very well to the training event; (5) The results of the teachers' responses to the developed training packages showed that all the packages being developed received very good response from the participants.

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**RESEARCH ARTICLE**

**RACE AND GENDER IN TONI MORRISON'S *BELOVED*.**

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**Abstract**

This article points to investigate Toni Morrison's "Beloved" by a cultural materialistic approach. We have sought to embrace African-American society and history. This story is of enthusiasm as it is founded on a comprehension of contrast. Cultural materialists emphasize on the cultural aspects and components of literary texts. They examine topics such as race, gender, sexuality, societal division, and slavery. In other words, they put under investigation the marginalized masses of social club, like black people, females, and slaves. In this regard, Toni Morrison is a great author whose compositions is replete with ethnic events. As Morrison accepts that each show-stopper 'must be political', she strives to uncover force relations in the American civilization through her exceptionally cognizant dialect and fastidiously shaped stories. She intensely opposes the overwhelming Euro American power and its pervasive talk, and overturns a few American myths, for instance, the kindheartedness of the blank and the savagery of the dark – exhibited by the prevailing talk. She likewise portrays force relations inside Afro American groups with no leanings toward the dark, to uncover how cataclysmic supplanting white prejudice with dark closedmindedness would. These records have helped me get into an entirely different society furthermore, history, and helped me in my comprehension of a generally ignored segment of the human group, whose spirits and societies, have been permanently affected, in the same fashion as our own, by radical and pioneer forms. As most of the principal characters of Toni Morrison's novels are black people, then it can be concluded that for her, marginalized people of society and minorities especially females, are at the core.

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**Introduction:**

Chloe Anthony Wofford, later known as Toni Morrison. The melodies and stories of Chloe Wofford's youth without a doubt affected her later work; undoubtedly, Toni Morrison's oeuvre draws intensely upon the oral works of artistic production of African Americans. Toni Morrison's written work was likewise extraordinarily impacted by her crew. She was a greatly talented understudy, figuring out how to peruse at an early age and performing admirably as she learns at an integrated school. Morrison, who moved to Hawthorne Elementary School, was the main African American in her first grade classroom. She was additionally the main understudy who started school with the

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capacity to persevere. Since she was so talented, Morrison was regularly asked to help different understudies figure out how to persevere. She as often as possible worked with the offspring of new migrants to America.

Her guardians' longing to shield their child from the bigot environment of the South succeeded in numerous regards: racial bias was to a lesser degree an issue in Lorain, Ohio than it would have been in the South, and Chloe Wofford played with a racially assorted gathering of companions when she was young. Inevitably, on the other hand, she began to experience racial segregation as she and her companions developed more established. She graduated with distinction in 1949 and extended to Howard University in Washington D.C. At Howard, she majored in English and minored in classics, and was effectively included in theater expressions through the Howard University Players. She went on from Howard in 1953 with a BA in English and another name: Toni Wofford (Toni is an abbreviated form of her center name). She moved ahead together MA in English from Cornell in 1955.

A standout amongst the most basically acclaimed living scholars, Morrison has been a significant designer in making an artistic dialect for Afro-Americans. Her use of moving viewpoint, fragmentary story, and an account's voice greatly near to the awareness of her characters uncovers the impact of journalists like Virginia Woolf and William Faulkner: two authors that Morrison, not unintentionally, mulled over broadly while at school understudies. Every last piece of her work additionally demonstrates the impact of African-American fables, tunes, and women tattle. In her efforts to guide these oral artistic expressions onto abstract modes of theatrical performance, Morrison has drawn a group of work cultivated by a notably dark sensibility while drawing a perusing crowd from crosswise over racial limits.

### ***Beloved:***

In 1993 Toni Morrison was given the Nobel Prize for Literature. Her books connect with settings and inquiries running from the way of bondage in the frontier period to the poetics and legislative issues of Harlem in the Jazz Age, from investigations of the class contrasts that cut crosswise over relations between African American people also, groups to the physical and mental savagery that constituted isolation and Jim Crow. Certainly, it is difficult to distinguish an "American reality" in which Morrison has not produced an accurate and singing mediation; even as her books concentrate personally on the spirits of African Americans, white Americans are interpellated just as by the courses in which her investigations uncover the operations of whiteness—the repudiations of correspondence and the unsuccessful labors of equity that went into its creation and maintenance. Similarly, as the global point of persuasion of a large percentage of the members in the symposium illustrated, Morrison's record of the history of "race" is not in any case constrained to American Reality.

In *Beloved*, gender oppression is not a visible problem that exists between African men and women, but it is one that survives inside the context of the economic relationship between master and slave, and race is alone a later justification for the subjugation of African people. Understandably, then Morrison's choice of setting is germane in crystallizing the nature of African's oppression, for the economic origin of both race and gender oppression is unobscured in slavery. The crucial matter in her exploration of the collective solution to the African's oppression is the slave setting, for it serves to enhance the theme of *Beloved* by pointing up the dialectical relationship between problem and solution: that his solution to the problem arises from the status that makes it. Morrison's setting had to be one in which the strategy for solving the problem was not only clearly evident but also inevitable. (Dorothea, 94)

*Beloved* represents the difficult, conflicting racial inheritance and identity of the blacks, both life affirming and life devouring. It's an inheritance of pain, shame a despair that turns the victim in victimizer, love into killing. Its very beauty and triumph, sharpened by deprivation, is linked with despair and destruction. It's an inheritance, hard to embrace or disown – like the name of the *Beloved*. The symbolic configuration of *Beloved* as the racial identity is proposed in the epitaph of the book: "I will call them my people, which were not my people; and her beloved, which was not beloved."

*Beloved* represents the racial inheritance and identity that its people require both to acknowledge and disown, to love and to love, and it is a difference of opinion arising from the poignant sense that they are the forsaken people of God. The difficult black inheritance is suggested by the paradoxical relationship between Paul D and *Beloved*, when she makes love to him. Her insistence on him to holler her name elicits in him a torrent of memories that is the core of racial identity, hence that he croaked to himself, "Red Heart, Red Heat, Red Heart." *Beloved*'s mesmerizing effect on Paul D on her sexual advance both attract and repels him. The allusion to Lot's wife hits at

the danger of looking backward at a hard past. Beloved represented the racial identity embedded in the past memories that all the references in the book try to escape but cannot. Beloved's insistence of Paul D, against his revulsion, to call her the name Beloved externalizes Paul D's inner compulsion to recognize and comprehend the humiliating and life affirming racial past and identity. (Hong, 97)

Morrison makes a more complex Womanist space in the Beloved as characters, in their quests to obtain self-forth, the conflict between controlling and falling prisoner to the places they inhabit. Under schoolteacher's reign, Sethe Suggs tries to make Sweet Home her own by gathering flowers in the kitchen; however, she cannot relate safety because school teacher receives the force to turn sweet home into a space that ruptures Sethe's body, mind and family. Furthermore, Morrison initially suggests that 124 Bluestone road, under the Baby Sugg's dominion would offer Sethe the healing and nurturing community necessary to "remember" herself. Yet, even though Baby Suggs tries to eradicate the slavery's presence by remodeling 124, neither she nor Sethe can control this space after schoolteacher invades her yard. 124 threatens to destroy its inhabitants with its eighteen years of spiteful baby venom, and again after Sethe recognizes Beloved. For Sethe, domestic spaces represent sites of crisis and self-destruction.

In Beloved, Morrison strikes a balance between missing or hostile female community and a healing sisterhood. Beloved helps Sethe recall the painful memory of her birth, her mother's hanging, and her own feelings deprivation from her mother's inability to nurse her. (Elizebeth, 47,48)

The cultural importance of Toni Morrison's most popular novel, Beloved, hardly can be overstressed. Beloved, Toni Morrison's fifth Novel is "the book [that] had to exist. For Morrison, this publication was a conscious act towards healing a painful wound: this publication to the great social wrong of the enslavement of Africans. Her powerful words, behalf of millions give voice to a profound lament: the absence of a historical marker to remind us never to let his atrocity happen again. In its absence has neither erased nor diminishes its pain; rather, it reminds us only for itself: of what is missing. The author was pleading for the wall or that bench or that tower or that tree when he penned the final words. Morrison told The World. It is too significant, though not surprising, that Toni Morrison took the responsibility for action to correct the negligence. She frequently talks of the role of the black novelist in the world as one to address and explore issues meaningful to the well being of the whole world community. As it responds in kind to her expression of grief, and accepting her offering, Beloved made its way into the New York Time's Bestseller Morrison wanted to explore the nature of slavery, it's from a rational or the slave narrative perspective, but from within the day-to-day lived experience of the slave themselves. Morrison claims she experienced many more worries in writing Beloved than with any of her previous books. Morrison believed that this book is quite different from other books:

The dear was like I'd never a script ahead.... I recognized that I was in the society of people whom I absolutely adored, in a position which I absolutely loathed. To stand in their society, to heed, to imagine, to invent – and not to write – was exhausting. (Morrison and Richardson, 40)

The major difference for Morrison between "Beloved" over the other novels was the sense impression of melancholy she felt over the story. For exemplar, in writing the scene in which the minor is killed, she recalls going up periodically to take long walks and feeding back to rewrite, "over and o'er once more," She wanted the fact of infanticide to surface early in the narrative so that the information would be known, the repugnance of the act was equally difficult for her as it is for the readers. She was forced to struggle to find a voice communication in which the violence would not "engorge" her or her readers, or struggle with the language itself. She struggled against producing either obscenity or pronography. (William, Nelly, 9,10)

Beloved is a powerful, fully tender romance. Morrison strongly insists that her literary context is essentially African American, and Beloved overtly involves slave narratives as it processes. And the style and narrative procedures have more of a literary relationship to William Faulkner and Virginia Woolf, than to any African American Writers. Love is a long perspective, is a child of Faulkner's masterpiece, As I lay dying, while the heroine Sethe has more in common with Lene Grove of Light in August than with any female character of African American Fiction. This is anything but a limitation, aesthetically considered, but is rejected by Morrison and her critical disciples alike. Ideology aside, Morrison's fierce assertion of independence is the norm for any strong writer, but the author does not believe that this defense of a swerve from indubitable literary origins can be a critical value in itself. Honey is a calculated series of shocks; whether the retention of the shock is aesthetically persuasive

has to seem secondary in a novel dedicated to the innumerable victim of American Slavery. Morrison, whose earlier novels were not as over-determined by ideological consideration as *Beloved* is, many have sacrificed lots of her art upon the altar of a government, perhaps admirable in itself, but not necessarily in the inspection and repair of high literature. (Harold, 2,3).

Toni Morrison creates focal characters that don't live in a vacuum in light of the fact that they inhale and come together with others inside the story construction of every book. As they strike all through the novel, these characters uncover layers of feelings that expand the peer user's creative ability. Morrison goes to an affection scene that rattles the spirit. She uncovers an enthusiasm that rises above social and monetary foundations. Morrison emphatically puts stock in structuring an abnormal relationship inside her books; Sula Mae Peav and Nile Wright Greene in *Sula*, Jadine.

### **Race:**

The term **race** refers to groups of people who have differences and similarities in biological traits deemed by society to be **socially significant**, meaning that people treat other people differently because of them. For illustration, while conflicts and similarities in eye color have not been treated as socially significant, differences and similarities in skin color have. According to John H. Relethford, author of *The Fundamentals of Biological Anthropology*, race "is a group of populations that share some biological characteristics.... These populations differ from other groups of populations according to these characteristics." Scientists can divide some organisms into racial categories easier than others, such as those which remain isolated from one another in different environments. In contrast, the race concept doesn't go so comfortably with humans. That's because not only do humans exist in a broad scope of environments, they also move backwards and forward between them. As a consequence, there's a high level of gene flow between people groups that makes it tough to devise them into distinct groups.

Skin color remains a primary trait Westerner use to point people into racial groups. However, someone of African descent may be the same skin tone as someone of Asian lineage. Someone of Asian descent may be the same tone as someone of European origin. Where do one race end and another lead off? In addition to skin color, features such as hair texture and face-shape have been utilized to separate people into races. But many people groups cannot be categorized as *Caucasoid*, *Negroid* or *Mongoloid*, the defunct terms used for the so-called three races. Take Native Australians, for illustration. Although typically dark-skinned, they tend to hold curly hair which is often light colored. On the basis of skin color, we might be tempted to label these people as African, but on the basis of hair and facial shape they might be classified as European," Relethford writes. "One approach has been to make a fourth category, the 'Australoid.'"

Why else is grouping people by race difficult? The concept of race posits that more genetic variation exists interracially than intra-racially, when the reverse is true. But around 10% of variation in humans exists between the so-called races. Then, how did the concept of race take off in the West, especially in the United States? . The stand for the thought of race espoused by Judge Tucker, and still popular today, that there exist naturally, physical divisions among humans that are hereditary, reflected in morphology, and roughly, but correctly captured by terms like Black, White, and Asian (or Negroid, Caucasoid, and Mongoloid). Under this perspective, one's ancestors and epidermis ineluctably determine membership in a genetically defined racial group. The link between human physiognomy and racial status is concrete; in Judge Tucker's words, every individual's race has been "stamped" by nature. . . . [D]espite the prevalent belief in biological races, overwhelming evidence proves that race is not biological. Biological races like Negroid and Caucasoid simply do not survive. [A]. . . Newly popular [argument] among several scholars, [is] that races are totally illusory, whether as a biological or social concept. Under this thinking, if there is no natural link between looks and races, then no association exists.

On that point are no genetic characteristics possessed by all Blacks but not by non- Blacks; similarly, there is no factor or cluster of genes common to all Whites but not to non-Whites. One's race is not decided by a single factor or gene cluster, as is, for example, sickle cell anemia. Nor are races marked by significant differences in gene frequencies, the rates of appearance of certain gene types. The information accumulated by various scientists demonstrate, contrary to popular belief, that intragroup differences exceed inter-group conflicts [6]. That is, greater genetic variation exists within the populations typically labeled Black and White than between these populations. This finding refutes the assumption that racial divisions reflect fundamental genetic differences.

Note this does not imply that people are genetically indistinguishable from each other, or even that small population groups cannot be genetically differentiated. Small populations, for example the Xhosa or the Basques, share similar gene frequencies. However, specialization is a function of separation, usually geographic, and comes in gradations rather than across fractures. . . . The opinion that humans can be divided along White, Black, and Yellow lines reveals the social rather than the scientific origin of races. The estimation that there exist three races, and that these races are "Caucasoid," "Negroid," and "Mongoloid," is rooted in the European imagination of the Middle Ages, which encompassed only Europe, Africa, and the Near East. . . However, the history of science has long been the history of failed attempts to justify these social beliefs. Along the way, various minds tried to fashion practical human typologies along the following physical axes: skin color, hair texture, facial angle, jaw size, cranial capacity, head mass, frontal lobe mass, brain surface fissures and convolutions, and even body lice. As one student notes, "[t]he nineteenth century was a period of exhaustive and--as it turned out--futile search for criteria to fix and describe race differences." . . . Attempts to define racial categories by physical attributes ultimately failed. By 1871, some leading intellectuals had recognized that even applying the word "race" "was virtually a confession of ignorance or evil intent." The genetic studies of the final few decades have simply added more nails to the coffin of biological race. Evidence proves that those features usually coded to race, for example, height, skin color, hair texture, and facial structure, do not correlate strongly with genetic mutation. The rejection of race in science is now almost complete. In the final stage, we should embrace historian Barbara Fields's succinct conclusion with regard to the plausibility of biological races: "Anyone who continues to believe in race as a physical attribute of individuals, despite the now commonplace disclaimers of biologists and geneticists, might as well also believe that Santa Claus, the Easter Bunny and the tooth fairy are real, and that the earth stands still while the sun moves."

#### **Race in Social Culture:**

To define a "race" as a vast group of people loosely bound together with historically contingent, socially significant elements of their morphology and/or ancestry. I indicate that race must be realized as a sui generis social phenomenon in which contested systems of meaning serve as the links between physical features, races, and personal characteristics. In other words, social meanings connect our faces to our people. Race is neither an essence nor an illusion, [Anthias, Davis, ] but rather an ongoing, contradictory, self-reinforcing process subject to the macro forces of social and political struggle and the micro effects of everyday decisions. . . [R] referents of terms like Black, White, Asian, and Latino are social groups, not genetically distinct branches of humankind.

#### **Gender:**

Gender refers to the social attributes and opportunities connected with being male and female, the relationships between women and men and girls and boys, and the relations between women and between human beings. These attributes, opportunities and relationships are socially constructed and read through the acculturation processes [6]. They are context-/time-specific and changeable. Gender determines what is expected, allowed and assessed in a womanhood or a man in a given setting. In most societies there are conflicts and inequalities between women and men in decision-making opportunities, responsibilities assigned, activities undertaken, and access to and control over resources. Gender is part of the wider social-ethnic setting. Other important criteria for social-cultural analysis include class, race, poverty level, cultural group and age.

Gender equality refers to the equal rights, obligations and opportunities of adult females, human races, girls and male children. Gender equality is attained when the different behaviors, dreams and needs of adult females and human races are as respected and privileged and do not give rise to different events that reinforce inequalities.

#### **Gender in Toni Morrison's novel:**

Sexual orientation (Gender) is important in the evolution of self. Sexual orientation is the nation of being male and female. The term sex indicates those socially affirmed parts, exercises, activities and twists that are taken by a general public fit for adult males and dames. These particular parts bring about sexual orientation disparities i.e. those contrasts in the middle of adult males and women that deliberately offer support to one gathering by disfavoring the other. Sexual orientation will be broken down with a unique reference to a woman's right. Woman's rights, as a social development perceive and in the meantime scrutinize the male matchless quality and suggest systems to shift it.

Women's activists claim for the equivalent rights for the women and contend about women's equivalent experience society's prospects. Women's activist hypothesis endeavors to perceive the direction of imbalance by fixating its emphasis on sexual orientation governmental issues, gender relations, power issues and gender.

Disparity originates from the negation of equivalent rights. The main snag to balance is sexism. Women are viewed as the initial stifled gathering, confronting this sexism; women' concealment is most pervasive and most mysterious. No humans will give up sexual orientation advantage as any white gives up bigot advantage. Social hypothesis ought to be surrounded by women, holding back in perspective issues identified with the dames. Information gained from a male's perspective is one-sided; hence bullhead deceptions must be found if an exact epitome of learning is to exist.

History ought to be her story to reflect disregarded and trivialized women' commitments in writing. Because of this reason the scientist has picked Elaine Showalter's gyno critic model to measure the sexual orientation parts. Gynocriticism is a source recorded examination that investigates writing by focusing on the authentic foundation, topic, classifications, and social system of writing by women to edge a technique for investigating writing composed by women and to construct models of elucidation formed on female experience, instead of embracing male interpretive hypothetical models.

Dearest reports the lives of African American women who are battling tricky to gather their lives back again, to claim a feeling of self that they misplaced or that they never demanded in any shell. She exhibits, the one of a kind legacy of African American society at the inner of her complex and multidimensional story. The writer utilizes verifiable actualities and insights concerning the past to make her per user mindful of the deep and complex legacy of the African American culture and support of women in it. She "reminds" her pursuers of the past through divided pictures of dark personality, hereditary society, and the African family unit. Morrison's intentional portrayals, while not letting the per user, overlook the terribleness, and embarrassment of bondage, frequently return over to a prior time of personality, familiarity, and petition. Morrison joins the mental and social components of the dark group and investigates the issues of character, family, and confidence in our current reality where bondage has clearly worked into a grievous issue of the past, however develops, all through, as a frequenting vicinity. No matter, there are different manifestations of servitude that still subject and oppress women. The novel exposes the subject of sex character and the twofold mistreatment, confronted by Black women and the forms in which they can break free of this persecution, on the evidence that they are women as well as black. African American dark women battle hard to insure flexibility and to comprehend what such opportunity implies [Morrison, ]. Composed on the association of social personality, the novel is the chronicled and mental investigation of dark individuals to progress to an independent and detached self. To claim for this free self the dark women need to adapt to patriarchy, subjugation, neediness, prejudice, social separation, and various different cases of mistreatment. In the adventure of examination toward oneself the characters are battling once again with this outsider world, asserting for a self that merits regarding as opposed to living in the shadows, by submerging their personalities.

Toni Morrison tests profound into the spirits of the dark individuals to trace back the enthusiasm and psychic panics of subjection on their subliminal. The commonwealth of being suppressed, the torment of the reverse of making one's status as a person, have profound consequences for the intimate personality of the individual individual. These repercussions of the past are so exceptional thus significant that however one gets opportunity in the outdoor universe, yet the intuitive is still captured in the past traumatic world that holds the acknowledgment and genuine representation of the free self. As Seth puts it, "Liberating yourself was one thing; asserting responsibility for liberated self was an alternate".

#### **Racis and Gender on Black Women;-**

*"I think Black women were affected by the women's movement, but I think that for most Black women despite Clarence Thomas, Anita Hill, our first allegiance is to race. We feel that we are oppressed more by our color than our gender, and we want Black men to prosper and move ahead."*- **Author and social critic Bebe Moore Campbell**

Historically, gender and different types of separation, including racial segregation, have been considered in parallel. Nonetheless, interlinked and commonly fortifying patterns, including suggestions of United Nations gatherings and summits, have expanded the interest for a more exhaustive investigation of the flow of victimization women, including the convergence of the different distinctive manifestations of such discrimination.

The consolidated impacts of racial and sex segregation on the headway of women and their accomplishment of equity with men have pulled in expanding consideration, especially in the usage of the discriminating territories of



concern of the Beijing Platform for Action, and in connection to substantive issues, for example, relocation, including brutality against women vagrant specialists and trafficking in women and young women. [Batchu, Westwood, ].

The reasons Black women experience the ill effects of misuse are intricate. Bigotry and sexism are two of the greatest impediments that Black women in America face. But since numerous Black women and men accept prejudice is a greater issue than sexism, [Collins, ] Black women have a tendency to feel committed to put racial issues in front of sex-based issues. For Black women, a solid feeling of social proclivity and dependability to group and race renders a number of us quiet, so our stories frequently go untold.

One of the greatest related hindrances is our delay in believing the police or the equity framework. As Black individuals, we don't generally feel good surrendering "our own" to the treatment of a racially one-sided police state and as women, we don't generally feel safe calling cops who may hurt us as opposed to helping us. Furthermore when we do stand up or look for help, we time and again experience backfire from individuals from our groups who accept we are airing out filthy clothing and making ourselves look awful before White individuals.

Access to job and monetary independence are likewise imperative. Prejudice has an unique effect on Black individuals, men particularly, who have, for as long as six decades, reliably been held to an unemployment rate pretty much twofold that of white men.

In a general public that measures "masculinity" basically by one's capacity to give, being denied access to the intends to give can result in some men to look for force through ruling women. For some men, the venting of annoyance turns savage and their accomplices endure the best blows. Dark women likewise confront livelihood differences, procuring not as much as Black men and White men and women. This compensation uniqueness limits accessible alternatives and leaves numerous women, especially moms, feeling caught in awful connections where monetary needs trump all. Spiritual beliefs and negative views about mental health services also factor into why many Black women remain with abusive partners. One in three Black Americans who need mental health treatment actually receive it, and we are more likely to rely on religious guidance and faith-based practices when working through relationship issues. Religious beliefs often discourage divorce, encourage forgiveness and occasionally condemns those who seek psychiatric services instead of relying on faith.

Black women's perceptions of what constitutes abuse have been influenced by their negotiation of spiritual and mental health beliefs and how they have shaped our paradigms. Researchers have also found that Black women report feeling more obligated to fight back than to report abuse and that is reflected in the disproportionate rates of DV/IPV reported by Black men. Our attempts to embody the "strong Black woman" stereotype have often done more harm than good, to us and those we love.

Sexual orientation has been thought to be less notable than race among dark women. Information from two national reviews of dark Americans, led in 1984 and 1996, demonstrate that dark women distinguish as firmly on the premise of their sex as their race, and that these sexual orientation and racial personalities are commonly fortifying. By and by, among dark women, their ID with their race more effectively influenced their political mentality than did their distinguishing proof on the premise of sex, aside from in cases where the hobbies of blacks straightforwardly clash with the diversions of women. These exactly based discoveries identify with the issue of why the state of mind of dark women to contemporary sex issues can pointedly separate from those of white women.(White, )

### **Conclusion:**

As it has starting at now been stated, Toni Morrison can without quite a bit of an extend be scrutinized as a dim ladies' extremist maker. She talks as a Black woman in a world that still disparages the voice of the Black woman. Her books especially advance themselves to ladies' lobbyist readings because of the courses in which they challenge the social norms of sexual introduction, race, and class. Dull ladies' activists suggest that the Black woman and the Black woman writer organize different social regions in securing a place in American culture and composing—not only those of sex and class found in all ladies' dissident systems moreover that of race. Subsequently, Black women writers have always, out of need, expected to move outside of the mind-boggling white (tallying the white woman's) creative system. Their restriction from the standard masterful traditions drove them to make and use elective strategy for passing on, drawing upon their own specific experiences of manhandle and impenetrability to shape their compositions and to address the characters and conditions inside it. Morrison's mindfulness toward the Black society

and the perseverance of its momentous culture can be seen all through her theoretical work. She by and large returns to the subjects of underestimation and irritation of blacks in the white society.

Gynocentric perspectives help the pursuers to test into the lives of woman in Afro-American social universes bitterly. Woman endeavored to exist and expect their parts in all the possible courses in family and society however, men were either truant from the families or contracted from their commitments. Women have strived hard under the association of subjugation to fulfill their parts as mothers. This affirmation of self identity is the principal requiring of ladies' activists and it transforms into their circumstance in social requests where woman are taken as a useless animals, as items with a prize names. Remembering the true objective to think about themselves, dim women, fight for their rights and are regarded people from the dim social requests.

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### RESEARCH ARTICLE

## FEBRILE CONVULSIONS AND IRON DEFICIENCY ANEMIA: A CASE-CONTROL STUDY IN ZAGAZIG UNIVERSITY HOSPITALS, EGYPT.

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##### Key words:-

Febrile convulsion, iron deficiency anemia, children.

#### Abstract

**Background:** Febrile convulsion (FC) is the most common convulsive disorder in children. The maximum age of occurrence is 14-18 months, which overlaps with the maximum prevalence of iron deficiency anemia (IDA) which is 1-2 years old.

**Aim:** To compare the iron deficiency rates in children with febrile convulsions with those in the febrile children without convulsions.

**Subjects:** This case-control study included 50 FC children (case group) with mean age of 30.3±19.2 months and 50 children with febrile illness without convulsion (control group) with mean age of 28.8±19.3 months attended to outpatient clinics of Neurology and Pediatric Departments, Zagazig University hospitals.

**Methods:** All patients had detailed history taking, thorough clinical general and neurological examination, laboratory tests (complete blood count, hemoglobin level, hematocrit value, mean corpuscular volume, serum ferritin level, serum iron level, total iron-binding capacity), and EEG.

**Results:** Respiratory tract infection & history of previous seizure were significantly higher in cases. Microcytosis & IDA were significantly more frequent in febrile seizure group. Median serum iron & mean serum ferritin levels were significantly lower in cases. Generalized seizures were significantly higher and the mean duration of seizures was significantly longer in cases with iron deficiency than in those without iron deficiency. Focal seizures were significantly more frequent in cases without iron deficiency.

**Conclusion:** children with low serum iron level and those having iron deficiency anemia are more liable to develop FC when compared with those with febrile illness without convulsion.

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#### Introduction:-

The most common neurologic problem in children is convulsion which occurs in 4-10% of children before the age of 16 [1]. Febrile Convulsion (FC) refer to the convulsion that happens in children between the ages of six months and five years, with body temperature of 38°C or higher, not resulting from central nervous system infection or any metabolic imbalance and without any preceding afebrile seizures [2].

Febrile convulsion is the most common convulsive disorder in children, which affects 2-5% of neurologically healthy children aged 6 to 60 months [3].

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The most frequent micronutrient deficiency is iron deficiency (ID) which influences at least one third of the planet's population. Anemia is the most frequent clinical manifestation of iron deficiency, nevertheless, other systems and organs may also be affected. Restless leg syndrome, disturbance in behavior, Cognitive dysfunction, psychomotor retardation, pica, breath holding attacks and thrombosis have been linked to iron deficiency [4].

The age of FC maximum occurrence is 14-18 months, which overlaps with the age of maximum prevalence of iron deficiency anemia (IDA) which is 12-24 months [5].

Conflicting results have been shown by researchers about the association between iron deficiency and seizures [1]. Reports from some studies declared that the incidence of febrile convulsion in patients with IDA is higher significantly than that in control group [6,7]. Per contra, other studies concluded that the risk of FC in children without IDA appears to be more than that in children with IDA [8]. At last, other studies found no role of IDA in pediatric FC [9,10].

### **Aim of Work:-**

This study was done to compare the rates of both iron deficiency and iron deficiency anemia in children with febrile convulsions with those in febrile children without convulsions.

### **Subjects:-**

This is a cross sectional case-control study that enrolled 50 children who presented with febrile convulsion (27 males and 23 females with mean age of  $30.3 \pm 19.2$  months) as case group and 50 sex and age-matching children who presented with non-neurological febrile illness without convulsion (26 males and 24 females with mean age of  $28.8 \pm 19.3$  months) as control group from June 2015 to June 2016 presented to outpatient clinics of Neurology and Pediatric Departments, Zagazig University Hospitals.

- Informed consents were taken from the patients' parents.

### **Methods:-**

#### *A-Inclusion criteria:*

1. Case group: included only patients presenting with their first febrile convulsion (febrile convulsion defined as the convulsion that occur in children between the ages of six months and five years, with body temperature of  $38^{\circ}\text{C}$  or higher not resulting from central nervous system infection or any metabolic imbalance without any prior afebrile seizures [2].
2. Control group: included only age and sex matched patients who presented with acute non-neurological febrile illness without convulsion.

#### *B-Exclusion criteria:*

4. History of central nervous system (CNS) injuries including significant head trauma, CNS infection, afebrile seizure, receiving an iron supplementation or epileptogenic drug within the past month, history of perinatal complication or neuro-developmental delay or the presence of any chronic systemic diseases (metabolic, rheumatologic, malignancy, cardiac, and renal).
5. The exclusion criteria applied to case group were also applied to the control group.

All patients were assessed according to the following scheme of clinical evaluation and investigations:

#### **1-Detailed medical history.**

#### **2-Complete general examination.**

#### **3-Complete Neurological examination.**

Febrile convulsion (FC) has been defined as a convulsion associated with fever without acute disturbances in electrolyte balance or central nervous system infection in children with age ranging from 6 months to 5 years with no history of any afebrile seizures. Febrile convulsion is sub-classified as complex and simple. Complex FC is a seizure lasting more than 15 minutes and recurring within 24 hours [11].

#### **4-Electroencephalography (EEG) [done for cases].**

#### **5-Investigations (for both cases and controls):**

##### *A-Laboratory investigations:*

Complete blood count (CBC) including total and differential leukocytic count.

❖ Urine analysis and urine culture.

- ❖ Liver function tests.
- ❖ Renal function tests.
- ❖ Fasting and post-prandial blood sugar level.
- ❖ Erythrocyte sedimentation rate (ESR).
- ❖ Serum level of C-reactive protein (CRP).

B- Special investigations:

A venous blood sample was obtained from all the children in both groups and serum ferritin level, serum iron level, and total iron-binding capacity (TIBC) were measured for all children.

Anemia was defined as hemoglobin (Hb) level of less than 110g/L in 6 months to 2 years and less than 11.5g/dl in 2 to 6 years. Iron deficiency was defined as serum ferritin level of less than 12 ng/mL if CRP was negative or 1+, ferritin level of less than 30 ng/mL if CRP was  $\geq 2+$ , or serum iron levels of less than 22  $\mu\text{g/dL}$  or transferrin saturation (a percentage calculated as serum iron concentration/TIBC  $\times 100$ ) of less than 16% [12,13].

#### Statistical analysis:-

The data were collected, entered and analyzed using SPSS version 20 statistical software [14]. Data were expressed as mean  $\pm$ SD for quantitative variables, frequency and percentage for qualitative variables. Chi-square test ( $\chi^2$ ) and t-test were used when appropriate. Differences were considered statistically significant at P-value of less than 0.05 ( $P < 0.05$ ).

#### Results:-

A total of 100 children, aged from 6-36 months were included in this cross-sectional case-control study according to the above mentioned criteria. Fifty children [27 males (54%) and 23 females (46%)] with ages ranged from 6 to 36 months (mean age  $\pm$ SD was  $30.3 \pm 19.2$  months) who presented with febrile convulsion (case group) and 50 sex and age-matching children who presented with febrile illness without convulsion (control group) were included in this study as shown in **table 1** which also shows that age, gender distribution, history of fever before admission and mean body temperature on admission were non-significant between the two groups, however history of previous seizures was significantly higher in cases (40%) than in control group (18%),  $P=0.015$ , also respiratory tract infection was significantly higher in case group (60%) than in control group (28%),  $P=0.0012$ , on the other hand, gastroenteritis showed no statistically significant difference between the two groups.

**Table.2** shows the hematological and biochemical indices in the two groups. It shows that hemoglobin level  $< 110$  g/L, and microcytosis were significantly more frequent in febrile seizure group than in those with febrile illness without seizure [86% of febrile seizure cases had hemoglobin level  $< 110$ g/L vs. 68% of control ( $p=0.032$ )] and microcytosis was found in 86% of cases vs. 54% of control, ( $p=0.001$ ) respectively), mean cell volume was [71.6(9.4) in cases vs. 76.6(12.1) in control group ( $p=0.021$ )]. Also median (IQR) serum iron  $\mu\text{g/dl}$  was significantly lower in cases [16.9 (14.4-23.8)] than in control group [20.7 (15.3-26.4)], ( $P=0.03$ ). Iron deficiency anemia was significantly more frequent in cases (32.0%) than in children with febrile illness without convulsion (14%), ( $P=0.032$ ). Also, mean serum ferritin level ng/ml was significantly lower in case group [ $38.52 \pm 11.38$ ] than in control group [ $54.32 \pm 13.46$  ( $P=0.001$ )], while mean serum transferrin level was found to be non significant between the two groups.

**Table.3** shows number, type and duration of seizures among cases with and without iron deficiency. Generalized seizures were found significantly higher in febrile seizure cases with iron deficiency than in those without iron deficiency (75% of cases with iron deficiency were having generalized seizure, vs. 41% of cases without iron deficiency, ( $p=0.025$ )). On the other hand, focal seizures were significantly more frequent (58.0%) in cases without iron deficiency than in cases with iron deficiency (25%), ( $p < 0.025$ ). Also, the mean duration of seizures was significantly longer in cases with iron deficiency ( $7.52 \pm 3.77$ ) minutes than in cases without iron deficiency ( $5.17 \pm 2.95$ ), ( $p=0.01$ )

**Table 1:-** Demographic data and clinical characteristics of cases and controls.

Demographic data Groups	Cases (N = 50)	Control (N = 50)	P-value
Age (Mean±SD) months	30.3±19.2	28.8±19.3	0.77
Gender			
Male N(%)	27 (54%)	26 (52%)	0.84
Female N(%)	23 (46%)	24 (48%)	
Clinical characteristics			
Fever before admission N(%)	48 (96%)	45 (90%)	0.436
History of previous seizures N(%)	20 (40%)	9 (18%)	0.015*
Mean body temperature on admission (Mean±SD) °C	38.51±1.2	38.0±1.2	0.13
Respiratory tract infection N(%)	30 (60%)	14 (28%)	0.0012*
Gastroenteritis N(%)	8 (16%)	12 (24%)	0.317

\* significant; SD: standard deviation; N: Number

**Table 2:-** Comparison of hematological and biochemical indices in cases and controls.

I- Hematological indices	Cases (N = 50)	Control (N = 50)	P-value
Hemoglobin <110 g/L	43 (86%)	34 (68%)	0.032*
Packed cell volume <33%	39 (78%)	40 (80%)	0.8
Mean cell volume (SD)	71.6 (9.4)	76.6 (12.1)	0.02*
Microcytosis (%)	43 (86%)	27 (54%)	<0.001*
Mean (SD) white blood cell count/ml	13.0 (7.4)	14.1 (8.3)	0.6
II- Biochemical indices			
Median (IQR) serum iron level, ug/dl	16.9 (14.4-23.8)	20.7 (15.3-26.4)	0.03*
Mean serum ferritin(±SD), ng/ml	38.52± 11.38	54.32± 13.46	0.001**
Mean serum transferrin, mg/dl	223 (95)	227 (110)	0.83
Iron deficiency anemia	16 (32.0%)	7 (14.0%)	0.032*

\*\* Highly significant; \* significant. N: Number; g/L: gram per liter; SD: standard deviation; ug/dl: microgram per deciliter; ng/ml: nanogram per milliliter

**Table 3:-** The number, type and duration of seizures in febrile seizure cases with and without iron deficiency.

Clinical	Cases with iron deficiency (N = 16)	Cases without iron deficiency (N = 34)	P-value
Median (IQR) number of seizures	1 (1-2)	1 (1-2)	1.6
Seizure type N(%)			
-Focal	4 (25.0%)	20 (58.0%)	0.025*
-Generalized	12 (75.0%)	14 (41%)	
Mean duration of seizure in minutes ±(SD)	7.52±3.77	5.17±2.95	0.01*

\*\* Highly significant, \* significant; N: Number; SD standard deviation

## Discussion:-

Febrile convulsions (FC) are considered the most important and common seizure type occurring in childhood between the age of six months and five years, it affects nearly 2-5% of neurologically healthy children. [5]

This case-control cross sectional study included 50 children presented with FC [27 males (54%) and 23 females (46%)] and 50 age and sex matched control children [26 males (52%) and 24 females (48%)] who had febrile illness without seizure activity. The mean age ± SD of cases was 30.3±19.2 months and that of control group was 28.8±19.3 months.

In the present study, the respiratory tract infection was significantly more frequent among cases than controls (60% in cases vs. 28% in controls, (p=0.0012). On the other hand, gastroenteritis was present in 16% of cases and 24% of control but with no significant difference, In a case-control study done by **Bidabadi and Mashouf [15]** on

association between iron deficiency anemia and febrile seizures, upper respiratory tract infection and gastroenteritis were reported among the most frequent underlying cause of fever in cases and controls.

In the current study, the iron status of both children with FC and that of age and sex matched control group was assessed and compared, also different hematological parameters for identification of iron deficiency anemia (IDA) were assessed [Hemoglobin (Hb), hematocrite(Ht), Mean cell volume (MCV), serum iron, and serum ferritin] and reported to be significantly lower in children with FC than in control group. The Hemoglobin level <110g/dl was significantly more frequent in children with FC than in control [43(86%) in cases with FC vs. 34(68%) in control group,  $P=0.032$ ], [MCV ( $\pm$ SD) was 71.6( $\pm$ 9.4) in cases vs. 76.6 ( $\pm$ 12.1) in control,  $p=0.02$ ], microcytosis was also significantly more frequent in children with FC than in those with febrile illness without seizure [43(86%) in cases vs. 27(54%) in control ( $p=0.001$ )].

The median serum iron and mean serum ferritin levels were also found in this study to be significantly lower in FC children than in those with febrile illness without seizure activity [the median IQR of serum iron (ug/dl) was 16.9(14.4-23) in cases vs. 20.7(15.3-26.4) in control,  $p=0.03$ , mean serum ferritin level (ng/ml) was  $38.52 \pm 11.38$  in cases vs.  $54.32 \pm 13.46$  in control,  $p=0.001$ ]. Moreover, IDA was reported to be significantly more frequent in FC children than in control (32% of cases had IDA vs. only 14% of control ( $p=0.032$ )).

Our results concerning decreased hematological and biochemical indices for IDA and increased frequency of IDA among children with FC were supported and in agreement with studies of **Hartfield et al [6]** and **Modaresi et al, [16]** who found that mean Hb, Ht, MCV, serum iron and ferritin were significantly lower in FC children than in those with febrile illness without seizure. Also **Akbayram et al [17]** in their study reported a significantly lower serum iron level in children with FC than in healthy children group .

Another study [18] showed that the mean serum ferritin levels were found to be significantly lower in children with FC than in children with febrile illness without seizure. our results were also in accordance with a meta-analytic study done by **Habibian et al [5]** who found that IDA was 1.52 times more frequent among patients with FC than children with febrile illness without seizure, and added that IDA is considered a cofactor in producing FC in which genetics trigger the effect of IDA on the occurrence of FC.

Contrary to our findings, the study done by **Bidabadi and Mashouf [15]** showed that IDA was less frequent in children with FC in comparison to children with febrile illness without seizure .

In explanation for the causal relationship between IDA and FC, **Schultz et al [19]** showed that iron deficiency leads to dysfunction of myelination as well as disturbance of tyrosine and tryptophan hydroxylase synthesis which in turn plays an important role in production of neurotransmitters like (serotonin, dopamine and GABA) from the synaptic vesicles .

On analyzing the relationship between IDA and both the clinical type and duration of seizures in cases, we found that children with IDA were significantly having more generalized seizures than those without IDA (75% of cases with IDA presented with generalized seizure vs. 41% of cases without IDA,  $P=0.025$ ). Regarding the duration of seizure among cases, it has been found that cases with IDA were having statistically significantly longer duration of seizures than those without IDA (mean  $\pm$ SD) was  $7.52 \pm 3.77$  minutes vs.  $5.17 \pm 2.95$  respectively,  $p=0.01$ ). These results were in agreement with those of **Fallah et al [1]** who recorded that children with IDA were having longer duration of seizures.

### **Conclusion:-**

Children with low serum iron level and those having iron deficiency anemia may be at higher risk for developing febrile convulsions when compared with those with febrile illness without seizure. This makes iron deficiency anemia as a possible modifiable nutritional risk factor for febrile convulsions among children.

### **Recommendations:-**

Screening, early detection and correction of iron deficiency anemia should be considered in children presenting with febrile seizures, furthermore giving iron supplements should be routine in children who have a risk of developing febrile seizures like presence of family history of febrile convulsions.

**Study limitation:-**

The study had some limitations, as small sample size, and also the serum ferritin level, being a non-specific acute phase reactant which may rise during any inflammatory condition.

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Nil.

**Conflicts of interest:-**

There are no conflicts of interest.

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### RESEARCH ARTICLE

#### ASSESSMENT OF KNOWLEDGE, ATTITUDE AND PRACTICE TOWARD DIABETIC PATIENTS IN RIYADH CITY, 2016.

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#### Abstract

**Background:** Diabetes mellitus (DM) is a global public health problem. The prevalence of diabetes mellitus is increasing and the number of persons with the disease will double by 2025. The management of diabetes mellitus (DM) largely depends on patients' ability to self-care in their daily lives, and therefore, patient education is always considered an essential element of DM management. Studies have consistently shown that improved glycemetic control reduces the rate of complications and evidence suggests that patients, who are knowledgeable about DM self-care, have better long term glycemetic control.

**Objectives:** To assess the level of awareness, Attitude And Practice toward diabetes in Riyadh city to identify barriers.

**Methods:** A cross sectional analytical questionnaire based study among the general population in Riyadh city. This study (2016) was carried out among a sample of 461 subjects. The mean age of citizens was 28,82. To assess citizens' demographic factors and beliefs about diabetes consenting citizens completed an anonymous online questionnaire. The data was entered and analyzed using SPSS version 20.

**Results:** The sample is consisted of 65,8% women and 34,2% men. Among the respondents 7,7% reported suffering from diabetes and 13,6% confirmed having a history of diabetes illness in their family. The results of the study showed that 153 (34,8%) subjects had weak knowledge related to the disease, 260 (59,1%) subjects had average level of knowledge while only 27 (6,1%) subjects had good knowledge regarding diabetes. There was a statistical significant association between gender, educational level and the level of awareness about diabetes.

**Conclusion:** diabetes is a chronic disease that is potentially controllable but that cannot be cured. Education still be important overall the treatment of the patients.

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**Background:-**

Diabetes mellitus (DM) is a global public health problem <sup>[1]</sup>. The prevalence of diabetes mellitus is increasing and the number of persons with the disease will double by 2025 <sup>[2]</sup>. The management of diabetes mellitus (DM) largely depends on patients' ability to self-care in their daily lives, and therefore, patient education is always considered an essential element of DM management. Studies have consistently shown that improved glycemic control reduces the rate of complications and evidence suggests that patients, who are knowledgeable about DM self-care, have better long term glycemic control <sup>[3-4-5]</sup>. Although the prevalence of DM is high among populations in the Middle East and Gulf countries, patients often lack the knowledge and skills to self-manage their condition <sup>[6-7-8-9]</sup>. During the past three decades, the population of the Kingdom of Saudi Arabia has undergone tremendous changes in lifestyle, primarily leading to decreased physical activity and unhealthy eating habits. These changes have had a considerable negative impact on the health of the society. Indeed, this lifestyle transformation is thought to be responsible for the epidemic of non communicable diseases and their complications in the country <sup>[10-11]</sup>. Our Study Was Designed To Examine Health Beliefs And Assessment Level OF Awareness Toward Diabetic among Population In Saudi Arabia, Riyadh city And Applies The Health Belief Model To Determine Barriers.

**Rationale:-**

Diabetes mellitus (DM) is a global public health problem <sup>[1]</sup>. The prevalence of diabetes mellitus is increasing and the number of persons with the disease will double by 2025 <sup>[2]</sup>. The management of diabetes mellitus (DM) largely depends on patients' ability to self-care in their daily lives, and therefore, patient education is always considered an essential element of DM management. Studies have consistently shown that improved glycemic control reduces the rate of complications and evidence suggests that patients, who are knowledgeable about DM self-care, have better long term glycemic control <sup>[3-4-5]</sup>. Although the prevalence of DM is high among populations in the Middle East and Gulf countries, patients often lack the knowledge and skills to self-manage their condition <sup>[6-7-8-9]</sup>.

**Objectives:-****General objectives:-**

To assess the level of awareness, Attitude And Practice toward diabetes in Riyadh city to identify barriers.

**Specific objective:**

The goal of this study was to examine community health beliefs regarding diabetes and their perceptions related to it and evaluate the role of demographic factors in shaping beliefs about diabetes and assess possible associations between demographic characteristics with the preventive behavior of interest.

**Methods:-**

**Study design:** cross sectional study.

**Setting and data collection:**

This survey analysis was conducted among community population in Riyadh city. A preformed self-administered questionnaire was distributed among the community population.

**Sample:-**

Subjects will be chosen according to geographical and sex distribution. Sample size was calculated based on web-site calculator <sup>[11]</sup>, taking the total size of Riyadh population (4,087,000) <sup>[13]</sup>, confidence level (95%) and margin error (5%) to be 285. additional 20 % was added to cover the missing data . The total sample obtained was **360**.

**Study population:-**

The study population included were both male and female in Riyadh city.

**Study tool:-**

Pre-formed Self-administered questionnaire that requires information about:

- 1- Socio-demographic data: age, nationality, gender, education level, income, marital status, and employment status.
- 2- Risk Factors Associated with diabetes– clinical manifestation of diabetes- incidence and prognosis of diabetes.
- 3- Beliefs about diabetes assessment including 8 questions. A score of 1 was given right answer and 0 otherwise. For each subject, a maximum score of 8 was calculated. A scoring system was applied to measure the

respondents' beliefs about diabetes. The awareness level was categorized into 3 levels indicated by weak (0–2), average (3–5) and good (6–8).

- 4- Knowledge about prevention behavior assessment including one question “Do you believe that psychological pressure is one of the diabetes factors?”. A score of 1 was given to yes and 0 otherwise. For each subject, a maximum score of 1 was calculated. The knowledge level score was categorized into 2 levels indicated by poor knowledge (0) and good knowledge (1).

#### **Ethical considerations:-**

An informed consent was obtained from the participants included in this research before filling the questionnaire.

#### **Statistical analysis:-**

Data were entered into the Statistical Package for Social Sciences (SPSS, version 20) and descriptive analysis conducted.

Association of respondents' characteristics with beliefs about diabetes and knowledge about prevention behavior of interest was evaluated using:

- 1- Frequencies and percentages.
- 2- Chi-squared test.
- 3- Independent Samples Test (T-test).
- 4- ANOVA one-way test.

Statistical significance was accepted at  $p < 0.05$ .

#### **Results:-**

##### **I-Examine community health beliefs regarding diabetes and their perceptions related to it:**

##### **1-Demographics of the studied subjects:**

The socio-demographic characteristics are shown in table (1)

**Table 1:** socio-demographic characteristics

	Frequency	Percentage (%)
<b>Age (Years)</b>		
Mean age: 28,82		
<b>Gender</b>		
Female	298	65,8
Male	155	34,2
<b>Nationality</b>		
Saudi	395	87,6
Non Saudi	56	12,4
<b>Educational level</b>		
Primary	6	1,3
Middle	15	3,3
Secondary	139	31,0
University	278	62,1
Master	6	1,3
PH.D.	4	0,9
<b>Marital status</b>		
Not married	233	51,5
Married	219	48,5
<b>Income (RS)</b>		
<3000	183	42,5
3000-5000	52	12,1
5000-7000	38	8,8
7000-10000	65	15,1
>10 000	93	21,6
<b>Employment status</b>		
Unemployed	277	61,7
Employed	172	38,3

By looking at table (1), related to the distribution of respondents according to demographic factors:

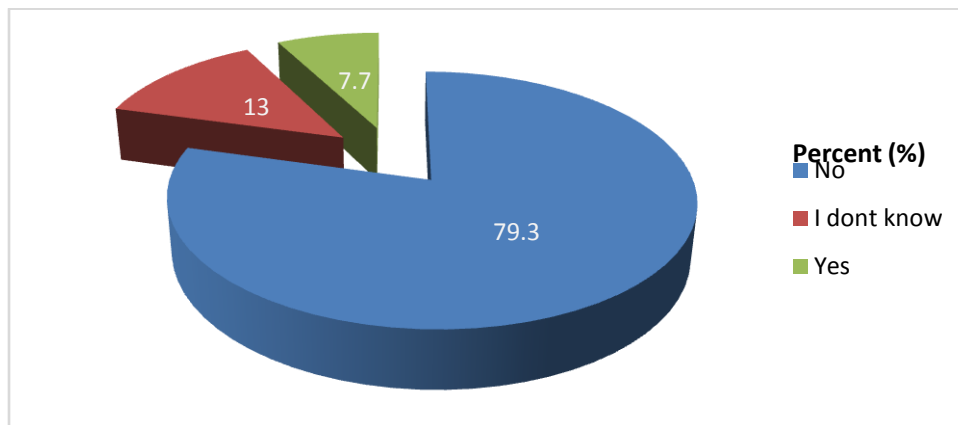
- The mean age of population was: 28,82 years.
- With respect to gender, a majority of the subjects (298)( 65,8%) were Female.
- -395 (87,6%) subjects had Saudi nationality.
- We see that (278) of the respondents have a university degree with a percentage of 62,1%.
- We see that (219) of the respondents are married with percentage of 48,5%.
- We see that (183) of the respondents have an income (<3000 RS) with percentage of 42,5%.
- We see that (277) of the respondents are unemployed with percentage of 61,7%.

**2-Knowledge regarding the diagnosis of diabetes**

**Table 2: Do you suffer from diabetes?**

Do you suffer from diabetes?	Frequency	Percent (%)
No	360	79,3
I dont know	59	13,0
Yes	35	7,7
Total	454	100,0

Out of 454 subjects, 360 (79,3%) subjects reported not being affected with diabetes, 13% did not know if they are affected or not and 35 (7,7%) respondents reported that they suffer from diabetes, as it is shown in the figure below:



**Figure 1: Do you suffer from diabetes?**

**3- Community health beliefs regarding diabetes and their perceptions related to it:**

**Table 3: Responses to questions on beliefs regarding diabetes**

(Green: correct answer)

	No	Yes	Don't Know
Do you suffer from diabetes?	360 (79,3%)	35 (7,7%)	59 (13,0%)
Q1: Is there a history of diabetes illness in your family?	291 (64,0%)	62 (13,6%)	102 (22,4%)
Q2: you have or ever had any of the chronic diseases?	246 (54,1%)	183 (40,2%)	26 (5,7%)
Q3: Do you think that diabetes could be prevented?	59 (13,0%)	228 (50,2%)	167 (36,8%)
Q4: Do you think that heredity play a role in having diabetes?	55 (12,1%)	273 (60,0%)	127 (27,9%)
Q5: Do you think that psychological pressure is one of the diabetes factors?	75 (16,5%)	217 (47,7%)	163 (35,8%)
Q6: Do you think that diabetes increases the risk of heart disease?	123 (27,1%)	65 (14,3%)	266 (58,6%)
Q7: diabetes may affect humans at any age category?	32 (7,0%)	250	172

		(55,1%)	(37,9%)
<b>Q8: If you have diabetes, do you feel socially ashamed by being affected?</b>	<b>161 (36,3%)</b>	<b>101 (22,8%)</b>	<b>181 (40,9%)</b>
<b>Q9: Do you think that diabetes can be cured?</b>	<b>47 (10,4%)</b>	<b>327 (72,0%)</b>	<b>80 (17,6%)</b>
<b>Q10: Do you think that diabetes can leads to death?</b>	<b>227 (49,9%)</b>	<b>88 (19,3%)</b>	<b>140 (30,8%)</b>

-Most of the respondents 228 (50,2%) answered that diabetes could be prevented.

- 273 (60%) of the patients were aware that diabetes was a genetically determined disease and 217 (47,7%) thought that psychological pressure is one of diabetes factors.
- Only 65 (14,3%) subjects knew that diabetes increases the risk of heart disease.
- Most of the subjects 250 (55,1%) knew that diabetes may begin at any age.
- The majority of respondents 181 (40,9%) did not know if they will be ashamed or not, if they have diabetes.
- The majority of respondents 327 (72%) think that diabetes can be cured and only 10,4% of the subjects knew the fact that the disease is not curable.
- The results of the study suggested that 227 (49,9%) subjects were aware of the fact that diabetes cannot cause death.

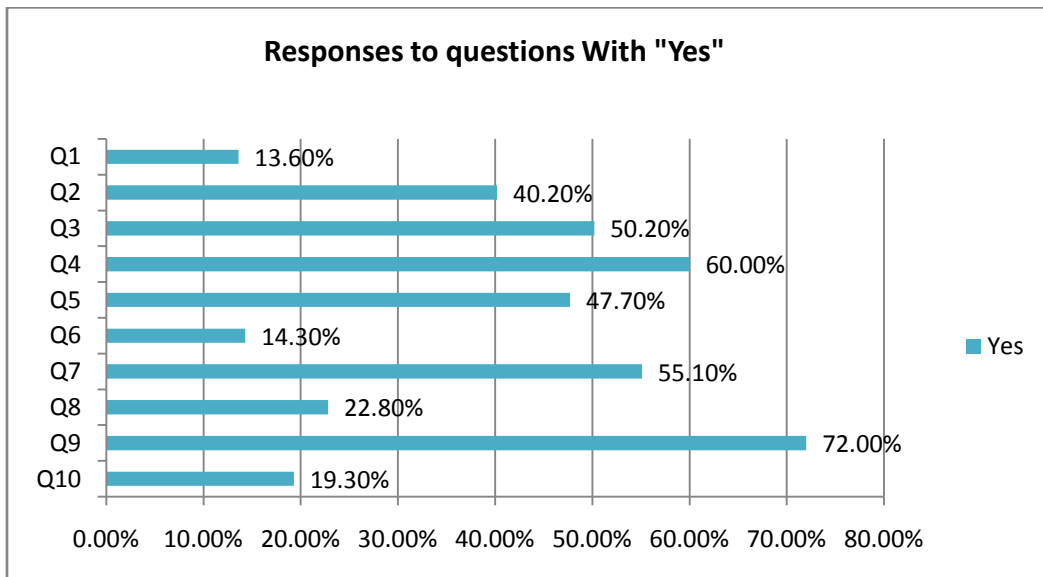


Figure 2: Responses to questions With "Yes"

**II-Evaluation of the role of demographic factors in shaping beliefs about diabetes**

**Level of awareness**

**Table 4:** Respondents' awareness evaluation for diabetes

Level of awareness	Frequency	Percent (%)
0-2 : Weak	153	34,8
3-5 : Average	260	59,1
6-8 : Good	27	6,1
Total	440	100,0

Table 4 shows that overall level of awareness on diabetes among the study participants showed that out of 440 subjects, 153 (34,8%) subjects had weak knowledge about the disease, 260 (59,1%) subjects had average level of knowledge whereas only 27 (6,1%) subjects had a good knowledge regarding diabetes(Figure 3).

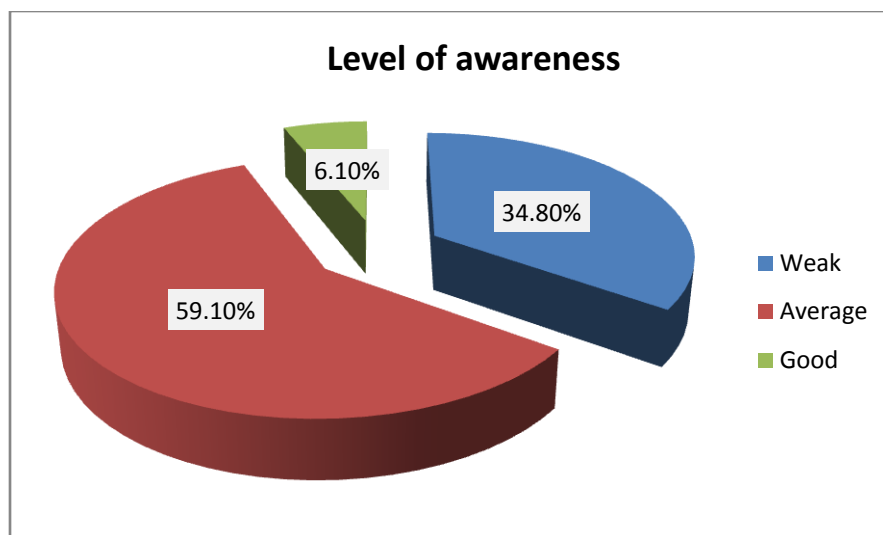


Figure 3: Level of awareness

## Association of the subjects' knowledge with socio-demographic variables

## 1-Ag

Descriptives								
Age								
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
0-2 : Weak	128	28,23	10,243	,905	26,44	30,02	15	65
3-5 : Average	220	28,71	11,080	,747	27,24	30,18	8	71
6-8 : Good	24	28,67	11,239	2,294	23,92	33,41	15	60
Total	372	28,54	10,783	,559	27,44	29,64	8	71

ANOVA						
Age						
	Sum of Squares	df	Mean Square	F	Sig.	
Between Groups	19,250	2	9,625	,082	,921	
Within Groups	43117,145	369	116,849			
Total	43136,395	371				

## 2-Gender

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13,269 <sup>a</sup>	2	,001
Likelihood Ratio	13,066	2	,001
Linear-by-Linear Association	11,568	1	,001
N of Valid Cases	440		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 9,14.

## 3-Nationality

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	,873 <sup>a</sup>	2	,646
Likelihood Ratio	,977	2	,614
Linear-by-Linear Association	,620	1	,431
N of Valid Cases	438		

a. 1 cells (16,7%) have expected count less than 5. The minimum expected count is 3,45.

**4-Educational level**

<b>Chi-Square Tests</b>			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	20,279 <sup>a</sup>	10	,027
Likelihood Ratio	24,811	10	,006
Linear-by-Linear Association	2,759	1	,097
N of Valid Cases	434		

a. 11 cells (61,1%) have expected count less than 5. The minimum expected count is ,24.

**5-Marital status**

<b>Chi-Square Tests</b>			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1,161 <sup>a</sup>	2	,560
Likelihood Ratio	1,162	2	,559
Linear-by-Linear Association	,423	1	,516
N of Valid Cases	438		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 12,82.

**6-Income**

<b>Chi-Square Tests</b>			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5,251 <sup>a</sup>	8	,730
Likelihood Ratio	5,752	8	,675
Linear-by-Linear Association	,355	1	,551
N of Valid Cases	419		

a. 3 cells (20,0%) have expected count less than 5. The minimum expected count is 2,45.

**7-Employment status**

<b>Chi-Square Tests</b>			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	,853 <sup>a</sup>	2	,653
Likelihood Ratio	,881	2	,644
Linear-by-Linear Association	,198	1	,656
N of Valid Cases	435		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 10,24.

There is a statistical significant association between gender, educational level and the level of awareness about diabetes, respectively ( $p=0,01 < 0,05$ ) and ( $p=0,027 < 0,05$ ).

**III-Assessment of possible associations between demographic characteristics with the preventive behavior of interest.**

Psychological pressure is one of the diabetes factors, which is reported in the fifth question; that is why it is important to avoid stress as prevention of the disease.

**Table 5:** Do you think that psychological pressure is one of the diabetes factors?

Level of knowledge	Frequency	Percent (%)
Poor knowledge	238	52,3
Good knowledge	217	47,7
Total	455	100,0

238 (52,3%) of the respondents have a poor knowledge about psychological pressure as a factor of diabetes while 47,7% of the subjects have a good knowledge.

**1-Age**

<b>Group Statistics</b>					
	5-Do you think that psychological pressure is one of the diabetes factors?	N	Mean	Std. Deviation	Std. Error Mean
Age	Poor knowledge	196	27,47	10,073	,719
	Good knowledge	187	30,13	11,679	,854

<b>Independent Samples Test</b>											
		Levene's Test for Equality of Variances		t-test for Equality of Means							
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference		
										Lower	Upper
Age	Equal variances assumed	2,327	,128	-2,389	381	,017	-2,659	1,113	-4,847	-471	
	Equal variances not assumed			-2,381	367,251	,018	-2,659	1,117	-4,855	-463	

**2-Gender**

<b>Chi-Square Tests</b>						
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	
Pearson Chi-Square	4,128 <sup>a</sup>	1	,042			
Continuity Correction <sup>b</sup>	3,735	1	,053			
Likelihood Ratio	4,145	1	,042			
Fisher's Exact Test				,048	,026	
Linear-by-Linear Association	4,119	1	,042			
N of Valid Cases	453					

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 74,25.

b. Computed only for a 2x2 table

**3-Nationality**

<b>Chi-Square Tests</b>						
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)	
Pearson Chi-Square	5,466 <sup>a</sup>	1	,019			
Continuity Correction <sup>b</sup>	4,818	1	,028			
Likelihood Ratio	5,497	1	,019			
Fisher's Exact Test				,022	,014	
Linear-by-Linear Association	5,454	1	,020			
N of Valid Cases	451					

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 26,82.

b. Computed only for a 2x2 table



**4-Education level**

<b>Chi-Square Tests</b>			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5,397 <sup>a</sup>	5	,369
Likelihood Ratio	5,576	5	,350
Linear-by-Linear Association	,365	1	,546
N of Valid Cases	448		

a. 6 cells (50,0%) have expected count less than 5. The minimum expected count is 1,91.

**5-Marital status**

<b>Chi-Square Tests</b>					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4,186 <sup>a</sup>	1	,041		
Continuity Correction <sup>b</sup>	3,809	1	,051		
Likelihood Ratio	4,192	1	,041		
Fisher's Exact Test				,048	,025
Linear-by-Linear Association	4,177	1	,041		
N of Valid Cases	452				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 105,14.  
b. Computed only for a 2x2 table

**6-Income**

<b>Chi-Square Tests</b>			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5,331 <sup>a</sup>	4	,255
Likelihood Ratio	5,363	4	,252
Linear-by-Linear Association	2,409	1	,121
N of Valid Cases	431		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 18,34.

**7-Employment status**

<b>Chi-Square Tests</b>					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,075 <sup>a</sup>	1	,785		
Continuity Correction <sup>b</sup>	,031	1	,860		
Likelihood Ratio	,075	1	,785		
Fisher's Exact Test				,846	,430
Linear-by-Linear Association	,074	1	,785		
N of Valid Cases	449				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 81,59.  
b. Computed only for a 2x2 table

There is a statistical significant association between age, gender, nationality, marital status and the level of knowledge about stress as factor of diabetes, respectively ( $p=0,17 < 0,05$ ), ( $p=0,42 < 0,05$ ), ( $p=0,19 < 0,05$ ) and ( $p=0,41 < 0,05$ ).

**Discussion:-**

This study identified that:

- The majority of respondents have an average level of awareness toward diabetes.
- The majority of the studied subjects have a good knowledge about the fact that psychological stress is one of the factors of the pathology of diabetes.

- Our study showed that about half of respondents were not sure or were affirmative that diabetesis contagious, respectively 30,8% and 19,3%.

### Recommendations:-

- Therapeutic management is not limited to its molecular aspect by using drugs.
- Improving the health of a patient goes through many other aspects as essential as drugs: education, prevention, listening, social solidarity...This change in vision has made it possible:
- To become aware of all the consequences of illness on the quality of life of the patient
- To identify the handicap and the resulting social exclusion
- To consider that psychological suffering is as important to take In charge as physical suffering, Indeed, the purpose of treatments is not only to eliminate the symptoms but, more generally, to improve the quality of life , to return to the patient all his freedom in his relations with himself and with others .
- Patients with diabetes need to improve their knowledge of the disease and self-care methods to avoid exacerbation of disease.
- The disease requires systematic treatment and appropriate care.
- Health education is a main part of the management of diabetes.

### Budget

Item	Price
Transportations	700 SR
Paper work	800 SR
Software programs	2000 SR
Books	1000SR
Stationaries	1000SR

### Work plan

Tasks in the work plan	Time period
Literature review	<b>2 Months</b>
Preparation for data collection	<b>1 Months</b>
Data collection	<b>3 Months</b>
Statistical analysis	<b>1 Months</b>
Discussion of results	<b>2 months</b>
Writing an abstract	<b>1 months</b>

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## RESEARCH ARTICLE

### TRACHEAL BRONCHUS AS AN INCIDENTAL FINDING IN TRAUMA PATIENT: A CASE REPORT

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#### Manuscript Info

##### Manuscript History

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#### Abstract

Congenital conditions of the major airways are very uncommon. Tracheal bronchus is the commonest, it affects 0.1-2% of the population. Usually asymptomatic but especially in childhood they may present with cough, recurrent infections, or hemoptysis. We describe a 25-years-old male trauma patient with a right-sided tracheal bronchus arising from the lateral wall of the trachea (Conacher's carinal trifurcation TYPE III) found incidentally on routine chest radiography upon admission to intensive care unit which confirmed by chest computed tomography and bronchoscopy. In adults with tracheal bronchus, the main concerns are complications during endotracheal intubation, risk of obstructive pneumonia, prolonged hypoxia, lung neoplasms and the association with cardiovascular, renal and other congenital anomalies.

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#### Introduction:-

Major airways congenital conditions are very uncommon, the most common anomaly is a tracheal bronchus that rises from the lateral wall of the trachea above the carina and supplies the right upper lobe, the prevalence of tracheal bronchus reported is 0.1-2% while the incidence was found to be 0.06% in other evidence (1, 2). This anomaly is usually asymptomatic, but it may present with respiratory manifestations especially in childhood (3). It is also referred to as "bronchus suis" or "pig's bronchus" because it is a normal anatomical finding in pigs, sheep, goats, and camels.

In intensive care units, intubation and bronchoscopy are done frequently for a variety of causes. However, the anatomical variants of the airways are not routinely included in the differential diagnosis either for consideration of possible endotracheal intubation complications, a recurrent infection, persistent cough, or hemoptysis, which may be associated with existence of pulmonary or cardiovascular anomalies or lung cancer in these cases (4, 5). Here, we report a case of tracheal bronchus detected incidentally in the intensive care unit during a daily practice.

#### Case Report:-

A 25-year-old man was admitted to the intensive care unit with multiple traumatic head injuries sustained in a motorcycle accident. He was intubated and placed on mechanical ventilation to protect his airway and remained in a coma in the intensive care unit for one month.

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He had no history of respiratory symptoms or admissions for any other indications. A review of systems was unremarkable, and physical examination revealed no clubbing of fingers and normal respiratory and cardiac examination. One pupil was dilated, and his score on the Glasgow coma scale was 7/15.

Chest radiographs (X rays and computed tomography), taken as part of complete trauma assessment at presentation (Figure 1) revealed a tracheal bronchus originating from the right lateral wall of the trachea, just above the carina, and supplying the complete right upper lobe.

After 10 days in the intensive care unit, he underwent tracheostomy with a flexible bronchoscope (Figure 2). During the procedure, we confirmed the finding of three openings: a tracheal bronchus to the right upper lobe with three clear segments, an opening from the carina supplying the right bronchus intermedius and the right lower lobe segments, and an opening from the carina supplying the left lobes. All openings originated at the level of the carina.

**Figure 1:-** Tracheal bronchus originating from the right lateral wall of the trachea, just above the carina, supplying the complete right upper lobe in a 25-year-old man admitted to the intensive care unit with multiple traumatic head injuries.



**Figure 2:-** Bronchoscopy revealed that the tracheal bronchus originated in the lateral wall of the trachea, less than 2 cm above the carina (Conacher's carinal trifurcation TYPE III).



**Discussion:-**

Tracheal bronchus was first described by Sandifort in 1785 as a right upper-lobe bronchus or “true tracheal bronchus, “originating from the trachea. The term “tracheal bronchus” has come to include all bronchial anomalies originating from the trachea or main bronchus and directed to either the upper lobe of either the right or left lung. They classified into two main types to either supranumerary (bronchial supply to affected lung segment is present) or displaced (bronchial supply to affected lung segment is absent) (3).

These congenital malformations are usually asymptomatic in adults, but they are often associated with respiratory complications, recurrent infection, cough, wheeze, stridor, respiratory distress, and thoracic masses in children (6). Chest radiography, as the initial radiological investigation, may show a bronchus directly arising from the trachea, as it did in our case. Computed tomography is the imaging modality of choice for investigating this anomaly because it shows the tracheal and bronchial anatomy. This anomaly usually is detected incidentally during bronchoscopy or by chest computed tomography performed for various respiratory conditions (6, 7).

Occasionally, tracheal bronchus represents the underlying cause of a chronic pulmonary disease, such as emphysema, bronchiectasis or persistent or recurrent pneumonia, especially if it involves the right upper lobe and reflects difficulties in clearing mucus from this lobe (3, 4).

Tracheal bronchus may be associated with many anomalies including ventricular septal defect, atrial septal defect, pulmonary stenosis, coarctation of aorta, azygos lobe, tracheal stenosis, pulmonary hypoplasia, hydronephrosis, kidney agenesis, deafness and Down's syndrome (6-8).

Among various classifications, the one proposed by Conacher is simplest and describes the anatomical relationship between the tracheal bronchus and the carina. Types II and III may present a problem for Intensivist and anesthesiologists during intubation, especially if one lung needs to be ventilated (9).

In adults with a tracheal bronchus, presented in a critical condition to emergency department, intensive care unit or going for surgery the main concern is endotracheal intubation. An endotracheal tube can obstruct the lumen of the tracheal bronchus, resulting in atelectasis of the involved lobe, post-obstructive pneumonia, or even respiratory failure (10). Accidental intubations of the anomalous lobe can cause pneumothorax and inadequate ventilation of the remaining lung. Patients with tracheal bronchus should be identified and those aware to have this anomaly must inform the anesthesiologist preoperatively for those going for elective surgery especially cardiothoracic surgery with single-lung ventilation because serious prolonged hypoxia and atelectasis may occur. (11-13).

In the absence of symptoms, tracheal bronchus need not be treated as in our patient where it went undiagnosed until his accident. In patients with a tracheal bronchus and right upper lobe disease with history of recurrent pneumonia which complicated by bronchiectasis, surgical resection of the anomalous lobe or segment is the treatment of choice (12-14).

**Conclusion:-**

Our patient was an adult with asymptomatic bronchial abnormalities with early identification for his anomaly at presentation, these tracheal anomalies are important to be considered in daily practice to prevent endotracheal intubation complications and to identify the patients with chronic respiratory manifestations and for whom lobectomy may be considered. If a tracheal bronchus is detected, other pulmonary, cardiovascular and renal abnormalities should be ruled out.

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### RESEARCH ARTICLE

#### HEPATITIS E VIRUS IN RENAL TRANSPLANT RECIPIENTS.

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ELISA; Hepatitis E virus, Ig, Real Time PCR, Viral Hepatitis

#### Abstract

Hepatitis E virus is claimed to represent the most frequent cause of acute hepatitis and jaundice all over the world. In 2008, HEV was reported possibly to be responsible for chronic infection in immunosuppressed patients such as organ transplant recipients. This study aims at detection of HEV RNA and HEV IgM and IgG antibodies in sera of renal transplant Egyptian patients compared to apparently healthy control group of matched age and sex. The present study was carried out on sixty renal transplant patients recruited from the Transplantation Unit at Alexandria Main University Hospital and sixty apparently healthy control subjects. Sera of all cases and controls have been subjected to Real Time PCR for detection of HEV RNA and qualitative ELISA determination of HEV IgM and IgG. Anti HEV IgG was positive in 56.7% of cases (34 out of 60) and in 75% of control subjects (45 out of 60). HEV RNA was detected in 2 cases (3.3%) among renal transplant recipients, while the sixty control subjects were all negative.

There is a high seroprevalance of HEV IgG among both patients and controls. The statistically insignificant lower prevalence among transplanted patients might be justified by intake of immunosuppressive drugs. Transplant recipients showed higher rate of HEV RNA positivity. The impact of immunosuppression on rate of viral clearance among such category of patients needs to be noted.

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#### Introduction:-

Hepatitis E virus (HEV) is considered the main cause of enterically transmitted hepatitis globally, being accountable for more than 50% of the cases of acute hepatitis in endemic countries where the disease is transmitted through drinking water and causes serious epidemic outbreaks. (Pérez-Gracia et al. 2013).

HEV is mainly prevalent in tropical and subtropical regions with much lower prevalence in developed countries. (Kumar et al. 2013) HEV infection courses as an asymptomatic or a self-limiting symptomatic acute hepatitis, but fulminant hepatitis may happen, particularly in pregnant women or in people with an underlying liver disease. (Péron et al. 2007) However, in 2008 it has been shown that HEV imposes a problem to immunosuppressed patients such as solid-organ transplant recipients, and HIV patients. Chronicity rates have been reported to be higher with failure of 60% of transplant

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recipients to clear the HEV, (Halac et al. 2012) and the possibility in 10% to develop cirrhosis within a short period of time. (Colson et al. 2009; Gérolami et al. 2008; Kamar et al. 2011; Ollier et al. 2009) Researchers have reported that an antibody response to HEV may be absent in these immunosuppressed patients and recommended the trial for the detection of HEV RNA when serum liver tests are elevated over several months. (Gérolami et al. 2009) Other researchers noted that Chronic hepatitis E in renal transplant patients has been found to be associated with normal liver enzymes and a negative serological assay. (Gérolami et al. 2008)

This study aims at detection of HEV RNA and HEV IgM and IgG antibodies in sera of renal transplant Egyptian patients compared to apparently healthy control group of matched age and sex.

### **Material & Methods:-**

The present study was carried out on sixty renal transplant patients recruited from the Transplantation Unit at Alexandria Main University Hospital during the period from 1/12/2013 to 28/3/2015. Sixty apparently healthy control subjects have been enrolled in the study with matched age and sex.

Serum samples collected from cases and control subjects were subjected to: RNA extraction using ISOLATEII RNA Mini Kit (Bioline, U.K) and amplification of HEV RNA by Real Time PCR technique using SensiFast SYBR No-ROX One – Step kit (UK) and a light cycler (Applied Biosystem, One Step)

In the present study a primer set on the ORF2 HEV genome was chosen in a highly conserved region, (GenBank accession no. X98292, strain hev037)(Orrù et al. 2004)

Primers used for HEV RNA amplification were 5'- GCGGTGGTTTCTGGGG -3' and 5' -TTCCCC AAC CAA CCT-3'

ELISA technique was employed for the detection of Specific IgM (DRG® International Inc. HEV IgM assays. USA) and IgG (DRG® International Inc. HEV IgG assays. USA) to HEV (Rostamzadeh Khameneh Z et al. 2011)

Aspartate transaminase (AST) and alanine transaminase (ALT) levels were measured for both transplant patients and healthy controls.

### **Results:-**

The age of renal transplant cases enrolled in the study ranged from 28-53 with a mean of  $38.48 \pm 6.41$ . Sex distribution showed 40 (66.6%) males and 20 (33.3%) females with no statistically significant difference when compared to controls. The graft age in the transplant group ranged from 2-9 years with the mean of  $6.225 \pm 2.638$ . Both cases and controls' sera were negative to anti HEV IgM . Table 1 shows distribution of cases and controls according to IgG positivity. HEV IgG positivity prevalence was higher among control group compared to cases with no statistically significant difference. ( $p= 0.098$ )

Transplant cases showed two positive HEV RNA cases by Real Time PCR (3.4%) while control subjects were all negative. There was no statistical significant difference ( $P=0.494$ ) (Table 2). IgG response was positively detectable in only one of the two PCR positive HEV cases.

In a comparison set between cases and control; the level of AST ranged between 12-65 IU/L with the mean of  $24.20 \pm 10.32$  IU/L for cases and 15-28 IU/L with the mean of  $21.42 \pm 3.75$  IU/L for control. There was no statistical significant difference between them. ( $P=0.311$ ).

In cases ALT level ranged between 15-85 IU/L with the mean of  $27.38 \pm 11.58$  IU/L and 16-34 IU/L with the mean of  $23.05 \pm 3.90$  IU/L for control, There was a statistically significant difference between cases and control regarding ALT. ( $P=0.017$ ) (Table 3).

Distribution of renal transplant cases with positive HEV RNA and transplant cases with negative HEV RNA according to liver enzyme level, AST showed a mean level of  $62.50 \pm 3.54$  IU/L for positive cases, and  $22.18 \pm 5.34$  IU/L for negative cases. There was a statistically significant difference between PCR positive and negative cases ( $P=0.018$ ).

ALT showed a mean level of  $70.0 \pm 21.21$  IU/L for positive cases, and  $25.13 \pm 5.09$  IU/L for negative cases. There was also a statistically significant difference between HEV RNA positive and negative cases regarding ALT level. ( $P=0.018$ ).

Comparing transplant cases with positive and negative IgG according to liver enzyme level, AST showed a mean level of  $23.83 \pm 9.08$  IU/L for positive cases, and a mean level of  $24.71 \pm 12.07$  IU/L for negative cases, with no statistically significant difference ( $P=0.891$ ). While ALT showed a mean level of  $27.65 \pm 13.53$  IU/L for positive cases, and  $27.0 \pm 8.67$  IU/L for negative cases. There was also no statistically significant difference ( $P=0.816$ ).

### **Discussion:-**

Hepatitis E virus (HEV) is responsible for more than 50% of the cases of acute hepatitis in endemic countries, and is considered to be an emerging infectious disease. (Pérez-Gracia et al. 2013)

To our knowledge this is the first cross sectional study to consider Real Time PCR for HEV in addition to serological tests in investigating the prevalence of HEV among renal transplant recipients in Egypt.

The present study was conducted on sixty serum samples collected from renal transplant patients; with sixty apparently healthy age and sex matched control subjects.

Most of the studies conducted for the detection of HEV RNA in serum samples selected the real time PCR as a reliable method for the assay. In a French study, Kamar et al, studied serum samples of 160 kidney transplant recipients and revealed HEV RNA in 7% of renal transplant recipients denoting the high endemicity of HEV infection in southern France.(Kamar et al. 2008a) In another study, he (Kamar et al), identified 6.5% positive cases of 217 patients, tested for serum HEV RNA receiving different types of grafts.(Kamar et al. 2008b)

In agreement with the previous data, our detection of HEV RNA by real time PCR results showed two positive cases (3.4%) in renal transplant cases while all control subjects were negative, which reflects a higher rate of detection of HEV RNA among transplanted patients compared to normal population. This observation can be justified by longer duration of viremia among immunosuppressed and less rate of clearance of the virus evidenced by many researchers.(Krain et al. 2014)

In a similar study, Legrand-Abravanel et al. detected HEV RNA using real time PCR. in 8% of 700 kidney transplant recipients (Legrand-Abravanel et al. 2011)

Serological assessment has been considered a gold standard for evidencing infection by HEV. Estimation of the IgG level in serum has been interpreted by many scientists to determine the state of infection whether past, acute or chronic infection.(Lin et al. 2000)

Our results of HEV antibodies of IgG in renal transplant cases were positive in 56.7% (including the two positive PCR cases) and negative in 43.3%. While the results in control subjects were 45 cases IgG positive and 15 cases IgG negative.

The negative results could be related to either the immunosuppressive drugs which may lead to a loss of antibodies or a possible weak antibody response.

In 2011 Rostamzadeh Khameneh et al. reported 28 subjects (30.8%) out of 91 kidney transplant patients were seropositive for anti-HEV IgG.(Rostamzadeh Khameneh Z et al. 2011) Another study by Kamar, et al showed the prevalence of HEV IgG was 14.5% from 241 kidney recipients, and 10.4% from 86 liver recipients. (Kamar et al. 2008b) Other researchers reported the seroprevalence of HEV in French renal transplant recipients to be 14.5%, while its prevalence in blood donors in southwestern France, represented as the general population, was 16.6%.(Mansuy et al. 2008)

In the present study the level of AST ranged between 12-65 IU/ml for cases and 15-28 IU/ml for control subjects. While, ALT level ranged between 15-85 IU/L for cases and 16-34 IU/L for controls. There was a statistically significant difference between cases and controls regarding ALT. ( $P=0.017$ ).

A similar association was also reported by Kamar et al who showed increase ALT levels from 13 to 156 IU/L (N =5–55), AST levels from 22 to 115 IU/L (N = 5–40) among renal transplant patient infected with HEV. (Kamar et al. 2011) Previous study by Kamar et al showed elevated ALT (15 to 200 IU/L) and AST level (25 to 110 IU/L) among renal transplant recipients infected with HEV.(Kamar et al. 2008a)

Confirming our results, Pas et al. studied 1,200 solid organ transplant recipients. Twelve HEV-infected patients had identified peak ALT level, 301 IU/L (81–909) and peak AST level, 172 IU/L (66–1016).(Pas et al. 2012)

In our study a comparison between transplant cases with positive IgG and transplant cases with negative IgG according to liver enzyme level, AST showed a mean level of  $23.83 \pm 9.08$  IU/L for positive cases, and  $24.71 \pm 12.07$  IU/L for negative cases. ALT showed a mean level of  $27.65 \pm 13.53$  IU/L for positive cases, and  $27.0 \pm 8.67$  IU/L for negative cases.

A similar association was also reported by Rostamzadeh Khameneh et al. In a comparison of patients' characteristics between the seropositive and seronegative groups for anti-HEV IgG, the ALT level ranged from 27–262 IU/L. The mean AST level was  $51.4 \pm 18.4$  IU/L. The mean ALT level was 1.71 times the normal values. Fifty patients (54.9%) had normal ALT levels, but 41 patients (45.1%) had elevated ALT levels.(Rostamzadeh Khameneh Z et al. 2011)

Our results confirm previous data reporting a high prevalence of HEV infection among Egyptian population. Furthermore, we agree with other researches that renal transplant recipients exhibited a higher rate of positivity for HEV RNA versus healthy control. Considering the small number of positive cases it was not possible to judge the possibility of HEV persistence.

The lower HEV IgG rates in transplant patients- although the difference was statistically non-significant - may be safely attributed to the known depression of immune response in such patients.

**Table (1):** Comparison between cases and controls according to seropositivity for HEV IgG.

	Cases (n = 60)		Control (n =60)		$\chi^2$	FE p
	No	%	No	%		
<b>Ig G</b>						
Positive	34	56.7	45	75	2739	0.098
Negative	26	43.3	15	25		

**Table (2):** Distribution of the renal transplant cases and control according to positivity for HEV RNA.

	Cases (n=60)		Control (n = 60)		$\chi^2$	FE p	Total (n = 120)	
	No	%	No	%			No.	%
<b>PCR</b>								
Positive	2	3.4	0	0.0	2.051	0.494	2	1.7
Negative	38	96.6	60	100.0			118	98.3

$\chi^2$ : Chi square test

FE: Fisher Exact

**Table (3):** Distribution of the renal transplant cases and control according to liver enzymes.

	Cases (n = 60)	Control (n = 60)	Z	p	Total (n = 120)
<b>AST IU/L</b>					
Min.– Max.	12.0 – 65.0	15.0 – 28.0	1.014	0.311	12.0 – 65.0
Mean± SD.	$24.20 \pm 10.32$	$21.42 \pm 3.75$			$22.81 \pm 7.84$
Median	23.0	21.50			23.0
<b>ALT IU/L</b>					
Min.– Max.	15.0 – 85.0	16.0 – 34.0	2.379*	0.017*	15.0 – 85.0
Mean± SD.	$27.38 \pm 11.58$	$23.05 \pm 3.90$			$25.21 \pm 8.86$
Median	26.0	22.50			23.50

Z: Z for Mann Whitney test

\*: Statistically significant at  $p \leq 0.05$

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### RESEARCH ARTICLE

#### DEVELOPMENT OF INTELLIGENT HYBRID ARCHITECTURE FOR AUTONOMOUS UAV.

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#### Abstract

The emerging area of intelligent unmanned aerial vehicle research has shown rapid development in recent years and offers a great number of research challenges for distributed autonomous robotics systems. However, with the development of more complex robots that must operate in uncontrolled and dynamic environments, an autonomous UAV is understood to be intelligent robot capable of performing complex operations in dynamic, real-world, uncertain, sometimes hostile environments without any explicit human control over its movements and must constantly reconfigure itself to adapt to the external conditions and its own goals. To provide the aerial vehicles with these capabilities, robot control architecture is necessary. The challenge is to develop a UAV control system capable of obtaining intelligent, suitable responses to changing environments and adapt the software to the current situation. The definition of control architecture to manage these reconfigurations becomes of paramount importance for increasing the level of autonomy and successful navigation of such robots. The Control architectures define how these abilities should be integrated to construct and develop an autonomous navigation with little or no human intervention. Numerous intelligent control architectures do exist in the literature for mobile robots. However, none of these are specifically targeted at providing the required support for a wide range of UAV missions. Operations of UAV require robust methods for dealing with emergency scenarios such as performing forced landings and collision.

In this work, we firstly study and analyze the different architectures adopted in the literature, on the basis of their flexibility, ease of implementation, reactivity, robustness, efficiency and other architecture specifications. This analysis led us to propose intelligent and hierarchical control architecture, decentralized, generic and reusable, applicable to autonomous aerial vehicles flying in an unknown, dynamic and potentially hostile environment; our control is a hybrid architecture based on multi-agent technology (MAS), which can handle unpredictable events in an unstructured world, composed of distributed, independent and asynchronous behaviors. In addition, it integrates multiple knowledge representation approaches to build cognitive models and intelligent systems that significantly advance the level of intelligence we can achieve. Our architecture is a family of intelligent control systems, hybrid and decomposed into flexible autonomous subsystems, its containing elements of sensory processing, world

modeling, localization, Mission planning & high level Expert system, and action processes to achieve or maintain its goals. The reactive part will guarantee that simple tasks are achieved under time constraints (real-time) while deliberative part will grant planning and reasoning. The whole architecture assures the safety of the UAV and the environment, so it provides the mechanisms to deal and reduces the impact with hardware and software failures of onboard.

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## **Introduction:-**

In the past several years, the rapid development of unmanned aerial vehicles equipped with autonomous control devices have become a real center of interest, and different kinds of autonomous vehicles have been studied and developed all over the world. UAV are mostly being used for military applications, but with the evolution of avionics technology (The newest sensors, microprocessors, lighter and propulsion systems are smaller and....), a huge market in civil applications is now emerging; major advantages are offered when used in emergency situations in disaster monitoring and contaminated environments (After a natural or industrial disaster such as wildfires, an active volcano, earth-quakes, a flood, or a nuclear disaster). Indeed, UAVs are better suited for dull, dirty, or dangerous missions than manned aircraft. The low down side risk and higher confidence in mission success are two strong motivators for the continued expansion of the use of unmanned aircraft systems. However, to realize these applications, seamless operation of UAV will be required. Increasing the levels of onboard autonomy will help to address this requirement. Additionally, increased autonomy also reduces the impact of onboard failures, potentially lower operational costs, and decrease operator workload. Autonomous intelligent control is execution of a given control strategy without human intervention and in an optimal manner, and capability to adapt autonomously and in a fast and efficient manner to a new set of circumstances on-line sensing, information processing and control reconfiguration[1]. It is essential for an autonomous intelligent unmanned aerial vehicle system to sense the surroundings, perceive the working environment, make decisions, plan a path and execute appropriate reaction using the sensors information. The design of perception, navigation, planning and control systems is a crucial step in the development of such autonomous flying machines. It must be able to fly within a partially structured environment, to react and adapt to changing environmental conditions. To provide the UAV with these capabilities, control architecture is necessary; it's one of essential part of robotics system development. Architecture is the structure that identifies, defines, and organizes components, their relationships, and principles of design; the assignment of functions to subsystems and the specification of the interfaces between subsystems.

Indeed, the main components that any autonomous robot has to include are the following: a deliberative component enabling it to reason about how to achieve high level goals, a reactive component to deal with the environment; and perception and actuators to deal with the physical world.

This work deals with architecture for controlling a mobile robot in accordance with the main objective in robotics, which is to develop a UAV control system capable of intelligent and suitable responses to changing environment. Our control architecture has to possess a number of desirable features: flexibility, real-time response, coherent behavior, adaptability, fault tolerance, easy design and granularity. There are good reasons for organizing the control of large systems in a hybrid distributed hierarchy. Among these are: deeper understanding facilitated by the hierarchical structure, reduction in complexity of communication and computation, modularity and adaptability to change, robustness, scalability and autonomy. UAV's actions are both the result of intelligent reasoning from superior and executive decision-making layers knowing the situation and actions that respond directly to environmental stimuli [2].

The key contributions of this work are tow fold: Firstly comparing each of these control architectures on the basis of their flexibility, ease of implementation, reactivity, robustness, efficiency and other architecture specifications. Secondly we propose a distributed architecture for autonomous unmanned aerial vehicle, in order to provide a system with several types of intelligence (Reactive intelligence, Deliberative intelligence and creative intelligence). An illustration of our study will be given in an application of control of an autonomous hexarotor developed by the team architecture of systems, to the ENSEM of Casablanca.



**Figure 1:-** A picture of the developed hexarotor (EAAS\ENSEM)

The paper remainder is organized as follows: In the next Section, an overview of architecture for UAV control is presented while section III gives and describes the proposed UAV control architecture based on a multi-agent system, for the autonomous navigation, allowing a UAV to navigate in an unknown and hostile environment. This architecture is being developed in a modular and incremental way allowing the incorporation of several techniques of mapping, localization and path planning independently of the reactive strategy. Finally, some conclusions and future works are presented in Section IV.

#### **Overview of Architectures Control:-**

Autonomous systems are typically quite complex, it is expected that the robot will be able to achieve high level goals while interacting with complex and dynamic environments. The robot must deal with its own dynamics, noise and uncertainty and has to be reactive to unexpected changes.

Well-designed software architectures can provide concepts, constraints and tools that make it easier to design, implement, and debug such systems. There are many ways to structure a robot, yet everyone will fall into one of the basic architecture control systems that can be found in technical literature: hierarchical/deliberative, reactive/behavior-based and hybrid. The categories differ largely in how they handle task achievement and in their reactivity. The aim of this section is to describe the three major paradigms of control strategies for a completely autonomous navigation [3]:

- Deliberative strategy: look ahead, think and plan, then act.
- Reactive strategy: no look ahead, react (time-scale)
- Hybrid strategy: think slowly, react quickly.

Brief descriptions of the above mentioned control strategies, the significance, advantages and drawbacks of the architectures are presented, discussed and compared with each other in the following paragraph.

#### **Historical control architecture:**

An overview of existing architectures in robotics is presented in this paragraph to identify relevant architecture design methodologies and give the benefits and shortcomings of different architectures. Robot architectures and programming began in the late 1960s with the Shakey robot at Stanford University. Generally, the literature on control architecture proposes three types of control architecture [4]. Their conceptual representation is presented in Figures 2/3.

#### **Reactive VS Deliberative Control Architectures:**

Reactive architecture is a fast response sense-act type of organization, which is particularly suitable for a dynamic environment. Since a planning stage is absent, it has low computational burden, but has relatively low level intelligence. Many modules connects several inputs sensors/actuators, each module implements a behavior. These behaviors are called "reactive" because they provide an immediate output of an input value, and cognitive otherwise [5]. Reactive architecture serves best when the real world cannot be accurately characterized or modeled. Very often, uncertainty, unpredictability and noise from the world cannot be removed. Reactive architectures were developed in response to this difficulty (figure 2-a).

An alternative to the reactive paradigm, for increasing decision capabilities a second type of architecture, called deliberative, is proposed (figure 2-b). This architecture presents generally three independent levels [6]: sense, plan and act. This decomposition facilitates considerably the development of each part of the architecture. In this kind of architecture, each layer provides sub-goals to the layer below. They include a global world model which is modified

and updated through perception. Based on this world model, planning and reasoning for making decision are carried out that result in actions to be performed by the UAV. As reasoning takes a significant amount of time, it becomes a bottleneck in the architecture.

Deliberative architecture is a high level, intelligent, top-down, suitable for a static environment. All the sensing data is utilized to set up a world model. Based on the world model, the planner then generates an action sequence.



Figure 2: (a) Reactive architecture (b): Cognitive architecture

As shown in table 1, the deliberative layer uses a purely symbolic representation and the reactive layer is free to choose its representation model. The reactive layer is usually represented in a way that facilitates the translation into actuators commands. Thus, there is a need for a common world model or knowledge system which shares information between these layers.

table 1: comparison with the deliberative and reactive architectures.

Deliberative	Reactive
(Purely symbolic)	(reflexive)
Speed of response	Predictive capabilities
Dependence on accurate, complete world models	
<ul style="list-style-type: none"> <li>- Needs internal representation</li> <li>- Slower response</li> <li>- High-level intelligence</li> <li>- Capable of learning / prediction</li> <li>- Finds strategic solution</li> </ul>	<ul style="list-style-type: none"> <li>- No internal representation</li> <li>- Real-time response</li> <li>- Low-level intelligence</li> <li>- very fast in terms of motions and computation</li> </ul>
<b>Limitations</b>	
<ul style="list-style-type: none"> <li>- Planning requires search through potentially all possible plans ⇒ these take a long time,</li> <li>- Requires a world model, which may become outdated,</li> <li>- Too slow for real-time response</li> </ul>	<ul style="list-style-type: none"> <li>- No/minimal state</li> <li>- No memory of the world</li> <li>- Unable to plan ahead</li> <li>- Unable to learn</li> <li>- Difficulty in coordination among the behaviors.</li> </ul>

**Hybrid Control Architectures:**

Neither the purely reactive scheme nor the purely deliberative architectures perform well when performing complex tasks, because of difficulties in modeling the world and relying too much on inadequate sensors. Hybrid Architectures aims to combine the best of both Reactive and Deliberative approaches, trying to reduce the restriction on the scope of each of these approaches: reactivity, so they can respond in real-time to changes in dynamic environments and deliberation, so they can plan and provide the adequate sequences of actions needed to achieve the goal using higher reasoning and an internal knowledge representation of the world, so the goals of the robot can be achieved efficiently. Thus, a hybrid paradigm connects deliberation and reaction reducing the response time of the robot to environmental changes and performing plans (figure 3). Control architectures for complex autonomous



mobile robots have largely settled on hybrid architectures for their suitability at dealing with the opposing forces of planning and reactivity [6].



Figure 3: Hybrid architecture

The hybrid control architecture specifications, each specification is described in Table 2.

TABLE 2: ANALYSIS OF THE CONTROL SYSTEMS ARCHITECTURE.

<i>Specifications</i>	<i>Deliberative RAP</i>	<i>Reactive BERRA</i>	<i>Hybrid AURA / SSS</i>
<b>Goal oriented</b>	VG	NG	G
<b>Flexibility</b>	VB	VG	VG
<b>Ease of application</b>	VB	VG	G
<b>Reactivity</b>	VB	VG	G
<b>Optimal operation</b>	VG	VB	G
<b>Task learning</b>	VG	M	M
<b>Robustness</b>	NG	G	VG
<b>Planning</b>	VG	NG	G
<b>Efficiency</b>	NG	VG	VG

#### *Discussion of control architectures:*

The robotic researchers all agree that control architectures should be deliberative, reactive, robust, generic, modular, and intelligence.

An autonomous robot is understood to be an intelligent machine capable of performing tasks in the outside world by itself, without any explicit human control over its movements. Also, an intelligent machine is taken to be a machine able to extract information from its environment and use knowledge about its world to move safely in a meaningful and purposive manner.

To achieve a comprehensive control system, robot needs more abilities that exceeds deliberative and reactive paradigms such as perception and world representation ability to enable information gathering and processing, fast reacting for static or dynamic obstacle avoidance, world modeling ability to insure the robot to localize itself relative to the environment, inference and decision making ability to make reliable decisions based on that particular information.

Various control architectures for autonomous navigation of mobile robot have been described and developed for building intelligent systems. Some of these (such as SOAR [7] and Expert Systems architectures [8]) are designed to model high-level cognitive elements of human reasoning. However, they do not address the low-level details of perception and real-time behavior in uncontrolled and dynamic environments. Others (such as Subsumption [9] and its many derivatives) have been designed to model low-level reactive behaviors. However, these do not address the high-level elements of cognition, knowledge representation, reasoning, and planning. Still others (such as AuRA [10] and RCS [11]) are hybrid architectures designed to combine high-level planning with low-level behaviors. The review of this architectures showed that the hybrid scheme has the best performing supervisory control architecture and it is more prosperous and promising dealing with unknown, dynamic navigation problem.

The review of this architectures showed that the hybrid scheme has the best performing supervisory control architecture and it is more prosperous and promising dealing with unknown, dynamic navigation problem.

After analyze these architectures, a list of important features has been defined. They include the way the architecture is built, its capacity to deal with real-time, the manner in which coordination is performed as well as the method used to do so, communication requirements, adaptability to different conditions and environments, capability to detect and repair failures, scalability, granularity and the level of abstraction used to program the components of the architecture.

The first step in our study for the conception of our architecture is to identify and analyze the qualities we want the architecture to have. The main objective is to use and provide a system with several types of intelligence to evaluate the performance of various algorithms in operational conditions and to study their robustness. In order to fulfill this objective our architecture requires much more qualities than : robustness, security, modularity, to ease maintenance, adjustable autonomy, and self-reconfiguration, re-usability, communication, concurrency, interoperability, parallelism and data flow synchronization. Of course, it is obvious that in a first time, our architecture must have a maximum of functionality that can contribute to the global autonomy of the systems (figure 4). Here are described the main qualities we want to provide to our architecture [12]:

**To ensure intelligent behaviors:** The intelligence results in perception, reasoning and action capacities. The perception translates acquired information into knowledge on the environment. The decisional system generates plans of operations that describe actions to undertake in order to reach objectives of a mission and to react in the face of asynchronous events. The amount of intelligence is closely linked to the different kind of environments in which the robot has to evolve, as well as to the complexity of tasks it has to fulfill [13]. The intelligence of the robot can be situated in several levels. The first one is associated to the local environment of the robot. Thus, in the case of an unknown environment, it is indispensable to endow the robot of an intelligent behavior allowing it to avoid obstacles met on a nominal path. This behavior relies on an on-line control of this path. The second level of intelligence is situated at the control level of the robot's behaviors. It is therefore necessary to have a mechanism that allows changes of strategy in order to adapt the robot's behavior to external events. In other words, this level of intelligence allows adopting adaptively an adequate behavior of the robot from evaluations of its internal state and those of its environment (We like that our architecture provide a system with several types of intelligence: reactive intelligence, deliberative intelligence and creative intelligence).

**Cognition:** From perception to action to learning: Cognition is the key to how robots will deal with unconstrained environments, learn from their encounters, and apply the new knowledge to similar situations in the future. Cognition is the process by which intelligent entities receive and handle information [14]. It is not one discrete thing, but a synergistic combination of multiple capabilities. For robotics, cognition is a combination of perception, understanding, motion planning, and automated learning. Improved cognitive ability means robot can work in diverse, dynamic, and complex environments autonomously and improve performance by learning from experience.

**To ensure rapid sensing and reactivity to the environment:** The mobile robot has to be able to manage external asynchronous events in real time so as to respect the dynamics of the environment (the capability to sense external events rapidly). An external event can have several origins: presence of an unforeseen obstacle, sudden breakdown, request from another robot, etc. The reactivity generally implies a real time processing of these events. The real time implies constraints on the reply delays and on some information flows (the ability to respond within a limited time period to external events occurring in its domain). These constraints depend on the equipment type and the way those events are managed. Thus, the command system has to include the notion of priority and urgency of event processing.

**Self-reconfiguration:** this ability is very important. First, in case of failure of one or more modules, or when the chosen modules are no more able to fulfill the designed task, the system must self-adapt and find a new module or series of modules to efficiently do the task. Second, the architecture must fit the needs of the users and adapt itself to his change (from a full remote control interaction to a supervised remote control one for instance). The architecture must also update and change the data exchange between the modules depending of the circumstance

**To ensure modularity and composability:** The modularity of the control architecture of a mobile robot is achieved by the decomposition in modules that can be developed, implemented, and realized separately. The ability to be reconfigured and to be extended are two characteristics that allow any command system to evolve by the addition of new functionalities and the endowing of a flexibility of adaptation. The main advantage of distributed controlled robots and subsystems is the decentralized task execution by the system components. This way, properties for the design of flexible control architectures like modularity, fault-tolerance, integrability and extendibility are easy to obtain, further it is possible to use the concepts of distributed knowledge and decentralized world representation.

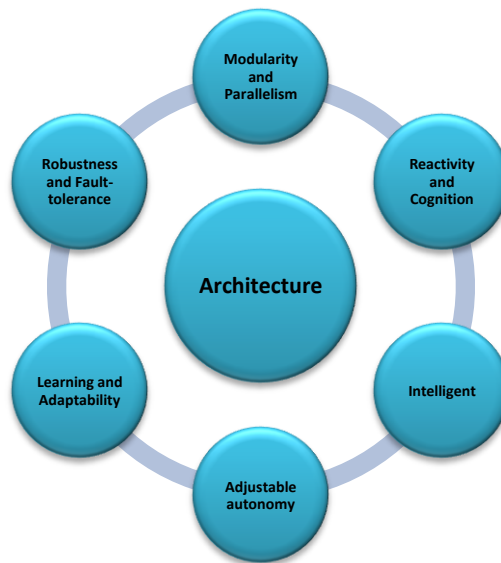
**Maintenance:** the architecture must be designed to ease the maintenance. Especially the reconfiguration and the re-launch of a module must be possible while the system is running and without interrupting the experiments.

Moreover the module must be able to record and save online their internal data and their interfaces so that in case of failure, it is possible to identify the module responsible of this dysfunctional execution. The modules can also be tested alone, their input and their output perfectly controlled.

**To manage interruptability:** Higher priority environmental threats must be able to interrupt normal operations of the robot. The robot must also be able to resume its original task after responding to the threat. Therefore, the robot's control system must be able to halt an existing control process and later resume that process after completing the new control cycle initiated by the higher priority task.

**To manage Fault-tolerance:** one of the most primordial aspects in robotic control architecture is the robustness to the execution failure. All must be done in the architecture to avoid the system stop working in the correct way. Whatever the circumstances, the system must be as fault-tolerant as possible. In others words, the failure of a part of the system, e.g. of one or more modules, should not be synonymous with the failure of all the architecture, whatever the nature of this failure (lack of memory, data reading mistake, segmentation fault, etc.) [15]

To develop an architecture capable of integrating and validating new technologies, such as different kinds of actuators and sensors.



**Figure 4.** Main features of our architecture.

#### **The Proposed Control Architecture:-**

In this section, we propose hierarchical/intelligent control architecture for an unmanned aerial vehicle (UAV), including a deliberative part and a reactive part. The proposed architecture aims to supply autonomous behavior in unknown environment considering the uncertainties of the UAV's sensors and mainly the possibility of existence of mobile or stationary obstacles which are not expected in the navigation plan. The specificity of the control architecture that we propose, is the organization between perception (sensors), making decision and action (actuators) around the loops executed at different time scales: real-time loop closely linking sensors and actuators, and another loop taking place on a slower time scale that manages one hand the representations of the environment that builds drone, and others from various events that can happen to unforeseen moments. Hybrid architecture is used to control our UAV because he has both desirable properties: reactivity, so they can respond in real-time to changes in dynamic environments and deliberation, so they can plan actions ahead in time.

Our architecture is a family of intelligent control systems, distributed and decomposed into flexible autonomous subsystems, its containing elements of sensory processing, world modeling, localization, makes decisions, creates plans, and controls actions to achieve or maintain its goals as shown in figure 5.

The flow of information between the World Model and Mission planner is bidirectional. While the World Model provides Mission planner with information regarding the state of the external world, Mission planner provides the

World Model with information about the state of the task. This enables the World Model to represent what task is in progress, and what commands are currently being generated at each echelon in the Mission planner hierarchy. Mission planner also informs the World Model about plans for possible future actions. The World Modeling processes can then simulate the probable results of these possible future actions, computes an estimate of cost, benefit, and risk. This enables Mission planner to choose among alternative future courses of action. The flow of information between the World Model and Sensory Processing is also bi-directional. While Sensory Processing keeps the World Model updated, the World Model provides context and predictions that assist Sensory Processing in the interpretation of sensory data [16],[ 17].

Our architecture consists in five blocks organized around a sixth: perception processes, representation and world modeling, localization, mission planning, action processes and expert system. The core of the architecture relies on Expert system.

Our architecture, nommed “EAAS\ENSEM”, is potentially applicable to diverse robotic systems that could include aircraft, spacecraft, ground vehicles, surface water vessels, and/or underwater vessels. EAAS\ENSEM (see figure3) includes an integral combination of five coupled agents: a dynamic planning engine, a behavior agent, world model of knowledge, expert system agent and a perception agent. The perception and dynamic planning engines are also coupled with a memory in the form of a world model. EAAS\ENSEM is intended to satisfy the need for two major capabilities essential for proper functioning of an autonomous robotic system: a capability for reaction to unanticipated occurrences and a capability for re-planning in the face of changing goals, conditions, or resources.

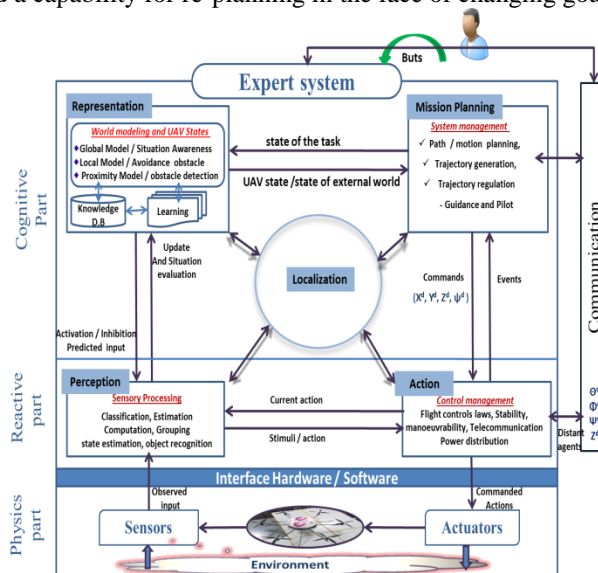


Figure 5:- Overall architecture of UAV (EAAS/ENSEM)

Fundamental capacities of our architecture encompass autonomy, Distribution of data and control, Robustness and reliability, Flexibility and Scalability, Real-time response, extensibility, coherent behavior, reliability and parallel execution. The architecture features a useful organization structure for high-level skills and offers flexible construction options for low-level behavior hierarchies.

#### Bottom-Up description of the Components:-

The five basic of processing modules from which our architecture is built, as can be seen in figure 5 are:

**Expert System module:** Our aim is to build a real-time expert system to make intelligent inferences from the environmental data. It must employ an efficient control strategy and must meet the specifications listed in the previous section. This module defines the meta-behavior of the UAV. It has the information about the overall mission objectives and constraints. This information, in conjunction with the sensory and situational awareness, is used to make appropriate decisions as trade-offs between the mission success and vehicle survivability. The decisions reached are relevant to achieving assigned missions efficiently and safely. it acts as an interface between the Mission Planner and the rest of the architecture. It ensures that changing the operating modes of the aerial robot

is done in the correct step sequences. It also reports the execution status of the current action to the Mission Planner. It also monitors some safety measures regarding the rules of the competition and conflict resolution. Also, this layer is responsible for collision avoidance, mission retaking, data analysis, fault diagnostics, and goal reassessment. It manages the data flow and ability to carry out fault detection/diagnosis procedures and accommodate faults (in the actuators and sensors) so as to assure an acceptable performance level (fault tolerance ability). It also manages the asynchronous events coming from the environment. Moreover, it allows adapting an appropriate behavior by aggregating several behavior modules in front of special situations. In other words the expert system here should be part of a conventional feedback loop with a process, a controller, a parameter/state estimator, a fault detector/isolator and a supervisor.

**Mission planning (The highest level):** This level can be defined as the “driver or cognitive” of a UAV that comprises various autonomy-enabling functions to achieve assigned goals. This is the hierarchical level of this architecture where the modules in Part deliberation which decompose the mission in executable tasks and decide what action to perform based on his knowledge of the environment and the internal state UAV. It takes inputs from the censoring system and uses targeting information (mission goals) to make appropriate decisions at its high level and to generate Autonomous, path planning, reference trajectories and commands for the Automatic Flight Control System at its low level. The UAV system must have the capability to plan and replan its own flight path. This results in the requirement for a high level computing environment where flight planning algorithms can be run. At this level, the important design challenge is to arrive at efficient algorithms (search optimization) for on-line generation and execution of a motion plan that enables the UAV to move to a desired location and perform a given task, even while avoiding obstacles. Given different way-points along a desired path, the objective of the autonomous trajectory generation system is to fit a feasible trajectory through the way-points, given the UAV and control input constraints. Many of the trajectories can be calculated off line and stored. However, in the presence of hazards and subsystem or component failures, the trajectory may need to be reconfigured on-line to reflect the new environment, or the new achievable dynamics, or both. Indeed, In the event of system faults, the UAV must have the capability to reconfigure itself and re-plan its flight path in a fail-safe manner. The control system will need to generate and execute the movement plan in near real-time and in an environment with a complex topology and with dynamically changing and uncertain components.

We have broken down in our architecture that level in tow modules with specific functions. These are prioritized and contribute to dissociate the different tasks in clearly identified functions: path planning and trajectory generation [18].

**Path Planning:** determining an optimal path for UAV to follow while meeting mission objectives and constraints, such as obstacles or energy requirements. The role of this layer is to generate the motion plan for the overall mission, and compute spatial and other constraints needed for the design of the desired trajectories. Many of the routes and constraints can be computed off-line to cover different situations. The constraints are computed in the form of safe set boundaries around the waypoints. In our architecture, we have included an automated planning systems onboard can potentially improve mission efficiency and reduce the need for laborious input from a ground based human operator. Dynamic path planning refers to onboard, real-time. He receive a description of the state of the world and a goal, and then in turn compounds produced plans of actions and implementing rules sequences corresponding to the realization of this objective. The supervisor associates sends him to realize the objective, and then monitors the execution of the plan in light of the events produced by the execution or by a changing environment. The adopted strategy is that instead of giving the mobile system a path to follow, it is more concerned to grant him a goal and let the control architecture independence in defining the optimal path to follow. This can be expressed in different forms: set of points in rallying, in a specific order, to reach position. This strategy needs an internal representation of the environment that is to define places of space in which perceptions are the same, and associate an action with each of them.

**Trajectory Generation:** The Trajectory Generation is determining control maneuvers to take in order to follow a given path or to go from one location to another. this level of planning receives as input, the paths to follow, and provides more accurate trajectories, taking into account local information from the environment. The aim of this layer is to fit a feasible trajectory through the way-points. A trajectory generator has the role of computing different motion functions (reference position, reference heading, etc.) that are physically possible, satisfy UAV dynamics and constraints, and can be directly used as reference trajectories for the flight controller. Reference trajectories can be preprogrammed and uploaded, or generated in real time onboard the UAV. Trajectory generation is commonly

based on minimization of a given criterion (e.g. time between the way points, energy consumption, or low exposure to known stationary threats), and can be generated either on-line or off-line. In the case of failures, upsets, or other anticipated or unanticipated events, the path planning layer automatically reconfigures the desired path by modifying the waypoints. This level is considered the level of refinement, and its existence is essential. Indeed, the upper level, the representations of the environment and tasks are necessarily incomplete because they are too abstract, they can't express in particular all interactions with the environment of the drone, the intrinsic parameters of the UAV system are generally fixed, as against the constraints of the environment are often vague and scalable.

**Environment modeling and Learning:** The world model is the system's internal representation of the external world. It acts as a bridge between sensory processing and behavior by providing a central repository for storing sensory data in a unified representation (Knowledge database). It decouples the real-time sensory updates from the rest of the system. During the mission, the modeling functions will help incrementally build models of the environment, through aggregation (or rather merge) successive models developed from sensory data corresponding to the various acquisitions.

World modeling processes maintain a rich and dynamic database of information about the world in the form of images, maps, entities, events, and relationships at every level. Other World modeling processes use that information to generate estimates and predictions that support perception, reasoning, and planning at every level.

We distinguish following spatio-temporal three criteria:

The instantaneous patterns: are constructed from common sense data and values of observed, estimated, and predicted attributes and state variables (corresponding to a given sensory acquisition).

Local models: the result of the merger of several flash patterns acquired in the same topological location. It's a short term memory containing iconic and symbolic representations of geometric entities and events that are the subject of current attention.

Global models: The global models are maintained update by a local models modeling process, aggregations of all local models built during a given mission. The global models includes models of portions of the environment, images, maps, models of entities, events, rules, task knowledge, abstract data structures, and pointers that represent relationships, and a system model that includes the intelligent system itself. For our architecture, this part can be defined as the process of data acquisition, data analysis, and extraction and inference of information about the vehicle's states and its surrounding environment with the objective of accomplishing assigned missions successfully and safely (figure 6).

It creates and keeps the knowledge database current and consistent (of maps, situations, relationships, and knowledge of task skills and laws of nature and relationships among them). It gives a best estimate of the state of the world to be used as the basis for predicting sensory feedback and planning future actions (learning). It predicts sensory observations based on the estimated state of the world. It simulates results of possible future plans based on the estimated state of the world and planned actions [19].

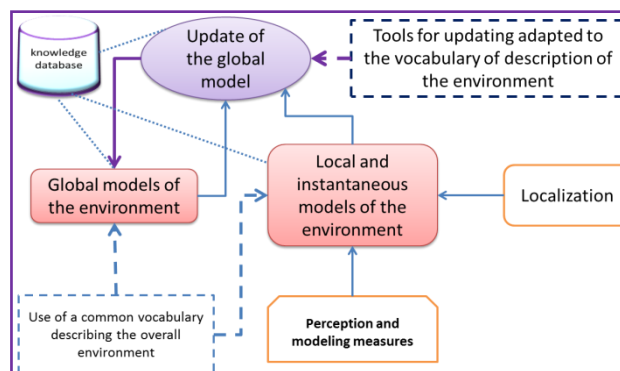


Figure 6: General schema of the modeling of the environment

Learning has the advantage that it allows the agents to initially operate in unknown environments and to become more competent than its initial knowledge alone might allow. Learning agents have the potential to learn about their environment and about other agents through adding to the knowledge held in their working memories.

For some problems, it is desirable to create agents that are capable of more fundamental learning: where the internal structure and processing of the agents adapt to changing circumstances. There are two techniques commonly used for this: neural networks and evolutionary algorithms such as the genetic algorithm (figure 7). It is possible for either an individual agent to be modeled using a neural network, or a whole society to be represented by a network, with each neuron given an interpretation as an agent (although in the latter case, it is hard to build in all the attributes of agents usually required for multi-agent modeling).[20]

**Localization:** Localization is a technique that permits the robot to give an answer to this question [21]: Where am I? It is the main point in any success physical interaction. For many applications an imperative need for UAV autonomy is the ability to self-localization in the environment, especially for extended periods of time, when estimator drift tends to destroy alignment to any global map. Indeed, precise localization is crucial in order to achieve high performance flight and to interact with the environment.

Increasing innovation in the field of electronic communications has led to a current trend of utilizing sensing system such as Global positioning system (GPS), radio technologies or vision-based solutions for localization of UAVs. Fusing data from different sensors helps to improve performance of the overall sensing system. For aerial navigation outdoors, fusion of GPS measurements with INS measurements by means of filtering techniques delivers the level of localization precision required by UAV missions. The proposed architecture provides routines for corrections in the positioning through the combination of information of the Mapping, Sensing and Location modules.

**Perception processes (Filter, detect, recognize, and interpret):** Perception in robotics means the ability to collect process and format useful information to the UAV to act and react to the world around. It covers the acquisition components, filtering, detection, segmentation, tracking, identification and interpretation. Strong perceptual abilities are a basic requirement for a robot working in an environment that was not specifically designed for the robot. Such a surrounding might be completely unknown or may change over time, so that a model cannot be provided to the robot a priori. The perception includes obtaining data about the vehicle and its environment and extracting useful information from the data. The Perception can be further divided into various functions on different levels such as mapping, obstacle and target detection, state estimation, object recognition and Situational Awareness (the perception of elements in the environment within a desirable volume of time and space, the comprehension of their meaning, and the projection of their status in the near future).

The sensory processing is a set of processes by which sensory data interacts with a priori knowledge to detect or recognize useful information about the world. Sensory processing accepts signals from sensors that measure properties of the external world or conditions internal to the system itself. Correlations between sensed observations and internally generated expectations are used to detect and classify entities, events, and situations. Differences between sensed observations and internally generated predictions are used to update the knowledge database.

Most people would only judge a robot to be truly intelligent if it perceives its environment, understands what is happening around it and acts accordingly (A robot that moves through an environment and interacts with it has to know what is going on around it, where it is, where it can go, and where objects necessary for its task are located). The correct interpretation of raw sensor data is often a crucial part when one aims at applications in the real world. A robot must be able to understand its surrounding, in order to work in it and interact with it. Without appropriate sensors a robot is very restricted in what it can achieve and is only able to work at very specific tasks. The topic of this module is therefore the interpretation of low-level sensor information and its application in high-level tasks.

**Action (Flight Control low) :** For UAV, the design of flight controllers low consists of synthesizing algorithms or control laws that compute inputs for vehicle actuators to produce torques and forces that act on the vehicle in controlling its motion (position, orientation, and their time derivatives). At this lowest level, we have the actual interaction with the physical plan: this is sometimes referred to as skill or reflexive level, and includes the traditional control functions (stabilization, regulation, commands tracking). The aim is to convert a trajectory into orders to be performed by the action. At this level, the desired role of the inner-loop controller is to assure rapid stabilization of the overall system in the presence of failures, control input and vehicle constraints, and improve accuracy of vehicle models through on-line learning. A hierarchical flight controller uses a system based on the nonlinear model of rotorcraft unmanned aerial vehicles (UAV) and considers a system's non linearity's as well as coupling between the

rotational and translational dynamics. By exploiting its structural properties, the standard mathematical model of rotorcraft UAVs has been transformed into two cascaded linear subsystems that are coupled by a nonlinear interconnection term.

In this part, we present the main steps for designing a hierarchical flight controller using the inner and outer-loop control scheme: when the flight path is laid out, a flight control system is required so that the UAV can follow the planned flight path and execute the mission. Control inputs are generated based on the reference paths and the current states. The flight control loop generates actuator signals for the control surfaces and thrust vector. The set points for low-level stabilizing controllers whose function is to maintain the vehicle in a stable state and to follow accurately the commanded trajectory are provided. After synthesizing control laws for each subsystem, there by resulting an outer loop with slow dynamics that controls the position and an inner loop with fast dynamics that controls the orientation. The asymptotic stability of the entire connected system is proven by exploiting the theories of systems in cascade. The resulting nonlinear controller is thus easy to implement and tune, and it guarantees the asymptotic stability of the closed-loop system.

**Physical layer:** Finally the physical layer represents the physical part of the robot, i.e. the articulated mechanical system and actuators to move the robot. This constitutes the basis on which the entire architecture is built.

The hardware link agent is an interface between the software architecture and real robot. Changing the real robot require the use of a specific agent but no change in the overall architecture.

Our architecture is a reference model architecture that provides a theoretical foundation for designing and integrating intelligent systems software for unmanned aerial vehicles (how their software components should be identified and organized). It prescribes a hierarchical control principle that decomposed high level commands into actions that employ physical actuators and sensors. Each module of our architecture is capable of accepting and decomposing task commands with goals into actions that accomplish task goals despite unexpected conditions and dynamic perturbations in the world. The architecture give plan on a model of the world rather than planning directly on processed sensor output. This may be accomplished by real-time sensors, a priori information, or a combination of the two in order to create a picture or snapshot of the world that is used to update a world model.

We note an interesting link between the desirable properties of intelligent control architecture for complex systems requiring a large degree of autonomy and the Multi-agent systems. To fulfill these requirements, we decided to use a multi-agent's formalism that fits naturally our needs. The Multi-Agent System paradigm is one of the most promising approaches to create autonomous, open and dynamic systems, where heterogeneous entities are naturally represented as interacting autonomous agents, who can enter or leave the system at will. In accordance with these properties, the multi-agent system is suitable for developing the control architecture of a UAV since it has inherent characteristics that are also desirable for architecture and offer many potential advantages. The fact that the architecture is a multi-agent system provides flexibility in terms of the software level. This architecture will have reactive and deliberative agents at least. The reactive agents will guarantee that simple tasks are achieved under time constraints while deliberative agents will grant planning and reasoning. The whole architecture must assure the safety of the UAV and the environment, so it should provide the mechanisms to deal with hardware and software failures.

#### **Agents' description and Task distribution:-**

One recent trend in autonomous robotic architectures has been the focus on multi-agent hybrid layered systems. Unlike the hierarchical and centralized structures, a distributed multiagent system can integrate its component capabilities to solve real-time complex problems.

Fundamental capacities of our architecture encompass modularity, encapsulation, scalability and parallel execution. To fulfill these requirements, we decided to use multi-agent formalism that fits naturally our need for encapsulation in independent, asynchronous and heterogeneous modules. The communication between agents is realized by messages. For us, a multi-agent technique is an interesting formalism and though our architecture could be implemented without them it led to a very convenient and scalable framework.

EAAS architecture consists in six types of agents: Human interface agent, actions selection agent, perception agent, action agent, the expert system agent and hardware link agent [22].



*The human interface agent (HIA)* is the high level of our control architecture. It must generate a succession of goal, or missions for the actions selection agent, according to the general mission of the robot. It also visualizes the progress of the mission while the UAV is executing it. It can follow up the UAV's position, trajectories, obstacle information, etc. It can show a local map, with the obstacles detected by the UAV and the global map with trajectories and the available readings of the different sensors.

*The perception agents* manage the processing of incoming data (the sensor measurements) and create representations of the environment. They are passive; they only run upon request, perform a one shot execution and then wait for a new message. A perception agent can activate another agent and build a more specific representation using its complementary data. The perception subsystem agents obtain information about the environment and the internal condition of the UAV (for example the level of the battery). They collect data from the sensors and adapt them to provide the information requested by the other agents in the system [23]. There are as many perception agents as there are sensors or sensor groups in the UAV. Finally, this agent is executed upon request by any other agent that has to use the UAV position and whenever new data are available.

*The actions selection agents:* The deliberative subsystem is composed of the actions selection agents in charge of carrying out high-level complex tasks which require a certain amount of time.

Five deliberative agents (actions selection agent) have been defined: *the mission planning, the path planner, the navigator for itinerary generation, the guidance and pilot and the localization*. The actions selection agent must choose and activate the UAV behavior suited for the mission according to all information available and necessary to this choice [24].

-Mission planning agent's goal is to plan the sequence of tasks based on the information provided by the interface and localization agents to know the position of the UAV on the global map, and to ensure that the mission is achieved. Also, the mission planning agent receives information from the battery charger agent to judge whether a mission is possible considering the level of battery charge.

-The path planner agent may take a goal as input and give a path for achieving the goal as output. The Navigator agent must translate a path into a trajectory for the guidance and pilot. The path does not take into account physical constraints of the robot, but the trajectory that it delivers must integrate them.

-The navigator for itinerary generation agents has two main goals: the calculation of trajectory to the goal that is free of non-moving obstacles, and the estimation of the energy consumption of the planned trajectory. The optimal trajectory calculation is obtained in two steps: first with a graph method to obtain a general sequence of destinations (considering only rooms and hallways), and second with a grid method to find the path between two consecutive destinations (considering all the non-moving obstacles). In both methods a search algorithm is used, Dijkstra's algorithm for the first and the A\* search algorithm for the second one. Once the trajectory is determined, an estimation of energy consumption is made based on the cruising speed. Other alternative methods for path planning can also be used, as for example potential fields [25].

The function of the guidance and pilot agent is to convert this trajectory into orders to be performed by the action agent. This agent may be totally autonomous or constitute the process that runs the human interface.

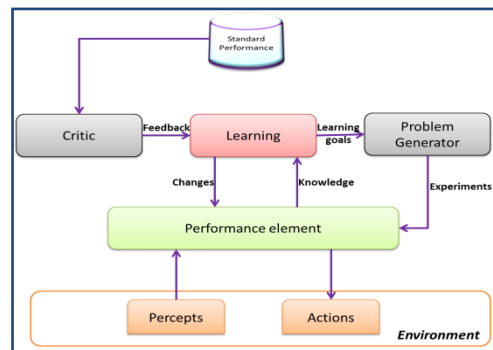
*The localization agent:* The localization agent's goal is to locate the UAV on the goal map. It receives the sensor measurements from the GPS, odometer, laser data and encoder agents as well as the map representation as input and outputs a representation containing the current position of the UAV. In order to accomplish the agent's goal, the localization agent collaborates with the mission planning. It also sends information to the encoder agent to prevent wide derivations from the current estimated position. In this way, the encoder agent can correct accumulative errors produced by the encoder's readings.

The action agents consist of a set of behaviors controlling the UAV effectors. It is activated by a specific request coming from the behavior selection agent. The selection orders him to work with a perception agent by sending its reference. The action agent sends in turn a request to the proper perception agent. This agent is responsible for driving the UAV to the goal position. Given a desired position and an orientation, and based on the current position and heading, this agent calculates the linear and angular speeds to drive the UAV to the target position (goal). It

receives the global coordinates of the UAV from the encoder agent and the desired points of the trajectory from the guidance and pilot agent from the battery agent. The basic action agents are the goal position and the avoid agents, although more agents can be added [26].

**The Expert System Agent:** The strength of our architecture is its expert system whose different diagnostics and recoveries envisaged at its level are the following: Fault diagnosis of sensors, effectors and communication links; Control of batteries (autonomy), accuracy of the trajectory and accuracy / quality of the measured data; Control of the embedded control software (partial failure).

**The learning agent:** The learning element uses feedback from the "critic" on how the agent is doing and determines how the performance element should be modified to do better in the future. The performance element is what we have considered to be the entire agent: it takes in percepts and decides on actions. The last component of the learning agent is the "problem generator". It is responsible for suggesting actions that will lead to new and informative experiences.



**Figure 7:-** A general learning agent

*The hardware link agent* is an interface between the multi-agent architecture and real UAV. Changing the real UAV require the use of a specific agent but no change in the overall architecture. Within a behavior, it is up to the action agent to analyze representations coming from the perception agent and to establish the correct control orders for the platform. Specifically, the hardware link agent communicates with the UAV and obtains its current position, sonar readings and battery charge, and distributes this information to the different sensor agents as required [27].

## CONCLUSION:-

This article describes our work concerning the development of effective architecture to control a UAV in hostile environment. We have created a robot control architecture based on a multiagent paradigm that allows various levels of autonomy and interaction between an operator and the UAV.

In this work, the first part presents the three paradigms used to develop UAV control architecture, the reactive, the deliberative and the hybrid paradigm. The significance, advantages and drawbacks of the architectures are described and compared with each other. The hybrid paradigm is the most used since it combines the advantages of planning in deliberative architectures and quick response of reactive architectures in dynamic or unknown environment. In it, we looked at the issue of control architectures for autonomous robot. First, we defined a set of requirements for such architecture, which focus on a different time of cognition (From perception to action to learning), provide a system with several types of intelligence, easy management of the competition, the satisfaction of robustness properties and verifiability, the satisfaction of modularity and composability requirements, and finally giving the ability to autonomous learning expands the variety and diversity of tasks that UAV can perform. Based on these requirements and analyzing the state of the art, we proposed hybrid intelligent control architecture for autonomous navigation of an unmanned aerial vehicle (UAV).

Our architecture consists of a multi-layered multi-resolutional hierarchy of computational modules containing elements of sensory processing, world modeling, Localization, Mission planning & high level decision making, and a Flight control laws.

Our architecture is a real-time intelligent control system for unmanned aerial vehicles operating in the real world. It provides an excellent control in which integrate multiple knowledge representation approaches (ranging from iconic

to symbolic and from declarative to procedural,) to build cognitive models and intelligent systems that significantly advance the level of intelligence we can achieve. Sensory processing and planning processes have access to a model of the world that is resident in a knowledge database; this world model enables the intelligent system to analyze the past, plan for the future, perceive sensory information in the context of expectations and thus give, on the one hand, the ability for the UAV to control its own autonomy, and on the other hand the capacity to evolve and to learn. The strength of our architecture is the expert system module. This module defines the Meta - behavior of the 'UAV'. It manages the data flow, as much as the perturbations. It also manages the asynchronous events coming from the environment. Moreover, it allows adapting an appropriate behavior by aggregating several behavior modules in front of special situations. It also manages the activation of a behavior module, and transfers the control to it.

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### RESEARCH ARTICLE

#### AWARENESS ABOUT EPILEPSY IN CHILDREN AMONG SCHOOLTEACHERS IN RIYADH, KSA

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##### **Key words:-**

Awareness, Epilepsy, Seizure, Children, School Teachers, First Aid, Impact on Health.

#### *Abstract*

**Introduction:** Epilepsy is a brain disorder characterized by a pathological abnormality in electrical activity of the brain resulting in an unprovoked abnormal movement or behavior leading to a neurobiological, cognitive, psychological, and social consequence. The level of public awareness, and the attitudes and knowledge of epilepsy in the Saudi population is limited, and requires significant improvement.

**Objective:** This study aimed to assess the awareness about the definition of epilepsy in pediatric ages, types of epilepsy, managing an epileptic fit in children and awareness about the impact of epilepsy on children's educational and social performance among schoolteachers.

**Methodology:** 320 teachers were selected from different schools in Riyadh city KSA by a cross-sectional study. The data collected by 14 Statement questionnaires including our objectives.th data reviewed, and statistically analyzed using percentages and frequencies.

**Result:** the results show that 99.4% of teachers have heard about epilepsy, Most of the teachers want to learn more about epilepsy, and about 73% of teachers know that one type of seizure is generalized seizure, 35.9% know partial seizure. More than the half of the teachers has been a witness of an epileptic fit in their classes and around 43% of teachers' first reaction to an epileptic fit was trying to help. The first aid in epileptic fit, is to put a soft towel in the mouth to protect the tongue and keep airway open was 70%, and 46.3% think to secure the media around the patient. The media 38% encountered the most frequently as source of knowledge and an abnormal electrical activity in the brain 70.3% as cause of epilepsy.

**Conclusion:**This study has revealed a critical issue that a majority of schoolteachers do not have adequate knowledge about epilepsy. We recommend the mandatory implementation of epilepsy and basic life-support training and refreshing courses for all schoolteachers across KSA. In addition to enrolling in training courses, teachers must be aware of the availability of first aid kits at schools and the contact numbers of the Saudi Red Crescent Services.

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## Introduction:-

Epilepsy is a common neurological disorder in Saudi Arabia, with a prevalence of 6.54 per 1000. The level of public awareness, and the attitudes and knowledge of epilepsy in the Saudi population is limited, and requires significant improvement<sup>1</sup>. Epilepsy is a brain disorder characterized by a pathological abnormality in electrical activity of the brain resulting in an unprovoked abnormal movement or behavior leading to a neurobiological, cognitive, psychological, and social consequence<sup>2</sup>. Epileptic seizures can be divided into two major classes, Partial-onset seizure is a seizure that begins on a focal area of the cerebral cortex. This class is further categorized as simple focal seizure the main characteristic thing about this seizure is that the level of consciousness is persevered. This type of seizures has subtypes, which are sensory, motor, autonomic, and psychic. Complex focal seizure; unlike simple complex seizure in this type of seizure there is an impairment of consciousness, those patients usually have an aura before their seizure and this aura is usually the simple focal seizure, it typically begins with a behavioral arrest followed by staring, automatism and postictal confusion. Secondary generalized seizure often begins with an aura then proceeds to complex focal seizure and then to generalized tonic clonic seizure.

## Generalized onset seizure; these are classified into six major categories:-

Absence seizure; brief episodes of blank staring with impaired consciousness, it's without aura or postictal confusion. Myoclonic seizure; brief rhythmic jerking motor movement. Clonic seizure; consist of rhythmic jerking motor movement with or without impairment of consciousness. Tonic seizure; sudden onset of tonic extension or flexion of the head, trunk and extremities for several seconds. Primary generalized tonic – clonic seizure (grand mal seizure); they consist of several motor behaviors, including generalized tonic extension of the extremities lasting few seconds followed by clonic rhythmic movement and prolonged postictal confusion. Atonic seizure (drop attacks); brief loss of postural tone often results in fall and injures. It is very important to know how to deal and handle an epileptic fit. When you see a person with an epileptic fit the first thing to do is, protect them from injury by removing harmful object, then cushion their head and time the length of the jerking movement, aid the breathing by gently placing the body in the recovery position, once the jerking have stopped, then stay with them until they fully recover, it is very important not to put anything in their mouth or try to restrain their movement, don't give them anything to eat or drink until they are fully recovered<sup>(2)</sup>. Epilepsy is a complex disorder that has an impact on many aspect of child's development, and school personals may have basic understanding about seizure and its related safety concerns but have less knowledge about the impact of seizure on child's emotional, behavioral and social adjustment. As a result, these children are at increased risk of learning difficulties and unsuccessful school experience; they might face difficulty in social engagement with friends and inadequate social skills and poor self-esteem. And that's why it's important for educators and family members and health care providers to partnership in the care of those children and provides a plan for academic success and safety<sup>3</sup>. A study was done on Kuwait among 824 teacher in 2016, about "Knowledge about Epilepsy and Attitudes toward Students with Epilepsy among Middle and High School Teachers in Kuwait", by cross-sectional study and randomly selected schools, and its show that there is a relatively poor knowledge about epilepsy among school teacher but they have positive attitudes toward students with epilepsy<sup>4</sup>. In 2015 a study about "Knowledge and practice of schoolteachers towards students with epilepsy in Khamis Mushate, Southern Saudi Arabia", among 315 male teachers. It shows that about three-quarters of schoolteachers had attended epileptic fits. About half of them believed that electrical discharges caused epilepsy. Most of them were not with teaching epilepsy separately, nor preventing them from activity. More than half of schoolteachers were not able to do first aid of seizure attacks<sup>5</sup>. In 2015 a study about "Knowledge and attitudes toward epilepsy among school teachers in West of Iran", conduct on 305 teachers from 25 schools. The study shows that the majority of schoolteachers heard about epilepsy. There were positive Attitude and knowledge about epilepsy, but there were deficits in first-aid of epileptic fit<sup>6</sup>. In 2014 a study about "Knowledge, attitude and practices of school teachers towards epileptic school children in Karachi, Pakistan". Among 120 teachers, it was showed that majority of the teachers heard about epilepsy, 14.5% of them think epilepsy is contagious while 72.7% see that epileptics children can succeed as other normal children. A 62.7% were willing to help if they attend epilepsy fit<sup>7</sup>. A study was conducted in 2013 by authors in King Abdulaziz University, Jeddah, about "Primary school teacher's knowledge and attitudes toward children with epilepsy", show that 17% of the teachers well informed about epilepsy. And according to the teachers' attitude, they found that it depends on teachers' knowledge, about 58% of teachers whom happened to have epileptic students in their class, didn't know what to do when they came across an acute seizure in the classroom as their first seizure attack they face<sup>8</sup>. A study was conducted on a sample of a 259 teachers and counselors in 2012 about "Knowledge and attitudes toward epilepsy among school teachers and counselors in Jordan". The results showed average knowledge of epilepsy, however they have poor knowledge about how to deal epileptic person<sup>9</sup>. A study in Pilsen, Czech Republic, that was published in 2012 about "Familiarity with and attitudes towards epilepsy among teachers at Czech elementary schools—The effect of

personal experience and sub specialization". They found significant differences between the teachers with and without personal experience in the aspect of their attitudes. Teachers without personal experience were convinced that epileptic student were more likely to have psychological problems and impaired self-realization than other student<sup>10</sup>. A study was done in Italy in 2011 about "Knowledge and attitudes toward epilepsy among primary and secondary schoolteachers in Italy". It was conducted on a random sample of 600 of Italian schoolteachers through a nationwide telephone interview, the result shows different knowledge and attitude among the teachers, around half of them believed epilepsy hereditary and incurable, and more than one third of them thought it requires support at school<sup>11</sup>.

In 2011 done a study in Gezira State, Sudan about Knowledge, practice and attitude toward epilepsy among Two hundred primary and secondary school teachers, they found that the majority of them had never informed about epilepsy nor previously trained to deal with it. Some of teachers considered epilepsy as an attack from a demon or contagious. About 64% of secondary schoolteachers had knowledge of the initial behaviour toward a child with seizure compared to primary schoolteacher, which shows only 47%<sup>12</sup>. A study was conducted by self-administered questionnaire on 189 teachers in Egypt 2010 about "Knowledge, attitude and practice with respect to epilepsy among school teachers in Assiut city, Egypt". Result show that all teachers had heard about epilepsy, and more than half of them deal with epileptic students as normal students<sup>13</sup>.

A study was in 2008 about "Knowledge awareness and attitude about epilepsy among schoolteachers of primary and secondary levels in India". Therresults show that the majority of schoolteachers were aware that epilepsy is a brain disease. More than 30 % were unsure if epilepsy is related to insanity, and have low IQ. Half of them allow their children to play with an epileptic. 27% only had given first aid to epileptic fit, and only 16% giving it properly<sup>14</sup>. A study published in 2005 about "Perception and attitude to epilepsy among teachers in primary, secondary and tertiary educational institutions in middle belt Nigeria". It was conducted on 460 schoolteachers, and found that even though almost the entire almost teacher had heard about epilepsy negative attitude towards epilepsy is still there. More than half did not knew the cause of epilepsy and several of them had wrong information on the etiology. Some of them misunderstood epilepsy for insanity<sup>15</sup>. In 2004 done "A study on awareness and attitude of teachers on epilepsy in Istanbul" the study done among 346 teachers, and it was showed that more than half of teachers heard about epilepsy, while 71.9% attended seizure attack, and 59.4% knew someone with epilepsy. There was some misconceptions like 2.3% think epilepsy is contagious, or a psychological disease 17.8%<sup>16</sup>.

In 2002 a study about "Awareness, attitudes and understanding towards epilepsy among schoolteachers in Medan, Indonesia", they found that 16% of the teachers are well informed about epilepsy, and there are significant proportion had negative attitude and misunderstanding the disease<sup>17</sup>. A study was conducted in 2001. About "knowledge and attitudes toward epilepsy among primary, secondary and tertiary levelteachers ". Among 300 teacher, show that almost all the teachers had heard about epilepsy, some teacher believe that the epilepsy either contagious or they don't know, and (43%) of teachers had knowledge of the initial procedures during a seizure<sup>18</sup>. The goal of this study was to assess the awareness about the definition of Epilepsy in pediatric ages, types of epilepsy, managing an epileptic fit in children and awareness about the impact of epilepsy on children's educational and social performance among schoolteachers.

### **Materials and Methods:-**

A cross-sectional study with a 14 Statement questionnaire about epilepsy knowledge was administered to teachers at general and private educational schools in Riyadh, KSA. The study was conducted for 6 weeks and starting November 2016. 32 schools were chosen randomly to be part of the study.

The questionnaire was designed to assess the knowledge among teachers about definition, types, management of epilepsy and epileptic fit and its impact on children's social and educational performance in school aged children. Teachers gave written consent before conducting the study.

The variables under study were having heard about epilepsy, sources of information about the disease, types of the disease, possible causes, the need of more knowledge about the disease, the differences when comparing epileptic children's behavior and school performance to their classmates, and finally whether they have ever encountered an epileptic fit , their first reaction and steps taken during management.

**Ethical approval:-**

The study was approved by the ethical committee at College of Medicine of Al Maarefa Colleges followed by approval of the ministry of education, Riyadh, Kingdom of Saudi Arabia.

**Statistical analysis:-**

After completion of data collection, it was reviewed, organized, tabulated and then statistically analyzed using percentages and frequencies

**Results:-**

The study conducted in Riyadh city KSA. The data was obtained from 320 teachers from different schools .The response rate was 100%, but many questions were unanswered. It was found 5.4% of teachers teaching kindergarten students, 37.2% teaching primary students, 35.3% teaching intermediate students and 22.1% teaching secondary students. 99.4% of teachers have heard about epilepsy, while 0.6% hasn't heard about epilepsy. Most of the teachers want to learn more about epilepsy, which represent 96.6%, while 3.4% don't care about it. About 73% of teachers know that one type of seizure is generalized seizure, 35.9% know partial seizure, 11% know complex partial seizure, 30% know absence seizure, 23% know generalized tonic clinic seizure, 28% know status epileptics and 7.7% know pseudo seizure (Table 1).

**Table 1:-**Demographic characteristics and epilepsy Knowledge among teachers.

	Frequency	Percent
Levels of teachers:		
Kindergarten	17	5.4%
Primary	118	37.2%
Intermediate	112	35.3%
Secondary	70	22.1%
Total	320	100%
Heard about epilepsy:		
Yes	315	99.4%
No	2	0.6%
Total	320	100%
Need to now about epilepsy:		
Yes	308	96.6%
No	11	3.4%
Total	320	100%
Types of seizure:		
Generalized seizure	199	72.9%
Partial seizure	98	35.9%
Complex partial seizure	30	11%
Absence seizure	84	30.8%
Generalized tonic clonic seizure	63	23.1%
Status epileptics	78	28.6%
Pseudo seizure	21	7.7%

It was found 55.2% of teachers have been a witness of an epileptic fit in their classes and 44.8% haven't been. 43% of teachers' first reaction to an epileptic fit was trying to help, 10.5% was feeling afraid and steeping back, 19.8% was calling for help and standing by and about 27% don't know what to do. 59% of teachers know the first aid in epileptic fit, 41.4% don't know (Table 2).



**Table 2:-** Comparison between teachers in dealing with a case requiring epilepsy.

	Frequency	Percent
Witness of an epileptic fit in class:		
Yes	99	44.8%
No	122	55.2%
Total	320	100%
First reaction:		
Feel afraid and step back	18	10.5%
Go and help	74	43%
Call for help and stand by	34	19.8%
I don't know what to do	46	26.7%
Total	320	100%
Knowing first aid:		
Yes	136	58.6%
No	96	41.4%
Total	320	100%

It was found 70% of teachers think that one of the first aid in epileptic fit is to Put a soft towel in the mouth to protect the tongue and keep airway open, 46.3% think to Secure the media around the patient, remove all harmful objects and put him on his left side, 43.6% think to try to put hard object in the mouth to protect the tongue and keep mouth open, 21.6% think to try to use any perfume to wake him up, 11.5% think to give him some water and about 10% think to give him his medication during the attack (Table 3).

**Table 3:-**Comparison between teachers in dealing with a case requiring first aid.

	Frequency	Percent
First aid:		
Try to put hard object in the mouth to protect the tongue and keep mouth open	99	43.6%
Secure the media around the patient, remove all harmful objects and put him on his left side.	105	46.3%
Put a soft towel in the mouth to protect the tongue and keep airway open.	160	70.5%
Try to use any perfume to wake him up.	49	21.6%
Give him some water	26	11.5%
Give him his medication during the attack.	23	10.1%

It was found about 38% of teachers know epilepsy from media, 22.1% from friends, 19.4% from relatives, 12% from affected member in their families and 8.4% from other sources (Figure 1).

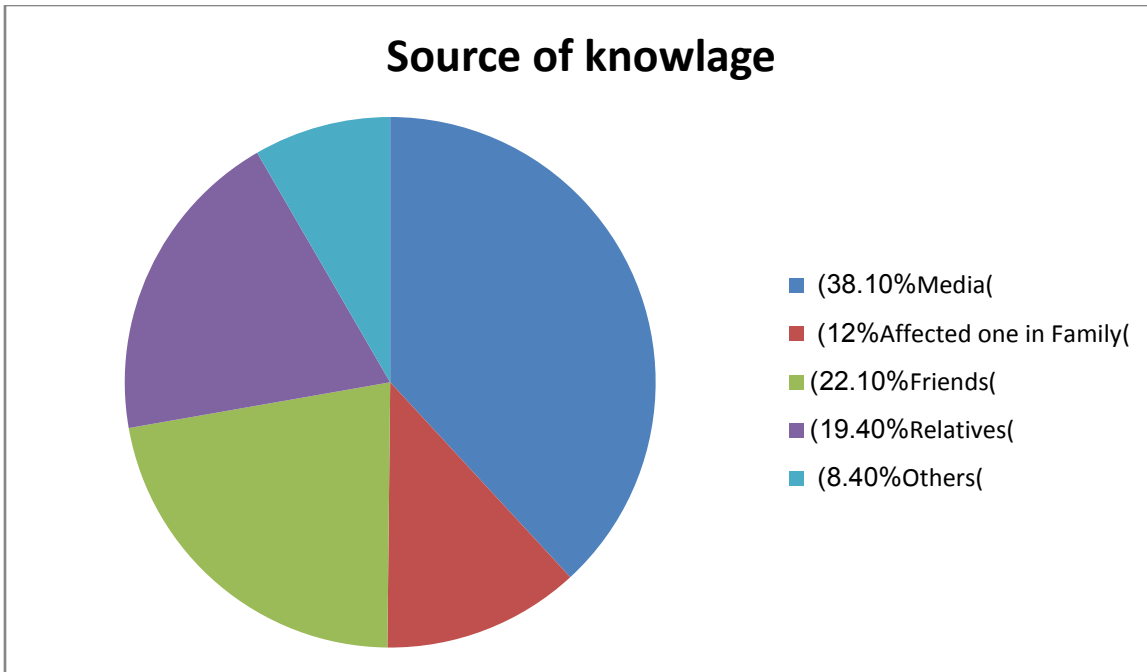


Figure 1:-source of knowledge about epilepsy among teachers.

It was found 70.3% of teachers think one cause of epilepsy is an abnormal electrical activity in the brain, 23.8% think it's from brain trauma, 21.6% from brain infections, 14.4% from genetic defect, 14.1 from anxiety and stress, 7.8% from birth defect, 4.1% from brain cancer and about 12% don't know the cause (Figure 2).

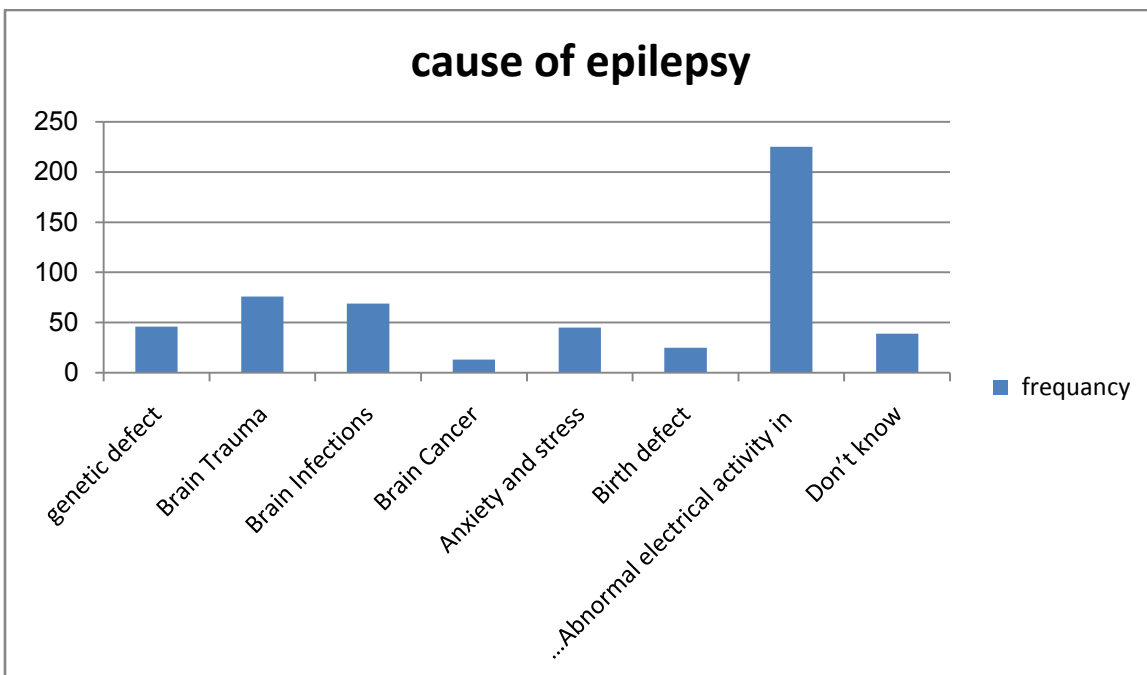


Figure 2:-Opinion about cause of epilepsy among teachers.

It was found most of teachers think that epilepsy is a neurological disease witch represent about 84%, 6.9% think it's psychiatric disease, 5% think it's hereditary disease and 4.4% think it's from evil spirit or spell. It was found 83.3% of teacher thinks that there are many types of seizure and about 16.7% don't think. It was found 55.7% of teachers notice that an epileptic student doesn't have low school performance, 39% notice some of them and 5.2% notice

they have low school performance. It was found 4.5% of teachers notice an epileptic student have social behavior issues, 34.2% notice some of them and 61% don't notice.

### **Discussion:-**

Awareness about epilepsy is considered very important to the society in general, and among school teachers becomes even more, as they are in contact with children for long hours on daily basis, which makes them more prone to encounter epileptic fits or other emergencies. Therefore this research was made to assess the awareness of schoolteachers about epilepsy and how to manage an epileptic fit among children.

In our study, a sample made of 300 male/female teachers, from deferent levels, ranging from kindergarten to secondary grades. The majority were primary school teachers. Almost all of the teachers heard about epilepsy, from deferent sources, mostly from media. However, the majority emphasizes the fact that they want to know more about epilepsy.

There are deferent believes among people in the society regarding the nature of the disease, this intern, can affect how people adapt and behave towards it, many people are shy to even tell that they have an epileptic member in the family. In our study we found that most of teachers think that epilepsy is a neurological disease, in contrast to a study that was done in Italy in 2011 about "Knowledge and attitudes toward epilepsy among primary and secondary schoolteachers in Italy" that showed half of the sample believed epilepsy is a hereditary and incurable disorder. Surprisingly still there are some who think that epilepsy is a result of power from evil spirit. In another study done in Gezira State, Sudan about Knowledge, practice and attitude toward epilepsy among Two hundred primary and secondary school teachers, Some of teachers considered epilepsy as an attack from a demon or contagious.

The majority of the sample has a good knowledge about the cause of the disorder as they mention the correct answer that it is abnormal electrical activity in the brain.

In this study the majority of the school teachers knew that seizure has different types but mostly recognized generalized tonic clonic seizure and only one third of the sample knew about partial seizure, although a study that was made in Finland about " Distribution of seizure types in an epileptic population<sup>1</sup>. ", and showed that partial seizure accounts for 50% of epileptic disorders in children.

When teachers were asked about low school performance, more than half of the study sample noticed that epileptic students don't have a low school performance. And this result is supported by a study made in Nigeria about Academic performance of school children with epilepsy and <sup>2</sup>where they found that the overall academic performance of epileptic children without other chronic disorders attending normal schools is not different from that of normal children in the same setting, though they are under-achieving in some subjects.

In regards of the impact of the disorder on social behavior of epileptic children most of the teachers didn't notice any behavioral issues.

This study showed that there is no significant differences in the number of teachers have been a witness of an epileptic fit in their classes and those who haven't been. However, less than the half percentage of our sample had attended epileptic fits. In comparison with other researches that have same sample conducted in different cities in Saudi Arabia, it indicate d that the teachers in Khamis Mushate and Southern Saudi Arabia have attended epileptic fits more than in Riyadh, and Jeddah had the least attendance. In our study results, we found that most of schoolteachers know how to provide first aid when seizure attacks happened in classrooms, this was noticed by choosing the correct steps of management that was asked in the questionnaire. However, still there is more than half percentage of schoolteacher's think that they need more knowledge in handling a situation of an epileptic fit. As our study showed that most of our sample knew about epilepsy, however, the majority as well didn't know how to deal with an epileptic fit. This finding was similar to many other studies conducted about "knowledge and practice of school teachers toward students with epilepsy in Khamis Mushate, Southern Saudi Arabia, West of Iran, Jeddah, Jordan, Egypt, India, Indonesia and Italy". Gezira state and Sudan, showed higher percentage of knowledge about the initial steps taken toward a seizing child. When asking about the first aid in managing a child who is seizing, many teachers choose to put a soft towel in the mouth to protect the tongue and keep airway open and only Few teachers choose to secure the media around the patient and remove all harmful objects and put him on his left side and try to put hard object in the mouth to protect the tongue and keep mouth open. This study has confirmed that

most of schoolteachers have poor knowledge of how to deal with seizure attack as first aid. And accordingly we need to arrange more school activities talking about the awareness of epilepsy and let the teachers do practical application of first-aid management of epileptic patient.

### **Conclusion:-**

This study has revealed a critical issue that a majority of schoolteachers do not have adequate knowledge about epilepsy. We recommend the mandatory implementation of epilepsy and basic life-support training and refreshing courses for all schoolteachers across KSA. In addition to enrolling in training courses, teachers must be aware of the availability of first aid kits at schools and the contact numbers of the Saudi Red Crescent Services.

### **Authors' contribution:-**

All authors took part equally in writing, revising and final approval of the manuscript.

### **Conflict of interest:-**

The authors have no conflict of interest to declare.

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### RESEARCH ARTICLE

#### IS THE APPROACH OF ELIMINATING FGM IN KENYA USING THE RIGHT APPROACH?

Weldon Korir.

#### Manuscript Info

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Female Genital Mutilation, Society,  
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#### Abstract

The purpose of this study is to evaluate the current approach by the people of Kenya on eliminating FGM among the locals.

Female Genital Mutilation is a social nonconformist which has existed in Kenya just like in other countries. This research was based on review of literature, authors own experiences about female genital mutilation in his own community in Rift valley in Kenya. This study will describe Female Genital Mutilation in Kenya and evaluate the various approaches used to encourage the society to abandon Female Genital mutilation in Kenya.

However, it is worth to note that the fight to eliminate the FGM has full support of the previous and the current Government but the one million question which this research will try to find out Is the approach of Eliminating FGM among the locals in Kenya the right approach?.

This study finds evidence that suggests that Kenya's performance in this vice is far below international expectation as the practice is still there though in hiding or behind public knowledge. Several deaths are met as a results of the same and there is a likelihood that many are not reported or some of the over bleeding victims are not take to hospitals for treatment and hence leading to several complication in the later part of life.

It is on the context that the research finds that there is a likelihood to change the approach of discouraging the practice instead of using punitive measures like police harassment, chief or Government administration threatening the people, a new social based and participatory approach should be used to seek the buy-in by the society on the need to eliminate FGM in the communities around them.

A primary data analysis which uses data gathered through interviews and secondary data analysis which involves the utilization of existing data collected from the existing documents, questionnaires and interviews shall be conducted within sampled and selected individuals which according to the researcher are likely to provide an objective view of the evaluation of the practices or common view by those who practice and those who understand their society needs.

The target population under study was 80 individual in 8 counties or regions in Kenya, the distribution is to cover at least 15 Government administrators from the 15 different locations where it is assumed that the practice is higher than other regions, 10 elders from the identified areas who are mature enough to give independent opinion on the evaluation of current Government directives, 15 Officers working in

Gender Department within the Ministry of Gender, Sports and Social Services, 40 Girls who have undergone the practice (FGM) recently or some years back and have an opinion on their views of the same, 20 of the girls who have been rescued by the Government or Church and secluded from the others to avoid any force full or influence towards going back to the practice.

The study used both quantitative and qualitative data, tables, charts and graphs are used to illustrate findings. A conclusion on approach and recommendations to the future expectation as per the research in Kenya and the need for potential donors to understand the happening and views from the common people in Kenya about FGM.

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### **What is Female Genital Mutilation (FGM):-**

According to World Health Organization (2008). Female Genital Mutilation involves an elderly women from the community slicing off all or part of a woman's clitoris and labia as part of a ceremony that is often conducted around the time that the woman reaches puberty.

According to Kalenjin culture circumcision of girls (Female Genital Mutilation) is the practice that is widely believed to increase a girl's chances of marriage, prevent promiscuity and promote easy childbirth. According to Thomas, an elderly Kalenjin man, Women who did not circumcise their daughters ran the risk of being seen as irresponsible, immoral and should be secluded from the inner circle of women on the kalenjin community.

From the two explanations, it shows that there is a different understanding of the Female Genital Mutilation in its concept and this could be attributed to the difference too in understanding the need to eliminate it in the society.

In relation to WHO, FGM is a violation of the human rights of girls and women. Female genital mutilation (FGM) comprises all procedures that involve partial or total removal of the external female genitalia, or other injury to the female genital organs for non-medical reasons.

In African tradition understanding, Female Genital Mutilation is a rite of passage from childhood to adulthood and to an extent to be ready for marriage.

### **What are the Importance of Female Genital Mutilation is the Kenya context:-**

Across all the 8 regions visited during this research demonstrated a common cultural understanding of the FGM, the reasons female genital mutilations are practice in their society are more of sociocultural factors which have been inherited from the previous generations and families in the communities. The following are some of the common cited background roots on the practice as stated or found by this research in Kenya:

It is a social acceptable norm with social pressure to practice based on the old practice in the community and the need to be accepted in social circle of friends and family, the fear of being rejected by the community in Kuria they called it ""**Machobere**"" , in Kalenjin they called it "" **Korket**"" , in Kisii they called it '**Irīgũ**and these are serious negative connotation used in the society against those who have not undergone FGM. In 6 of the 10 communities visited during this research, FGM is a universally performed and accepted practice in order to belong to the community of elders.

It is always considered necessary, the only way of raising a girl, and a way to prepare her to shift from childhood to adulthood, once the girl has been accepted in the community as an adult then it gives way for positive acceptance for marriage in the community.

Although there is No scientific proof, some communities' belief that FGM will reduce a woman's libido and that it helps resist extramarital sexual acts. This idea was upheld by some region strongly but some in the research did not put it as a genuine reason towards the practice.

Some of these views are supported by the previous research which stated that the other justifications offered for female genital mutilation are also linked to girls' marriageability and are consistent with the characteristics considered necessary for a woman to become a "proper" wife. It is often believed that the practice ensures and preserves a girl's or woman's virginity (Talle, 1993, 2007; Berggren et al., 2006; Gruenbaum, 2006).

WHO(2006) estimates that between 100 and 140 million girls and women worldwide have been subjected to one of the first three types of female genital mutilation (WHO, 2000a). Estimates based on the most recent prevalence data indicate that 91,5 million girls and women above 9 years old in Africa are currently living with the consequences of female genital mutilation (Yoder and Khan, 2007). There are an estimated 3 million girls in Africa at risk of undergoing female genital mutilation every year (Yoder et al., 2007).

Many girls and young women are still subjected to genital mutilation in the name of 'tradition.' According to Egypt's 2008 Demographic and Health Survey, at least 91% of Egyptian women between the ages of 15-49 have undergone genital mutilation and 72% of the practice is conducted by medical doctors. While the prevalence of FGM is down from 97% in 2000, combating it is a long-term endeavor that involves changing long-held beliefs. More than 200 million girls and women alive today have been cut in 30 countries in Africa. When the girls undergo FGM in the Igembi society, they make a vow with their blood that they will continue this tradition or bring down a curse upon their families and land.(Tanui 2006, 17.)

### **Global Approach towards eradicating FGM:-**

In 2013, with UNDP support, a 5-year national strategy for FGM abandonment and family empowerment was developed, in partnership with local authorities, civil society organizations and several UN agencies. The initiative is implemented with contributions from the European Union, the Governments of Sweden, of the Netherlands and of Germany.

Sweden was the first country in the world to ban FGM in 1982, and in 1999 the ban was extended to include circumcision carried out in other countries. But police have struggled to apply the law, securing only two convictions in more than 30 years

The education campaigns have been greatly successful in many communities that have now understood the incomparable difference between the informal education and the formal one. (Creel & Ashford 2001).

The practice was outlawed in the US in 1996, but at least 228,000 women in the US are thought to be affected, according to research from Brigham and Women's hospital in Boston.

"The strongest advocates are the families themselves," notes Ignacio Artaza, UNDP in Egypt Country Director. The momentum continues with a national broadcast campaign that advocates putting an end to FGM and, for the first time in Egypt, features real testimonials from families who refused FGM, bravely faced community pressure and decided to protect their girls. Women who were mutilated and men talk about their own experiences and how FGM negatively influenced their marriage and life.

In Egypt, the programme has held awareness sessions targeting 20,000 men, women and youth. Awareness meetings were held in primary and secondary schools at risk of FGM, addressing students and teachers, social workers and parental board members.

A study in UK estimated that 66,000 mainly African women resident in England and Wales in 2001 had undergone female genital mutilation and 23,000 girls largely from African communities here under the age of 15 were at risk of FGM or may well have undergone FGM (Efua 2007)

Recognizing that FGM is part of a bigger package, the programme also integrates comprehensive health, social and education services. It supported the improvement of science labs in schools and nurseries. Vulnerable women were aided in acquiring national IDs so they could receive public services and were trained on developing home economics projects to improve their income. Medical professionals received training on counseling and closing gaps in service and medical caravans were created to benefit almost 3500 villagers.



The existing Female Genital Mutilation Act 2003 prevents British citizens and permanent residents from assisting or carrying out FGM abroad but cannot be used against others who live in this country but take children overseas for the procedure. (The guardian 2014)

Putting an end to FGM requires a cultural shift, and changing the mindset of families and individuals is necessary to move FGM from a tradition to a crime. Already, people are recognizing that it is illegal for doctors to circumcise and young girls in schools say that FGM is a crime. The National FGM Abandonment Programme, set to run through 2017, will continue to institutionalize the issue and work through families and individuals to change traditions.

UNDP Gender Equality Strategy is well placed to ensure that gender equality and the empowerment of women are integrated into every aspect of its work to support countries to eradicate poverty and reduce inequalities and exclusion.

Organizations such as the United Nations have campaigned against the practice, calling for its abolition as a matter of global health and human rights. But despite a decades-old movement against it, FGC rates in some countries haven't budged. According to a survey by the Population Reference Bureau, in Egypt more than 80 percent of teenagers still undergo the procedure.

The number of American women and girls affected or at risk is believed to have grown by 35 per cent to at least 228,000 between 1997 and 2000, according to the African women's health center of Brigham and Women's hospital in Boston, Massachusetts.

#### **Kenya's Approach in eradicating FGM:-**

The pre-independent Kenya regime enacted various legislations between 1926 and 1956, seeking to eradicate FGM practice by reducing the severity of the cut, defining the age for circumcision among other regulations. After much opposition to this form of regulation in 1958, the colonial government rescinded all the resolutions outlawing FGM on the basis that it was a deeply rooted and acceptable practice in the communities (Concellia 2010).

In Kenya, circumcision of girls under the age of 17 was outlawed in 2001 as measures contained in the Children's Bill passed by parliament. However, the practice is still going on in the rural areas despite imprisonment of those found to have broken the law. The law leaves room to girls above this age of 17 to make a choice on whether to undergo the practice or not.

In 2001, former President Daniel arap Moi gave a presidential decree that Circumcising of girls under the age of 17 was a crime punishable by at least a year in jail. But despite the order, the practice remains widespread in rural Kenya. The next question is why was it not possible to implement the presidential order and according to the findings of this research is that the Police and chiefs who are supposed to implement the order are part of the society which believe and have practice it since the time of their grand fathers. The small catch of the order was that girls under 16 years were circumcised but in the records they were stated as above 17 hence they were within the law.

The other loophole in the order was the choice of girls above the age of 16 years to 23 to be circumcised or not depends on individual. Although many might not have been of the idea to undergo FGM but the community pressure and the thought of being considered outcast force many to be circumcised although the then new law protect them.

The Question of "Are you for or against FGM practice in your tribe" yield the following, that more than half young girls in the tribes sampled in Kenya still practices FGM or are for FGM. The results vary from ethnic groups e.g the Kisii (79%), Maasai (72%), the Kalenjin (60%), TaitaTaveta (52%) and Meru,(47%), Embu (38%), the Kikuyu (33%) and The Kamba(24%), the Mijikenda( 17%), Swahili/somali (10%).

S.No	Tribes	Percentage among the particular tribe	
		For It	Against It
1	The Kisii	79%	21%
2	The Maasai	72%	28%
3	The Kalenjin	60%,	40%
4	The Taita&Taveta	52%	48%
5	The Meru	47%	53%
6	The Embu	38%	62%
7	The Kikuyu	33%	67%
8	The Kamba	24%	76%
9	The Mijikenda	17%	83%
10	The Swahili/somali	10%	90%

Source: Author (2016)

There is a close link with the finding of the previous research such as the Kenyan Demographic and Health Survey in terms of the trends but there is too a lot of reduction in numbers currently(2016) as compared to the research period then(1998). From the result, it demonstrated that among Kisii a large number of those interviewed strongly are for the FGM to continue and closely followed by The Massai. The research combined the Taita&Taveta together, the Swahili and Somali together based on their close cultural practice and nearness to each other. There was a differing opinion from some independent observers during the interview that the practice is high or prevalent in the Somali community but they are not open to talk about it hence not easy to figure out the actual figures. Similar to Swahili which according to socialist within their society, the practice is still high though they closing guard any information from getting out of the immediate family:

The Question of “Do you think the Kenya Government is using the right Approach to eradicate FGM”, shows the following responses from each tribe sampled in the research.

S.no	Tribe	Percentage among the particular tribe	
		Yes	No
1	The Kisii	23%	77%
2	The Maasai	32%	68%
3	The Kalenjin	50%,	50%
4	The Taita&Taveta	47%	63%
5	The Meru	42%	58%
6	The Embu	46%	54%
7	The Kikuyu	58%	42%
8	The Kamba	50%	50%
9	The Mijikenda	70%	30%
10	The Swahili/somali	72%	28%

Source: Author (2016)

Although there are similar responses on the opposite direction,t the trend is closing following the negativity from the tribes which practice FGMe.g The Kisii find out not proper as according to them, this should be an individual choice if they like but not to force the tribe to follow a general Government directive. Swahili/Somali though they were the least in those who practice were strongly supportive of the Government approach as to have punitive measures against those who practice FGM, It is on this context that Most of them who still practice includes locals who reside outside Kenya but bring home their girls during holidays to undergo FGM within confines of their homes.

The Question of “who is doing a better role in eradication FGM among the 3 agents”, shows the following responses from each tribe sampled in the research.

S.No	Tribe	Percentage among the particular tribe		
		Government	NGO	Local Community
1	The Kisii	10	53	37
2	The Maasai	25	62	13
3	The Kalenjin	17	57	26
4	The Taita&Taveta	32	53	15
5	The Meru	30	56	14
6	The Embu	31	52	17
7	The Kikuyu	34	54	12
8	The Kamba	35	46	19
9	The Mijikenda	35	42	23
10	The Swahili/somali	45	20	35

Source: Author (2016)

There is a common trends among all the tribes that NGO is doing far much better than the Government and Local community combined. It was fully acknowledged from the research that The Government is contributing a lot in the fight against FGM in the Society as shown by the statistics in the table above. Although the local community plays a role but their contribution is so low when compared with the NGO and the Government whereas in the real life practice they should be the leading in fight against FGM.

#### **FGM behind the Government's back:-**

According to one senior nurse who is familiar with the practice, many young girls goes to dispensary the day before and they request for antibiotics and an anti-tetanus injection, request for a clean disposable razor or even buy from shops, this was supported by a shopkeeper in 7 areas visited during this research that disposable razor are in high demand during school holidays and more so during December holidays. Some of the learned ladies who happened to come from well-educated families but have undergone the FGM provided the research with a new view on approach behind the Government back, this is done in collaboration with Medical practitioners on a mutual personal understanding where young girls go to healthcare providers and have the circumcision performed there, stay in the hospital for some days in the pretext on a certain ailment, their semi modern group thinking is, if it is done by a doctor, it make it safer.

#### **Some of the Success approach in Kenya:-**

Mostly formal education from the locally recognize women and leaders within the community have yield positive results. The appointment of Hon MrsChebiiKilimo who had demonstration a real need for eradication of the practice shows a serious commitment by the Government of the day (2013-2017). The formation of a full time Government body to deal with Anti- Female Genital Mutilation gives a strong views and direction towards those who still have the desire or practice it behind the Government's back.

According to a common view which came from this research was that there is need for a multi-sectoral approach whereby the government, non-governmental organizations, religion, and the elite in the communities have a joint effort in the fight against this tradition by launching heavy education campaigns in the communities.

It was also found out by this research that Mothers are not solely in charge of the decisions for their daughters. There is need to target people who are in the extended family, and who have authority in these families, and who have a certain level of influences on them in the community. An practical encounter during this research among Maasai community where there was a meeting between reformed elders on the matter, senior church elders in the community and the youth led to serious heated debate which demonstrated a high level of cultural commitment to practice the same among the youth whereas the few reformed community people are fighting the same, a similar encounter was found in Kisii, Meru, Embuetc, the most difficult communities to understand their real thinking towards the fights of FGM are the Kalenjins, Kikuyu and Taitas since although there are a lot of talk against the vice but practically on the ground the practice is still strong. The research therefore recommend a society based participatory approach, increase the funding to the newly form Government agencies, close working relation between Government, NGO and community, increase community based education through baraza, film etc, need have male elders buy in the idea of eradicating the FGM in their community.

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### RESEARCH ARTICLE

## THE INFLUENCE OF THE ISLAMIC BUSINESS ETHICS AND SPIRITUAL INTELLIGENCE OF ISLAMIC LEADERSHIP AND PERFORMANCE MANAGER SHARIA BANK IN SURABAYA

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Islamic business ethics, spiritual intelligence, islamic leadership and performance manager

### Abstract

Performance is a problem that will always be faced by the management, as the management needs to know the factors that affect the performance of managers. Assessment the success of performance a manager is highly dependent from the performance of inferiors because a manager unable to work own .Hence a manager have to be able to apply islamic business ethics and lead inferiors performed well in his work , and have intelligence spiritual. The purpose of this study was to investigate the influence of Islamic business ethics and spiritual intelligence on the performance of the manager through the leadership of Islam as a moderating variable. The population in this study is the manager of Sharia Bank which has a network of offices in Surabaya. The sample in this study took the profile of Sharia Bank in Surabaya, with a total sample of 95 managers. Testing the hypotheses used in this study is a multivariate analysis with SEM using AMOS software. Based on data analysis using SEM and discussion of the results of research that has been presented, it can be concluded: That the Islamic business ethics to contribute positively to the Islamic leadership manager Sharia Bank in Surabaya, intelligence spiritual provide a positive contribution to the Islamic leadership manager Sharia Bank in Surabaya, Ethics Islamic business contributed positively to the performance manager of Sharia Bank in Surabaya, intelligence spiritual contributed positively to the performance manager of Sharia Bank in Surabaya Islamic leadership contribute positively the performance of the Sharia Bank in Surabaya.

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### Introduction:-

As the country with the largest Muslim population, Indonesia should become a pioneer in the development of Islamic finance in the world. It is not an impossible dream because of the potential for Indonesia to become a global player in a very large Islamic financial, among others are: The number of large Muslim population into potential clients Islamic finance industry. The economic outlook is bright, reflected relatively high economic growth (6.0% -6 range,%), supported by solid economic fundamentals. (Alam, 2012). After experiencing relatively high growth in previous years, in the years 2013- 2014 syariah banks face the challenge of slowing growth. Slowing the growth of Sharia Bank is considered as a serious problem. Honorary Chairman of the Association of Indonesian Sharia Bank said that the slowdown in the growth of Sharia Bank in the year to whip for the banking industry to continue to find innovative ways that Sharia Banks remain in the hearts of the public. According Association of Indonesian Sharia

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Bank, slowing the growth of Sharia Bank at least caused by several things. First, *pricing*. Sharia Bank less competitive. Second, product and human resources are less clearly distinguished from conventional banks. The balance of the growth of Sharia Banks, followed by the need for increased workforce. It aims to provide excellent service to consumers and educational Sharia Bank products. However, there are a number of problems in human resources in Sharia Banks. According Permana (2012) one of the biggest problems of human resources sharia is the banks difficult to find sharia banking human resources competent and qualified. Sharia Bank tends to take human resources from outside the college sharia for human resources in Sharia Banks usually just easier to give knowledge on Sharia Bank. Based on the above issues, the performance of managers in the spotlight major in solving problem the growing of Sharia Bank and human resources issues , Because managers in the life of any organization or institution or the other in Islam pushed in a common life, society and the nation motivate a manager based on the agreement to the public by giving to people you trust and are considered able to lead and give instructions to people on all the issues facing the life. A manager who is Muslim is obliged to follow the example of the Prophet Muhammad, for all his attitudes and behavior in leading Muslims is basically a paragon enviable and followed.

Performance is a problem that will always be faced by the management, as the management needs to know factors affecting the performance of managers. Assessing the success of a manager's performance is highly dependent on the performance of subordinates because the manager can not work alone. Therefore, a manager must be able to apply Islamic business ethics and lead subordinates to excel in his work, and has a spiritual intelligence. Factors that may affect the performance of the manager will make the company's management can take various policies required, so as to improve the performance of managers to match the expectations of these institutions. Areas of business ethics islamic very important to popularize the Islamic economic system, and it requires the search and excavation Islamic law relating to business ethics so that there is no longer practices that harm either party or both side. Moreover, there is no doubt Muslims to carry out their business. Doing business by selling and buying or other types of work are allowed to obtain sustenance is something that is commanded by religion because of the benefits to be gained from it for personal and community (Thanksgiving 2012). In the concept of Islamic economics, although humans have an important role as a principal economy, they still make moral principles in the law as a source of business ethics, as a base that must be held and executed a person or group in doing activity. Ethic need for working when people started to realize that progress in the field of business has led to people increasingly marginalized from the values humanity .In a tight business competition, companies that excel not only companies that have business criteria managerial good, but also companies that have good business ethics.

In addition to the Islamic business ethics which is owned by the employees, the leader's role in leading the organization to improve performance is also very instrumental in realizing the objectives of the company. According Siagian (2009) the ability and skill to a post as leader of the work unit can influence behavior by motivating others, especially subordinates to think and act in order to achieve performance in line with the objectives set. Applied management of Islam in these institutions certainly needs a leader which is expected to lead and bring the institution in order to develop and advance in accordance with the characteristics of the Islamic leadership. Leadership manager is a relationship between individuals or subordinates and superiors who influence others to get them to work towards the achievement of specific goals into organizational goals. Islamic teachings require the necessity of their manager despite of two. This is as stated by the Prophet Muhammad hadith narrated by Abu Daud argued that: "when leaving the three people on their way, let them lift one of them becomes the leader" (Mangkunagara, 2005: 57) The effectiveness of leadership greatly affect the effectiveness of the organization. To be a successful leader, intelligence is one of the requirements that must be possessed. The ability of a person is determined by its intelligence, that intelligence is *Spiritual Quotient* (SQ) or spiritual intelligence. Spiritual intelligence as the intelligence of a person in terms of finding and interpret the meaning, value, purpose deepest, and motivation of the most high, served as the cornerstone for the proper functioning of the intellectual and emotional intelligence effectively for spiritual intelligence is supreme intelligence possessed by humans. Based on the explanation above, the factor of Islamic business ethics, Islamic leadership and emotional intelligence is needed to prevent potential abuses and scandals at Sharia Bank to have the same possibilities with conventional banks as well as to improve the performance of managers. Sharia Bankers, executives and bank officials, including commissioners also human beings who have the desire to be tempted wallow material, so it is not impossible for corruption and irregularities can occur so that the transparency of the Sharia Bank to be very important in order to prevent a potential scandal. As an example of Religious Affairs had received the title agency's most corrupt in the management of pilgrims who were unable to show transparency in financial management, which is still in question would be transparency by the public for their alleged corruption as a religious symbol does not guarantee the institutions and people who are in these institutions net of irregularities .

Based on the description of the background, the formulation of the problem in this study is:

1. Does the Islamic business ethics affect the Islamic leadership manager Sharia Bank in Surabaya?
2. Does intelligence spiritual affect the Islamic leadership manager Sharia Bank in Surabaya?
3. Does Islamic business ethics affect the performance of managers Bank Sharia in Surabaya?
4. Does spiritual intelligence on the performance of Sharia Bank manager in Surabaya?
5. Does Islamic leadership affect the performance of managers in Surabaya Sharia Bank?

## **Matherial and Methods:-**

### **Research Variables:-**

Latent variable is a variable whose value is determined by measurable variables or indicators. In accordance with the background of the title, the formulation of the problem, objectives and hypotheses, in this study is 5 latent variables, namely: Islamic business ethics (X1), spiritual intelligence (X2), the leadership of Islam (Y1) and performance manager (Y2). Definition of variables -variable exogenous and endogenous intervening can be explained as follows:

### **Islamic business ethics (X1):-**

Person or organization doing business or mutually beneficial business contacts in accordance with the values of Islam. Indicators of Islamic business ethics, among others (Harahap: 2011: 78):

- *Unity* that emphasizes ethics and teachings which avoids any business practice that is forbidden.
- *Equilibrium* that is always trying to do justice in carrying out the work
- *Freewill* which are companies embed freedom of managers in making the rules in accordance with the norms of
- *Benevolence* that provide benefits to others.

### **Spiritual Intelligence (X2):-**

Intelligence to face and solve the problem of meaning and value, the intelligence to put the behavior and life in the context of a broader meaning and rich, intelligence to judge that the action or the way a person's life is more meaningful than others. The values of spiritual intelligence based indicators in Spiritual Intelligence (SQ) which is much needed in the business world, including the (Sukidi (2002: 94):

- a. Absolute Honest is the consistent stand managers Sharia Bank in carrying out the work and have confidence to always work honestly
- b. openness is the attitude of the manager of Sharia Bank in accepting any criticism and input for himself, open to any criticism and feedback
- c. self-knowledge is the way the manager of Sharia Bank behave and knowing who he was and the role of its work for the organization as well as to understand the duties and roles for the organization
- d. focus on the contribution that attitude and ability Sharia Bank managers to focus more giving than receiving. belief to focus more contributions than the right.
- e. Spiritual non dogmatic beliefs that have to be flexible in any situation at hand.

### **Islamic Leadership (Y1):-**

Leadership charged humanization values, liberation and transcendence. Indicators of Islamic leadership (Alwi, 2008: 874):

- a. Love the truth that is a leader who is faithful shall hold fast to the truth.
- b. Can keep the mandate and trust others namely leader must keep the mandate that has been granted to him .
- c. Altruistic and having the spirit of devotion namely in the running of a wheel his leadership
- d. Good in intercourse namely help one another in all sectors in life
- e. Wise is placing all the problems appropriately and proportionately.

### **Performance Manager (Y2):-**

Results in quality and quantity of work achieved by one's employees in carrying out their duties in accordance with the responsibilities given to him. Manager performance indicators are: Quantity of Work, Employment Quality, Timeliness, Cooperation and Personal Qualities. (Schuler and Jackson, 2005: 18)

- a. The quality of work, measured from managers 'perceptions of the quality of work produced and the perfection of the task against the skills and abilities of employees.
- b. The quantity of work, measured from the managers' perceptions of the amount of activity that is assigned and results.

- c. Timeliness, measured from perceptions of managers towards a completed activity from the beginning of time to be output. Can be completed at a predetermined time and maximize the time available.
- d. Working together, measured from Traffic employees in collaboration with co-workers and the environment
- e. Personal Qualities is the independence of an employee in completing the tasks assigned to them without the need for supervision of the supervisor.

#### **Population:-**

Population in research this is the manager of Sharia Bank that has network offices in Surabaya, which include: PT. Bank Muamalat Indonesia ; PT. Bank Victoria Syariah ; Bank BRI Syariah ; Bank BNI Syariah ; Sharia Bank Mandiri ; Sharia Bank Mega Indonesia ; Bank Panin Syariah ; PT. Sharia Bank Bukopin ; PT. BCA Syariah ; PT Bank Tabungan Pensiunan Nasional Syariah, Bank Niaga Syariah ; Bank Danamon Syariah dan Bank Jatim Syariah.

#### **Sample:-**

Sample for sampling in this study using the technique of Non-Probability sampling with purposive sampling that sampling based on the features or characteristics possessed by the sample. Sampling technique used is based on the guidelines for the measurement of the sample according to Augusty (2002: 48), among others:

- 100-200 samples for maximum likelihood estimation technique.
- The guidelines are 5-10 times the number of parameters to be estimated.
- Depending on the number of indicators used in the entire latent variables. The number of samples is multiplied by the number indicator 5-10. if there are 20 indicators, sample size is 100-200. Since there are 19 indicators, the number of samples in this study were  $(19 \times 5 = 95)$ , the sample used was 95 managers Sharia Bank in Surabaya.

#### **Data Analysis Techniques:-**

Data analysis stage is a stage which is very important because it required precision and accuracy are high, therefore the data processing using SEM as described below. The model used in this study were tested by the research instrument using *Structural Equation Model*. Use of *Structural Equation Model* considering that this method has the ability to see the effect of directly or indirectly, an influence of independent variables on the dependent variable. The size of the effect that occurs in a particular pathway will be apparent from the results of the calculation method of *path analysis*. According to Hair *et al.*,(2010), there are five steps that should be taken if using *Structural Equation Model* that is :

#### **Development of theoretical models:-**

The first step is the principle of testing causality in empirical theories that already exists and is used to confirm the theoretical models through empirical data.

#### **Development path diagram (path diagram):-**

The second step shows the theoretical models that have been built in the first phase will be described in a flow chart the relationship between the construct will be expressed through the arrows. A straight arrows indicate a direct causal relationship between the construct to construct another while inter construct curved lines with arrows on each end show a correlation between the construct. A construct that was built in the flowchart can be divided into two groups: a construct exogenous (*exogenous constructs*) and a construct endogenous (*endogenous construct*).

#### **Conversion chart a path into the structural equations and the measurement model:-**

##### **Choosing the matrix inputs and estimation models:-**

The fourth step explains that the data input *structural Equation Model* is the matrix of variance / covariance or correlation techniques for the overall estimation models do. Covariance matrix is used for *Structural Equation Model* has the advantage of presenting a valid comparison between different populations or different samples that can not be served by the correlation. In the use of *Structural Equation Model* suggested to use a matrix of variance / covariance at the time of testing the theory because it would better satisfy the assumptions methodology whereby the standard error filed will show the figures are more accurate than when using the correlation matrix.

##### **The possibility of the emergence of problem identification:-**

Step five explained that after to revise the model is still a *results*, unique estimation then other treatments is creating *composite variables* through *composite measure* or develop more of a construct.

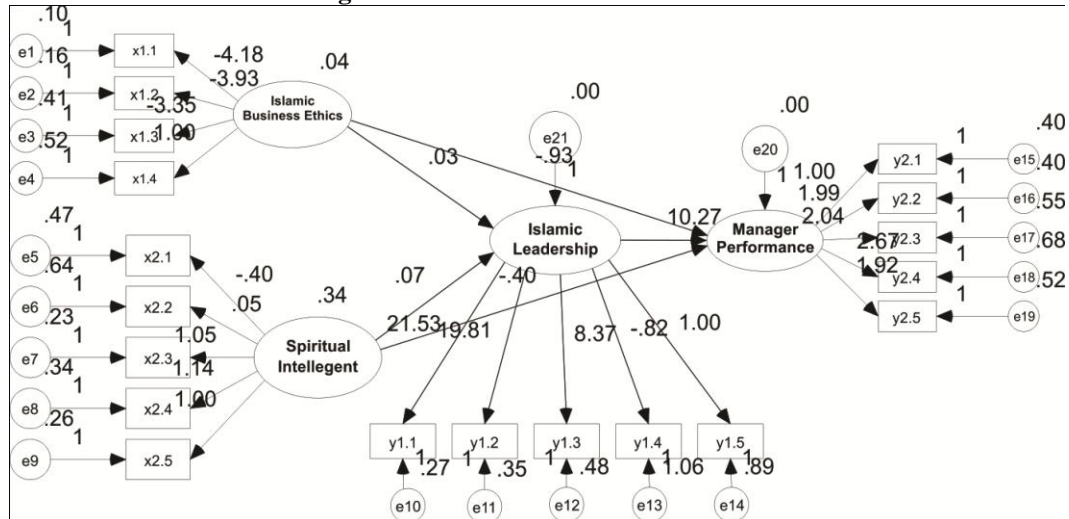


In the sixth step testing of the appropriateness of the model through an evaluation of the various criteria of goodness-of-fit.

**Results:-**

In the model SEM, the measurement model and the structural model parameters are estimated jointly. This method is rather experiencing difficulties in meeting the demands of the model fit. The possibility is caused by the interaction between the measurement models and structural models are estimated jointly (one - steep approach to SEM). (Hair, et al, 1998). The results of estimation and fit model one step approach to SEM using Amos 16 application program shown in Figure and Table Goodness of Fit below

**Figure 1:- Model and Structural Measurement**



**Criteria Table 1:- Evaluation of Goodness of Fit indeces**

Criteria	Results	Critical Value	EvaluationModel
C min / DF	1099	≤ 2.00	good
Probability	0154	≥ 0.05	good
RMSEA	0.032	≤ 0.08	good
GFI	0.900	≥ 0.90	good
AGFI	0.900	≥ 0.90	good
TLI	0955	≥ 0.95	good
CFI	0962	≥ 0.94	good

From the results of the evaluation of the model one step approach turned out from all the goodness of fit criteria are used, all of which are good results of the evaluation models, means that the model has been in accordance with the data. That is, the conceptual model was developed and based on the theory has been fully supported by the facts. Thus this model is the best model to describe the relationship between variables in the model

**Causality Test:-**

Direct effect [path coefficient] observed from standardized regression weights, with significance testing comparative value of p [probability] that is equal to the value t. If t is greater than t table means significant. Thus the regression coefficient of each factor can be trusted as seen on causality test below.

**Table 2:- Causality Test Data**

			Estimate	SE	Prob.
Islamic Leadership	<---	Islamic Business Ethics	1,168	0,766	0,000
Islamic Leadership	<---	Spiritual Intelligence	0,864	0,682	0,073
Performance Manager	<---	Islamic Leadership	0,542	0,652	0,057
Performance Manager	<---	Spiritual Intelligence	0,311	0,227	0,018
Performance Manager	<---	Islamic Business Ethics	0,093	0,048	0,053
Limit Significance					≤ 0.10

1. Islamic Business Ethics factors influence the Islamic Leadership Factor, acceptable [Prob. causal  $0,000 \leq 0,10$  [significant [positive].
2. Factors Spiritual Intelligence affect the Islamic Leadership Factor, acceptable [Prob. causal  $\leq 0,073$   $0,10$  [significant [positive].
3. Factors Islamic Business Ethics effect on Factor Performance Manager, acceptable [Prob. causal  $\leq 0,057$   $0,10$  [significant [positive].
4. Factors Spiritual Intelligence effect on Factor Performance Manager, acceptable [Prob. causal  $0,018 \leq 0,10$  [significant [positive].
5. Factors affect the Islamic Leadership Factor Performance Manager, acceptable [Prob. causal  $\leq 0,053$   $0,10$  [significant [positive].

### Discussion:-

Based on test results using SEM analysis, it can be concluded as follows:

**That the Islamic business ethics contribute positively to the Islamic leadership Sharia Bank, [Prob.  $0,000 \leq 0,10$  significant [positive]. This means:-**

- Manager always trying to do justice in carrying out the work to create islamic leadership.
- Manager provide benefits to others to create islamic leadership.

**Intelligence spiritual contribute positively to the Islamic leadership Sharia Bank, [Prob.  $0,073 \leq 0,10$  significant [positive]. This means:-**

- Attitude Manager consistent in carrying out the work and, have confidence to always work honestly is one of the ways to create islamic leadership.
- attitude Manager in accepting any criticism and input for himself to create islamic leadership.

**Business ethics Islamic contribute positively to the managers performance in Sharia Bank, [Prob.  $0,057 \leq 0,10$  significant [positive]. This means:-**

- Sharia Bank embed freedom of managers in making the regulations according to the norm to increase managers performance in Sharia Bank.
- Emphasizes the unity of common purpose in carrying out the work to increase managers performance in Sharia Bank.

**Intelligence spiritual contributed positively to the manager performance Sharia Bank , [Prob.  $0,018 \leq 0,10$  significant [positive]. This means:-**

- Managers understand the duties and roles for the organization to increase manager performance in sharia bank.
- Managers have the confidence to be flexible in all situations faced.

**Islamic Leadership contributed positively to the performance manager of Sharia Bank in Surabaya , [Prob.  $0,053 \leq 0,10$  significant [positive]. This means:-**

- Manager can be completed at a predetermined time and maximize the time available.
- The ability of managers in collaboration with employees to create islamic Leadership that can be increasing manager performance.

### Conclusion:-

Based on test results using SEM analysis, it can be concluded as follows:

1. That the Islamic business ethics to contribute positively to the Islamic leadership manager of Sharia Bank in Surabaya
2. Intelligence spiritual contribute positively to the Islamic leadership manager Sharia Bank in Surabaya
3. Business ethics Islami leave a positive contribution to the performance of managers in Surabaya Sharia Bank
4. Intelligence spiritual contributed positively to the performance manager of Sharia Bank in Surabaya
5. Islamic Leadership contributed positively to the performance manager of Sharia Bank in Surabaya

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### RESEARCH ARTICLE

## BIODEGRADATION OF ORGANIC MATERIAL FROM PRODUCE WATER USING CONSORTIUM MICROORGANISM WITH STEP AERATION PROCESSING

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#### Key words:-

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 microorganism, step aeration

### Abstract

Produce water is an effluent discharge from oil processing, which have an physical-chemical characteristic is a high organic pollutant as an Chemical Oxygen Demand (COD), ammonium, sulfida, phenol, oil content and high temperature. Sometimes the pollutant also metal content as a mercury which an toxic substance that can be an inhibitor for biological processing. Five strain microorganisms i.e. : *Pseudomonas*, *Staphylococcus aureus*, *Thiobacillus ferrooxidans*, *Bacillus* sp, and *Alcaligenes* to be acclimated using produce water as a carbon source from real waste on batch system for 30 days. The condition in the batch system is a biomass concentration 10% (v/v), waste concentration 100%, CNP ratio 100:10:1, incubation time 4 days at room temperature (28°C). Growth rate microorganism was checked for make sure that microorganism could be growth, and the kinetic constant obtained is specific growth rate ( $\mu$ ) : 0,037/h, maximum growth rate ( $\mu_{max}$ ): 0.45/day organic removal coefficient (k) : 207.8 mg/l COD/day, and half velocity constant (Ks) : 35 mg COD/l. The operation continued to the biological reactor with step aeration processing after batch system. The flow rate in to continuous reactor is 0,90 l/h with detention time 2 (two) days and return sludge (r) : 0.5, dissolved oxygen > 2 mg/l and sampling periodic interval 0, 2 and 4 days. The result show that removal efficiency for organic matter as a COD is 87.1%, ammonia 95.88 %, sulfide 99.2% and phenol 99.7%

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### Introduction:-

Water is very often found together with petroleum in the reservoirs where the water, as a consequence of higher density than oil, lays in vast layers below the hydrocarbons in the porous reservoir media. This water, which occurs naturally in the reservoir, is commonly known as formation water (Dorea et al., 2007). After oil and gas production has been occurring for a time, the formation water will reach the production wells and water production will initiate. The well water-cuts will normally increase throughout the whole oil and gas field lifetime, such that when the oil production from the field is shut down, the oil content can be as low as a couple of percent with ninety eight percent

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water (Wang et al., 2007). To maintain the hydraulic pressure in the petroleum reservoir, which is reduced as soon as production is started, seawater is commonly pumped into the reservoir water layer below the hydrocarbons. This pressure maintenance due to water injection causes high extensions in recoverable hydrocarbons but simultaneously contributes to increased water production. During petroleum production, vast volumes of liquids have to be managed each day. Deferred production causes high economical losses and therefore continuous operations are always strived for. The capacity, reliability and performance of the produced water management system is often critical for continuous oil production particularly in mature oil field where the water production can greatly exceed the oil production (Liu et al., 2010). The water production system needs to be designed to receive continuously increasing quantities of water as oil production continues (Riviere and Garland, 1994). The most common practice in use in Indonesia for management of produced water is treatment in gravity based separation equipment and discharge to sea/water body (Sponza and Gok, 2010). This research is carried out to see if the biological process can be a good candidate to treat the produced water to meet the standards or regulation requirement.

## Materials and Method:-

### Microorganism:-

Isolation and characterization of bacteria isolated from several site of oil contaminated soil was conducted in order to find the bacteria that have an ability to metabolize produced water as sole carbon source. Cultures of bacteria were adapted with produced water as sole carbon source. Bacteria that able to degrade or use produced water as sole carbon were isolated and then used as inoculums in this research. Consortium bacteria containing five different bacteria which is *Pseudomonas* sp, *Staphylococcus aureus*, *Thiobacillus ferrooxidans*, *Bacillus* sp, and *Alcaligenes* to be acclimated using produced water as a carbon source from real waste on batch system for 30 days.

### Kinetics study of produced water biodegradation:-

To prepare the inoculums, mixed bacterial isolates were grown in 1-liter Erlenmeyer flasks containing 500 ml of the minimal medium (CNP ratio as Glucose:(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>:K<sub>2</sub>HPO<sub>4</sub> of 100:10:1) as sole carbon and energy source. Isolates were grown to mid-log phase (app. 10<sup>6</sup> CFU/ml) and used as the inoculums (2%) for the biodegradation of produced water in the reactor. The growth conditions in the reactor were as follows: Room temperature, agitation at 110 rpm, pH 7.0 (adjusted with 1 N HCl-NaOH). The growth of microorganism was measured every certain time.

### Produced Water Biodegradation Assay:-

To determine the performance of bacteria in degrading produced water, a biodegradation assay developed and set up as follows:

- Continues baffled reactor equipped with diffused aerator.
- The flow rate adjusted to 0,90 l/h with detention time of 2 (two) days and return sludge (r) : 0,5, dissolved oxygen > 2 mg/l.
- Organic and biomass concentration were observed on certain time.

## Result and Discussion:-

### Growth kinetics determination:-

The aim of growth kinetic experiments is to determine the ability of isolated microorganisms in the degradation of produced water. The characteristics of produced water used in this experiment are as depicted in **Table 1**.

**Table 1:-** Characteristics of Produced Water

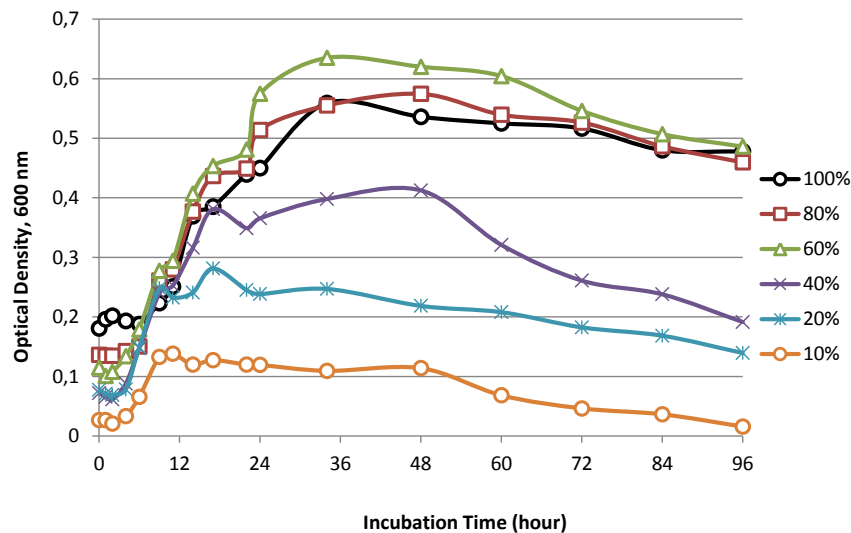
No	Parameters	Unit	Value
1	pH	-	7.470
2	BOD	mg/l	368
3	COD	mg/l	829.84
4	Nitrate	mg/l	0.8167
5	Nitrite	mg/l	0.023
6	Ammonia	mg/l	66.04
7	Total Oil	mg/l	37
8	Phenol	mg/l	2.56
9	Ortho Phosphate	mg/l	<0.002

The kinetics parameters to be determined are as follows:-

- Specific growth rate,  $\mu$ , 1/time
- Decay coefficient,  $k_d$ , 1/time
- Organic removal coefficient,  $k$ , mg/l.day
- Half saturation constant,  $K_s$ , mg/L

The growth of a microbial culture is a complex phenomenon composed of a number of simultaneously occurring events. The relative magnitudes of the respective rates determine what the net effect is upon the culture. The primary events are the utilization of substrate and the growth of organisms. These two events are closely related because it is only through the utilization of substrate that energy and carbon are made available for cell growth. The growth rate is referred to as a specific rate because it defines the rate of cell growth in terms of the concentration of cell present. To find the relation of cell growth and substrate utilization, bacterial consortia were grown on produced water with variation in substrate concentration which is 10%, 20%, 40%, 60%, 80% and 100% of produced water. Growth curve of bacterial consortia were linearized at exponential phase resulting regression line which slope is its specific growth rate.

**Figure 1:-** show the time-course of a liquid culture of the bacterial consortium using produce water as sole carbon source.



**Figure 1:-** Time course of mixed culture grown on various concentration of produced water as sole carbon source.

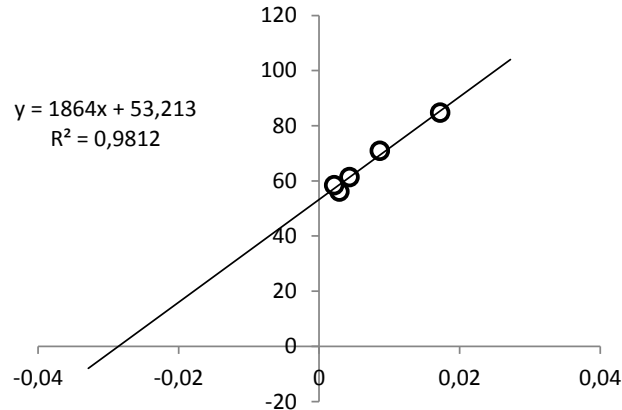
Growth curve of bacterial consortia were linearized at exponential phase resulting regression line which slope is its specific growth rate. Specific growth rate of bacterial consortia were shown in **Table 2**. The value of the kinetics parameters are very dependent upon the organism and substrate employed. If a given species of organism is grown on each of several substrates under fixed environmental conditions the value of kinetics parameters observed will depend upon the substrate. Likewise, if several pure cultures are fed the same substrate under identical environmental conditions, the value of kinetics parameters will depend upon the species of organisms.

**Table 2:-** Specific growth rate ( $\mu$ ) of bacterial consortia at difference substrate concentration

No	Produced Water (%)	$\mu$ (1/hour)
1	10	0.0118
2	20	0.0141
3	40	0.0163
4	60	0.0178
5	80	0.0171
6	100	0.0123

Based on **Table 2** above showed that specific growth rate of bacterial consortia tend to increase as substrate concentration increased. The highest specific growth rate occurs in bacterial culture that grown on 60% produced water which is  $0.0178 \text{ hour}^{-1}$ . Once data are available relating to  $\mu$  and substrate concentration, it can be used to estimate the kinetics parameter which is the half saturation constant ( $K_s$ ) and the maximum specific growth rate ( $\mu_m$ ). The most common transformation is obtained by taking the reciprocal of both side of the Monod equation, known as the Lineweaver-Burk equation. A plot of  $1/\mu$  as a function of  $1/C_s$  (**Figure 2**) give a linear regression were slope or gradient is  $K_s/\mu_m$  therefore the intercept on X is  $(-1/K_s)$  and to the Y is  $1/\mu_m$  (Schulz, 1994).

From linear regression yielding the half saturation constant  $K_s$  value of 35 mg/l and maximum growth rate value of 0.45 per day. It means that if  $\mu_m$  condition have achieved, increasing in substrate concentration specific would not take effect on growth rate of viable biomass anymore



**Figure 2:-** A plot of  $1/\mu$  as a function of  $1/C_s$  to determine the kinetics parameters  $K_s$  value showed the affinity of biomass to substrate and therefore a concentration of substrate at half of its maximum growth rate. Biomass which high affinity to substrate have a low  $K_s$  value, that mean growth rate will not effected until substrate concentration decrease to a very low value. As opposite if biomass which low affinity to substrate have a high  $K_s$  value, its mean growth rate will be effected by the remain substrate concentration which still high. If the substrate concentration is below the  $K_s$  value thus the growth of biomass will very slow. That why the addition of substrate in the reactor at least equal to or much higher than its  $K_s$  value.

#### Produced Water Biodegradation Assay:-

To determine the performance of both isolated bacteria in degrading produced water and bioavailability of produced water, a biodegradation assay was established as described in methods. A continuous step aeration reactor with flow rate of 0,90 l/h, detention time 2 (two) days, return sludge (r) : 0.5 and dissolved oxygen to be maintain  $> 2 \text{ mg/l}$  as depicted in **Figure 3**.



**Figure 3:-** A continuous step aeration reactor used for biodegradation assay of produced water

**Table 3:-** Organic (COD) removal efficiency

Hari	Inlet mg/l	Outlet mg/l	Efisiensi (%)
0	827	114	86.2
2	827	110.5	86.6
4	827	107	87.1

**Figure 4.** Time course of COD degradation and bacterial growth by bacterial consortia

**Figure 5.** Pollutant removal efficiency

### Conclusion:-

Referring to the Indonesian Ministry of Environmental (Decree no. 4/2007), it was mandatory to manage a safe treatment of these wastes (produced water) and also disposed off in an environmentally friendly manner. It was regulated that the final concentration of COD, ammonia, sulfide and phenol must less than 200; 5; 0.5 and 2 mg/l respectively. Based on the data presented in this paper indicate that the bacterial consortia have a quiet low  $K_s$  value (35 mg/L). Its mean that bacterial consortia that used in this study were effective to degrade the produce water to a final low concentration. COD, ammonia, sulfide and phenol removal efficiency in the continuous step aeration reactor was 87.1;95.88;99.2 and 99.7%, respectively.

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### **RESEARCH ARTICLE**

#### **INTRAORAL VENOUS MALFORMATION WITH PHLEBOLITHS – A CASE REPORT WITH REVIEW OF THE LITERATURE**

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Developmental disturbance,  
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#### **Abstract**

Venous malformations form due to disturbances during the developmental period of an embryo. Occasionally, associated with calcified bodies known as phleboliths. Pathological calcification of soft tissues is modulated by the deposition of calcium and other mineral salts. Phlebolith formation, is reported as a predictable feature of hemangiomas was first described in the splenic vein by Canstatt in the year 1843. The overall incidence of vascular anomalies is approximately 1 in 10,000 while children are more affected. They can occur anywhere in the body involving dermis, subcutaneous tissue, intraoral mucosa and skeletal tissue with an incidence around 40% in head and neck regions. They are arbitrarily distributed in various number and size, radiographs aid in detection of calcifications. Vascular malformations of oral cavity are not uncommon, with preponderance towards tongue, lips, buccal mucosa, gingiva, palatal mucosa and oropharynx. Treatment of vascular malformations are managed by more than one modalities like surgical excision, laser therapy and sclerotherapy. Herein we are reporting a rare case of an intraoral venous malformation with phleboliths.

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#### **Introduction:-**

Venous malformations form due to disturbances during the developmental period of an embryo. Occasionally they are associated with calcified bodies known as phleboliths. Injury to a vessel wall or torpidity in the blood flow triggers thrombus formation. Pathological calcification of soft tissues is modulated by the deposition of calcium and other mineral salts.<sup>1</sup> Phlebolith formation, is reported as a predictable feature of hemangiomas was first described in the splenic vein by Canstatt in the year 1843. The overall incidence of vascular anomalies is approximately 1 in 10,000 while children are more affected. They can occur anywhere in the body with an incidence around 40% in head and neck regions. They are arbitrarily distributed in various number and size,, radiographs aid in detection of calcifications.<sup>2,3,4</sup>

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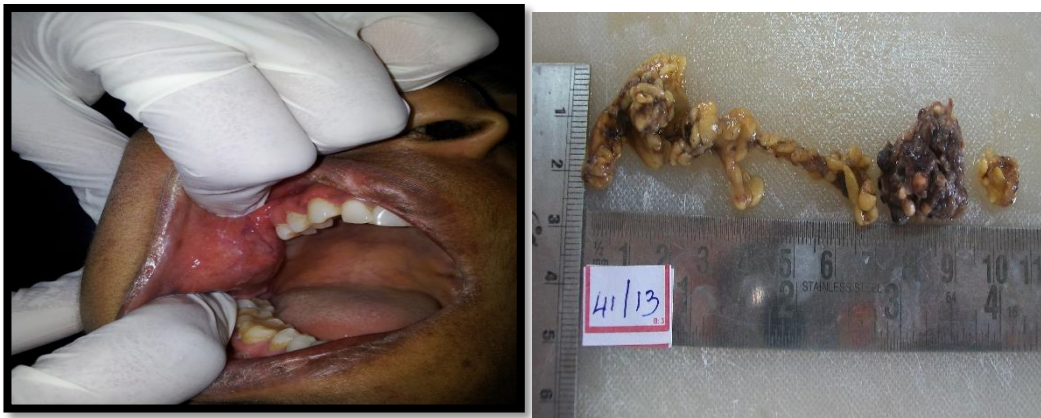
Vascular malformations of oral cavity are not uncommon, with preponderance towards tongue, lips, buccal mucosa, gingiva, palatal mucosa and oropharynx. On literature search few cases in buccal mucosa, masseter, temporalis, mentalis muscle and floor of the mouth were found to be present as swellings.<sup>2,3</sup> Treatment of vascular malformations are managed by more than one modalities like surgical excision, laser therapy and sclerotherapy.<sup>5,6</sup> The present case of venous malformation with phleboliths was found intraorally on the buccal mucosa of a 45-year-old woman.

#### Clinical Details:-

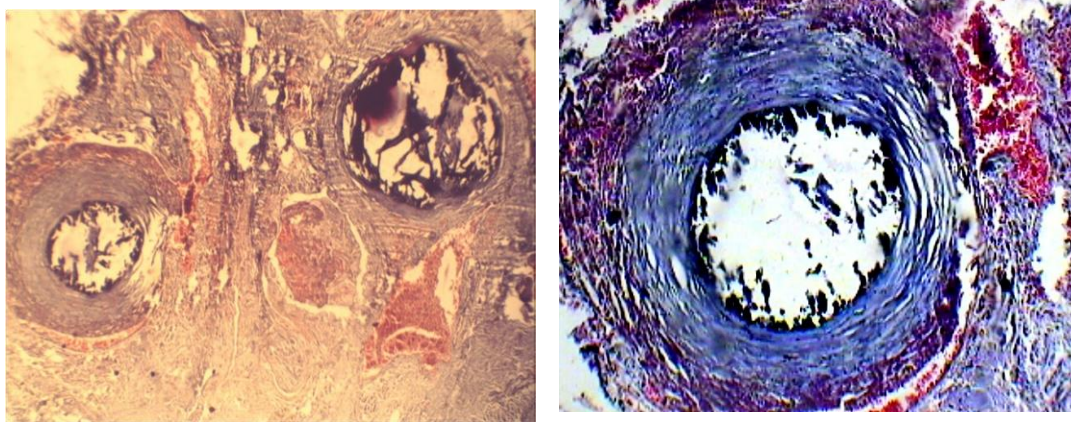
A 45 years old woman presented with swelling and pain in the right cheek of 8 months' duration. No other relevant dental or medical history were found. History of an injury to the right cheek 3 years back with increase in the firmness of swelling over the years. Clinical examination revealed bluish tinge on the right buccal mucosa extending from the vestibule close to first molar to the anterior border of the ramus. Submucosal mass was firm in consistency, compressible and with no pulsation. Submandibular lymph nodes were palpable, parotid and submandibular salivary glands were normal. It was provisionally diagnosed as sialolithiasis.

#### Gross details & Histopathology: -

Excised specimen was yellowish blue in colour with multiple whitish hard nodules. Histopathology revealed loose adipose tissues with interconnected numerous dilated blood vessels. Thrombus formation with dystrophic calcifications were present inside these dilated veins. Thickened veins displayed collagen deposition on the wall lined by flat endothelial cells along with neutrophils, lymphocytes and plasma cells. The diagnosis indicated a venous malformation with phleboliths.



**Fig 1:-** Swelling in the right buccal mucosa. **Fig 2:-** The gross specimen yellowish blue in colour measuring around 10cmx2.5cmx2cm.



**Fig 3:-** Numerous interconnected blood channels with thrombus formations (4x Magnification, Hematoxylin & Eosin).

**Fig 4:-** A large dilated vein with phleboliths (10x Magnification, Masson's Trichrome).

**Discussion: -**

Venous malformations also known as venous hemangioma, cavernous hemangioma or cavernous angioma are rather old terms used quite often in the earlier literatures. These are present at birth but hardly make their presence obvious. The classification of hemangiomas and vascular malformations was clearly emphasized by mulliken et al.<sup>7,8</sup> It is based on their biological characteristics. Disturbances in vasculogenesis and angiogenesis leads to defects in the capillaries, veins, arterioles, lymphatics or combination of vessels. They are typically divided according to the blood flow into low-flow (capillary malformation, lymphatic malformation, and venous malformation) and high-flow lesions (arteriovenous malformations, arteriovenous fistulae). These have become the source of interest in the study of embryonic angiogenesis. Their presence is usually felt later in life. They accelerate during puberty, pregnancy as well as trauma like in our case.<sup>9,10,11</sup> The lesion was present in the buccal mucosa, for years till the trauma triggered it to expand with inflammation and pain.

Vascular anomalies have a propensity to occur in the skin, mucosa, subcutaneous tissue and muscle. Phleboliths associated with vascular anomalies in the maxillofacial region were discovered by Kirmission in 1905. They are more characteristic of low-flow vascular malformations. According to the theory adopted by Ribbert, phlebolith formation begins with intravascular thrombus formation and is followed by progressive lamellar fibrosis.<sup>12,13</sup> In initial diagnosis, radiographs are the essential tools. Based on the anatomic considerations, differential diagnosis depends on the contents in and around lesion, buccal pad of fat, minor salivary glands, lymph nodes, Stenson's duct, accessory parotid gland, numerous vessels and nerves. Since the mass was localized to an area for many years and not invading the other structures, malignancy was ruled out. Though major salivary gland functions were normal possible shortlisted differential diagnosis included sialolithiasis as bluish tinge of the mucosa was visible. Other possibilities were lipoma, vascular malformations, lymph node infections, neurofibroma, reactive soft tissue proliferation due to trauma, bacterial or fungal infections. Intraoral lipomas are seen most common on the buccal mucosa, with predilection for adult males. They are found to be soft and nodular masses sessile or pedunculated.<sup>14</sup> Venous malformations are present from birth but patient may be without symptoms unless or otherwise due to trauma or infection. Found intraorally more on the buccal mucosa, masseter or tongue. Colour of the lesion are clinically observed varies depending on the depth, from colourless to bluish tinge visible on the mucosa. Compressible lesions help in identifying venous malformations from lymphatic malformations. Calcifications requires differentiation mainly from sialolithiasis, phleboliths, calcified lymph nodes, healed acne lesions.<sup>15,16</sup> Histopathology revealed phlebotrombotic areas in numerous large dilated vessels with collagen formation, flat endothelial cells and haphazard channels. It was verified by Masson's trichrome special staining. Location, extent, growth rate, accessibility, patient's age, and aesthetics plays an important role in treatment options. Interstitial laser therapy has found to be effective for capillary and venous malformations. Embolization solely or accompanied with surgery holds good for high flow vascular malformations.<sup>17,18,19</sup>

**Conclusion:-**

Phleboliths in vascular malformations are calcified bodies, not many intraoral cases have been found in the literatures. Though clinical diagnostic hypotheses were numerous to deal in the present case, histopathology confirmed the diagnosis. Since, now the old terminologies are not in vogue, venous malformations are identified well, as clear entities on their own.

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### RESEARCH ARTICLE

#### 3D ULTRASONOGRAPHY DAIGNOSIS OF POLYPOID GALL BLADDER IN DOG.

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ultrasound, polyp, gallbladder, dog

#### Abstract

Ultrasonographic examination of a five-year-old, male, mixed-breed dog, identified gallbladder wall thickness, accompanied by intraluminal contents suggestive of polyps mass. The liver present normal structure and limits with no mass lesions detected. A cholecystectomy was performed one week after initial case presentation. The gallbladder was enlarged (5 cm in diameter) with a thickened wall; intraluminal mass 2 cm in diameter .The fatty mass had a sessile attachment at the neck of the gallbladder and partial occluded the lumen. The surgical removed polyps were later confirmed as cholesterol polyp composed of fatty tissues

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#### Introduction:-

The function of the gallbladder is very closely related to that of the liver. When one is "sick", it is likely to affect the other organ. Drugs that affect one can also affect the other. Therefore it is not uncommon for both diseases to exist in the same dog. The commonest affections of gall bladder and biliary tree included cholangitis, cholecystitis, cholecystolithiasis and choledocholithiasis. Among these the incidence of cholecystolithiasis is very less as evidenced from the published veterinary literatures. The incidence of disorders restricted to the gallbladder and the biliary tree is low, when compared with the parenchymal hepatic affections that occurs in dogs (Veronica et al., 2006). The extrahepatic biliary tract obstruction in dogs is caused most frequently by biliary carcinoma, pancreatic carcinoma, pancreatic disease and intestinal neoplasia. The biliary or intestinal inflammations are less commonly recognized in clinical practice. In human pathology, gall bladder polyps are outgrowths of the gallbladder mucosal wall. They are usually found incidentally on ultrasonography or after cholecystectomy. When detected on ultrasonography, their clinical significance relates largely to their malignant potential. The majority of these lesions are not neoplastic but are hyperplastic or represent lipid deposits(cholesterolosis). On the other hand, imaging in human pathology, gall bladder polyps are outgrowths of the gallbladder mucosal wall. They are usually found incidentally on ultrasonography or after cholecystectomy. When detected on ultrasonography, their clinical significance relates largely to their malignant potential. The majority of these lesions are not neoplastic but are hyperplastic or represent lipid deposits(cholesterolosis). On the other hand, imaging studies alone are insufficiently specific to exclude the possibility of gallbladder carcinoma or premalignant adenomas. Furthermore, even benign lesions can occasionally lead to symptomssimilar to those caused by gallbladder stones. The use of ultrasonography (US) imaging technique became widespread and popular, detection of polypoid lesions of the gallbladder (PLG) has increased significantly (Collett, 1998; Heyder, 1990). Initial studies estimated that PLGs are found in 2.6% to 12.1% of cholecystectomy specimens Heyder, 1990). In a large study of 3,608 Danish

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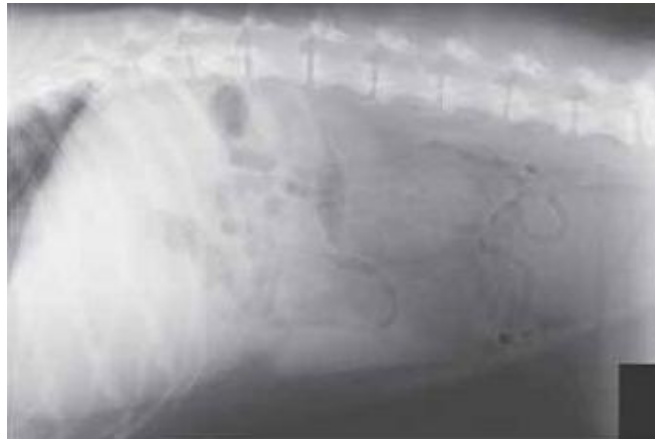
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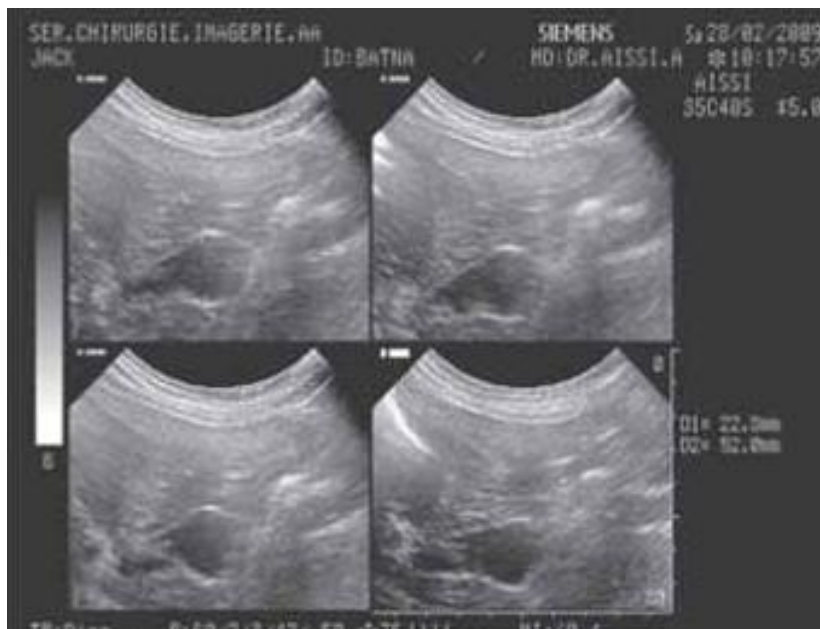
subjects, the prevalence of PLG was found to be 4.6% for men and 4.3% for women and similar to other studies, these lesions had a higher prevalence in the third and fifth decades of life. Currently, most agree that the average prevalence of PLG in cholecystectomy specimens is about 3% to 12%. The polypoid lesion of the gall bladder rarely observed in veterinary medicine

### Description:-

A five-year-old, male, mixed-breed dog was presented with persistence vomiting, anorexia, weakness, for one week. Physical examination revealed icterus mucous membranes and a slightly tensed abdomen with normal hematological profiles. Serum biochemistry abnormalities included increased liver enzyme activities, including alkaline phosphatase (5,360 U/L; reference range 10-140 U/L) as well as hyperbilirubinemia (Total bilirubin 5.6 mg/dL; reference range 0-0.6 mg/dL) consistent with hepatocellular damage and cholestasis. With normal levels of blood urea nitrogen (10 mg%) and creatinine (0.2 mg%) were identified on the serum biochemical analyses. The radiographs demonstrated normal hepatic size and without hepatobiliary calcification (Fig.1). Subsequent ultrasonographic examination identified gallbladder wall thickness (Fig.2), accompanied by intraluminal contents suggestive of polyps mass. The liver present normal structure and limits with no mass lesions detected (Fig. 3).



**Fig. 1:-** Radiograph of hepatic and abdomen cavity demonstrating normancy



**Fig. 2:-** Large gall bladder with thickened walls indicating Polyps mass

### 3D Ultrasonography:-

After exact tracing of gall bladder and mass structures B-real ultrasonography (2D), 3DU image acquisition was performed as a volume of data with nearly immediate reconstruction and simultaneous display of sectional anatomy in three orthogonal planes (sagittal plane, transverse or coronal plane). Finally a 3D rotating animation of the gall bladder structures at the desired angle could be reconstructed for better visualization and recognition of different parts of mass with gall bladder (Fig. 4).



**Fig. 3:-** Transhepatic ultrasonograms of gall bladder with large mass (Polyp), without a distal acoustic



**Fig. 4:-** Three dimension (3D) reconstitution of gall bladder and intraluminal mass (polyp).

### Treatment:-

On the basis of these findings, a cholecystectomy was performed one week after initial case presentation. The gallbladder was enlarged (5 cm in diameter) with a thickened wall and intraluminal mass 2 cm in diameter. The fatty mass had a sessile attachment at the neck of the gallbladder and partial occluded the lumen. An exploratory

laparotomy performed at the time of cholecystectomy surgery did not identify other abdominal lesions. Microscopically the mass was composed of fatty tissue (cholesterol polyp).

### **Discussion:-**

The cause of most gall bladder disease is not well defined in the dog. Many dogs with gall bladder disease have some sort of underlying metabolic or hormonal problem (Weedon; 1984). Both hypothyroidism (low thyroid hormone levels) and hyperadrenocorticism (excessive steroid hormone levels) are associated with an increased risk of developing a biliary disease (Terzi, 2000). These are very rare tumors that account for less than even 1.5% of all canine tumors. However, secondary hepatobiliary tumors are more common and occur 2.5 times more frequently than primary ones (Collett,1998). In human medicine gallbladder polyps have been observed in 0.004 to 13.8 percent of resected gallbladders (Christensen, 1970; Stringer, 2003), and in 1.5 to 4.5 percent of gallbladders assessed by ultrasonography (Jorgensen, 1990; Veronica, 2006). In one report, no association was observed between the presence of polyps and the patient's age, sex, weight, number of pregnancies, use of exogenous female hormones, or any other risk factors that are generally believed to be associated with gallstones (Stringer, 2003). Gall bladder polypoid lesion has very rarely been reported in dog and domestic animal.

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### RESEARCH ARTICLE

#### THE SEARCH ON THE FORMATION OF CHARACTER IN MODERN UZBEK DRAMATURGY.

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dramaturgy, Uzbek dramaturgy,  
 character, plot, hero, aesthetic ideal.

#### Abstract

The new era has begun in the area of art as in all social spheres after Uzbekistan gained independence. The new period requires the theatre to stage the people of that particular era. This, in the first place means a huge responsibility should be borne by playwrights and requires them to create an ideal character. The extent to which this task is being carried out, the achievements and pitfalls in this sphere, the theoretical and practical issues in creating a character in their example will be discussed in this article. The search that has been carried out in this direction will be assessed in the example of concrete plays.

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#### Introduction:-

Although dramaturgy is one of the components of the theatre in creating literally perfect performance, it has a very complex inner composition. Therefore, dramaturgic play is not written, but built. All of the compositional parts of the play should be developed perfectly from the literal and logical point of view so that the play would develop as a single organism in harmony. The composition of the play, conflict, the sequence of events, character, speech, and even remarks are developed in an interrelated manner and if one of them is flawed, there is no chance that it won't affect others. The consistency of events, that is to say, the logical development of the plot and acuteness of conflict in any play is affected by the factor of character. "The importance of a fight will change when you replace one participant by another. In as much as, heroes have an individual attitude towards any event in the play. Their specialty depends on the concreteness of the characters" (Blok, 1963). This issue made playwrights of each period contemplate. Similarly, the fact that research has been conducted on creating character in contemporary Uzbek dramaturgy and the fact that there are a variety of cases on this issue is the absolute truth. On one hand, some playwrights are succeeding, on the other hand, the rest are facing serious problems. The primary reason of this is, as Karl Iglesias said, "Yet many writers obsess so much on plot points and structure that they often forget the people who inhabit the story" (Iglesias, 2005).

The playwrights of the Independence period have to meet new requirements. The heroes who were empowered with very strong political ideas who sought the soviet politics from an every aspect of life in the dramaturgy of former USSR have been replaced with the ones who possess positive qualities as well as pitfalls that can be found in people. More and more attention is being paid to national values in this period and naturally, the flavor of nationality increased significantly in the character of heroes. "The roots of Uzbek dramas are directly linked to the national character of the people, its pride and dignity" (Abdusamatov, 2000). In fact, this is the case that is applicable to the arts of all nations. Each piece of play reflects the features of the country in which it has been created in the first place. The play should concern the whole humanity with the topic it is portraying.

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### **Materials and methods:-**

Creation of the character includes three directions that are interrelated. The playwright, director, actor lay the foundation for the interconnectedness of the events and the solution to the formation of a character that is perfect for the stage. "The dialectics of creating a stage figure come into existence on the basis of the actor's psychology, talent, his/her special nature, worldview, the extent to which their creative individuality has been formed, the formation and perfection of their abilities" (Eraliyeva, 2015). This means that, in the majority of cases, the director has to assign the role to the actor whose appearance and inner world fit the above-mentioned features. In other words, the roles are assigned deriving from the theatrical character of the actors. In the first place, it ensures that this figure is trustworthy; moreover, it allows the play to be staged in a short period of time. The actor seeks the necessary features needed for their character in their selves. The playwright's job when it comes to this is very difficult. He/she should ponder about the character of each hero and find the spiritual experiences beyond his/her nature. "The character is the carrier of the aesthetic ideal. The characters are represented and developed as a result of acting in a specific psychological situation." (Sultonov, 2005). The author's aesthetic ideal, the ideas that he puts forward in the play are decisive factors in the development of heroes' characters. Besides that, the nature of the character depends on the genre of the play. The genre normally represents in what ways the problem in the play can be solved and its type of expression. Deriving from the genre, the hero's attitude towards the events and problems varies.

**Creative approaches in the formation of character.** The drama and comedy are the main types of genres that are addressed in contemporary Uzbek dramaturgy. It is obvious that these genres are also divided into several sub-genres. Particularly, a lot of historical dramas have been created in contemporary Uzbek dramaturgy. The images of heroes have been created on the basis of historical facts in biographic-portrait plays whereas the plays written to criticize the Soviet period emphasized the conflict between the person and the period. As a result, the fate of a person has been interpreted philosophically in the oppression period. One of such plays is "The garden of grief" by the poet and playwright named Shukrullo. This play did not portray the life of a certain individual; it differs significantly from such plays as it expressed a general attitude towards a particular historical period. Primarily negative effects of the oppressive period on people's lives in the example of several heroes have been highlighted in this play. As a result of watching the play carefully, the author's introduction of personages appeals to the audience. Evidently, usually the main hero is introduced first in the play and other actors are introduced directly in connection to him/her. However, Shukrullo adopts a different approach and introduces others using the person who does not participate in the play. For example, Ulmas – the murdered soldier. The mother – Ulmas's mom. Murod – Ulmas's uncle, ...Mels, Ashrafiy, Azim – Ulmas's friends..." (Shukrullo, 2012). The corpse of the soldier called Ulmas is brought in the play and the story of so many soldiers who have been dying in the wars of colonization are told. The confused fates of Mels, Ashrafiy, Jamila, Azim and Kholikulov are directly portrayed in the play. All the heroes except Mels are divided into two groups – the positive and the negative. This very situation in the play shows that the audience and readers should pay more attention to the complex character in the dramaturgic play, the various colorations in the character of the hero with inner conflicts causes a surge in the interest to the further sequence of events in the play. It is true that "there are such characters in plays that are identical to each other with their attitudes towards society and life as well as their behavior and actions" (Abdusamatov, 2000). Hence, one cannot criticize the fact that authors classify heroes into certain types. Nevertheless, Mels who possesses a special character in the play has not been developed further. He gives up without fighting when he could fight and strive towards his goals. Mels's character is very complex. He is represented as the person who possesses true love and pure feelings at the beginning of the play. He loves Jamila from the deep of his heart with pure intentions without intending to satisfy any personal interests and his love has been reciprocated. Jamila also loves him so much. Their relationship arises such a feeling of love among the audience that it encourages spectators to envy them in a positive manner. In as much as, the feelings of admiration, spat, jealousy and trust in their relationship are experienced in the same sincere way. But the main risk factor to their relationship is the fact that Mels's father is to blame for Jamila's father's death. Jamila does not feel hatred towards Mels when she finds out this truth, she doesn't blame him, but she, as a conscious and proud person, realizes deeply that she cannot be with the murderer of her father. Because, this approach would not fit her values. Even though Mels was represented in a positive light at the beginning, his inner world became more and more evident as the sequence of events developed. He serves the system in which he was brought up with loyalty and he treats its enemies cruelly. Perhaps, it is impossible to criticize him from the principal point of view. However, it was not possible to find him innocent from the humane and spiritual perspective. The reason is that he confuses the true feeling of conviction and duty with disloyalty, hypocrisy, slander and disrespect towards his own nation. He becomes friends with Azim and Ashrafiy and informs the top political organizations of their views. He give every opinion a political coloration. Furthermore, he takes a dogmatic approach towards the ideas he believes. He was completely under the influence of fanaticism. Obviously, there is no absolute truth in real

life. Every event has its own pros and cons. It is possible to take a rational and objective approach to each event and interpret it deriving from the existing circumstances. But Mels used to estimate every single act beyond the existing situation, and jumped to conclusions without thinking about consequences of an oppressive regime. He started to realize that it was wrong to liquidate people for unworthy reasons and take an irresponsible approach towards other people's fate when there was a risk for his own life. Nonetheless, the fact that Mels commits a suicide without any apparent reason and the fact that the main event that expresses the play's idea happened with Kholikulov and as a result of the confusion over the ideological direction, there is an imbalance between the inner conflict of the hero and the conflict of the play. However, "the playwright should generalize the disagreement that lies under the dramatic conflict and the conflicts in the inner world of the personage and reveal the interrelationship between them. Because, the inner conflict is the triggering force of the character and it is the source that increases its activity in the plot." (Yuldashev and Tulyakhodjayeva, 1990). The abstractness of the concrete main hero leads to the abstractness of the plot's direction. As a result, one will have an impression that there are some events that express a certain idea rather than expressing ideas on the basis of events. In other words, the prose-related feature comes into existence in the play first rather than dramatic and theatre-related characteristics.

The character of the hero is researched more deeply and thoroughly in the psychological dramas among dramatic plays. Usually, a particular social event is chosen and its effect on the psychology of people is discussed in such type of plays. The play "The distance of stone's throw" by the author Usmon Azim, with its multilayer problematic feature, became a real phenomenon in contemporary Uzbek dramaturgy. The conflict in the play is the role of the spiritual and material wealth in people's lives, everybody's inner spiritual values, the living principle and the truth they are striving to. The playwright tries to reflect life as it is and to create the spiritual portrait of their contemporaries. Indeed, there is an ongoing conflict going on between material well-being and a spiritual development. Consequently, the wars, global problems and behavioral crises are widespread all over the world. Surely, anyone who read the play and watched the performance staged by the director V.Umarov will naturally contemplate about their life, and the life in society in which they are living. The author will come up with the heroes of the play deriving from the prototypes of various people we can meet in real life. They are similar to each other in appearance, their way of thinking, but differ from one another regarding their dreams and unattained goals. These characters are various and complex like life itself. "The liveliness of the character is the main factor that ensures the play's permanency." (Galsworthy, 2010). If we look at the essence of the issue more deeply, the playwright raises the classic conflict between two forces: goodness and evil. The negative hero Shokir is at the centre of the play's events and ideological direction. He acquired a significant amount of money by committing crimes. He sold his heart to the devil. As the author portrays, he did it consciously. It is understood from the events of the plot that Shokir who had a hard time and lived in poverty since his childhood aims to be wealthy. Becoming rich no matter how became the meaning of his life. As a result, he becomes so skilled in how to manipulate money that he made people who were interested in money work for him and ordered them what to do. The author made an effort to reveal the problems present in various layers of society in the example of one family. The atmosphere of the play is sad from the beginning to the end. It is implied that every hero considers themselves to be unhappy based on their speeches and thoughts about themselves. The name of the play originated from the father's dream whose three sons are the main heroes. The old man has lived all his life with a dream of going to Samarkand which was located in a close proximity. Not being able to go to Samarkand is definitely a surprising case for the person who lives in Uzbekistan. The participants in a play were also shocked to hear this. The author reveals the reasons of this by researching the three sons' characters. The investigation of these characters leads to the obvious expression of the main problem of the play. The old man's eldest son, Jura was the farm's director. He is one of the officials. He can't provide his family financially even though he works day and night as he is an honest man. His lifestyle doesn't resemble that of officials'. Shokir's worldview is completely different although they are brothers by blood relationship. He would do anything to acquire wealth. The brothers' character, their true principles and their hopes as well as dreams are demonstrated in their conversation:

"Jura: Our community has been investigated 7 times so far this year. They couldn't find any fault to accuse me. They tried to blame of something. I didn't bribe them. I am a man of principles. I won't give a penny to dishonest men.

Shokir: You won't accept bribes as well...

Jura: I won't!...

...Shokir: Why don't you live in abundance?...

Jura: I have been assigned a salary...Moreover, everyone has their own destiny. For example, you disappeared for 20 years...

Shokir: I left this village saying “I won’t come to my hometown unless I become rich”. I became wealthy, so I returned. Living in poverty doesn’t differ from living in prison. The only freedom is money. I don’t respect people who chase after money. Money should serve people... I am sorry bro, but you have so few such servants. I am not talking about your community’s money. It’s people’s money. You must have your own servants.

Jura: I am a man of ancient values. I think we should serve our people and nation anyway. Any person lives his life regardless of the fact whether they are full or hungry. It is a shame to live in abundance while so many people are hardly earning a living...” (Azimov, 2011).

“It is a particular sort of character that shows of what sort the choice is; hence character has nothing to do with speeches in which there is nothing of a general sort which the one speaking chooses or rejects” (Aristotle, translated by Joe Sachs, 2006). What two brothers want is evident from their conversation and this shows that there is a wide disparity between their worldview, character and values. It is impossible to judge them and say that one is morally right and the other is not in this argument. Looking at the issue from the perspective of the general truth, Jura’s honesty has been approved by wise men over thousands of years; honesty is the reason why human beings exist in this life. No matter how true this path is, any person who realized that one should live honestly sees that the present day society puts more emphasis on materialism than spirituality, people who have higher financial status are controlling others and honest people are increasingly becoming poor and consequently they are being left in a very poor condition. Shokir is represented as a figure who is very complex and full of conflicts in the play. As he is blunt, rich and since he expresses the problems faced by many people openly, he orders anything he wants and says anything that comes to his mind in order to laugh at and offend his friends. He is well aware of the fact that he doesn’t have friends. In fact he says: “A person who is involved in dealing with money doesn’t have any friends”. In the example of this play, we can see that the idea which states “Plot is the history of character, it develops character and the events of the plot are the means of creating character” is not that correct. The events of the play develop sometimes due to the heroes’ special characters and their individual approach to a particular occasion. In other words, the hero’s choice in the play and his striving towards his goals serve as a stepping stone in the development of particular events. The events develop consistently as a result of needs. One can observe it in the example of the old man’s youngest son Kosim in the play “The distance of stone’s throw”. He tells anyone what he thinks. Kosim’s words and behavior in the play show that there is no slightest element of dishonesty. Specifically, his quote: “We should love Allah unconditionally” is an example of this. Most of these people seem like those who have entered a shop. I pay to you, let me enter the paradise...” (Azimov, 2011). In harmony with these words, Kosim tells Eshmatov and Boltaboyev that they are criminals and involved in bribery. One thought arises at this point if Kosim didn’t have any secrets to hide from everyone. When the mine exploded in front of him in the war and he couldn’t have kids, in one word, would he be able to follow this path if he had something to lose in his life? It is possible to understand it when we replace him with the person of different personality, the one who is weak-willed and afraid of officials in this situation and make a comparison between them. If the situation is like the one mentioned-above, and if the hero’s character was different, he would not show any resistance or become totally depressed. Kosim preferred to free the world of one evil as the death was unavoidable... It is possible to realize by looking at the play deeply that the person ought to want goodness regardless of in what situation they are in and no matter who they are. It has been obvious that the consequences of crimes would be devastating after Shokir’s son who is very powerful and who achieved a lot of things in life was eventually arrested with accusations of drug dealing. And Shokir who used to not respect anyone started to panic. He was ready for all so that his only son’s life would be saved. Events make the play exciting to watch for the audience meanwhile characters develop the ideological aspect of the play. The author reveals the heroes’ inner world depending on their attitude towards existing situations and the conclusions they draw. The heroes’ nature that has been revealed consistently gives the audience a hard time and encourages them to understand the essence of this life deeply and understand the self. Certainly, only the figurative expression of an idea and the realistic end of events can make some ideas we have heard of so many times including honesty and dignity great. The play “The distance of stone’s throw” became one of the plays that looked global problems more vigilantly in the example of one family. The fact that none of the heroes of various destinies are happy make the audience come to know that the concept of absolute happiness is relative and that the person can realize the notion of happiness only when they gain insights to their inner feelings, their principles in life and when they give up the quality of being self-centered and live for the happiness of community.

Aristotle divided characters into four groups. According to this classification, the hero should be a gentleman, characters should be special; characters should be real; characters should be consistent (Aristotle, translated by Joe

Sachs, 2006). There are a lot of plays that satisfy above-mentioned criteria in contemporary Uzbek literature. One of such plays is the comedy "Life is behind the door" by Salokhiddin Sirojiddinov. The events of the play are connected with science-fiction and mystics. The main hero Bahtiyor's dream is also to achieve true happiness. The author did not portray the hero as a poet without a reason. Inasmuch as, the poet is the person who sings the humanity, great feelings, goodness and spirituality. It will become evident from the events that the poet didn't know people well. That's to say, he thought that all people said what they thought. He loses his concentration because of a single unusual and wonderful event. It became clear that people were not as simple and sincere as he thought. The woman in white whom he saw in his childhood comes up to Bahtiyor again when her hair becomes grey and tells him that she can't give the key to the door he asked for and tells the poet that he was mistaken in life. In spite of this, she gives one more opportunity to the owner of a sincere heart and promises him to realize his three wishes. Through this very quality, Bahtiyor gets to know the character of his wife in the first place as well as the personality of his neighbors and the head of the neighborhood. The author reveals the negative characteristics of heroes in the play with means of laughter. One of the privileges of comedy is that it strives to make the negative qualities in the character disappear with the help of laughter. Even though, no one considers themselves to be fool in this life, it is only natural for them to find themselves in foolish situations sometimes. This usually happens out of hurrying or actions carried out without thinking. All the participants' character apart from the main hero's are described in two interpretations. Contrast is given very convincingly and lively, each spectator and reader sees himself or the people surrounding him in the example of characters who are being represented. Indeed, if it is mentioned consciously, all the people try to behave well and show all the positive qualities of theirs in the public. However, the true face of a man is revealed in his attempts to satisfy his needs and interests. In the play, Ravshan does not worry about his wife's case of being dumb; he tries to make the most of this situation. He tries to get several things from Bahtiyor by accusing him of making his wife dumb. The head of the neighborhood talks about the interests of the neighborhood but he wants to acquire everything by being a wolf in sheep's clothing and he wants Bahtiyor to do what he says. Even Bahtiyor's wife who has lived with him so many years doesn't understand him. She only thinks about wealth and live extravagantly. Probably, living a good life may be the dream of majority, indeed. But, sacrificing the person one loves for the sake of wealth is to what extent humane? It is true, the door through which Bahtiyor and the woman in white had a conversation and what kind of life is there behind the door is not expressed clearly in the play, it is complex to comprehend that this is a miraculous power as it has not been justified sufficiently. Besides that, one should not forget one truth, even though dramaturgy is the basis of the performance, the dramaturgy cannot be interpreted as the performance itself. The director's unique solution in the staging process has an important role to play. For example, there is a difference between the end of this play and that of the performance. According to the play, Bahtiyor gets fed up with people who only think about their personal interests and doesn't want to live among them, so he prefers to fly to the sky and disappears at the end of the play. Inside the locked iron gates, his wife who had been looking after her son with fever was left alone. On the other hand, Bahtiyor doesn't accompany the woman in white even if she insists and tells her that he doesn't want to go to the other side of the door where he was going to take the key and says he is mistaken. Actually, the real life tells us that the real life is in the inner world of each of us and that the person can't find happiness in this world if they cannot find their selves and their real life. It is not at all surprising if this is the real theatrical solution. Hence, the theatre should express the clear patterns of hero's fight and destiny deriving from the idea of the play rather than leaving the audience in dilemma with the abstract end.

The play "Dance in Uzbek style" by Nurilloh Abboskhon has become a phenomenon among the comedies written in the independence period. This play succeeded in to some extent in the research carried out towards creating the character. The principal attention there is drawn to an Uzbek mother named grandmother Kumri and the Russian girl who was ready for everything to achieve happiness and bright future. Maria goes far away from her parents for the sake of her lover, Tursunboy. Definitely, she thinks about living a happy life with her lover in her imagination. But the thought that she is coming towards another nation, other people, different circumstances and different traditions doesn't cross her mind. She starts to imagine that she will face many difficulties after her first meeting with her mother-in-law. But she doesn't become afraid. She begins to fight for her happiness. This very fight starts to surge the audience's interest. It is true that grandmother Kumri does not do her any harm. But she becomes upset as her only son got married to a girl of different nationality. Because, she was very loyal to her national values, she used to practice the traditions loyally and she was a typical Uzbek woman who wanted the traditions to reflect in every minute of life. It is obvious, conflict does not always occur between positive and negative forces. Occasionally, two good people whose way of thinking and worldview are different can misunderstand each other. In addition, concepts like pride and shame may prevent people from admitting that others are right. In this very play, there are such cases in which the mother-in-law insists on what she says whereas the daughter-in-law tries to keep her self. It is

impossible to say one is right and another one is wrong and mention them as enemies here. The mother-in-law treats her daughter-in-law strictly as she wants her to comply with Uzbek traditions in the eyes of her neighbors and preserve the values that made her happy by teaching them to her daughter-in-law and since she sincerely wants her grandchildren to be happy. Even though the daughter-in-law wants to be happy with the son of a different nationality, she wouldn't like to forget her national values and forego her identity. As this is the case that is understandable for everyone, the conflict between them makes the audience laugh. The audience want them to kiss and make up and find their happiness. Maria acquires the name Maryam. She gets used to the local lifestyle slowly. As a result, Maryam who has a son, a daughter-in-law, and grandchildren becomes a housewife mother-in-law owing to the traditions she learned from her mother-in-law. The play covers the lives of several generations, it shows processes from Maryam's childhood till she becomes a senior citizen. It is true that not all events in this process are represented in sequence, but the events that reveal the playwright's idea are shown consistently. "We often talk about the infinity of the artist's imagination. In fact, there is a clear limit to both height and length of the artist's imagination no matter how great and wonderful their flight is. The limits are placed by historical time" (Sakhnovskiy-Pankeev, 1969). One of the playwright's important responsibilities is to indicate the period in which events are taking place. The very period shows how important or controversial the events described by the playwright are. Looking at the issue from this perspective, the description of complex 80s justify the fact that Maryam stayed with her mother-in-law despite so many difficulties. Nonetheless, the grandmother Kumri's hard working habit, sincerity and her kindness as well as mercy towards her neighbors always stayed in Maria's heart. The situations to which heroes are exposed are slightly exaggerated in comedies. In spite of this, it will become obvious from the hilarious situations of heroes that they have the sincere and pure hearts. As a result, the audience falls in love with them as if they are their close people. The audience's love grows stronger towards them as they laugh at every possible hilarious situation of theirs. One of the achievements of this play in which friendship between nations and love among people are described is that people who do dirty tricks and intriguers cause the relationship between the mother-in-law and the daughter-in-law to be closer. Co-operating against people who do dirty tricks brings them together. This, in turn, ensures the consistency of given events and creates the basis for characters to develop and become clearer as events take place.

**The theoretical foundation of character formation.** As it was mentioned above, characters provide the ideological direction of the play and the basis of the conflict. This case is the important feature in all plays. It is true, characters are not portrayed the same in all plays. It is possible to say agreeing with the views of Volkenstein, there are two ways of expression of characters in the dramaturgic play. First, the character rich in psychology that becomes obvious to the audience slowly. Second, as it happened in the commedia dell'arte, the fixed characters (divided into two groups via masks)" (Volkenstein, 1969). Almost in all plays in Uzbek dramaturgy, characters are interpreted in the first way. Certainly, not all of them achieved the same level of success. From one perspective although the issue of skills may seem to be the primary reason for this, actually playwrights pay too much attention on the format of the play and forget about the content. Thin in turn leads to discontentment towards playwrights in their efforts to create the character. According to Mamur Umarov, complaints to the creator of characters are expressed in four ways:

- ❖ For the portrayal of unimportant things;
- ❖ For portraying something against the common sense;
- ❖ For expressing something against their own opinions;
- ❖ For expressing something against the rules of art" (Umarov, 2014).

One can add the following agreeing with the ideas of M. Umarov, there might be a complaint if the playwright describes something against life! Certainly, the formation of such complaints derives from the definition of characters on the basis of certain requirements. The pitfalls in the dramaturgic play will be evident as a consequence of the partial accomplishment or total failure of demands, and this, of course, directly depends on the character. As M. Umarov talks about the above-mentioned criticism, he expresses his opinions on the definition of characters in literary books. In his opinion, the analysis of the character starts with collecting data about personage in three stages and it is accomplished as follows. The first – the definition given to the personage by the author – gender, age, profession, the living atmosphere are gathered from the play and remarks about it. Next, ideas, descriptions and comments about the personage made by others are sorted out and written. Thirdly, the opinions from monologue told by the personage himself are chosen and copied down" (Umarov, 2014). Certainly, it is possible to identify the participant's figure clearly through the means mentioned in the process of analysis by the scientist. Compared to the examples provided above, if we look at these methods, it is inferred that the first impression about the hero is developed from the first description of the hero by the author. Other's opinion of the personage and their own

opinion about themselves give certain ideas about the features of the character. However, these only are not sufficient to get to know the hero's character truly and thoroughly. Because, other's opinion about them depends on how they present themselves to others. Usually, it is possible to understand via real-life examples, any person wears a particular mask in the society. They might not have revealed their heart even to their close people including their parents, spouse, children and friends and they may have concealed certain aspects of their character. Moreover, it is possible to get to know one's character clearly from the way they describe themselves. Even the people's opinions of themselves when they are alone may not be the whole truth in their hearts. In most cases, in both real life and in the performances that are literal replications of real life, people prefer to boast and listen to their wants and needs rather than their conscience. It is possible to observe that people even commit a sin and try to lie to their conscience by stating that they were doing it in order to accomplish something good, with good intentions. Therefore, there is a need to add several processes to these cases in order to fully reveal the hero's character. Firstly, the hero's opinion about others. It is usually derived from the way heroes estimate others, their choices about how to choose people and their objectivity in assessing people. Secondly and most importantly, when the hero is left in a dilemma when they have to choose their own interests or other people's interests. Actually, "there is an element of fast pace of life that is typical of the modern world in the power of interests" (Sagdullayev, 2012). The primary reason why this is the most important factor is that people can express positive opinions about themselves and other people and others may know only good sides of them. Nevertheless, their true face is revealed when they are left in front of the real choice and this element is present in all classic and ideal plays. The research shows that leaving the hero in front of the choice, in majority of cases, is the peripeteia of the dramaturgic play. When the events that are beyond the hero's control suddenly take place under the influence of external factors, the events of the play develop in a totally unexpected direction and the hero's character is fully revealed. It is a pity to mention that this very feature is lacking in the plays that are being written in modern Uzbek dramaturgy is subsequently resulting in the fact that the hero's character becomes abstract and disappearance of sharing their problems and following them on the part of audience. It is well-known that the playwright cannot carry out in-depth analysis of all hero's characters in literary plays. It is for sure that if all the participants' characters are created perfectly and if they are not similar to each other and if each of them has a special feature. But accomplishing such a task is very difficult. Hence, in most cases only the main hero's character is developed and secondary heroes are reflected in particular simple templates. Especially, playwrights almost do not think about episodes. Therefore, when one talks about a particular famous actor, people state how skillfully they played a particular episodic role and how they developed a small role into the level of a figure. Because, actor find certain characters for this episode and they expand it depending on their horizon. But the playwright should develop the character of episodes to some extent so that they would become a force that direct other heroes in their mutual relationships and the power that means a certain truth. In a nutshell, the heroes who do not make a big difference and who just serve to attract the audience's attention are not needed. Such personages may confuse the audience from the main idea of the performance and be an obstacle to the consistent development of events. Nonetheless, another objective reason makes it necessary to express the main hero's character more and thoroughly in the play. This is related to the fact that one play is dedicated to the complex process of a certain individual and that it emphasizes all the details connected with the solution to the problem. Hence, almost all theorists claim that it is important to find the main hero's character. Specifically, Volkensteins recommendations on identification of the hero's character are worth noting:

1. According to their puposes and what they want;
2. According to the types of battle in words and actions. For instance, someone may try to achieve their goals by asking other people gently and begging them whereas others use threat and violence to do so;
3. According to temperament. That's to say, their attitude towards events or their perception of something;
4. According to their speech" (Volkenstein, 1969).

### **Conclusion:-**

Having summarized all the opinions of theorists on the character, the main and reliable method of identifying the hero's character in a dramaturgic play can be considered to be determining their goals and to what they are striving to achieve. People can sometimes make a mistake, follow the pursuit of their wants and occasionally do something bad against other people intentionally. Nonetheless, what dreams they have, to what they are striving to, what they want from the deep of their hearts identify their true face in their colorful character. "Drama – the type of art that describes determination" (Afinogenov, 1957) people's minds must mature and achieve perfection with the help of it. People must be able to look critically and objectively at their actions, they should live in this world not only thinking about their own satisfaction and joy but also be able to do good deeds and turn it into their daily activity. The main task before playwrights, specifically, present-day Uzbek playwrights is to develop moral framework for today's people and make the common interests the main priority in this framework. This in turn means that forming a

character is one of the primary problems in dramaturgy, and by only solving this issue, one can achieve their goals in creating a perfect play and convert the theatre into the social institute that is beneficial to people.

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## RESEARCH ARTICLE

### SPECTROPHOTOMETRIC CHARACTERIZATION OF RUTHENIUM(II) POLYPYRIDYL COMPLEXES WITH PARA QUINONES IN AQUEOUS MEDIUM.

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quinones, binding, Benesi Hildebrand Plot, UV/Vis spectroscopy.

#### Abstract

Two Ruthenium(II) polypyridyl complexes  $[Ru(NN)_3]^{2+}$  [(NN)→bpy, dmbpy] were synthesised. The binding interaction of these ruthenium complexes with para quinones have been studied by absorption spectral technique. These metal complexes have the absorption maximum in the range of 448 - 458 nm. They have the emission maximum in the range 590-610 nm. The binding constant ( $k_b$ ) for these complexes are determined from the Benesi-Hildebrand equation using the absorption intensity data. Structural effect plays an important role in the binding of the quinones with the complexes.

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#### Introduction:-

Quinones are ubiquitous in nature. p-quinones are important molecules in biological electron transport. They act as electron acceptor in photosynthesis [1-3]. They are well known for their cytotoxicity. They have very high toxicological and pharmacological effects. They are used as anticancer drugs. They have antiviral, antifungal properties. Quinones have the capacity to accept electrons and are easy to protonate. They form stable hydrogen bonds. Due to their high mobility and small size, they have the property to get reduced. In order to understand the electron transfer properties of quinones, several photosensitizers have been designed. Inter and intra molecular electro transfer reactions have been studied. Their properties can be changed on complexation with proteins [4]. Transition metal complexes have received a considerable amount of attention over the past three decades [5-7]. Of these, particularly ruthenium (II) polypyridyl complexes have received much attention due to its tunable photophysical and photochemical properties. These complexes have a potential application in the field of photochemistry and biochemistry [8-10]. Recently reports show the advantages of ruthenium complexes in the field of cellular imaging and act as anticancer agents [11-14]. They act as good photocatalysts, particularly in the splitting of water molecule into  $O_2$  and  $H_2$ , used in dye sensitized solar cells and used in photodynamic therapy. We present here a comprehensive study of interaction of ruthenium polypyridyl complexes with quinones in aqueous medium by using UV/Vis spectrophotometric parameters.

#### Experimental methods:

##### Materials:-

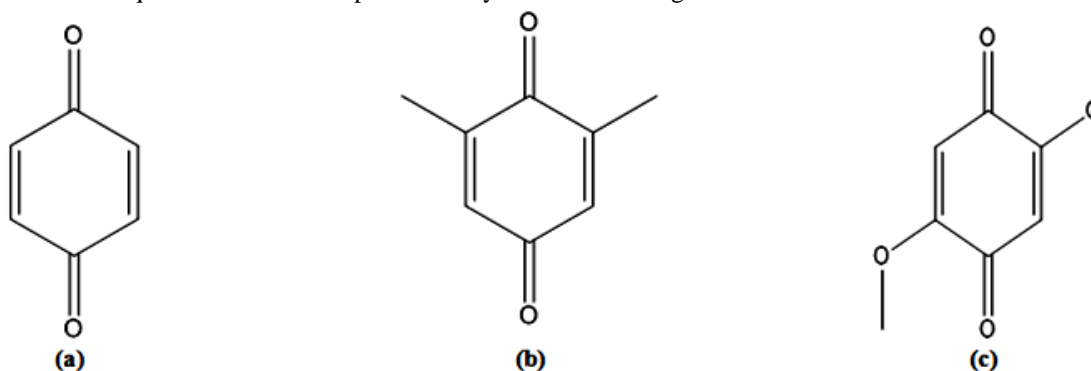
The ruthenium polypyridyl complexes  $[Ru(NN)_3]^{2+}$ , where NN = 2,2'-bipyridine (bpy) and 4,4'-dimethyl- 2,2'-bipyridine (dmbpy) were prepared by reacting  $RuCl_3 \cdot 3H_2O$  with the corresponding ligands according to the known procedures [15,16]. The ligands and quinones used for this present work were procured from Sigma Aldrich. Binding studies were carried out using double distilled water. All experiments were carried out at room temperature.

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**Spectroscopic Measurements:-**

The absorption spectral measurements were carried out using SYSTRONICS 2203 Double beam Spectrophotometer. Emission intensity measurements were carried out using JASCO FP 8600 spectrofluorometer. The structure of the quinones used in the present study was shown in fig 1.



**Figure 1.** Structure of Quenchers; (a) 1,4-benzoquinone  
(b) 2,6-dimethyl -1,4- benzoquinone (c) 2,5-dimethoxy -1,4-benzoquinone.

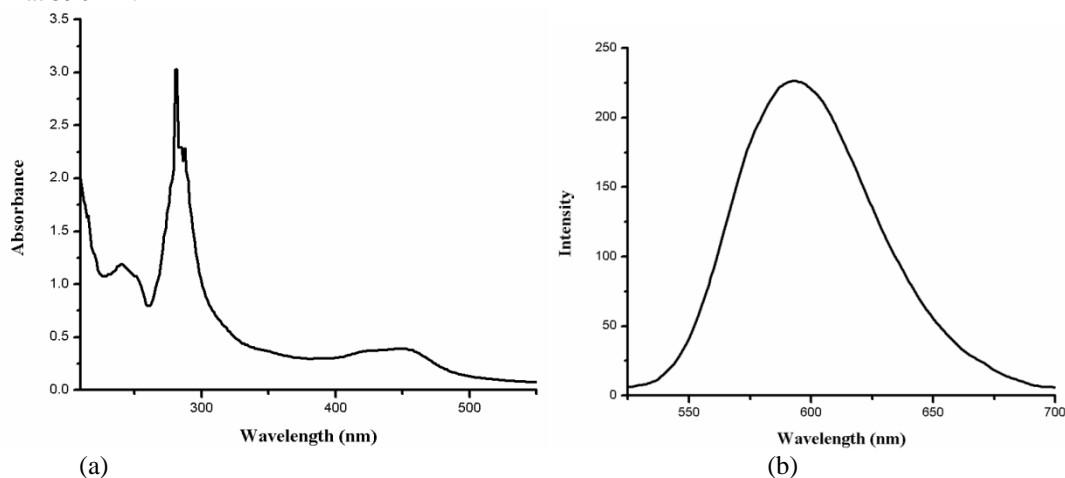
The binding of  $[\text{Ru}(\text{NN})_3]^{2+}$  with various concentrations ( $4 \times 10^{-6}$  –  $2.8 \times 10^{-7}$  M) of quinones have been studied by absorption spectral techniques. The binding constant ( $k_b$ ) of the  $[\text{Ru}(\text{NN})_3]^{2+}$  complexes with quinones were determined from Benesi-Hildebrand equation [16] using absorption intensity data [17].

$$1/\Delta A = 1/K_b \Delta \epsilon [H] + 1/\Delta \epsilon [Q]$$

Where  $\Delta A$  is the change in the absorption of the complex with various concentrations of  $[Q]$  of the quinones. The plot of  $1/\Delta A$  versus  $1/[Q]$  gives a straight line and the binding constant  $k_b$  is calculated from the ratio of y intercept to the slope of the straight line.

**Results and discussion:-**

The absorption spectrum and emission spectrum of  $[\text{Ru}(\text{bpy})_3]^{2+}$  in aqueous medium is shown in fig. 2. The complex shows a ligand Centred (LC) absorption peak of high energy at 290 nm which is due to the promotion of electron from  $\pi_L$  to  $\pi_L^*$  and a metal to ligand charge transfer (MLCT) peak at 448 nm. The weak shoulder around 320 nm corresponds to the metal centered (MC) transition from  $t_{2g}$  to  $e_g$ . The complex  $[\text{Ru}(\text{bpy})_3]^{2+}$  has the emission maximum at 596 nm.



**Figure.2:-** (a) Absorption spectrum and (b) Emission spectrum of  $[\text{Ru}(\text{bpy})_3]^{2+}$  complex in aqueous medium.

Table 1 gives the photophysical data of the two  $[\text{Ru}(\text{NN})_3]^{2+}$  complexes. The red shift in the LC and MLCT transition, on the introduction of methyl group to the parent ligand bipyridine is due to the lowering of the excited state energy. The introduction of dimethyl ligand results in the red shift in the absorption maxima from 448 nm to

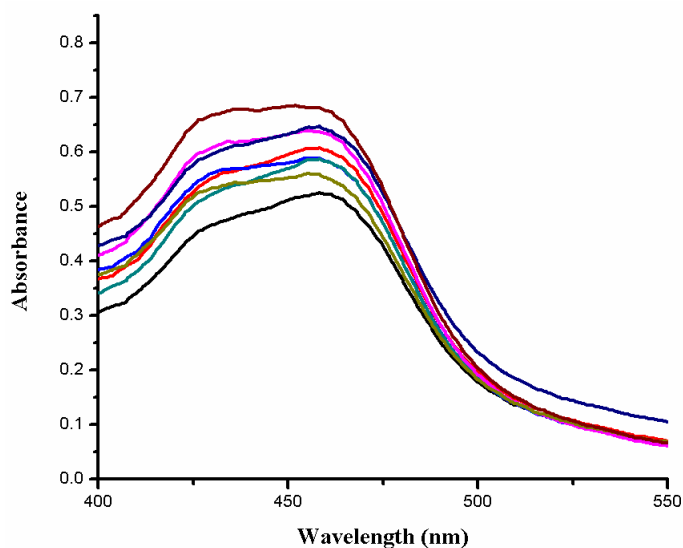
458 nm to the tune of 10 nm, while the emission maxima is red shifted to the tune of 8 nm in homogeneous medium.

**Table 1:-** Absorption maximum, emission maximum and lifetime of  $[\text{Ru}(\text{NN})_3]^{2+}$  in aqueous medium

Complex	Absorption maximum(nm)	Emission maximum(nm)	Lifetime(ns)
$[\text{Ru}(\text{bpy})_3]^{2+}$	448	593	*650
$[\text{Ru}(\text{dmbpy})_3]^{2+}$	458	605	*360

\*Data taken from the published report[18]

Electronic absorption spectroscopy is an important technique to explore the interaction of metal complex with p-quinones. In order to compare the binding strength of the  $[\text{Ru}(\text{NN})_3]^{2+}$  complexes with quinones, the intrinsic binding constant ( $k_b$ ) were obtained to monitor the changes in the absorption intensities at 290 nm. The absorption spectra of  $[\text{Ru}(\text{dmbpy})_3]^{2+}$  with incremental addition of 1,4-benzoquinone in aqueous medium is shown in fig. 3.



**Fig. 3:-** Absorption spectrum of  $[\text{Ru}(\text{dmbpy})_3]^{2+}$  complex with incremental addition of 2,6 –dimethyl -1,4 benzoquinone in aqueous medium.

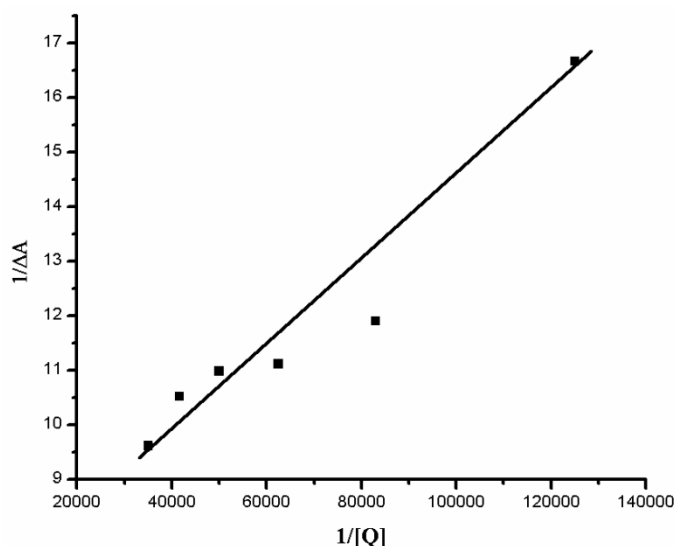
The absorption spectral studies of  $[\text{Ru}(\text{NN})_3]^{2+}$  complexes show a steady increase in the LC and MLCT absorption maximum, with incremental addition of 1,4-benzoquinone, 2,6-dimethyl-1,4 benzoquinone and 2,5-dimethoxy-1,4-benzoquinone. These results indicate the formation of ground state complex. Addition of 1,4-benzoquinone to the  $[\text{Ru}(\text{bpy})_3]^{2+}$  complex increases the absorption at 290 nm and 448 nm, showing the binding of the quinone to the complex. All the quinones show a weak absorption near the MLCT absorption of the complex. So the quinones bind with the LC and MLCT absorption peaks of absorption peaks of  $[\text{Ru}(\text{NN})_3]^{2+}$  complex in the ground state [19]. The  $k_b$  values of  $[\text{Ru}(\text{NN})_3]^{2+}$  complexes with the quinones 1,4-benzoquinone, 2,6-dimethyl-1,4-benzoquinone and 2,5-dimethoxy-1,4-benzoquinone are tabulated in table 2.

**Table 2:-** Binding constant,  $K_b$  ( $\text{M}^{-1}$ ) for 1,4 benzoquinone , 2,6 –dimethyl -1,4 benzoquinone and 2,5-dimethoxy -1,4 benzoquinone with  $[\text{Ru}(\text{NN})_3]^{2+}$  complexes in aqueous medium.

Quinones	$[\text{Ru}(\text{bpy})_3]^{2+}$	$[\text{Ru}(\text{dmbpy})_3]^{2+}$
	Binding constant $K_b$ ( $\text{M}^{-1}$ )	
1,4 benzoquinone	$1.748 \times 10^4$	$2.729 \times 10^4$
2,6 - dimethyl -1,4 benzoquinone	$3.138 \times 10^4$	$5.412 \times 10^4$
2,5- dimethoxy -1,4 benzoquinone	$3.337 \times 10^4$	$9.754 \times 10^4$

The binding constant of  $[\text{Ru}(\text{bpy})_3]^{2+}$  complex with 1,4 benzoquinone and 2,6 –dimethyl -1,4 -benzoquinone are  $1.748 \times 10^4$  and  $3.138 \times 10^4$  respectively. There is an increase in the intrinsic binding constant value for  $[\text{Ru}(\text{dmbpy})_3]^{2+}$  complex of  $2.729 \times 10^4$  and  $5.41 \times 10^4$  for the same quinones. The binding constant value for  $[\text{Ru}(\text{bpy})_3]^{2+}$  complex with 2,5-dimethoxy -1,4- benzoquinone is  $3.337 \times 10^4$  and  $[\text{Ru}(\text{dmbpy})_3]^{2+}$  complex has a value of  $9.754 \times 10^4$  for the above said quinone. These datas show that the  $K_b$  values increase on moving from 1,4-benzoquinone to 2,5-dimethoxy -1,4- benzoquinone. The value of the binding constant increases when the ligand of the ruthenium complex is changed from bipyridine to dimethyl bipyridine.

Benesi-Hildebrand plot on MLCT absorption of  $[\text{Ru}(\text{dmbpy})_3]^{2+}$  complex with incremental addition of 1,4-benzoquinone is shown in fig 4. The plot of  $1/\Delta A$  versus  $1/[\text{Quinone}]$  gives a straight line. The binding constant,  $k_b$  of 2,5-dimethoxy - 1,4-benzoquinone with  $[\text{Ru}(\text{dmbpy})_3]^{2+}$  complex can be obtained from the ratio of y intercept to the slope of the straight line.



**Fig.4.** Benesi –Hildebrand plot on MLCT absorption of  $[\text{Ru}(\text{dmbpy})_3]^{2+}$  complex with incremental addition of 2,5-dimethoxy -1,4- benzoquinone in aqueous medium.

The ground state interaction between the quinones and the bipyridine ring of  $[\text{Ru}(\text{bpy})_3]^{2+}$  complexes are hydrophobic and  $\pi$  –stacking in nature.  $\pi$ - $\pi$  stacking interactions exist between the ligands of the Ru(II) complex and the quinones, so the binding also becomes stronger. Binding occurs in the LC and in the MLCT absorption maximum of the complex in the ground state. The  $k_b$  calculated for the quinones shows that, the  $[\text{Ru}(\text{NN})_3]^{2+}$  complexes bind strongly to 2,5-dimethoxy -1,4-benzoquinone than that of 2,6-dimethyl-1,4-benzoquinone and 1,4-benzoquinone.

### Conclusion:-

In this chapter a comprehensive study was carried out to study the binding interaction of  $[\text{Ru}(\text{NN})_3]^{2+}$  complexes with p-quinones in aqueous medium by using absorption spectral techniques. The binding constants were calculated using Benesi – Hildebrand plot. The experimental results show that the binding of the  $[\text{Ru}(\text{NN})_3]^{2+}$  complexes with p-quinones depend on the size of the ligand as well as the quinones. Of the two complexes,  $[\text{Ru}(\text{dmbpy})_3]^{2+}$  complex shows the maximum binding interactions with the quinones. The binding of  $[\text{Ru}(\text{bpy})_3]^{2+}$  complex with 2,5-dimethoxy -1,4-benzoquinone shows a high value of binding constant  $3.337 \times 10^4$  which shows that this interaction is stronger than the other two quinones. This may be attributed due to the bulkiness of the quinone. The binding constant of  $[\text{Ru}(\text{bpy})_3]^{2+}$  complex with 1,4-benzoquinone is  $1.748 \times 10^4$  which is the lowest value, which shows the smaller size of 1,4-benzoquinone when compared to the other quinones.

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### RESEARCH ARTICLE

#### THE STUDY OF H-REFLEX EFFICACY IN DIAGNOSIS OF LUMBOSACRAL RADICULOPATHY.

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#### Abstract

**Background:** Electrophysiological studies are playing useful and valuable role in the diagnosis and prognosis of lumbosacral radiculopathies. The correct diagnosis of lumbosacral radiculopathy is very essential for administration of timely and appropriate treatment. H-reflex is one of the types of electrophysiologic studies helpful in diagnosis of lumbosacral radiculopathies. Hence, it is reasonable to evaluate the diagnostic efficacy of H-reflex study in lumbosacral radiculopathy.

**Objectives:** The present study was undertaken to evaluate the diagnostic efficacy of various parameters of H-reflex in lumbosacral radiculopathy

**Methodology:** In this cross-sectional study, a total of 283 subjects (168 males and 115 females) aged 40 years and above who were clinically diagnosed as having lumbosacral radiculopathy were enrolled after getting ethical approval and informed written consent. All the patients were subjected to electrophysiological evaluation using RMS EMG EP Mark –II machine in Clinical Neurophysiology unit, Department of Physiology through which their H-reflex study was conducted.

**Result:** No statistically significant difference was observed between right and left sided values for all the H-reflex parameters tested ( $P > 0.05$ ). All parameters were found to have reliable sensitivity, specificity and accuracy in diagnosing lumbosacral radiculopathy

**Conclusion:** H-reflex studies are useful supportive diagnostic tool for lumbosacral radiculopathy.

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#### Introduction:-

Radiculopathy is one of the most common causes for referral to the electromyography (EMG) laboratory. Studies have reported that lumbosacral radiculopathy affects 4-6% of the population at some point in their lives<sup>1</sup> and it has also been shown that L4-5 and L5-S1 are the most common level affected in lumbosacral radiculopathy. This disease is commonly caused by the compression of nerve root while coming out of the intervertebral foramen.

The diagnosis of lumbosacral radiculopathy is somewhat difficult which is usually done by employing radiological imaging techniques, electrophysiological evaluation involving nerve conduction studies and EMG, and rarely cerebrospinal fluid (CSF) examination.<sup>2</sup> Radiological imaging can usually recognize the presence of anatomical lesion compressing the nerve roots however, it is important to note that radiculopathy may occur without a structural

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lesion seen on radiological imaging. In such cases additional investigation like electrophysiological study is usually required.

Electrophysiological studies are playing useful and valuable role in the diagnosis and prognosis of lumbosacral radiculopathies. In cases with negative and aberrant radiological and clinical findings, electrophysiological studies are particularly useful; whereas in cases with positive radiological and clinical findings, it plays a complementary diagnostic role. The correct diagnosis of lumbosacral radiculopathy is very essential for administration of timely and appropriate treatment.

Late response study which is one of the type of electrophysiologic study allows assessment of the functional state of the proximal portions of the peripheral nerves, which are affected to a varying extent in the course of lumbosacral radiculopathy. H-reflex is one of the types of late response in electrodiagnosis which was first described by Hoffmann<sup>3</sup> in 1918. M-latency, H-latency, H-M latency, H-amplitude are the various parameters of H-reflex study that can be taken into account while analyzing it.

As the appropriate and correct diagnosis can minimize pain, discomfort, disability, and the direct and indirect costs of care due to this disease, it is reasonable to evaluate the diagnostic efficacy of H-reflex study in lumbosacral radiculopathy. Therefore, the present study is undertaken to study the usefulness of various H-reflex parameters to diagnose lumbosacral radiculopathy.

### **Materials and methods:-**

The present cross sectional study was performed in a total of 283 subjects aged 40 years and above who were clinically diagnosed by the consultant orthopedic surgeon as having lumbosacral radiculopathy. We have excluded the subjects with diabetes mellitus, clinical or electrophysiological evidence of polyneuropathy, myopathy, myelopathy, neuromuscular transmission disorders, having symptoms of less than 3 weeks duration, in whom spinal surgery was performed within the preceding 15 years and the patients with local injuries/lesion that may interfere with the electrophysiological study. A total of 168 males and 115 females were recruited in the study after getting their written informed consent. Prior Ethics approval from the Institutional Ethics committee was obtained. After doing detailed clinical and neurological examination, the electrophysiological evaluation was performed using RMS EMG EP Mark –II machine in Clinical Neurophysiology unit, Department of Physiology through which their H-reflex study was conducted. All tests were performed under constant room temperature (30°C) to shortlist the errors.

H reflexes were readily obtained using percutaneous stimulation and surface recording techniques. The stimulating cathode was placed proximally to avoid the theoretical possibility of anodal block. Stimulus pulses of long duration (1 ms) were used to preferentially activate large sensory fibers. The stimulus frequency was 1 per 3 seconds or less to allow full recovery of the H reflex from a prior stimulus. By starting with submaximal stimuli and increasing to supramaximal stimulation, we determined that: (1) the “late” response should be larger than the preceding direct motor response, (2) the H reflex with the largest amplitude, and (3) the inhibition of the H reflex with increasing stimulus intensity. Latencies were measured to the onset of the responses. For calf H reflexes, the tibial nerve was stimulated in the popliteal fossa. Surface recordings were made from the soleus muscle. Active electrode was placed medial to the tibia at a point that was one half the distance between the stimulation site and the medial malleolus, with the indifferent electrode placed on the Achilles’ tendon. Settings were kept at sweep speed 10 ms/D, intensity 2 mV, frequency 2 Hz and stimulus strength duration was 1 ms. Stimulus intensities were amplified gradually in steps of 1-2 mA until the maximum H-wave amplitude was obtained and further by 2-5 mA until the maximum M-wave amplitude was obtained. Three stimuli were live averaged for single response. Downward deflection was marked as latencies of waveforms. Minimum stimulus intensity required obtaining an H-wave and M-wave of 0.4 mV amplitude was considered H and M threshold respectively.<sup>4,5</sup>

Electrophysiological parameters evaluated were M-latency in milliseconds (ms), H-M latency in milliseconds (ms) and H-amplitude in millivolts (mV).

Structured format was used to record the observations. Statistical analysis was done by using descriptive and inferential statistics using Kappa Statistics, z-test for difference between two means and diagnostic accuracy. The study observations were analyzed to find the Specificity, Sensitivity, Positive Predictive Value and Negative Predictive Value. The software used in the analysis were SPSS 17.0 and Graph Pad Prism 5.0 and  $p < 0.05$  was considered as level of significance ( $p < 0.05$ ).

### Results:-

The age and gender wise distribution of patients and physiological variable of study subjects are shown in table 1 and 2. Descriptive statistics of H-reflex study is shown in Table 3. No statistically significant difference was observed between right and left sided values for all the H-reflex parameters tested in posterior tibial nerves ( $P > 0.05$ ). The sensitivity, specificity, positive and negative predictive values of all the H-reflex parameters is shown in Table 4. H-reflex parameters were found to have reliable sensitivity and specificity in diagnosing lumbosacral radiculopathy. Accuracy of these electrophysiological parameter was also observed to be comparable to gold standard test and by using kappa statistics fair to slight agreement was found between H-reflex parameters and MRI. (Table 4).

**Table 1:** Age and gender wise distribution of patients

Age Group(Years)	Male (N)	Female(N)	Total(N)
40-49	75(26.50%)	45(15.90%)	120(42.40%)
50-59	47(16.61%)	33(11.66%)	80(28.27%)
60-69	32(11.31%)	31(10.95%)	63(22.26%)
70-79	12(4.24%)	5(1.77%)	17(6.01%)
$\geq 80$	2(0.71%)	1(0.35%)	3(1.06%)
Total	168(59.36%)	115(40.64%)	283(100%)

**Table 2:** Physiological variable in study population

Physiological Variables	N	Minimum	Maximum	Mean	Std. Deviation
Age(years)	283	40	81	53.31	9.89
Height(cm)	283	145	180	161.42	7.19
Weight(kg)	283	40	95	62.37	7.96
BMI(kg/m <sup>2</sup> )	283	17.54	33.76	23.91	2.48

**Table 3:** Descriptive Statistics for H-Reflex study

Electrophysiological Parameters	Right Side		Left Side		z-value	p-value
	Mean	SD	Mean	SD		
M- latency(ms)	7.08	1.76	7.34	3.16	0.13	0.89
H-M latency(ms)	25.1	4.15	24.29	3.30	0.30	0.76
H-amplitude (mV)	3.85	2.29	3.39	2.23	0.20	0.84

**Table 4:** Diagnostic Accuracy of H-reflex parameters

Diagnostic Accuracy	M- latency	H-M latency	H-amplitude
	Percentage (%)	Percentage (%)	Percentage (%)
Sensitivity	50.44	61.84	49.12
Specificity	85.45	74.55	78.18
Positive Predictive Value	93.50	90.97	90.32
Negative Predictive Value	29.38	32.03	27.04
Accuracy	57.24	64.31	54.77
Likelihood Ratio	3.46	2.43	2.25
Kappa Statistics	0.20	0.24	0.15

### Discussion:-

The H-reflex is considered the electrophysiologic equivalent of the Achilles' tendon muscle stretch reflex. It evaluates the physiological integrity of tibial or S1 sensory path even the intraspinal course of S1 root. H reflexes involve conduction in proximal fibres, and provide a valuable technique for defining proximal nerve injury and may be abnormal even when more distal studies are unremarkable<sup>6</sup>.

Velazquez Perez L et al<sup>7</sup> concluded that H reflex was useful tools for evaluating patients with compressive radiculopathies. They found H-reflex abnormality in 77.5% of cases of S1 radiculopathy. This is in accordance with



our observation. Our findings coincides with the observations by Tsao BE et al<sup>8</sup> who reported absent H-reflex or low H-reflex amplitude in 82 % of surgically proven cases of S1 radiculopathy. H-reflex, a monosynaptic reflex can differentiate to some extent, L5 from S1 radiculopathy. Many researcher have found the its sensitivities and specificities with respect to lumbosacral radiculopathy ranging from 32% to 88%.<sup>9,10,11,12,13</sup> Similar observations are also reported by I-Hsuan Tsai and Hao-Hsuan Tsai<sup>14</sup> who narrated that abnormal H-reflex profile parameters which includes M-wave, H-wave, H/M ratio, H-amplitude etc. were associated with both current and chronic lumbosacral radiculopathy.

Our findings are identical with the observations by Marin R et al<sup>15</sup> who reported that H-reflex showing 50% sensitivity and 91% specificity in L5, S1 radiculopathy. Hesham N Alrowayeh and Mohamed A Sabbahi<sup>16</sup> studied the electrophysiological changes in H-reflex amplitude and latency in patients with radiculopathy and found that decrease in H-amplitude is earlier sign of nerve root involvement in patients with radiculopathy compared with latency. Our findings are comparable with these observations. R E Rico and E J Jonkman<sup>17</sup> reported that H-reflex was not of any value in diagnosing L5 radiculopathy. This is in contrast to our findings as we found it to be useful diagnostic tool in L5, S1 radiculopathy.

We observed a significant reduction of the amplitude of the soleus H-reflex. This might be because of loss of axons, obstruction to impulse conduction or dispersion of the afferent volley and well correlates with no elicitation of the Achilles reflex. If the H-reflex is not delayed, then it is noteworthy that changes in H-reflex threshold and amplitude occur before any slowing of conduction through the nerve.

The severity of the compression of nerve roots may explain H amplitude reduction and prolongation of H latency of Soleus H-reflex study<sup>18</sup>. Because of nerve root compression, there is insufficient microcirculation and ischemia present in lumbosacral radiculopathy, this may lead to membrane potential and ion channel changes in the nerve fiber as well as focal disturbance to myelin. Both these factors together may influence the temporal dispersal of the compound sensory afferent volley and/or axonal conduction block.<sup>19</sup> This might be the reason why did we get abnormality in all the H-reflex parameters tested in lumbosacral radiculopathy.

### **Conclusion:-**

H-reflex studies are useful and valuable supportive diagnostic tool for lumbosacral radiculopathy. All the parameters of H-reflex study have reliable sensitive and specific in diagnosing lumbosacral radiculopathy.

### **Acknowledgement:-**

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### RESEARCH ARTICLE

#### HISTOPATHOLOGICAL STUDY OF OPHTHALMIC LESIONS.

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Ophthalmic Pathology, Eyelids,  
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#### Abstract

Ophthalmic pathology is the subspecialty of pathology. It is unique in many respects as it encompasses wide range of tissues, epithelial elements, connective tissue and specialized tissues. The present study focused on most common ophthalmic lesions and to establish their accurate pathological diagnosis. The study was conducted in department of Pathology in collaboration with department of Ophthalmology, Dr. D. Y. Patil Medical College, Hospital and Research Centre, Kolhapur, on 132 cases of ophthalmic lesions received in the Histopathology laboratory during period from May 2014 to April 2016. Ophthalmic specimens were routinely processed and H& E stain was performed. The study concluded that, ophthalmic lesions reported were mostly non-neoplastic. Eyelid was the commonest site followed by cornea and conjunctiva. A wide range of lesions including some rare conditions like retinoblastoma, were studied on various parameters and histopathological features were highlighted. Many neoplastic conditions clinically mimic other less aggressive neoplastic or inflammatory conditions and needs differentiation before definitive therapy is planned. So, to establish their accurate diagnosis, histopathological correlation is important and mandatory.

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#### Introduction:-

Eye is a heterogenous tissue; hence we tend to see a variety of lesions, both non-neoplastic and neoplastic with tumoral types and subtypes. It is unique in many respects as it encompasses wide range of tissues, epithelial elements, connective tissue and specialized tissue.<sup>1</sup> The goal of the Ophthalmic pathology service is to enhance communication between the ophthalmic surgeon and the pathology laboratories.<sup>2</sup> Eye and ocular adnexa is composed of eyelids, lacrimal passages and glands, orbit, conjunctiva, cornea, sclera and intraocular tissue, mainly retina, choroid plexus, iris, etc. Ophthalmic lesions are divided into non neoplastic and neoplastic. Non neoplastic lesions include the developmental anomalies, inflammatory diseases and degenerative diseases. Neoplastic lesions are benign and malignant.<sup>3</sup>

Ophthalmic specimens submitted for histopathologic evaluation are obtained mostly from eyelids.<sup>4</sup> Among eyelid lesions, dermoid cyst is commonest, followed by epidermal inclusion cyst, intradermal nevus, sebaceous (meibomian) carcinoma, skin carcinomas (basal cell carcinoma, squamous carcinoma, accessory glands carcinomas,

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and malignant melanoma).<sup>5</sup> The knowledge of corneal pathology is limited. The most common diseases are endothelial decompensation, fibrosis and vascularization. Conjunctival tumors are one of the most frequent of the eye and adnexa. They comprise a large variety of conditions, from benign lesions such as nevus or papilloma, to malignant lesions such as epidermoid carcinoma or melanoma.<sup>6</sup> Lacrimal gland lesions include inflammatory pseudotumor, malignant lymphoma, and leukemia. Among the epithelial tumors, benign mixed cell tumor (pleomorphic adenoma) is the most common.<sup>7</sup> Melanomas arising from the pigmented or potentially pigment producing cells of the uvea are the most frequent primary intraocular neoplasms in adults.<sup>8</sup> Retinoblastoma is the most common primary malignancy of young children.<sup>9</sup> The histopathological diagnosis of the diseases plays an important part in patient care.

### Methodology:-

The present study was conducted in the Department of Pathology at Dr. D. Y. Patil Medical College, Hospital and Research Institute, Kolhapur . This is a prospective study conducted for a period of 2 years from May 2014 to April 2016. The patients were selected at random irrespective of age, sex, socioeconomic status and residence. The eligible patients were briefed about the nature of the study and a written informed consent was obtained from the selected patients. Findings were recorded on predesigned proforma. All the biopsies related to the ocular site were included; the tissue samples included enucleated eyes, excision biopsies, corneal buttons, fine needle aspiration biopsies and intact tissue biopsies. The samples were processed according to the standard protocol and stained with routine technique and Haematoxylin & Eosin staining was performed. Histopathological interpretation was made by correlation of provided clinical data, studying of gross morphology and light microscopic examination.

### Results:-

In present study of 132 cases, 67 cases (50.75%) were males and 65 cases (49.25%) were females with male to female ratio of 1.03:1 suggesting a slight male preponderance. The most common age group in our study was 41 to 50 years with a total of twenty cases (20.45%) out of the total cases. Ophthalmic lesions we received were mostly non neoplastic (79 cases, 59.86%) and 40.14% (53cases) were neoplastic. Out of the neoplastic lesions 30.30% (40 cases) were benign and 9.34% (13 cases) were malignancies. Site wise distribution showed maximum number of lesions were from eyelids (48 cases,36.35%). Conjunctiva was the second commonest site (38 cases, 28.77%) followed by corneal lesions (34 cases, 25.74%); orbital lesions (5 cases, 3.77%) and lesions from intraocular tissues (4 case, 3.03%). Lesions from lacrimal gland and passages were least common.

Twenty seven cases (56.25%) were non neoplastic eyelid lesions and fourteen cases (29.17%) were benign eyelid lesions out of the 48 eyelid lesions. Majority of the cases were Inclusion cysts (11 cases, 40.74%), Nevocellular nevus (6 cases, 42.85%). Seven cases (14.58%) were malignant eyelid lesions out of the 48 eyelid lesions. Majority of the cases were Squamous cell carcinoma (4 cases, 57.14%), followed by Basal cell carcinoma (2 cases,28.57%).

Thirty eight lesions were received from conjunctiva. Majority were diagnosed as CIN (14 cases, 36.85%), followed by, Pterygium, Squamous cell carcinoma and conjunctival papilloma. Thirty four cases were received from corneal lesions. Majority were diagnosed as Suppurative and inflammatory lesions (26 cases, 76.47%). Five lesions were received from orbit. Of the 5 cases, three cases were diagnosed as Epidermal cyst (3 cases, 60%), one case of Neurofibroma (20%) and one case of Basal cell carcinoma (20%). Only 4 cases were from intraocular tissues, one case each (25%) of Retinoblastoma, Macular amyloidosis, Massive retinal gliosis and Choroid suppurative lesion were reported. Retinoblastoma, a rare paediatric tumor seen in 4years old was also received in this study. Three cases were received from lacrimal gland and passages.

**Table 1:-** Distribution of lesions as neoplastic and non - neoplastic

Lesions (n=132)	No. of cases	Percentage (%)
<b>Non-neoplastic</b>	79	59.86%
<b>Neoplastic</b>	<b>Benign</b>	40
	<b>Malignant</b>	13
<b>Total</b>	132	100%

**Table 2:-** Site wise distribution of ophthalmic lesions

SITE	NUMBER	PERCENTAGE(%)
Eyelid	48	36.35%
Conjunctiva	38	28.77%
Cornea	34	25.74%
Orbit	5	3.77%
Intraocular Tissues	4	3.03%
Lacrimal Gland And Passages	3	2.72%
<b>TOTAL</b>	<b>132</b>	<b>100%</b>

**Table 3:-** Shows distribution of various eyelid lesions.

<b>DISTRIBUTION OF DIFFERENT EYELID LESIONS (n = 48)</b>	
<b>NON NEOPLASTIC (27 cases, 56.25%) &amp; BENIGN (14cases, 29.17%) LESIONS</b>	
INCLUSION CYSTS (EPIDERMOID)	<b>11 (22.91%)</b>
NEVOCELLULAR NEVUS	<b>6 (1.25%)</b>
DERMOID CYSTS	<b>3 (6.25%)</b>
SQUAMOUS PAPILOMA	<b>2 (4.16%)</b>
BENIGN ADNEXAL TUMOR	<b>2 (4.16%)</b>
CHALAZION	<b>2 (4.16%)</b>
HIDROCYSTOMA	<b>1 (2.08%)</b>
OTHER BENIGN AND INFLAMMATORY LESIONS	<b>14 (29.14%)</b>
<b>MALIGNANT LESIONS (7cases, 14.58%)</b>	
BASAL CELL CARCINOMA	<b>2(4.16%)</b>
SQUAMOUS CELL CARCINOMA	<b>4 (8.33%)</b>
MEIBOMIAN GLAND CARCINOMA	<b>1 (2.08%)</b>

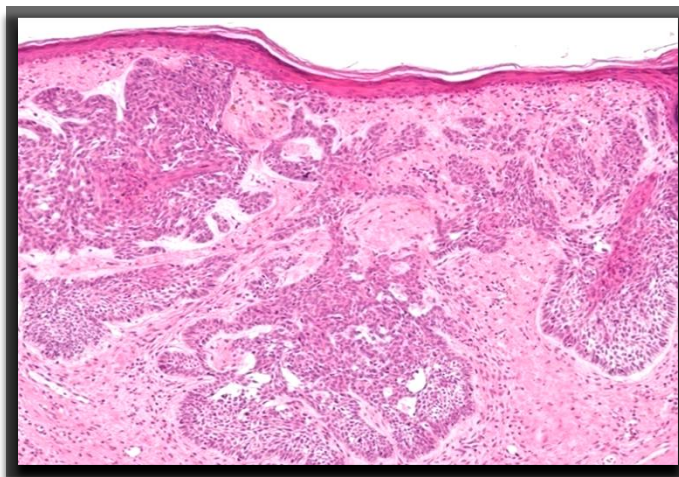
**Table 4:-** Distribution of conjunctival lesions

Disease	Distribution(n=38)	
	No. of cases	Percentage
Pterygium	4	10.53
Hemangioma	3	7.89
Conjunctival cyst	2	5.26
Rhinosporidiosis	1	2.63
Conjunctival Papilloma	4	10.53
Sebacious Hyperplasia	1	2.63
Mild Epithelial Dysplasia	2	5.26
Conjunctival intraepithelial neoplasia (CIN)	CIN I	5
	CIN II	7
	CIN III	2
Squamous Cell Carcinoma	4	10.53
Non Specific Inflammations & Granulation Tissues	3	7.89
<b>Total</b>	<b>38</b>	<b>100</b>

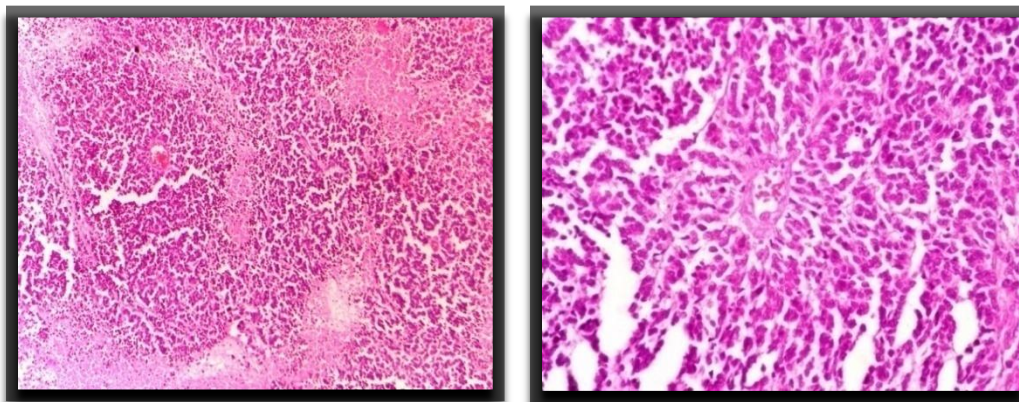
**Table 5:-** shows distribution of various lesions of other sites.

<b>DISTRIBUTION OF LESIONS OF OTHER SITES</b>	
<b>CORNEAL LESIONS (34, 25.74%)</b>	
CORNEAL ULCER	<b>2</b>
STAPHYLOMA	<b>1</b>
DYSTROPHIES (FUCH'S&LATTICE)	<b>3</b>
KERATOGLOBUS	<b>1</b>
PANNUS	<b>1</b>
OTHER SUPPURATIVE &INFLAMMATORY LESIONS	<b>26</b>
<b>INTRAOCULAR LESIONS (4cases, 3.03%)</b>	
RETINOBLASTOMA	<b>1</b>

MACULAR AMYLOIDOSIS	1
RETINAL GLIOSIS	1
CHOROID SUPPURATIVE LESION	1
<b>ORBITAL (5cases , 3.77%) &amp; LACRIMAL (3 cases, 2.72%) LESIONS</b>	
BASAL CELL CARCINOMA	1
EPIDERMAL CYST	4
NEUROFIBROMA	1
OTHER LESIONS	2

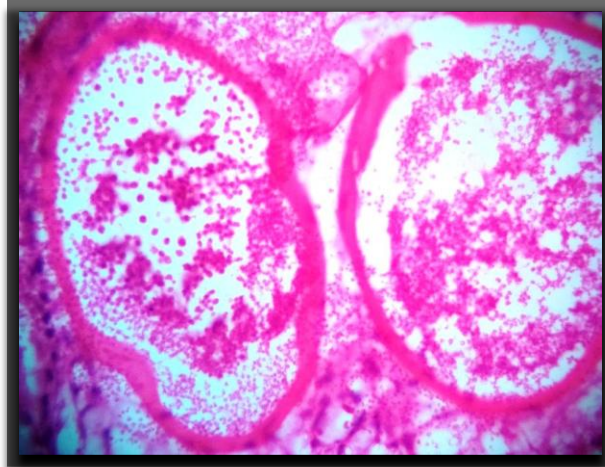


**Figure 1:- BASAL CELL CARCINOMA:** Section shows (H&E stain; X4) nests of varying sizes formed by atypical basaloid cells surrounded by a sharply demarcated desmoplastic stroma. Peripheral palisading, peritumoral clefting along with few mitotic figures are seen.



**Figure 2:- A AND B. RETINOBLASTOMA:** Section shows (H&E stain; X4) dark areas showing sheets and nests of small blue cells surrounded by pink areas of tumor necrosis and calcification (left figure). Section shows (H&E stain; X40) tumor cells clustered around blood vessels forming pseudorosettes and necrotic areas; numerous Flexner-Wintersteiner rosettes are also seen (right figure).





**Figure 3:- CONJUNCTIVAL RHINOSPORIDIOSIS:** Section shows (H&E stain; X40) multiple thick walled large spherules filled with thousands of endospores.

### Discussion:-

In present study of 132 cases, 67 cases (50.75%) were males suggesting a male preponderance with male to female ratio of 1.03:1 and majority (27 cases, 20.45%) of the cases belonged to 41 to 50 years of age group. Various studies done by Shah N & Trivedi N et al<sup>3</sup>, Bastola P & Koirala S et al<sup>2</sup>, Shaikh I et al<sup>10</sup>, Akpe B A & Omoti AE et al<sup>11</sup> and Ud-Din N et al<sup>12</sup>; found similar results comparable to present study. Chauhan SC & Shah S<sup>1</sup> et al reported slight female preponderance. While Pudasini S<sup>13</sup>, et al, reported 3th and 4<sup>th</sup> decade as the commonest age group in their studies. In our study, 79 cases (59.86%) cases were non neoplastic and 53 cases (40.14%) were neoplastic. Various studies found similar results comparable to present study. Ud-Din N, et al<sup>12</sup>, reported neoplastic lesions more in their study. Maximum number of lesions were from eyelids (48 cases,36.36%) followed by conjunctiva (38 cases, 28.79%), and least were seen from lacrimal gland and passages. All the studies indicated that eyelids and conjunctiva were the commonest sites. While Akpe B A & Omoti AE<sup>11</sup> et al and Pudasaini S<sup>13</sup> et al reported conjunctival lesions to be commonest.

Among the eyelid lesions, 27 non-neoplastic, 14 benign eyelid lesions and 7 malignant eyelid lesions were reported. Non neoplastic lesions were Inclusion cysts, followed by Non specific inflammation and granulation tissues, Dermoid cyst, Chalazion, Tuberculosis verrucosa cutis and Hidrocystoma. Benign eyelid lesions were Nevocellular nevus, followed by squamous papilloma, benign adnexal tumors, benign fibrous histiocytoma, hemangioma and neurofibroma. The 7 cases of malignancies were Squamous cell carcinoma (4 cases), Basal cell carcinoma (2 cases), and Meibomian gland carcinoma (1case). Various studies done by Gundogan CF<sup>14</sup>, et al, Chauhan S, et al<sup>15</sup>, Al-Faky YH<sup>16</sup>, et al and Paul S<sup>17</sup>, et al found similar lesions. Many other lesions reported in their studies which were not encountered in our study were lipoma, keratoacanthoma, seborrheic keratosis, cutaneous myxoma, embryonal rhabdomyosarcoma and malignant melanomas.

In the present study, 38 lesions were from conjunctiva, majority were diagnosed as CIN, followed by Pterygium, Squamous cell carcinoma, papilloma, cysts, Rhinosporidiosis, Hemangioma and Non specific inflammations & granulation tissues. Various studies found similar lesions. Other lesions reported in their studies were granuloma pyogenicum, lymphoma, malignant melanoma and sebaceous carcinoma. Of the 34 cases of corneal lesions, majority were diagnosed as Suppurative and inflammatory lesions, followed by Fuch's dystrophy, Staphyloma, Pannus, Lattice dystrophy and aphakic bullous keratoplasty. Nilesh Shah<sup>3</sup> et al, and Akpe<sup>11</sup> et al, have reported only one case each of Lattice dystrophy and staphyloma respectively. We received only 5 orbital lesions of epidermal cysts, basal cell carcinoma and neurofibroma. While, other studies also reported Non- Hodgkins lymphoma and Rhabdomyosarcoma of orbit. One case each of Retinoblastoma, Macular amyloidosis, Massive retinal gliosis and Choroid suppurative lesion was reported in intraocular lesions. Other studies only reported retinoblastoma from this site. Only 3 cases were reported from lacrimal system. Study by Nilesh SC<sup>3</sup>, et al reported similar findings with 2 cases of lacrimal sac cysts. However, some studies also reported pleomorphic adenomas and sebaceous adenocarcinomas.

**Conclusion:-**

Many Neoplastic conditions masquerade as or mimic other less aggressive Neoplastic or non-Neoplastic. However some of the histological features are specific and characteristic for each entity. Hence, combination of proper clinical observation and histopathological study gives a conclusive diagnosis. So, we can conclude that all ophthalmic lesions removed surgically should always be subjected to histopathological examination to establish correct diagnosis for further management.

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### RESEARCH ARTICLE

#### SCENARIO OF ANTI-KERATINOPHILIC ACTIVITY IN ETHNO-MEDICINAL PREPARATIONS USED BY SARANDA'S TRIBES.

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#### Abstract

Scenario of Anti-Keratinophilic Activity in Ethno-medicinal Preparations Used by Saranda's Tribes has been discussed in present research article. It was noticed that many promising drug candidates are of natural origin with the lessening of technical drawbacks associated with natural product research. There are better opportunities to explore the biological activity of previously inaccessible sources of natural products. In addition, chemical diversity of natural products is well suited to provide the core scaffolds for future drugs. There is need for further developments in the use of novel natural products and chemical libraries based on natural products in drug discovery campaigns. It is established that, majority of superficial infections are caused by a closely related group of Keratinophilic fungi called dermatophytes, which cause ringworm infection or Tinea infection (T. Pedis, T. Cruris, T. Corporis, T. Imbricata, T. Mannum, T. Barbae, T. Capitis etc.). Dermato-phytosis is caused by dermatophytes which colonize the hair, nails, and outer layer (stratum corneum) of the epidermis. There are 3 genera of pathogenic dermatophytes viz., Epidermophyton, Microsporum, and Trichophyton. Medicinal plants being used by the traditional herbal healers against skin diseases of local peoples of the Saranda forest have been documented. Interestingly, a total of 30 species belonging to 21 families of Angiospermic plants are documented. It was observed that many capable and natural origin drugs and their local preparations are very effective.

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#### Introduction:-

It was noticed that many promising drug candidates are of natural origin with the lessening of technical drawbacks associated with natural product research. There are better opportunities to explore the biological activity of previously inaccessible sources of natural products. In addition, chemical diversity of natural products is well suited to provide the core scaffolds for future drugs. Medicinal plants have been the mainstay of traditional herbal medicine amongst rural dwellers worldwide since antiquity to date. The therapeutic use of plants certainly goes back to the Sumerian and the Akkadian civilizations in about the third millennium BC. Hippocrates (ca. 460-377 BC), one of the ancient authors who described medicinal natural products of plant and animal origins, listed approximately 400 different plant species for medicinal purposes. Natural products have been an integral part of the ancient traditional medicine systems, e.g. Chinese, Ayurvedic and Egyptian (Sarker & Nahar, 2007). Over the years they have assumed a very central stage in modern civilization as natural source of chemotherapy as well as amongst

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scientist in search for alternative sources of drugs. About 3.4 billion people in the developing world depend on plant based traditional medicines. Medicine for their primary health care. According to the World Health Organization, a medicinal plant is any plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes, or which are precursors for chemo-pharmaceutical semi synthesis. Such a plant will have its parts including leaves, roots, rhizomes, stems, barks, flowers, fruits, grains or seeds, employed in the control or treatment of a disease condition and therefore contains chemical components that are medically active. These non-nutrient plant chemical compounds or bioactive components are often referred to as photo chemicals. The science of application of these indigenous or local medicinal remedies including plants for treatment of diseases is currently called ethnopharmacology but the practice dates back since antiquity.

After the survey of Saranda the sal forest was selected to collect the sample. The sal forest is in Singhbhum district of Jharkhand State. Spread over 820 sq Km. and is famous for natural sal forest very rich in flora & fauna. There is need for further developments in the use of novel natural products and chemical libraries based on natural products in drug discovery campaigns. In addition, scenario of Anti-Keratinophilic Activity in Ethno-medicinal Preparations used by Saranda's Tribes has not been studied/documentated much; therefore, present study has been undertaken. It is established that, majority of superficial infections are caused by a closely related group of Keratinophilic fungi called dermatophytes, which cause ringworm infection or Tinea infection. Dermatophytes is caused by dermatophytes which colonize the hair, nails, and outer layer (stratum corneum) of the epidermis. There are 3 genera of pathogenic dermatophytes viz., *Epidermophyton*, *Microsporum*, and *Trichophyton*. In the present study, medicinal plants being used by the traditional herbal healers against skin diseases of local peoples of the Saranda forest have been documented.

### Methodology:-

**Ethno-medicinal preparation:** The traditional herbal healers, tribal heads and tribal person were contacted and enquired to gather the related information about various preparations used for the treatment of skin diseases. The ethno medicinal plant were collected and washed thoroughly 2-3 times with sterile distilled water, and then air dried on sterile blotter under shades. Fresh preparations of selected plants free from disease were collected from herbal healers of various tribal villages and brought to the laboratory (Mudgal et al. 1997; Singh et al., 2001; Verma et al. 1993; Oommachan et al. 1996). Twenty grams of each fresh preparations comprising of leaf/bark/root/seed/flower/whole plant, fruits and other ingredients were crushed in a mortar and the medicinal paste was then extracted.

**Ethno medicinal material extraction:** The ethno medicinal material was extracted with 100 ml of hot sterile distilled water. Another set of preparations was macerated and extracted in 100 ml of hexane and methanol separately for 24 hours. The plant extracts were then filtered with sterile Whatman filter paper No. 1. Preparations which showed anti-keratinophilic activity were further extracted by Soxhlet apparatus. Fifty grams of the shade dried powder was filled in the thimble and extracted successively with hexane and methanol in soxhlet extractor for 48 hrs. The extracts of the separate solvents were concentrated under reduced pressure and preserved at 5°C in air tight bottle until further use. For the extraction of oils, air dried leaves of selected plants were chopped and grinded into small pieces. The known amount of leaves was placed in a round bottom flask (1L) together with distilled water and hydro-distillation was performed using Clevenger apparatus. Essential oil was collected dehydrated using sodium sulphate dispensed into dark bottles and stored at 4°C until used.

**Microbial culture:** The three species of keratinophilic fungi viz., *Aspergillus niger* (MTCC 10180) *Trichophyton rubrum* (MTCC 7859), *Candida albicans* (MTCC 1637) and three keratinophilic bacteria viz., *Escherichia coli* (MTCC 77), *Bacillus subtilis* (MTCC 10110) and *Enterococcus faecalis* (MTCC 9845) were obtained from Institute of Microbial Technology (IMTECH), Chandigarh and two species of fungi i.e. *Rhizopus* microspores and *Cryptococcus neoformans* were collected from the soil. Culture maintained as per standard protocols.

**Preparation of microbial suspension:** Fungal suspension were prepared from 21 days old culture of *T. rubrum* and *R. Microspores* one week old culture of *A. Niger* and 24 hrs old culture of *C. albicans* and *C. neoformans* grown on Sabouraud dextrose agar medium. The petri dishes were flooded with 8 to 10 ml of distilled water and conidia were scraped using sterile spatula. The spore density of each fungus was adjusted with spectro-photometer ( $A_{595nm}$ ) to obtain a final concentration of approximately  $10^5$  spores / ml. *Bacillus subtilis*, *Escherichia coli* and *Enterococcus faecalis* were pre-cultured in nutrient broth overnight in a rotary shaker at 37°C, centrifuged at 10,000 rpm for 5

min, pellet was suspended in double distilled water and the cell density was standardized spectrophotometrically ( $A_{610}$  nm). Each of the plates was homogenized to ensure uniform distribution of the inoculums and air-dried to remove surface moisture.

**Preparation of impregnated paper discs:** Standard size Whatman filter paper discs (5.0 mm in diameter) kept on a sterilized Petri plates was sterilized in an oven at  $140^{\circ}\text{C}$  for one hour. The sterilized discs were saturated with the (20 mg/ ml) test extract,  $5\ \mu\text{l}$ / disc of oil and (1 mg/ ml) for control. For enhancing the essential oil solubility, Tween-80, 0.5%(v/v) was added. Plates with Tween-80 but without any plant essential oil were used as control. Discs were then dried at room temperature to remove any residual solvent that might interface with the determination.

**Anti-fungal and antibacterial activity:** The antifungal and antibacterial activity was tested by discs diffusion method (Gould and Bowie, 1952). The inoculums of the test organism were evenly spread on the surface of the Sabouraud dextrose agar/ nutrient agar medium. The impregnated discs were then placed on the surface of sterilized medium inoculated with the test fungi/ bacteria. Blank disc impregnated with water, methanol, hexane and Tween 80 at 1 ml. Followed by drying off was used as negative control. After the colonies grew, the zones of inhibition around the discs were measured and recorded. Different standard discs of nystatin (Dr Reddy Laboratories Ltd ketoconazole (Jhonson Jhonson Ltd.) and fluconazole (Cipla Pharmaceuticals Ltd.) for different fungi and streptomycin (Abott. Health care Pvt.Ltd.) for bacteria were used as positive control. Before incubation, all the test and control petriplates were kept at  $5^{\circ}\text{C}$  for one hour to allow the diffusion of the substance from the disc into the agar medium plate. All the experiments were done in three replicates to determine activity. The antibiotics known to be effective against their respective test micro-organisms were used as reference for comparison of the antifungal activity of the test samples. Ketoconazole (1000  $\mu\text{g}/\text{ml}$ ) was used against *Trichophyton rubrum*, nystatin (1000  $\mu\text{g}/\text{ml}$ ) against *Candida albicans*, fluconazole (1000  $\mu\text{g}/\text{ml}$ ) against *Cryptococcus neoformans*, *Aspergillus niger* and *Rhizopus* microspores. Streptomycin was used as positive control against *Bacillus subtilis*, *Escherichia coli* and *Enterococcus faecalis*. The filter discs (5mm diameter) impregnated with 20 mg/ml extracts,  $5\ \mu\text{l}/\text{disc}$  of oil and 1 mg/ml of control were for separate fungal species seeded plates. These were incubated at  $28^{\circ}\text{C}$  for 7-24 days for *T. Rubrum*, *R. Microspores* and *A. Niger* 2 days for *Candida albicans* and *Cryptococcus neoformans* in an incubator and were looked for the development of clearance / inhibition zone around the disc. The diameters of the inhibition zones were measured in three replicates by using antibiotic zone scale.

**Gas chromatography-mass spectrometry (GC-MS) of oil:** The chemical constituents of *Cymbopogon citratus* leaf oil identified by GC-MS analysis was carried out on a Shimadzu 2010 Gas Chromatograph equipped with an FID and 25 m x 0.25 mm x 0.25  $\mu\text{m}$  WCOT column coated with diethylene glycol (AB-Innowax, 7031428, japan) at Indian institute of integrative Medicine (CSIR lab) Jammu. Both injector and detector (FID) temperatures were maintained at  $260^{\circ}\text{C}$ . Helium was used as carrier gas at a flow rate of 3.0 ml/min at a column pressure of 152 kPa. Samples (0.2 $\mu\text{l}$ ) were injected into the column with a split ratio of 100: 1. Component separation was achieved following in a linear temperature program of 60 -  $260^{\circ}\text{C}$  at  $3^{\circ}\text{C}$  / minutes and then held at  $260^{\circ}\text{C}$  for 10 minutes, with a total run time of 20 minutes. The percentage composition was calculated using peak normalization method assuming equal detector response. The samples were then analysed on same Shimadzu instrument fitted with the same column and following the same temperature program as above. MS parameters used were; ionisation Voltage (EI) 70 eV, peak width 2 s, mass range 40-600 amu and detector voltage 1.5 volts. Results are based on GC-FID; MS acquisition started after 4 minutes. Peak identification was carried out by comparison of the mass spectra with mass spectra available on database of NISTO5 and WILEY8 libraries and co-injection of available pure standards. The compound identification was finally confirmed by comparison of their relative retention indices with literature values (Davies, 1990).

**Statistical analysis:** Need based analysis was conducted as per standard protocol.

### Results And Discussion:-

Out of thirty four preparations used in the district for skin diseases fourteen preparations were active against fungal species and twelve against bacteria. The remaining ethno medicinal preparations were neither effective neither against fungi nor against bacteria Tables 1-5). The presence of active ingredients in herbal medicines is directly linked to their ability to prevent or treat keratinophilic infections. Moreover, the anti-keratinophilic action of the plants on the tested fungi and bacteria responsible for superficial mycoses, confirms their therapeutic potency and

this appraisal may authenticate their use in traditional medicines by different tribes for certain skin infectious. Amongst the plant species investigated, oil of *C. citrates* leaf showed the most remarkable activity. This plant oil can be further subjected to isolation of the therapeutic antimicrobials and carry out further pharmacological evaluation.

The traditional herbal healers, tribal heads and tribal person were contacted and enquired to gather the related information about various preparations used for the treatment of skin diseases. The ethno medicinal plant were collected and washed thoroughly 2-3 times with sterile distilled water, and then air dried on sterile blotter under shades. Fresh preparations of selected plants free from disease were collected from herbal healers of various tribal villages and brought to the laboratory (Mudgal et al. 1997; Singh et al.,2001; Verma et al.1993;Oommachan et al.1996). Twenty grams of each fresh preparations comprising of leaf/bark/root/seed/flower/whole plant, fruits and other ingredients were crushed in a mortar and the medicinal paste was then extracted. The ethno medicinal material was extracted with 100 ml of hot sterile distilled water. Another set of preparations was macerated and extracted in 100 ml of hexane and methanol separately for 24 hours. The plant extracts were then filtered with sterile Whatman filter paper No. 1. Preparations which showed anti-keratinophilic activity were further extracted by Soxhlet apparatus. Fifty grams of the shade dried powder was filled in the thimble and extracted successively with hexane and methanol in soxhlet extractor for 48 hrs. The extracts of the separate solvents were concentrated under reduced pressure and preserved at 5° C in air tight bottle until further use. For the extraction of oils, air dried leaves of selected plants were chopped and grinded into small pieces. The known amount of leaves was placed in a round bottom flask (1L) together with distilled water and hydro-distillation was performed using Clevenger apparatus. Essential oil was collected dehydrated using sodium sulphate dispensed into dark bottles and stored at 4° C until used.

The three species of keratinophilic fungi viz., *Aspergillus niger* (MTCC 10180) *Trichophyton rubrum* (MTCC 7859), *Candida albicans* (MTCC 1637) and three keratinophilic bacteria viz., *Escherichia coli* (MTCC 77), *Bacillus subtilis* (MTCC 10110) and *Enterococcus faecalis* (MTCC 9845) were obtained from Institute of Microbial Technology (IMTECH), Chandigarh and two species of fungi i.e. *Rhizopus* microspores and *Cryptococcus neoformans* were collected from the soil. The fungal cultures were sub-cultured on Sabouraud Dextrose Agar (SDA) medium (peptone - 10g , dextrose- 20 g , agar – 20 g , distilled water-1000 ml ) incubated at 28± 1° C. The bacterial procured cultures were sub- cultured in a nutrient agar medium (beef extract – 3 g, NaCl – 5 g , peptone – 5 g , agar – 15 g , distilled water - 1000 ml) and incubated at 37° C. The stock cultures of fungi were maintained on sabouraud dextrose agar slant and bacteria on nutrient agar slant at 28± 1° C and 37° C respectively.

Fungal suspension were prepared from 21 days old culture of *T. rubrum* and *R. Microspores* one week old culture of *A. Niger* and 24 hrs old culture of *C. albicans* and *C. neformans* grown on Sabouraud dextrose agar medium. The petri dishes were flooded with 8 to 10 ml of distilled water and conidia were scraped using sterile spatula. The spore density of each fungus was adjusted with spectro-photometer ( $A_{595nm}$ ) to obtain a final concentration of approximately  $10^5$  spores / ml. *Bacillus subtilis*, *Escherichia coli* and *Enterococcus faecalis* were pre-cultured in nutrient broth overnight in a rotary shaker at 37°C , centrifuged at 10,000 rpm for 5 min, pellet was suspended in double distilled water and the cell density was standardized spectrophotometrically (  $A_{610nm}$  ). Each of the plates was homogenized to ensure uniform distribution of the inoculums and air- dried to remove surface moisture. Standard size Whatman filter paper discs (5.0 mm in diameter) kept on a sterilized petriplates was sterilized in an oven at 140°C for one hour. The sterilized discs were saturated with the (20 mg/ ml) test extract, 5 µl/ disc of oil and (1 mg/ ml ) for control. For enhancing the essential oil solubility , Tween-80, 0.5%(v/v) was added. Plates with Tween-80 but without any plant essential oil were used as control. Discs were then dried at room temperature to remove any residual solvent that might interface with the determination.

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bacteria were used as positive control. Before incubation, all the test and control petriplates were kept at 5°C for one hour to allow the diffusion of the substance from the disc into the agar medium plate. All the experiments were done in three replicates to determine activity.

The antibiotics known to be effective against their respective test micro-organisms were used as reference for comparison of the antifungal activity of the test samples. Ketoconazole (1000 µg/ml) was used against *Trichophyton rubrum*, nystatin (1000 µg/ml) against *Candida albicans*, fluconazole (1000 µg/ml) against *Cryptococcus neoformans*, *Aspergillus niger* and *Rhizopus microspores*. Streptomycin was used as positive control against *Bacillus subtilis*, *Escherichia coli* and *Enterococcus faecalis*. The filter discs (5mm diameter) impregnated with 20 mg/ml extracts, 5µl/disc of oil and 1 mg/ml of control were for separate fungal species seeded plates. These were incubated at 28°C for 7-24 days for *T. Rubrum*, *R. Microspores* and *A. Niger* 2 days for *Candida albicans* and *Cryptococcus neoformans* in an incubator and were looked for the development of clearance / inhibition zone around the disc. The diameters of the inhibition zones were measured in three replicates by using antibiotic zone scale.

The chemical constituents of *Cymbopogon citratus* leaf oil identified by GC-MS analysis was carried out on a Shimadzu 2010 Gas Chromatograph equipped with an FID and 25 m x 0.25 mm x 0.25 µm WCOT column coated with diethylene glycol (AB-Innowax, 7031428, Japan) at Indian Institute of Integrative Medicine (CSIR lab) Jammu. Both injector and detector (FID) temperatures were maintained at 260°C. Helium was used as carrier gas at a flow rate of 3.0 ml/min at a column pressure of 152 kPa. Samples (0.2µl) were injected into the column with a split ratio of 100 : 1. Component separation was achieved following in a linear temperature program of 60 - 260°C at 3°C / minutes and then held at 260°C for 10 minutes, with a total run time of 20 minutes. The percentage composition was calculated using peak normalization method assuming equal detector response. The samples were then analysed on same Shimadzu instrument fitted with the same column and following the same temperature program as above. MS parameters used were; Ionisation Voltage (EI) 70 eV, peak width 2 s, mass range 40-600 amu and detector voltage 1.5 volts. Results are based on GC-FID; MS acquisition started after 4 minutes. Peak identification was carried out by comparison of the mass spectra with mass spectra available on database of NIST05 and WILEY8 libraries and co-injection of available pure standards. The compound identification was finally confirmed by comparison of their relative retention indices with literature values (Davies, 1990).

**Table 1:** Medicinal preparations being used by tribes of the district for keratinophilic infections

S. No.	Botanical and local names	Mode of preparations	Dose
1.	<i>Aegle marmelos</i> (Bel) + <i>Cicer arietinum</i> (Chana)	Equal ratio of fresh bark paste of bel and flour of Chana mix and make paste	Apply externally daily for 5 days
2.	<i>Annona squamosa</i> (Sitaphal) + <i>Ricinus communis</i> (Arandi)	Equal ratio of fruits of Sitaphal and leaves of Arandi pounded and make paste	Paste apply externally twice daily for one week
3.	<i>Argemone Mexicana</i> (Pili katai)	Root cut in small pieces and make paste	Apply externally twice daily for 10 days
4.	<i>Azadirachta indica</i> (Neem)	Leaves pounded and make paste	Apply externally 15 minutes daily for 5 days
5.	<i>Azadirachta indica</i> (Neem)	Bark cut in small pieces and make paste	Paste apply externally twice daily for one week
6.	<i>Azadirachta indica</i> (Neem) + <i>Pongamia pinnata</i> (Karanj)+ <i>Brassica campestris</i> (Sarson)	Equal ratio of bark of Nim, Karanj and seeds of Sarson pounded and make paste	Paste apply externally on the body twice daily for 3 days
7.	<i>Boswellia serrata</i> (Salay)	Bark pounded and make paste	Apply externally daily for 10 days
8.	<i>Caesalpinia sepiaria</i> (Sagar goti)	Leaves pounded and get extract	Extract apply externally daily for 7 days
9.	<i>Centratherum anthelminticum</i> (Banjira)	Seeds pounded and make powder	5g powder mixed with tap water and apply externally for 5 days
10.	<i>Cassia fistula</i> (Amaltas) +	Equal ratio of seeds of Amaltas and	2g powder mixed with tap

	<i>Plumbago zeylanica</i> (Chittawar)	root of Chittawar dry and make powder	water and apply externally daily for 5 days
11.	<i>Cassia tora</i> (Chakanda)	100g seeds put in container having one liter tap water, heated till volume remain ¼ part and get filtrate	2 ml filtrate apply externally daily for 10 days
12.	<i>Cymbopogon citratus</i> (Nimbu gass)	Leaves boiled with tap water	Extracted oil is then applied on the skin for one week
13.	<i>Cymbopogon nardus</i> (Nimbu gass)	Leaves boiled with tap water	Extracted oil is then applied on the skin for one week
14.	<i>Cymbopogon winterianus</i> (Nimbu gass)	Leaves boiled with tap water	Extracted oil is then applied on the skin for one week
15.	<i>Datura innoxia</i> (Pila dhatura)	Root pounded and make paste	Apply externally twice daily for 5 days
16.	<i>Eclipta alba</i> (Ghamra)	Leaves pounded and apply in hair	Apply in hair for 1 hour daily for 5 days
17.	<i>Elaeodendron roxburghii</i> Weight and Arn.(Jamrasi)	Bark crushed and extracted	Apply externally daily for one week
18.	<i>Ficus arnottiana</i> (Paras papal) + <i>Brassica cernua</i> (Raai)	Burn the fruits of paras papal till ash form and mix with seed oil of Raai	Ash mix with oil and apply externally daily for 15 days
19.	<i>Ficus arnottiana</i> (Paras papal)	Fruit pounded	Apply externally daily for 10 days
20.	<i>Holarrhena antidysenterica</i> (Bari karai)	Bark, cut in pieces	10g bark pieces chewed twice daily for 10 days
21.	<i>Holoptelea antidysenterica</i> (Bari karai)	Leaves pounded and make paste	Apply externally twice daily for 7 days
22.	<i>Ocimum gratissimum</i> (Kali Tulsi)	Leaves boiled with tap water	Extracted oil is then applied on the skin for one week
23.	<i>Mangifera indica</i> (Aaam)	Flower pounded and make paste	Apply externally twice daily for 2 days
24.	<i>Mentha piperita</i> (Podina)	Leaves boiled with tap water	Extracted oil is then applied on the skin for one week
25.	<i>Ocimum gratissimum</i> (Kali tulsi)	Leaves of the plant boiled with tap water	Extracted oil is then applied on the skin for one week
26.	<i>Ocimum sanctum</i> (Safed Tulsi)	Leaves pounded and make paste	Apply externally daily for 10 days
27.	<i>Plumbago indica</i> (Chitrak)	Root pounded and make paste	Apply externally with Cow urine for 6 days
28.	<i>Plumbago zeylanica</i> (Chittawar)	Root pounded and make paste	Paste apply externally twice daily for 5 days
29.	<i>Pongamia pinnata</i> (Karanj) + <i>Ipomoea pestigridis</i> (Panchpatri)	Equal ratio of fruits of Kanji and root of Panchpatri pounded and make paste	Paste apply externally twice daily 6 days
30.	<i>Pongamia pinnata</i> (Karanj)	Leaves pounded and make paste	Apply externally with mustard oil daily for 5 days
31.	<i>Selaginella bryopteris</i> (Sanjiwani)	Whole plant pounded and make paste	2g paste with honey daily for 2 days
32.	<i>Solanum anguivi</i> (Bhatkataliya)	Fruit pounded and make paste	Apply externally on the body daily for 3 days
33.	<i>Tectona grandis</i> (Sagon)	Dry leaves burn	Take fumes externally on body twice daily for 3 days
34.	<i>Terminalia alata</i> (Saja)	Leaves pounded and make paste	Paste apply externally twice daily for 5 days

**Table 2:** Activity of plant extracts (20mg/ml), oils (5µl/disc) and ( 1mg/ml) against keratinophilic fungi

S. No.	Plant Parts	E & O	Inhibition zone (mm)				
			<i>A.niger</i>	<i>T.rubrum</i>	<i>R. microsporus</i>	<i>C. albicans</i>	<i>C. neoformans</i>
1.	<i>Annona squamosa</i> (fruit) + <i>Ricinus communis</i> (leaf)	H	0	0	0	6	10
		M	0	0	0	0	13
		W	0	0	0	0	6
2.	<i>Argemone Mexicana</i> (root)	H	0	0	0	0	7
		M	14	14	9	8	13
		W	0	0	0	0	0
3.	<i>Azadirachta indica</i> (leaf)	H	11	14	0	0	0
		M	8	8	0	12	7
		W	0	0	0	6	0
4.	<i>Azadirachta indica</i> (bark)	H	8	0	0	10	8
		M	11	0	0	8	16
		W	0	0	0	0	3
5.	<i>Cassia tora</i> (seed)	H	0	0	0	8	10
		M	0	0	0	6	7
		W	0	0	0	0	0
6.	<i>Centratherum anthelminticum</i> (seed)	H	0	0	7	9	6
		M	12	8	0	0	0
		W	0	0	0	0	0
7.	<i>Cymbopogon citrates</i> (leaf)	O	32	30	10	15	30
8.	<i>Cymbopogon nardus</i> (leaf)	O	32	12	15	25	12
9.	<i>Mentha piperita</i> (leaf)	O	0	28	0	25	20
10.	<i>Ocimum gra tissimum</i> (leaf)	O	0	32	10	30	20
11.	<i>Ocimum gra tissimum</i> (leaf)	O	0	25	0	20	20
12.	<i>Ocimum sanctum</i> (leaf)	H	0	0	0	0	0
		M	10	8	0	8	8
		W	0	0	0	0	0
13.	<i>Plumbago zeylanica</i> (root)	H	14	0	0	8	10
		M	0	0	0	6	13
		W	0	0	0	7	0
14.	<i>Pongamia pinnata</i> (fruit) + <i>Ipomoea pestigridis</i> (root)	H	0	11	0	8	7
		M	0	7	0	9	10
		W	0	0	0	0	6
Antifungals		F	8	-	9	-	27
		K	-	25	-	-	-
		N	-	-	-	20	-

*A.niger* = *Aspergillus niger*, *T. rubrum* = *Trichophyton rubrum*, *R. microsporus* = *Rhizopus microspores*, *C. Albicans* = *Candida albicans* and *C. neoformans* = *Cryptococcus neoformans* .

E = Extract, H = Hexane extract , M = Methanol extract, W = Water V, O = Oil, C = Control, F = Fluconazole, K = Ketoconazole and N = Nystatin

**Table 3:** Activity of different oils against *Cryptococcus neoformans* at different concentrations in Tween 80

S.No.	Plant / essential oils	Inhibition zone (mm)			
		25µl/ml	50 µl/ml	75 µl/ml	100 µl/ml
1.	Mentha piperita	13	19	22	24
2.	Cymbopogon citrates	18	20	30	40
3.	Cymbopogon nardus	0	5	11	9
4.	Fluconazole (Control)	21	30	35	39

**Table 4:** Activity of plant extracts (20mg/ml), oils (5µl/disc) and control (1mg/ml) against keratinophilic bacteria

Sl.No.	Plant Parts	E&O	Inhibition Zone (mm)		
			Bacillus Subtilis	Escherichia Coli	Enterococcus Faecalis
1	Argemone Mexicana (root)	H	12	13	0
		M	6	12	0
		W	0	0	0
2	Azadirachta indica (leaf)	H	18	15	0
		M	0	0	0
		W	7	0	0
3	Azadirachta India (bark)	H	8	12	0
		M	11	0	6
		W	0	0	0
4	Cassia tora (seed)	H	10	0	7
		M	0	0	0
		W	0	0	0
5	Centratherum anthelminticum (seed)	H	13	0	0
		M	8	0	0
		W	0	0	0
6	Cymbopogon citrates (leaf)	O	27	18	22
7	Cymbopogon nardus (leaf)	O	0	32	0
8	Mentha piperita (leaf)	O	40	13	0
9	Ocimum gratissimum (leaf)	O	22	13	20
10	Ocimum sanctum (leaf)	H	8	15	0
		M	15	0	6
		W	6	0	0
11	Plumbago zeylanica (leaf)	H	10	8	13
		M	0	0	10
		W	0	0	0
12	Pongamia pinnata (fruit) + Ipomoea pestigridis (root)	H	0	0	8
		M	0	0	15
		W	0	6	0
	Streptomycin	C	13	8	12

E = Extract, H – Hexane extract, M = Methanol extract, W = Water extract, O = Oil and C = Control

### Conclusion:-

Out of thirty four preparations used in the district for skin diseases fourteen preparations were active against fungal species and twelve against bacteria. The remaining ethno medicinal preparations were neither effective neither against fungi nor against bacteria. The presence of active ingredients in herbal medicines is directly linked to their ability to prevent or treat keratinophilic infections. Moreover, the anti-keratinophilic action of the plants on the tested fungi and bacteria responsible for superficial mycoses, confirms their therapeutic potency and this appraisal may authenticate their use in traditional medicines by different tribes for certain skin infectious. Amongst the plant species investigated, oil of *C. citrates* leaf showed the most remarkable activity. This plant oil can be further subjected to isolation of the therapeutic antimicrobials and carry out further pharmacological evaluation.



With the increasing interest and so many promising drug candidates in the current development pipeline that are of natural origin, and with the lessening of technical drawbacks associated with natural product research, there are better opportunities to explore the biological activity of previously inaccessible sources of natural products. In addition, the increasing acceptance that the chemical diversity of natural products is well suited to provide the core scaffolds for future drugs, there will be further developments in the use of novel natural products and chemical libraries based on natural products in drug discovery campaigns. Further study at molecular level is needed to further authenticate the present findings.

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### RESEARCH ARTICLE

#### JUVENILE MYOCLONIC EPILEPSY AND MIGRAINE: STUDY OF COMORBIDITY AND CLINICAL CO-OCCURRENCE.

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#### Abstract

Epilepsy and migraine are comorbid with each other as they have common pathophysiological and electrophysiological phenomena. **Materials and methods:** Patients with Juvenile myoclonic epilepsy (JME) diagnosed by clinical and electrophysiological study (electroencephalogram) with or without comorbid migraine underwent detailed history for migraine headache, general examination, neurological examination and brain MRI and MRS.

**Results:** Migraine was clinically associated with JME in 58.6% of cases. NAA/CR and CHO/CR ratio were significant ( $P < 0.05$ ) between JME cases and control group and non-significant between JME cases with or without migraine ( $P > 0.05$ ).

**Conclusion:** migraine is highly comorbid with JME risk factors are female gender and family history of migraine, with no structural or functional comorbidity in MRS study

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#### Introduction:-

Migraine and epilepsy are highly comorbid disorders and share clinical features that suggest overlapping, pathophysiological and etiological conditions with episodic manifestations (1)

Both migraine and epilepsy represent distinct families of neurological disorders with typical constellations of symptoms (2)

Juvenile myoclonic epilepsy is a common epileptic syndrome, the etiology of which is genetically determined. Its onset occurs from 6 through 22 years of age, and affected patients present with myoclonic jerks, often associated with generalized tonic-clonic seizures (the most common association) and absence seizures. (3)

Migraine and epilepsy are often comorbid. Risk factors are positive family history and female gender or triggers as (alcohol, menses, and irregularity of sleep) as well as prophylactic drugs (valproate, topiramate) are shared by both. This suggests that migraine and epilepsy may have some common pathophysiological mechanisms (4). Proposed mechanisms include an increased excitability of the cortex accounting for the increased risk of migraine and epilepsy or seizures being triggered by migraine attacks, as the term migralepsy of the International Classification of Headache Disorders (2004) (ICHDII) suggests. It is well known that seizures can trigger secondary headache attacks as postictal headache (5,6)

### Material and Methods:-

The study was conducted on 41 Egyptian patients at Mansoura University Hospital, divided into two groups. The first group was 29 patients JME cases with or without comorbid migraine. And the second group was 12 control cases (normal cases who are not epileptic or suffer from migraine with no family history of epilepsy with normal conventional MRI brain). with the following **Inclusion criteria:** JME cases definitely diagnosed by clinical and electrophysiological studies with or without migraine with no age specific for JME patients and Informed consent.

### Methodology:-

All patients diagnosed will be subjected to the following **(1)Detailed history** : The following history items will be considered in assessment of comorbidity and exclusion of other causes of epilepsy and assessment of the type of migraine (if it is present).

- Age, sex personal history of the patient.
- Age of onset of seizures.
- The presence of migraine and its temporal profile, diagnostic criteria, type (common, classic or complicated).
- A careful family history with attention to epilepsy, consanguinity, migraine.

### General examination and Full neurological examination.

**sleep deprivation Electroencephalogram EEG** including both hyperventilation and photic stimulation.

**Radiological examination:** including (a)Conventional MR imaging:

Imaging were reviewed to exclude other pathologic processes. (b)**1H-MRS** :Cho, Cr were calculated. The ratios of integrals of various metabolites calculated with respect to Cr included, Cho/Cr and NAA/Cr.

### Data analysis:-

- Data were entered and statistically analyzed using the Statistical Package for Social Sciences (SPSS) version 20.
- Qualitative data were described as numbers and percentages.  $\chi^2$  test and Fischer exact test were used for comparison between groups, as appropriate.
- Quantitative data were described as means (SD) or medians, as appropriate. They were tested for normality by Kolmogorov-Smirnov test. In the normally distributed variables, one way ANOVA test and Student t test were used for comparison between groups; Spearman correlation was used for parametric quantitative and ordinal variables correlation.
- "p value  $\leq 0.05$ " was considered to be statistically significant and  $< 0.01$  high statistically significant.

### Results:-

The study was conducted on 29 JME cases 16(55.1%) male patients and 13(44.9%) female patients with median age  $21.4 \pm 8.1$  with non significant difference between  $p > .05$  (**table 1**).

17 (58%) patients were comorbid with migraine 6(35.3%) male and 11(64.7%) female with median age  $23.12 \pm 7.03$ . 12 (42%) patients were not comorbid with migraine, 10 (83.3%) male and 2 (16.7%) female with median age  $19.25 \pm 5.92$  (**table 2**).

The median age for the onset of migraine in the studied group was  $14.12 \pm 4.9$ , median duration of migraine attacks was  $12.0(4.0-48.0)$ , for the onset of the symptoms of JME (myoclonic jerks) was  $10.66 \pm 2.6$ , the onset of absence seizures was  $11.4 \pm 2.7$  while the onset of GTCs was  $18.72 \pm 3.9$ . (**table 3**).

In JME cases with migraine 12 (70.6%) cases were common migraine, while 5 (29.4%) cases were classic migraine, and as regard time of migraine in relation to seizures one (5.8%) patient showed migraine attacks post ictal, 2 patients (11.6%) pre ictal and 14 patients(82.6%) showed migraine attacks not related to seizures. In this studied group 10(58.8%) of cases showed positive family history of migraine (**Table 4**).

From logistic regression analysis it shows that in JME cases female and patient with frequent GTCS are of high risk to develop migraine (**table 5**)

MRS study showed that there was statistically significant difference ( $p < 0.05$ ) in NAA/CR and CH/Cr ration in both frontal lobe and thalamus between patients and control group and no statistically significant difference in NAA/CR and CH/Cr ration in both frontal lobe and thalamus between JME cases with migraine and JME cases without migraine (table 6,7)

**Table 1:-** Demographic characters of studied groups

	JME cases n=29	Control n=12	Significance
<b>Age</b>			
Mean $\pm$ SD (Min-Max)	21.4 $\pm$ 8.1 (8.0-40.0)	27.75 $\pm$ 9.39 (19.0-40.0)	F=1.329 P=0.28
<b>Sex</b>	n(%)	n(%)	
<input type="checkbox"/> Male	16(55.1)	5(41.7)	$\chi^2=2.263$ p=0.323
<input type="checkbox"/> Female	13(44.9)	7(58.3)	

F: One Way ANOVA test  $\chi^2$ =Chi square test

**Table 2:-** Demographic data of JME cases

	Cases without migraine n=12	Cases with migraine n=17	Test significance of
<b>Age</b>	19.25 $\pm$ 5.92	23.12 $\pm$ 7.03	t=1.55 p=0.132
<b>Sex</b>			
<b>Male</b>	10(83.3)	6(35.3)	$\chi^2=6.56$ p=0.01*
<b>Female</b>	2(16.7)	11(64.7)	

**Table 3:-** age of onset of JME and migraine and duration of migraine attacks

<b>Migraine onset</b> Mean $\pm$ SD(min-max)	14.12 $\pm$ 4.9 (8.0-26.0)
<b>Migraine Duration (hours)</b> Median(min-max)	12.0(4.0-48.0)
<b>Age of absence</b> Mean $\pm$ SD	11.4 $\pm$ 2.7
<b>Age of myoclonus</b> Mean $\pm$ SD	10.93 $\pm$ 2.9
<b>Age of GTC</b> Mean $\pm$ SD	18.72 $\pm$ 3.9
<b>Age of onset of symptoms</b> Mean $\pm$ SD	10.66 $\pm$ 2.6

**Table 4 :-** Migraine characters in studied cases

	n=17	%
<b>Classic /Common migraine</b>		
<input type="checkbox"/> Common	12	70.6
<input type="checkbox"/> Classic	5	29.4
<b>Relation to seizure</b>		
<input type="checkbox"/> Pre ictal	1	11.6
<input type="checkbox"/> post ictal	2	5.8
<input type="checkbox"/> non related	15	82.6
<b>Family hx of migraine</b>		
	10	58.8

**Table 5:-** Logistic regression in prediction of migraine

Predictors	$\beta$	P value	Odds ratio	95.0% C.I.	
				Lower	Upper
<b>Sex</b>					
<input type="checkbox"/> Male(r)					
<input type="checkbox"/> Female	2.566	0.017*	13.02	1.58	106.96
<b>frequent symptom</b>					
<input type="checkbox"/> GTC (r)					
<input type="checkbox"/> Myoclonus	-2.352	0.031*	0.095	.011	.802
<b>Model <math>\chi^2=12.84</math>      <math>p=0.002^{**}</math>      Constant=3.408</b>					
<b>percent predicted=79.3%</b>					

**Table 6:-** Ch/Cr and NAA/Cr of frontal and thalamic regions of patients and control

		<b>Patients n=29</b>	<b>Control n=12</b>	<b>t test</b>	<b>p value</b>
<b>Frontal</b>	NAA/Cr	1.48±0.195 (1.19-2.1)	1.88±0.32 (1.43-2.34)	4.84	<0.001**
	Ch/Cr	1.17±0.19 (0.79-1.67)	1.008±0.25 (0.78-1.59)	2.41	0.021*
<b>Thalamic</b>	NAA/Cr	1.526±0.29 (1.08-1.98)	2.304±0.32 (1.75-2.66)	7.58	<0.001**
	Ch/Cr	1.27±0.204 (0.93-1.76)	1.067±0.122 (0.93-1.24)	3.137	0.003**

**Table 7:-** Ch/Cr and NAA/Cr of frontal and thalamic regions of patients with and without migraine.

		<b>patients without migraine n=12</b>	<b>patients migraine with n=17</b>	<b>t test</b>	<b>p value</b>
<b>Frontal</b>	NAA/Cr	1.473 ± 0.114 (1.29-1.67)	1.487 ± 0.24 (1.19-2.1)	0.202	0.841
	Ch/Cr	1.188 ± 0.177 (0.92-1.58)	1.174 ± 0.203 (0.79- 1.67)	0.184	0.855
<b>Thalamic</b>	NAA/Cr	1.542 ± 0.32 (1.12-1.98)	1.515 ± 0.28 (1.08-1.98)	0.24	0.812
	Ch/Cr	1.248 ± 0.189 (0.96-1.58)	1.28 ± 0.22 (0.93-1.76)	0.404	0.689

**Discussion:-**

Juvenile myoclonic epilepsy is a well-defined type of idiopathic generalized epilepsy that comprises 5–11% of patients with epilepsy; it is characterized by myoclonic jerks and generalized tonic clonic seizures (GTCS) and typical findings of generalized 4–6 Hz spike and wave or polyspike and wave discharges on electroencephalography (EEG) (7)

Migraine is a primary headache disorder characterized by recurrent headaches that are moderate to severe. Typically, the headaches affects one half of the head, are pulsating in nature, and lasts from two to seventy two hours. Associated symptoms may include nausea, vomiting, and sensitivity to light, sound, or smell (8).

Migraine and epilepsy are two chronic disorders characterized by repeated attacks of neurological dysfunction and are mostly accompanied by gastrointestinal, autonomic and other pathophysiological disorders. Migraine and epilepsy are linked by their symptom profiles, comorbidity and treatment. A person suffering from one of these diseases is twice as at risk of having the other one (9,10).

The association of epilepsy and migraine indicates comorbidity which does not occur by accident, according to epidemiological studies. The reasons are partly genetic (11, 12), but at the same time both disorders exhibit common

pathophysiological and electrophysiological phenomena. These two disorders also exhibit comparable clinical phenomena which may lead to confusion (13).

In our study we tried to find the comorbidity both clinically and functionally (through MRS) between specific type of idiopathic generalized epilepsy which is juvenile myoclonic epilepsy and migraine.

The myoclonic jerks were a core feature for diagnosis of JME present in all cases (100%) diagnosed as JME, and GTCs were also present in all cases (100%) in comparison to a general incidence of about (80-90%) in JME patients and about 17% of patients show typical simple absence seizures, with the general incidence of absence seizures in JME patients 20-30% (14).

Our study had demonstrated a clinical co-morbidity between JME and migraine in about 17 cases of the studied sample (58%) compared to a general incidence of association between epilepsy and migraine about 15-24% (15) while the maximum incidence of association between epilepsy and migraine described by *Syvertsen et al(16)* was 52%. While the incidence of clinical comorbidity between migraine and JME was estimated to be 36-41% (17, 18, 19). The slight higher incidence in our study may be attributed to the small sample size.

Female gender of JME patients who are comorbid migraine was higher than male gender (65% female and 35% male) which is matched with other studies done on either JME and migraine or done on epilepsy in common and migraine(17,20). And this is can be attributed to the general common incidence of migraine in female (21).

*Ito et al(22)* had investigated the post ictal migraine attacks that occur immediately after the attacks of epilepsy and found a prevalence of about 4.25% of cases of comorbid epilepsy and migraine which is matched to our results which postulates that about 6% of JME patients experienced immediate post ictal migraine and also the same result was described in other studies that investigated the actual timing of occurrence of migraine attacks in epileptic patients and the relation of the migraine attack to the epileptic seizure (23,, 24).

Since both JME and migraine are highly linked to genetic and hereditary basis, in our study positive family history of migraine was found to a higher incidence in JME cases with migraine 60 % compared to only 25% positive family history of migraine JME cases with migraine which supports a strong genetic background(25).

*Elmassry et al,(26)* had postulated that migraine onset was more likely to have occurred 1–3 years after the onset of epileptic attacks in comorbid cases, and it is concomitant with our study as the age of onset of JME (the onset of myoclonic jerks) was about 10.5 years with the age of onset of migraine attacks about 14 years.

On summarizing the MRS finding in our JME patients in relation to control group we found significant decrease in the frontal and thalamic NAA concentration and NAA/Cr ratio in JME cases than control group. These findings are concomitant with the finding of meta-analysis by *Anderson, J and Hamandi, K(27)*. These results are also coincident with the findings of other studies, including behavioral and neuropsychological studies that revealed that patients with JME were similar to those with frontal lobe epilepsy upon impairment (28,29).

In our study there was no significant difference in MRS findings both in frontal lobe and thalamus in JME cases with or without migraine (either common or classic). These findings are supported by the fact that in migraine MRS findings show only a reduction in NAA in the occipital cortex in migraine with aura (classic migraine) before and after visual stimulation with normal NAA level in between the attacks compared to normal NAA level in migraine without aura and control group (30).

### **Conclusion:-**

On summarizing our findings there is a well-established clinical correlation between JME and migraine, which may be attributed to sharing the same pathophysiological aspects or sharing common genetic background, but unfortunately this common clinical association cannot be confirmed objectively by using functional MRS modalities which gives no added information when JME is comorbid with migraine than JME cases only.

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### RESEARCH ARTICLE

#### ROLE OF KUDUMBASREE IN POVERTY ALLEVIATION IN KERALA.

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Poverty Alleviation, Women  
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#### Abstract

Poverty is the state of being extremely poor. The poor are exposed to greater personal and environmental health risks, are less well nourished, have less information and are less able to access health care; they thus have a higher risk of illness and disability. Conversely, illness can reduce household savings, lower learning ability, reduce productivity, and lead to a diminished quality of life, thereby perpetuating or even increasing poverty.

Kerala is a land of baffling contradictions. Amidst the visible signs of affluence, there is a widening spectrum of poverty and deprivation, a phenomenon that continues to evade focussed attention. Large sections of the people in the State are faced with poverty. But poverty also has several unique dimensions in Kerala because of the peculiar path of socio-economic development of the State. The norms adopted by the Planning Commission to measure poverty, fail to capture these unique dimensions, leading to the gross underestimation of poverty in the State.

Among the programmes in Kerala for this purpose, Kudumbashree, literally meaning family prosperity is unique. This paper is an attempt to understand the

Kudumbashree programme in its nature and scope and its contribution to women's welfare in particular and as its spin off as social welfare in general. The paper will place the Kudumbashree programme in the broader context of measures alleviating poverty, improvising financial inclusion and majorly how it empowers women.

In the paper, part I will briefly explain about poverty specifically the nature of poverty in Kerala; part II will provide an overview of Kudumbashree from its inception to the present in terms of its stakeholders and their activities; part III will attempt an evaluation of Kudumbashree's progress in terms of what it has done, what it could not do, and the hurdles it faced towards poverty alleviation; part VI will bring together the highlights of the paper and argue why this programme should not be replicated in other states.

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### **Poverty:-**

*Poverty is the state of being extremely poor.* The poor are exposed to greater personal and environmental health risks, are less well nourished, have less information and are less able to access health care; they thus have a higher risk of illness and disability. Conversely, illness can reduce household savings, lower learning ability, reduce productivity, and lead to a diminished quality of life, thereby perpetuating or even increasing poverty.

Kerala is a land of baffling contradictions. Amidst the visible signs of affluence, there is a widening spectrum of poverty and deprivation, a phenomenon that continues to evade focussed attention. Ostentatious display of luxury by a rising middle class, camouflaging of the severe vulnerabilities of large sections of the people and the nonchalant attitude of the entire ruling class together seem to be obscuring an objective assessment of the multiple dimensions of poverty and deprivation in Kerala.

Experts say that this paradox of visible affluence and hidden poverty has deprived the State of its due share of Central assistance on the one hand. On the other, the State has miserably failed to evolve a scientific strategy to map the extent and profile of its deprivations. Consequently, many of the programmes launched to help the disadvantaged sections in the State have missed the target apart from causing severe drain of its scarce resources over the years.

As per the Planning Commission's nutritional criteria and make a direct assessment of the rural poverty level in the State, it can be said that 84 per cent of the people were poor in the State in 1993-94 while their share has been 82.5 per cent in 1999-2000.

It has been widely recognised now that poverty alleviation is not just a matter of having adequate consumption of food or other necessities of daily life, but should also include such other dimensions of life as education and health. The former is usually referred to as the

'entitlement' aspect of poverty and the latter as the 'capability' aspect. It is only when these two aspects are combined that one can move towards a more holistic definition of poverty.

Although Kerala is only a sub-national entity, its experience is taken out of the national context to demonstrate what can be achieved with all the limitations of such an assumption in mind. At the same time, taking it out of the national context is not insignificant analytically or quantitatively. First of all, issues that fall under poverty alleviation in the Indian federal system are the responsibility of the state administrations. Secondly, the size of Kerala in terms of population (around 30 million in 1991) is much larger than that of a large number of developing countries.

The major role has been Kudumbashree' Poverty Eradication Mission indicates that there has been a decline in absolute poverty in the State since its inception.

### **Kudumbashree:-**

*Kudumbashree is a female-oriented, community-based, poverty reduction project of the Government of Kerala, state lying in the south-west part of the Indian subcontinent, where many development experiments are being tested, refined and implemented.* In 1988 Government of Kerala introduced Kudumbashree scheme as a comprehensive poverty alleviation programme to focus primarily on poor rural and urban women. "Kudumbashree" in local language means prosperity of the family which helps enjoy the economic opportunities by a good number of the poor women folks in rural and urban Kerala. It makes every effort to alleviate poverty through an integrated approach which involves an effective convergence of resources and actions, and moreover, the programme is essentially linked to local self-government institutions. Though local government institutions are not organically linked to Kudumbashree, they are active partners in the programme. Today, Kudumbashree is one of the largest women-empowering schemes in the country. The ultimate objective of the Kudumbashree programme is to improve the standard of living of poor rural women by setting up micro-credit and productive enterprises.

The programme has 39.97 lakh members and covers more than 50% of the households in Kerala. Built around three critical components, micro credit, entrepreneurship and empowerment, the Kudumbashree initiative has today succeeded in addressing the basic needs of the less privileged women. It shows that the majority of economically

backward rural women people are working in Kudumbashree units and they got a notable level of improvement in various behavioural competencies.

Various forms of microfinance practices have been in existence in Kerala from early days. When the concept of Self Help Group was introduced in Kerala in the 1980s, it was quick to gather momentum. Launched as a community network that would work in tandem with local self-governments for poverty eradication and women empowerment.

#### History & Background:-

<input type="checkbox"/>	Various forms of microfinance practices have been in existence in Kerala from	
	early days.	
<input type="checkbox"/>	When the concept of Self Help Group was introduced in Kerala	in the 1980s, it was
	quick to gather momentum.	
<input type="checkbox"/>	In the early nineties a community led poverty identification format was developed	
	as part of the Alappuzha UBSP Programme.	
<input type="checkbox"/>	By this time the NABARD promoted SHG, linkage banking	programme had
	established itself as a viable microfinance model.	

- In 1994, the CBNP project of Malappuram tried to assimilate these experiences and develop a women based community structure for service delivery of government programmes.
- The 73rd & 74th constitutional amendments strengthened PRIs and ULBs.
- Shortly afterwards, the People's Plan Campaign for decentralised Governance created strong local self governments (Panchayaths and Municipalities) in the State.
- Kudumbashree was launched in 1998 as a community network that would work in tandem with local self governments for poverty eradication and women empowerment.

#### The mission statement of the programme being:-

"To eradicate absolute poverty in ten years through concerted community action under the leadership of local governments, by facilitating organization of the poor for combining self-help with demand-led convergence of available services and resources to tackle the multiple dimensions and manifestations of poverty, holistically."

There are two distinguishing characteristics to Kudumbashree which set it apart from the usual SHG model of empowerment. These are

The universality of reach – from its very inception Kudumbashree has attempted to bring every poor woman in the state within its fold, as a consequence of which today Kudumbashree is present in every village panchayat and municipality, and in nearly every ward, colony and hamlet. The sheer spread is mind boggling, and it is only because the local community of women drive the system that it has managed to persevere.

The scope of community interface in local governance – the functioning of Kudumbashree is tied up to the development initiatives of the local government be it for social infrastructure, welfare or right based interventions or for employment generation. From food security to health insurance, from housing to enterprise development, from the national wage employment programme to the jagratha samiti, every development experience depends on Kudumbashree to provide the community interface.

It is using these opportunities that Kudumbashree strives to convert a microfinance led financial security model into a more comprehensive model of local economic development.

The three tier community based organisation of women includes Neighbourhood groups (NHG's), Area Development Societies (ADS)- area level and Community Development Societies (CDS) at the panchayath/municipality level.

The above said organisations work as the community wings of the local self-governments. This approach highlights that any woman who is residing in the gram panchayath can become a member of Kudumbashree NHG's irrespective of the fact that she belong to Below Poverty Line (BPL) family.

Since this aspect gives an opening for the APL families to enter in to the community structures envisaged by Kudumbashree, it is further ensured that majority of the office bearers should belong to BPL families. These structures give added importance to women empowerment both social and economic.

**The objective of Kudumbashree programme includes:-**

- Identification of the poor families through risk indices based surveys, with the active participation of the poor and the communities to which they belong.
- Empowering the poor women to improve the productivity and managerial capabilities of the community by organizing them in to Community Based Organizations.
- Encouraging thrift and investment through credit by developing Community Development Societies to work as informal bank of the poor.
- Improving incomes of the poor through improved skills and investment for self-employment.
- Ensuring better health and nutrition for all.
- Ensuring basic amenities like safe drinking water, sanitary latrines, improved shelter and healthy environment.
- Ensuring a minimum of 5 years of primary education for all children, belonging to risk families.
- Enabling the poor to participate in the decentralization process through the Community Development Societies, as it is a subsystem of the local government, under which it works.

**Neighbourhood Group (NHG):-**

The Neighbourhood groups consists of 10 to 20 women pergroup, total 261,000 NHG groups available across Kerala, 4.1 million members.

**Area Development Society (ADS):-**

The second tier is Area Development Society, which is formed at the local government ward level by federating 8-10 NHGs. The activities of the ADS are decided by the representatives of the poor elected from various federated NHGs.

**Community Development Society (CDS):-**

At the Local Government level Community Development Society (CDS), a registered body under the Charitable Societies Act, is formed by federating various ADSs. The advantage of this system is that it is managed wholly by the representatives of the poor and has the flexibility of a non-governmental organisation which helps in channelling additional resources from various sources both internal and external.

Kudumbashree project is implemented by the State Poverty Eradication Mission of the State government through local self-governing bodies. It aims at eradicating absolute poverty in ten years through concerted community action under the leadership of local self-government bodies. This mission is the transformation of earlier Urban Poverty Alleviation Programmes (UPAP) like Urban Basic Services (UBS) and Urban Basic Services for the Poor (UBSP) which had been successfully implemented by the Government of Kerala for improving the livelihood of the poor in urban areas with community participation.

Around 700 neighbourhood groups were linked to various commercial banks under the Linkage Banking Programme of NABARD. The implementation of Government-sponsored programmes for improving health and sanitation in all the District was channelled through neighbourhood groups.

Unlike several government sponsored schemes which dole out money to the poor without achieving developmental goals, KDMS programme provides altogether different experiences and results. With the strong backing of local governments and SHG initiatives, the poor women in Kerala are being empowered, socially, politically and economically. According to the experience of KDMS, poor women should not be viewed as objects of development but agents of development. Women in SHGs have the power in translating their welfare into the welfare of families. This multi-dimensional women oriented poverty alleviation programme has played a significant role in regaining the lost direction of "public action" that has now restarted to contribute to the improvement of quality of life in Kerala.

**Evaluation of kudumbashree's progress towards poverty alleviation:-****Social Development:-****Asraya:-**

Asraya is a destitute rehabilitation program designed by Kudumbashree. The program is targeted at the poorest of the poor population. While implementing the poverty alleviation programmes, it was observed that the programmes implemented by the Government and other agencies never reach this population. These people, who live in utter distress and despair, constitute a very small number in the society, approximately the bottom two per cent of the total population. Kudumbashree designed a project called Asraya - Destitute Identification Rehabilitation and Monitoring Project for the rehabilitation of destitute families. Destitute families are identified using a transparent risk index framed by the Mission. Individual needs of the family are identified through a participatory need assessment. The project envisaged to address lack of food, health problems including chronic illness, pension, educational facilities to children, land for home, shelter, drinking water, safe sanitation facilities, skill development, employment opportunities, etc.

It was primarily initiated in the gram panchayath areas in the state. Panchayath which were willing to take up the difficult and sensitive task of improving the livelihoods of such people, accept the continuous responsibility and meet at least 75 per cent of the cost of the project were identified for piloting the project.

The Asraya project, supported by State Government was tried in 179 Gram Panchayath in the year 2003. From the XIth Five Year Plan, Asraya programme was universalized and plan preparation began in the remaining gram panchayath, and the urban local bodies. Today, it is implemented in 1042 local bodies, including the gram panchayath, municipalities and corporations across the state.

**As an incentive to Local Governments to take up Asraya, Government have committed to provide 40 per cent of the project cost subject to a maximum of Rs.25 lakh as special grant to each of the local bodies:-** This is known as Challenge fund, and is provided via the Kudumbashree Mission. According to the guidelines for Asraya, the fund allocation has to be on a ratio of 60:40, wherein a minimum of 60 per cent of the funds need to come in from the local government by means of plan fund, convergence with schemes etc. There is no restriction on the amount the local government can contribute towards the project. But all other sources including the challenge fund cannot exceed 40 per cent of the total project cost. Also, the challenge fund cannot be used to meet the infrastructural needs of the Asraya beneficiaries, which needs to be done in convergence with the schemes under the local government or the Plan fund. Special Asraya projects for the tribal population have also been initiated in Local Self Government Institutions where Government provides up to 40 per cent of the project cost subject to a maximum of Rs.40 lakhs.

**Balasabhas:-**

An imperative attempt to retain the knowledge base through self-evaluation, participation and inquiry can be considered as the newest form of empowerment process. Along with about 2, 00,000 Neighbourhood groups all over the state, a similar yet distinctive methods have been used to mobilise and nurture children collective-Balasabha. The Sabhas are structured neighbourhood network of children. Each Sabha consist of 15 – 30 children in the age group of 6 – 18 years. *The prime objective of constituting Balasabhas is to prevent inter-generational transmission of poverty through capability enhancement of children.*

**At present, 66,743 Balasabhas, covering 10, 59,283 children, creating glorious dimensions to the endeavour.(as of March 2016)**

**Tribal Special Project:-**

The Tribal special project facilitates the creation of ST NHGs as well as At ADSs, if necessary in areas where there are more than two Tribal NHGs. The project provides a corpus fund of Rs. 10,000 at all newly formed ST NHGs. Micro finance and Micro enterprise activities are given special; focus among the tribals as part of the project activities. Measures have also been taken to ensure cent percent tribal participation in the MNREGS actives. Formation of special Ashraya projects, provision of supplementary food for the malnourished aged, infants and adolescent girls, formation of ST Balasabhas etc are some of the highlights of the project.

**As on March 2016, Kudumbashree has been able to bring about 5,401 NHGs covering 99,478 families under its organizational network throughout the state.**

**Financial Development through Kudumbashree:-****Microfinance:-****Thrift & Micro Credit:-**

Kudumbashree plays a vital role in enhancing the financial status of the less privileged women in the State through its thrift and credit program. The small regular savings of neighbourhood groups are pooled together and given out as internal loan to the most deserving member of the group. These loans acted as a leveller to address the immediate financial shocks of the group members.

The function of thrift and credit is the core activity of the Kudumbashree neighbourhood group (NHG), and forms the basis of the weekly meetings of the NHG. The amount of loan and the priority of disbursement are decided by the NHG. The repayment is collected weekly during routine NHG meetings.

**The total thrift collected by NHGs in the state comes to Rs. 3170 Crore (as on Sep 2016) and the internal loans generated are to the tune of Rs. 12094 Crore (as on March 2016). Details are reported in the monthly meetings by the CDS.**

**Bank Linkage:-**

The Bank linkage program has made inclusive growth possible by providing easy access to bank loans without any physical collateral. The efficiency and effectiveness of the NHGs are verified on the basis of some objectively verifiable and easily identifiable parameters. NABARD has developed a 15-point index for rating NHGs on the basis of which they will be allowed to link with various banks under the Linkage Banking Scheme.

**The total amount which has been mobilized under linkage banking is Rs. 531963 Lakhs (current live linkage) and 1,72,824 NHGs have availed of the loans. The linkage loans may be raised directly by the NHG or as bulk loan through the CDS.**

**Matching Grant to thrift and credit societies:-**

Matching Grant is an incentive provided to NHGs. This grant linked to amount of thrift mobilized, performance of NHG in the Grading and loan availed from banks. An amount of 10% of the savings of the NHG subject to a maximum of Rs 5000/- is provided as matching grant to each NHG. The grant is released based on their assessment rated using a 15-point grading criteria developed by NABARD. In order to avail Matching grant a NHG must have passed the grading and availed loan from bank. In case of SC/ST NHGs, matching grant will be provided if the NHG has passed grading. Availing bank loan for a SC/ST NHG is not compulsory in order to be eligible for matching grant.

**As on 31 March 2016, total of 89,752 NHGs have availed of Matching Grant facilities**

**Interest Subsidy:-**  
The interest subsidy scheme is a new initiative by the Government of Kerala to enhance the affordability of formal credit. As per the scheme, all commercial and cooperative banks that are prepared to lend to Kudumbashree NHGs under the linkage banking programme at 9% or below, will be participants in the scheme. The CDS would be raising the claim with the banks and the amount would be dispersed to a designated nodal branch by Kudumbashree State Mission in the case of commercial banks and to the concerned cooperative banks/societies by the district missions in the case of cooperative institutions. The interest subsidy would be provided as annual instalments to the banks. One highlight of the scheme is the inclusion of joint liability groups for farming in the ambit of the scheme. Around 10099 groups (1737 Joint Liability Groups and 8362 Neighbourhood Groups) have benefited from the scheme.

**Kudumbashree Mission has been able to disburse Rs. 989 Crore under this scheme to various NHGs and JLGs:-**

Under NRLM( Central Scheme) Interest subvention program all women NHGs in category 1 districts namely Palakkad ,Malappuram, Idukki and Wayanad are eligible for interest subvention on credit upto Rs. 3 lakhs at 7% per annum. Further, these NHGs will be provided with an additional 3% subvention on the prompt repayment of loans. For category II districts, all Kudumbashree NHGs in rural area are eligible for interest subvention to avail the loan facility at an interest rate of 7%. Here Banks will charge the SHGs as per their respective lending norms and the difference between the lending rates and 7% subjected to a maximum limit of 5.5% will be subvented in the loan accounts of the NHGs by Kudumbashree with the support of NRLM Fund.

A recent survey of the performance of Kudumbashree units in a few selected panchayath, has brought out certain factors, which have come in the way of realizing the objectives of the mission. The government's decision to limit the activities to women belonging to below the poverty line (BPL) has made its reach very small in relation to the total population and overall credit needs. The educated and middle class women, as a result, withdraw from the scheme. Lack of management expertise, non-availability of raw materials, faulty planning, lack of coordination between panchayath and Kudumbashree units, and poor marketing were other observed deficiencies. Kudumbashree, the poverty eradication mission of Kerala aims to enhance women's economic development and enable women to become 'active citizens'.

No doubt the programme has been largely achieving in respect of the numbers of women involved, their levels of engagement with the local governments, and their increased ability to save money and access subsidised credit. However the field experience arises some questions regarding the sustainability of the mission as a result of local political cultures and sustained patterns of social exclusion, some of the poorest and most marginalized and backward women find it difficult to access the programme, many of the women who are involved still lack decision-making power and autonomy and the empowerment is suspected to be polarized to certain insiders and making a lion share of the members the outsiders and find it particularly difficult to achieve leadership roles within Kudumbashree groups.

#### **Micro Enterprises:-**

Supporting and sustaining micro enterprises has always been a challenge for development administration. Problems of scale, capability, market and vulnerability do not offer easy solutions. In the recent past Kudumbashree has been attempting to analyze and resolve these problems specifically and jointly, both by increasing the interface with the LSG and the entrepreneur regarding existing programmes, and by bringing new strategies and new programmes that help converge resources and address arising issues proactively and creatively.

#### **Schemes under Micro Enterprises:-**

##### **• RME Scheme:-**

The success of centrally sponsored enterprise programme in the urban areas prompted the Mission to come up with similar enterprise programme in rural areas. The Rural Micro Enterprises (RME) Programme was initiated to help women to set-up Individual and Group enterprises. The minimum number of people required for a group enterprise being ten. Various activities like catering groups, traditional delicacies, paper products, super markets, direct marketing, various food products, goat rearing, dairy units, rabbit rearing, etc have been formed under the RME programme. Even traditional activities like Goat rearing and Dairy have been set-up under RME.

#### **Details of scheme:-**

Group enterprise

- Project cost – INR 250000 or above
- Subsidy per group – INR 100000 (or 50% of the project cost whichever is less)
- Subsidy per individual – INR 10000 Individual enterprise
- Project cost – INR 50000 or above
- Subsidy – INR 7500 (or 50% of the project cost whichever is less)

#### **Yuvashree:-**

The success of the Rural Micro Enterprises (RME) programme has encouraged Kudumbashree to come up with the 50K or Yuvashree programme to provide employment to educated youth in the State through micro enterprises. The Objective of the programme is listed below:

- To facilitate youth in securing sustainable employment opportunities.
- To foster economic development by creating jobs for the poor.
- To identify innovative areas to set up micro enterprises for the youths from BPL families
- To provide hand holding and escort services to the new generation entrepreneurs

The emphasis was on providing employment opportunities for the educated youth, hence 50K was restricted to educated youth (at least appeared in 10th examination) in the age group of 18-40. This programme also gave a chance to men from the Kudumbashree families to setup their enterprises. Individual and Group (minimum of 5) enterprises are set up under this programme; emphasis is given in setting up innovative enterprises.



The various steps followed for setting up enterprises were similar to the RME programme, but certain innovations were also added. The use of MEC (Micro Enterprise Consultants) for identifying entrepreneurs, project ideas, helping in preparing bankable project proposals and monitoring the projects has been found to be a successful experiment.

**Innovation fund/Technology fund:-**

Innovation fund was initiated for supporting innovative micro enterprise. The main objective is to cover initial risk. The maximum amount eligible should not exceed 50% of total project cost including subsidy plus innovation fund. Suitable innovative micro enterprise projects will be identified by Micro enterprise and Samagra teams in Districts and Head Office who will then submit proposals to the Head Office.

Technology fund is planned to procure advanced and innovative technologies for setting up micro enterprises under Kudumbasree. The cost of technology includes the cost to develop a new technology, purchase of a technology from research organization, laboratory, and individuals, NGOs etc. The proposal from the District Mission Team will be scrutinized by a

screening committee constituted for the purpose at State level. Project proposals for the procurement or development of technology for micro enterprises are drafted by the District Missions and submit the same to screening committee.

**Revolving fund:-**

Revolving fund is meant for meeting urgent requirement of working capital. Enterprises are eligible for revolving fund @ 15% of the total project cost subject to a maximum of INR 35000 per group.

One of the major issues faced by Micro Enterprise is the shortage of working capital due to delay in payments by wholesalers and departments. Kudumbasree succeeded in providing Revolving fund to units, which helped them in harnessing working capital for continuous production-supply.

**Crisis management fund:-**

Crisis management fund is meant for responding to an unpredictable negative event to prevent it from escalating into an even bigger problem related to Micro enterprise activities of Kudumbasree. The scheme has only recently become operational.

**Kudumbasree adopts a four pronged approach towards crisis management:-**

1. Anticipate potential crisis situations and prepare for them
2. Provide accurate information during a crisis
3. React as quickly as possible to the situation
4. Long-term solutions

**Mnregs:-**

The National Rural Employment Guarantee scheme is a wage employment programme launched by Govt. of India which guarantees 100 days of manual work to anyone who registers under the programme and seeks work. It is executed through the panchayats of the country, and has a very strong rights based elements in it. In Kerala the ward level committee of Kudumbasree, the ADS has been entrusted with the task of organizing public works under MNREGS. Muster Rolls and other records are maintained by the ADS, implements are provided to labourers by them. Welfare amenities to the workers are also provided by the ADS. The involvement of Kudumbasree has brought a lot of women into the programme.

**Joint liability Groups:-**

Joint liability groups of women farmers are formed under the collective farming initiative to help women cultivators' access agricultural credit from the banking system. These JLGs are structured along NABARD guidelines, and open bank accounts in the name of the JLG JLGs are brought under the purview of Interest subsidy scheme of Kudumbasree (ISS). They become eligible for ISS when they avail agricultural loan from banks. 5% subsidy on 7% interest agricultural loan is provided by state government of Kerala through Kudumbasree.

**Outcome:-**

Through the Collective Farming programme the twin benefits of poverty eradication food security and financial returns through agriculture and increased agricultural production are sought to be accomplished.

**Concluding observations:-**

The State Poverty Eradication Mission, which aims at eradicating absolute poverty within a definite time frame, opted to achieve the goal through empowerment of women. The working slogan of the Mission *is to reach out the family through women and*

*reach out the community through family.* The process of empowerment is by following sequential steps right from organizing them in to Community Based Organisation. Kerala has, for a long time, recognized the social and economic imperatives for broader financial inclusion and has made an enormous contribution to economic development by finding innovative ways to empower the poor.

Kerala started the pilot project of the participatory poverty alleviation programme initially in Allepey municipal area with the support of UNICEF. Based upon the survey done from the pilot phase the same model was extended to all municipalities in the state covering in total of 96 panchayath in the year 1995. Since the background of the project has involved a major study and intense experimentation, the Kudumbashree programme is mainly the sole copyright of Kerala which highlights the participatory strategy for taking power to the people and especially the poorest and the weakest of all. This paper reviews the

literature on major steps taken to eradicate poverty, empowerment of women – through social and financial inclusion and its development nexus, it has got the national and international recognition as an ideal and workable model of participatory development for eradicating poverty through removing gender inequality.

Kudumbashree, the poverty eradication mission has evolved as a strategic tool for poverty eradication and women empowerment in Kerala through various multiple schemes to reach out people and enhance their standard of living by all means. Women have started identifying their strength as a result of joining in the Kudumbashree programme. No doubt it has contributed to the socio economic development of the women folks both in rural and urban areas. All these are the brighter face of the Kudumbashree programme which is unique and one of the major step that was initiated by the Government of Kerala towards the major development of the state through poverty alleviation and bringing out the socio economic changes in the under development society by the ways of financial inclusion.

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### RESEARCH ARTICLE

#### CULTURAL CONFLICTS IN ALICE WALKER'S THE THIRD LIFE OF GRANGE COPELAND.

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#### Abstract

Racial inequalities imposed on African American Americans resulted in historic repression of the blacks and created an imbalance in society to give a way to conflict for human rights in racially fraught America. It offered authority to whites and relegating the blacks to the rags. The whites dominated each sphere in economy and there was no scope left for the blacks. Racial crisis and cultural conflicts drove the blacks in utter poverty and rejected the right to life. Alice Walker as an eminent African American writer deals with the ethnic issues and throws light on the historic repression of the blacks in America to voice the African Americans. Her firsthand experience of her parents' lives as sharecroppers and their brutal exploitation enabled her to view it in her works more realistically. It encouraged the humanists to fight for the human rights in racially fraught America. The abolition of slavery did not uproot sharecropping completely. It continued even in more crude and violent form, ruined the blacks, and rejected them life worth to live as free human beings.

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#### Introduction:-

The roots of cultural conflict in American society are in the white class mentality. The whites strongly believed in the subjugation and oppression of the African Americans and denied them their human rights. The proclamation of the abolition of slavery did not end the exploitation and discrimination in American society. The exploitation continued even in the most brutal crude forms of sharecropping system that oppressed blacks and propelled them to live in utter poverty, and rejected them their right to life. The cultural imperialism of the white masters denied the blacks their recognition as human beings, relegated them to the rags, and labelled them as bonded labourers. In *Society and Self in Alice Walker's In Love and Trouble*, Dolan Hubbard strikingly points out this reality: "Despite the abolition of slavery, blacks find it extremely difficult to redefine their historic roles as labourers in a culture that is antagonistic to their very being" (Hubbard 2000, 212)

Alice Walker throws light on the devastating effects of cultural conflicts on the blacks that propelled them to be bonded labourers in sharecropping system, which ruined their lives. In this regard Barbara Christian's observation about the cultural crisis between the blacks and whites that arise due to the bonded labour is striking. She says, "By tracing the history of Copeland family through three generations, Walker demonstrates the relationship between the racist sharecropping system and the violence that the men, women, and children of that family inflict on each other." (Christian 1985, 84) The cultural conflict between the whites and blacks had strong negative impact on the

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families of the black people. Whites' cultural domination over the blacks destroyed the harmony in familial relationships in America and resulted into a family crisis. Grange Copeland, the protagonist throws more light on it. His exploitation as a sharecropper at the hands of his white master makes him more violent and abusive and turns him into a habitual drunkard who starts using his power against the weaker ones in his own family to get some power of feeling and authority over the family members. Alcohol serves here a means of an agent to take out his anger not on the white master but his wife and son. N. Seraman, N and A.R.Thillaikkarsi precisely comment on it and substantiate the same. They state, "He threatens his wife and son, taking too much of alcohol. It is a way to get some feeling of power." (Seraman 2013, 22)

His trap in cultural flux penetrates conflict in his own mind that does not allow him to understand the significance of education and as a result, he deprives Brownfield education. Grange's denial of education to his son proves how the slavery continued in sharecropping, kept the African Americans ignorant about the change that would come with education and relegated them to live their lives in abject poverty all their lives. Grange's exploitation in systemized bonded labour results in frustration that he inflicts on his wife and son. This cultural and racial crisis thus results in complete deterioration of Grange and his family. The exploitative nature of sharecropping that has its roots in cultural dominance, authority spoils Grange's life, and he remains in debt that he will never be able to pay off to his white master. His wife, Margaret tries to save her husband from the debt but in her attempts, she becomes a prey to the lust of the landlord. Thus, sharecropping does not result in mere Grange's exploitation in tiresome hard work but also a rape that Margaret is a victim of in a racist society that strongly imbibes the idea that the whites do have right to the black women. In this regard, Bell Hooks rightly comments on the black women's exploitation by the whites and the black masters, "American women have been socialized, even brainwashed to accept a version of American history that was created to uphold and maintain racial imperialism in the form of white supremacy and sexual imperialism in the form of patriarchy." (Hooks 1990, 120)

Cultural crisis and repression of the blacks ruined the entire humanity and brought the two cultures in flux. As the whites were in authority, their families did not suffer, rather they enjoyed the feeling of superiority over the black ones and did not question the unequal laws that stamped their authority. Even the black solidarity formed of the black community was not strong to stop wrong things happening in black culture. As a result the black women and children suffered and the black men became irresponsible and unaccountable towards their duties. In Grange's case, his failure in his duties as a husband and a father results in Margaret's suicide. Brownfield who is left orphaned too becomes what his father has left him for. He becomes the most degraded character in Walker's fiction.

Grange Copeland heads north to find some meaning in his life. But the intention with which he moves there results in despair and he soon finds the world unkind brutally ruled by the white cultural dominance everywhere. His encounter with a white pregnant woman who is deserted by her lover at the lake arises in him sentiments and the feelings of humanity for her. In order to save her from drowning in a frozen lake, he offers his hand to the woman who in turn calls him a nigger and humiliates him. Her expression of vicious hatred and racism directed at him angers him and he drops the idea of saving her and leaves the park. His encounter with the white pregnant woman results in cultural conflicts that leaves him repelled and he does not find any feelings of sympathy for anyone thereafter. In his violent disposition, that is the result of cultural domination and whites' superiority and authority over the blacks turns into violent anger that he vents at the whites and picks quarrels with them and fights with them. After realizing the futility of his actions, he soon returns south and tries to make amend for the wrongs, he caused in Brownfield's life, but finds that his son, Brownfield, rejects him. Grange takes the custody of Ruth after his son brutally kills his wife. Grange loves Ruth, sings and dances with her, tells her stories and even shares with her his experiences that he had in a culturally white dominated world. He shares, "The white folks hated me and I hated myself until I started hating them in return and loving myself. Then I tried just loving me, and then you, and ignoring them much as I could" (Walker 2004, 252) What Grange shared with Ruth throws light on Grange's response to the whites' hatred for him and the self realization that he should not hate himself but love. His vast experiences both in the south and north make him realize his sense of duty that he must have towards himself. He offers education to Ruth that he had denied to Brownfield. And for that purpose, he steals the books from the whites to provide her access in every subject to broaden her vision and understanding of the world around. Grange's sense of responsibility to look after his grandchild Ruth and protect her from every hostile culture and the deadly trap sets him on a new path for his emancipation into the first emergent black male protagonist in Alice Walker's entire work of fiction. He outshines as a wonderful human being completely changed and enamoured by the real feelings of love compassion, pity and sympathy that he completely missed in his earlier life.

Grange Copeland, in his pursuit of truth and his struggle with culturally dominated forces and the unjust law machinery and the court verdict, shoots his son in the court and makes his way to his farm with Ruth not to find an escape but to protect Ruth from the evil unjust court and law machinery that prevailed at the time. In his pursuit to save Ruth, he dies in the firing with the police. Grange's fight with the court throws light on the white culture that advocates unjust laws and discriminates between the blacks and the whites by affirming its trust in favouritism.

Cultural conflict does not end with Grange's fight with it but it continues even in the most evil form in Brownfield's life. Like Grange, Brownfield too becomes a victim of dehumanized culture that strongly believes in blacks' subjugation and oppression. Edwin Mhandu's observation in this regard is striking. He says, "Brownfield, as his name signifies, is a victim of the sharecropping system with its brown fields that is controlled by white as typified by Shipley." (Mhandu 2012, 7). It highlights the plight of black children who were denied the right to education due to their parents' ignorance and the blacks' world controlled by the racial imperialism of the whites that denied education to black children and forced them to work in the confines of the cotton fields.

Later in his life, Brownfield's knowledge of his young daughter, Daphne's work in the cotton fields enables him to find his family trapped in the chain of slavery that had begun with Grange. Daphne's mopping the cotton bushes with arsenic makes him realize the complex web of cultural dominance and slavery. The omniscient narrator observes, "It was the summer that he watched, that he had to teach, his frail five-year old daughter the tricky, dangerous and disgusting business of hand mopping the cotton bushes with arsenic to keep off boll weevils." (Walker 2004, 70) His daughter's work and her plight leaves him heartbroken and he senses that he is trapped in the same cycle of oppression and exploitation that his father lived. Realizing it, Brownfield contemplates suicide as he fails to get his family out of economic depression phase his family is witnessing. The narrator observes, "This was the year he first saw how his own life was becoming a repetition of his father's. He could not save his children from slavery..." (Walker 2004, 72) When he fails to find any way out, he starts taking out his anger on his wife, Margaret declaring her responsible for his failures. In this way, he too like Grange continues the same pattern to blame the whites and his wife for his own inactions as he fails to encounter with the cultural dominance of the whites and find any solutions to his problems. Like Grange, Brownfield too blames the white culture for his own inactions. Instead of accepting his faults and weaknesses, he blames the whites even for the results of his own actions. He believes as rightly stated by M. Evans: "that white folks are to blame for everything including his behaviour." (Evans 1983, 460)

He too like Grange, instead of confronting cultural dominance of the whites, vents his anger and frustration at his wife and three daughters. The narrator captures Brownfield's indifference and irresponsible behaviour towards his daughters in the following words:

TO HIS THREE DAUGHTERS Brownfield gave the dregs of his attention only when he was half drunk. To him they were not really human children, although his heart at times broke for them. He could not see them as innocent or even as children. He scolded Ornette, who had come a year after Daphne, with the language he would use on a whore. And the baby, Ruth, he never touched. (Walker 2004, 96)

Brownfield is torn in the cultural flux that he cannot escape the ghetto; the way Grange could break. The painstaking efforts and hardships in bigoted order emanate in him arrogance and violence that he uses as means of violence against his own family and thus it results in his family deterioration. The narrator recapitulates Brownfield's rough treatment as "He had enslaved his own family, given them weakness when they needed strength, made them powerless before any enemy that stood beyond him. Now when they thought of "the enemy," their own father would straddle their vision." (Walker, 287) Brownfield's irresponsible behaviour, his unaccountability and ignorance caused by fanaticism of the white culture, cripples down the entire family and destroys it terribly, making Brownfield alcoholic and more violent ever before. The pangs of cultural authority and superiority are so disturbing and destructive that makes the place menacing for the survival of the African Americans. In her interview with John O'Brien, Alice Walker regards *The Third Life of Grange Copeland* "a grave book" in which the characters observe "the world as almost entirely menacing" (Byrd, 2010, 50)

The white culture constantly made the blacks to move from one place to other. They did not permit the blacks to settle at one place and live life comfortably; rather they overworked the blacks and terminated them from the work after exploiting them for years of hardships. Mem Copeland is no exception to it. She is very much disturbed in xenophobic world that does not permit her to settle at one place. It results in disturbing her daughters' education and

they begin to suffer. Mem's plight throws light on the cultural crisis in which the white landlords did not allow the blacks to settle at one place. Sharecropping system kept them moving from one place to the other and that chain of moving had no end in their life. The narrator rightly captures this reality in Mem to throw light on her frustration she has experienced:

Being forced to move from one sharecropper's cabin to another was something she hated. She hated the arrogance of the white men who put them out, for one reason or another, without warning or exploitation. She hated leaving a home she'd already made and fixed up with her own hands. She hated leaving her flowers, which she always planted whenever she got her hands on flower seeds. Each time she stepped into a new place, with its new, and usually bigger rat holes, she wept. Each time she had to clean cow manure out of a room to make it habitable for her children, she looked as if she had been dealt a death blow. (Walker 2004, 77-78)

Mem Copeland tolerates the extremity of cultural dominance of the whites that drives her and her children to move from one place to the other. The moment she realizes the problem of her daughters' health, education and proper care, she rebels the circumstances and fights with the manipulative and abusive forces. She supports her husband despite his arrogance and negligence. She fails to understand the complex nature of her utilization in cultural imperialism. In *Racism and Feminism: The Issue of Accountability*, Bell Hooks explains, "The inability of American women to understand racism in the context of American politics is not due to any inherent deficiency in woman's psyche. It merely reflects the extent of our victimization." (Hooks 1990, 119)

Mem Copeland finds the white cultural environment hostile and the places she lived menacing for their existence and survival. Whereas Brownfield finds his existence at such menacing hostile places fit to inhabit as his life is destined to the lot he is conditioned in imperialistic world. The narrator rightly observes:

For Brownfield, moving about at the whim of a white boss was just another example of the fact that his life, as it was destined, had "gone haywire," and he could do nothing about it. He jumped when the crackers said jump, and left his welfare up to them. He no longer had, as his father had maintained, even the desire to run away from them. He had no faith that any other place would be better. He fitted himself to the slot in which he found himself; for fun he poured oil into streams to kill the fish and tickled his vanity by drowning cats. (Walker 2004, 78)

Like Margaret and Mem Copeland, Ruth too witnesses intolerance, but she cannot remain passive like them. To encounter the cultural dominance and authority of the whites, she turns to the civil rights movement and takes interest in it. She encounters civil right workers distributing some pamphlets regarding the movement and dares to drop the same at the white neighbour who leaves next to them. Grange has already informed her with the white neighbour's evil motive to usurp their land. Ruth's dropping of the pamphlets at the neighbours' farm is her first action and an entry into the civil rights movement. She is fascinated towards the movement, as she too desires for the equality and keeps a constant watch on the moves of the civil rights workers around. Education denied to Brownfield brings transformation in her life and expands her scope of knowledge. In a court on the day of verdict, Grange shoots Brownfield, saves her from his exploitation, and makes her free to make her way to any continent where she would find the environment fit for her survival and growth. Ruth's story towards the end of the novel offers more hopes for greater possibilities of freedom, growth and emancipation in an equal society that she would strive for and go beyond the black and white culture that is antagonistic to each other. Bloom Harold beautifully captures this would be reality in Ruth's life as below:

While Brownfield is a terrifying example of how the South can physically enslave and spiritually cripple black people, Ruth's story offers considerable hope because she is able to leave the South, rejecting the racist world which destroys Brownfield and, in so doing, move toward a larger, freer world which offers her fresh possibilities. (Bloom 2007, 91)

To conclude, racial and cultural crisis not only destroyed the lives of black men but it also critically affected the lives of black women and children in American society. Grange and Brownfield Copeland are the terrifying representatives and victims of destructive cultural imperialism. The involvement of Ruth in the civil rights movement and the active participation of even some whites signals towards the March for the world class human society that will be based on freedom, fraternity, equality, and social justice to benefit the entire humanity residing on this beautiful planet-the Earth.

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### RESEARCH ARTICLE

#### PERCUTANEOUS K-WIRE FIXATION FOR A COMMUNUTED PROXIMAL HUMERUS FRACTURE – A CASE REPORT.

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##### **Key words:-**

Comminuted proximal Humerus fracture, Osteoporotic bone, Severe anemia, Minimally invasive technique.

#### **Abstract**

Severe proximal Humerus fractures when left untreated have a poor functional outcome because of severe displacement of the fragments. Reduction is essential even though there is a danger that Open Reduction and Internal Fixation may increase the risk of avascular necrosis, especially in 4-part fractures. Open reduction doubles the risk of avascular necrosis compared with closed treatment [1]. The risk is increased still further by the exposure required for plating compared with that for a lesser procedure [2,3,4]. Here we describe a case of 90-year-old elderly female presenting with pain and restricted range of right shoulder movements following fall at her residence and was incidentally found to be suffering with severe anemia which was managed with a minimally invasive technique.

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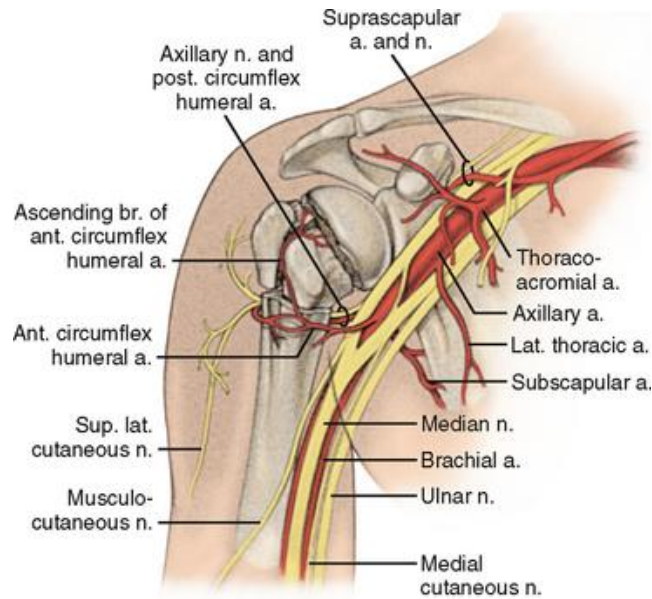
#### **Introduction:-**

Proximal humerus fractures are common, and about 80% are well managed non-surgically, the remaining 20% require surgical intervention so as to ensure healing and to optimize function. The priorities in surgical stabilization of proximal humerus fractures are to restore the anatomic relationship between the tuberosities and the articular head fragment and to maintain vascularity of the articular fragment [5]. ORIF may allow for rigid fracture fixation, but soft-tissue dissection may endanger residual vascularity of the articular segment, however closed reduction followed by percutaneous K-Wire fixation reduces the risk from soft-tissue dissection and may reduce the fracture indirectly and achieving provisional fixation for anatomic healing. Closed reduction and percutaneous fixation was first described by Bohler [6] for pediatric proximal humerus fractures treatment. He under general anesthesia reduced the fracture of the patient and provisionally fixed the shaft to humeral head fragment the using percutaneously placed pins. This method then was adapted to the treatment of fractures in adults. Initially, the technique was applied to the management of two-part surgical neck fractures [7] where it was as successful as open methods. More recently, closed reduction and percutaneous fixation with pins and cannulated screws has been applied to the management of three- and even four-part proximal humerus fractures [8,9,10]. Although these approaches to more complex fractures are challenging, vascularity of the humeral head seems to be more reliably preserved than in open treatments that require soft-tissue dissection to place rigid fixation implants [11]. The incidence of osteonecrosis is reduced with these methods [8-10,12-16] because the principal vascular supply to the humeral head, the ascending branch of the anterior circumflex humeral artery, is left undisturbed with no dissection in the region of the bicipital groove or around the subscapularis (Figure 1).

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**Figure 1:-** Diagrammatic representation of blood supply to proximal Humerus.

#### **Case presentation:-**

A 90-year-old female patient presented to the emergency department with pain, restricted range of movements with swelling of the right shoulder following accidental fall at her residence. Local examination there was a gross swelling over the right shoulder with tenderness at the deltoid region with restricted and painful active and passive range of shoulder movements with no external injuries. Both antero-posterior and axillary lateral radiographs revealed a four part fracture according to Neer's classification, with osteoporotic bones with intact gleno-humeral joint (Figure 2a,b).



**Figure 2a:-** Plain radiograph AP View showing greater tuberosity fracture.



**Figure 2b:-** Plain radiograph Axillary Lateral View showing four part fracture

Her Hemoglobin initially at the time of admission was 3.7gm/dL i.e., she was severely anemic and rest of the routine blood investigations were found to be normal. Her 2D-Echo revealed AV sclerosis, mild to moderate MR with mild TR/PAH. While an open reduction and internal fixation is recommended for such type of fractures, which takes a lot of time for healing, with risk of infections, prolonged intubation period during anesthesia, blood loss and even high risk as per her age, hemoglobin level and cardiovascular status, in view of all the above complications she was thoroughly evaluated and blood transfusion with five packs of packed cell volume was done until her hemoglobin improved to 9gm/dL. Under general anesthesia fracture was reduced by manipulation with fluoroscopic guidance

and fixed with five K-wires three infero-laterally and two of them supero-laterally giving the fracture a rigid fixation (Figure 3).



**Figure 3:-** Post-operative plain radiograph showing fracture reduced and fixed with K-Wires.

Patient was then immobilized with a shoulder immobilizer for about 2 weeks and was then gradually mobilized starting with pendulum movements and later with controlled abduction movements, K-Wires were removed after 6 weeks. Shoulder range of movements were achieved to the extent that patient was able to eat herself and do her daily activities to some desired extent without pain.

### **Discussion:-**

In elderly patients fractures of the proximal humerus are common. The overall prevalence is about 70 per 100000 population/year, representing about 5% of all fractures [17-19]. Restoration of muscle power to the injured arm is not the prime objective in elderly patients. The main requirement is to handle activities of daily living which do not need much strength, but require a reasonable range of movement. There is a particular need for sufficient internal rotation for eating and for personal hygiene and enough external rotation for combing hair and washing. The main aims of management in these fractures are a good functional result and pain relief, irrespective of a compromise on restoring precise anatomical congruity [20]. A good functional outcome is when an abduction and elevation of 90°, external rotation of 25° and an internal rotation good enough to touch the L1 vertebra is achieved. The choice of treatment for patients with a complex fracture of the proximal humerus remains controversial and is mainly based on the personal experience of the surgeon treating the injury. Here we planned for a closed reduction and internal fixation due to patient's poor compliance, her elderly age and other co-morbid conditions. The results of closed reduction and percutaneous pinning are favorable in most series [7-10,12-15]. The largest two series have been published by Jaberg and associates<sup>7</sup> and Resch and associates [8,12]. Over the past 15 years, we have performed closed reduction and percutaneous fixation of more than 50 proximal humerus fractures. All patients have regained overhead motion and have achieved stable fixation. No osteonecrosis was observed; including the patients who had true four-part fractures.

### **Conclusion:-**

ORIF results in lower rates of nonunion, shorter time to union, earlier mobilization, and better anatomical reduction. But this case has been presented with almost similar outcome treated with minimally invasive procedure as the patient was not compliant, had co-morbid conditions like severe anemia, cardio-vascular disease and elderly aged, who almost required a shorter period of intubation compared to ORIF, post surgically she had a shorter hospital stay and early mobilization of shoulder was initiated. However outcome depends on accuracy of reduction, avascular necrosis, and degree of comminution.

**Conflicts of interest:** None.

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## RESEARCH ARTICLE

### OBSTRUCTIVE UROPATHY AND ITS TREATMENT

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#### Abstract

**Background:** Obstructive uropathy is a major clinical problem defined as the presence of any functional or structural abnormality of the urinary tract that leads to blockage or reduction of urine flow. It accounts for almost 10 % of cases of renal failure.

**Objective:** The purpose of this review article is to evaluate the different Obstructive Uropathy treatment options that could be offered for patients suffering from this condition.

**Methodology:** A medical literature search using Pubmed/Medline that addressed both the pathophysiology and treatment of obstructive uropathy was performed.

**Conclusion:** Various causes are claimed for the occurrence of obstructive uropathy. Once presence of obstruction is confirmed, intervention is warranted. The type of intervention depends on the location of the obstruction, its degree, and its cause, as well as the presence or absence of concomitant diseases and complications, and the general condition of the patient.

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#### Introduction:-

Obstructive uropathy can be defined as any blockage of urine drainage from the kidney (renal calyces or renal pelvis), ureter, or bladder. As a result of the blockage, urine backs up into the kidneys, causing dilatation of the ureter, renal pelvis, and renal calyces, which can damage the kidney if it is not treated. The appearance of dilated or enlarged renal pelvis and calyces is referred to as hydronephrosis and is a symptom of obstructive uropathy. Obstructive uropathy can be a long-term disease (chronic) or occur suddenly (acute). As well, it can occur in one kidney (unilateral) or both kidneys (bilateral). Symptoms may include nausea, vomiting, excessive sweating (diaphoresis), and abdominal or groin pain. Obstructive nephropathy is of great importance to clinicians since it is a common entity that is treatable and regularly reversible. Patients with obstructive nephropathy might be asymptomatic or might show differing qualities of clinical disorders. Obstructive uropathy alludes to the vicinity of auxiliary or utilitarian changes in the urinary tract that hinder the ordinary stream of pee. Obstructive nephropathy is the renal malady brought on by impeded stream of pee or tubular liquid. Hydronephrosis signifies expansion of the urinary tract (1).

The occurrence of hydronephrosis reported by Bell (2) in a progression of 32,360 dissections was 3.8% (3.9% in guys, 3.6% in females). The rate of clinical signs of obstructive uropathy preceding demise was not reported, and it is likely that hydronephrosis was an accidental finding in a significant number of these patients. The rate of hydronephrosis at examination is to some degree lower in kids than in grown-ups, being 2% in one arrangement of 16, 100 post-mortems (3). More than 80% of youngsters with hydronephrosis at post-mortem examination were

under 1 year old, with the parity of youth cases being conveyed consistently through the adolescence years. Around 166 patients for every 100,000 populace had a hypothetical conclusion of obstructive uropathy on admission to healing centers in the United States in 1985 (4). Among male patients with kidney and urologic issue, obstructive uropathy positioned fourth at release (242 patients/100,000 releases). In females with kidney and urologic issue, obstructive uropathy positioned 6th as a determination at release (94 patients/100,000 releases). In the United States in 1985, around 387 visits for each 100,000 populace were identified with obstructive uropathy (5). New ultrasound methods have made conceivable the finding of obstructive uropathy in the baby amid pregnancy (6). In the grown-up, the occurrence and reasons for urinary tract obstruction fluctuate with the age and sex of the patient. In youthful and moderately aged guys, intense obstruction from renal calculi is common but provisional, and such cases would not be incorporated into post-mortem examination studies. In females of this age bunch, then again, pelvic disease is a vital reason for obstructive uropathy. In the more seasoned age bunch, urinary tract obstruction is more common in the anatomic or practical components are important in building up the reason for the obstruction. The level at which the obstruction happens in the urinary tract, and whether it is intraluminal, intramural (natural), or extramural (outward) are useful. The vital levels of obstruction in the urinary tract are the urethra and the bladder neck, the bladder and the ureterovesical intersection, the ureter, and the renal pelvis and ureteropelvic intersection. Obstructive uropathy is arranged by degree, term, and site of the obstruction. The degrees of obstruction are said to be high review when it is finished, and poor quality when partial or incomplete. When the obstruction is of brief term it is said to be intense. Most often this is because of stones. Obstruction that grows gradually and is durable is said to be unending, as in intrinsic ureterovesical variations from the norm and retroperitoneal fibrosis. Obstructive uropathy is because of useful or anatomic sores that can be found anywhere in the urinary tract from the renal tubules (gems) to the urethral meatus. Obstructive uropathy influencing the lumen of the renal tubules is said to be intrarenal, and those reasons for obstruction that emerge in the urinary tract are alluded to as extrarenal. Extrarenal obstruction thus is partitioned into upper urinary tract obstruction (over the ureterovesical intersection), which is normally one-sided in nature, and lower urinary tract obstruction, which by definition is respective. The causes of upper urinary tract obstruction can be characteristic or extraneous. Inborn causes are either intraluminal or intramural, with renal calculi being the fundamental driver of intraluminal obstruction. The intramural reasons for obstruction are either anatomic or useful. Anatomic lesions of the upper urinary tract, a less common cause of obstruction, incorporate ureteral strictures, considerate or malignant tumors of the renal pelvis and ureter, ureteral valves and polyps. The utilitarian issue incorporate vesicoureteral reflux and adynamic ureteral sections. The most common site of useful obstruction in the ureters is an utilitarian defect at the ureteropelvic junction. This is usually a disease of infants. The second most common cause is a functional defect at the ureterovesical junction.

Therapy for obstructive uropathy is largely determined by whether the obstruction involves one or both kidneys, and by the age of the patient. In the infant and child, obstructive uropathy is almost always due to a congenital malformation of the ureter, bladder, or urethra. Ultrasonographic prenatal diagnosis has permitted early detection and even fetal intervention for posterior urethral valves, although this form of treatment must be considered experimental at present. More important to the affected infant than optimal renal development is the prevention of pulmonary hypoplasia, which is a consequence of fetal oliguria and oligohydramnios. Removal of the stone can be accomplished surgically or by lithotripsy. Bladder outlet obstruction is usually secondary to prostatic hyperplasia, which may progress slowly, allowing a delay in surgical intervention. Neurogenic bladder may require intermittent catheterization or cholinergic therapy; those with hypertonic bladder may benefit from anticholinergics. Regardless of the patient's age, prompt and accurate diagnosis is essential to planning an optimal strategy for the management of obstructive uropathy (7).

#### **Objectives:-**

This study was undertaken to discuss the **Obstructive Uropathy and its treatment** with least rate of recurrence. And to highlight the most incidence causes of **Obstructive Uropathy** to educate patients who are going under surgical procedure about the condition that may cause more complication results than the condition was operated for, and also to evaluate the different **Obstructive Uropathy treatment** techniques that could be suitable for most of patients suffering from this condition.

#### **Methodology:-**

Medline (pubmed) literature review and analysis for previous studies that are discussing Obstructive Uropathy and its different management procedures for, which become a common nowadays, our searched was by using the search terms 'Obstructive Uropathy and its Treatment' and 'management of uropathy' alone and in combination. Publications were selected mostly in the past 30 years, but did not exclude commonly reference and highly regarded

older publications. The reference list of articles was also searched, identified by the search strategy and those selected that were relevant. Selected review articles and meta-analyses were included because they provide comprehensive overviews that may be beyond the scope of this article.

### **Results:-**

Here we would like to discuss different therapeutics aspects of Obstructive uropathy, in study that was performed by Gunter Wolf et al. in 2005 administration of an ACEinhibitor or an angiotensin II receptor (ATI) antagonist, to rats with unilateral ureteral obstruction, ameliorated the increase in interstitial volume and attenuated the increased expression of TGF- $\beta$ 1 in tubular cells, the increased production of extracellular matrix protein, the activation of NF- $\kappa$ B, the proliferation of fibroblasts and the conversion of their phenotype to myofibroblasts. A monocyte/macrophage infiltrate was present in the obstructed kidney of untreated rats and in the obstructed kidney of rats treated with the angiotensin II receptor antagonist. By contrast, this infiltrate was markedly decreased in the obstructed kidney of rats treated with an ACEinhibitor. This difference may be owing to greater generation of nitric oxide related to increased levels of bradykinin during ACE inhibition. In fact, rats with unilateral obstruction given both an ACEinhibitor and (LNAME)(an inhibitor of NO formation) had a substantial macrophage infiltrate. Administration of L-arginine in the drinking water significantly blunted the increases in interstitial volume, monocyte infiltration, interstitial collagen IV and smooth muscle actin expression (8).

There was a study by IoannisVakalopoulos et al. 2012 which discussed the Frontometaphyseal dysplasia is a rare genetic syndrome characterized by skeletal dysplasia comprising hyperostosis of the skull and modeling anomalies of tubular bones. The most common manifestations include supraorbital hyperostosis, hypertelorism, down-slanting palpebral fissures, and generalized skeletal dysplasia. The dysplasia manifests with thickening of the calvarium; agenesis of the frontal, ethmoidal, and sphenoidal sinuses; and bowing and undermodeling of tubular bone diaphyses and metaphyses, but the study indicates that obstructive lesions of the ureters and urethra commonly accompany frontometaphyseal dysplasia and should be specifically sought and excluded in individuals for whom the diagnosis is being considered. Our case represents a guide to how patients suffering from this rare syndrome may be approached to assess and correct functional and anatomical anomalies (9).

### **Surgical management and follow-up:-**

Emergency treatment of obstructive uropathy is needed in the presence of bilateral obstruction, urosepsis, uremia and hyperkalemia, persistent renal colic, worsening of hydronephrosis and renal impairment.

Regarding the dilemma to insert a ureteral stent (JJ stent) or a percutaneous nephrostomy, literature indicates especially Docimo SG et al. 1989 that both procedures do not show any statistically significant difference in terms of efficacy. However, in some hospitals, percutaneous nephrostomy is placed only by the interventional radiologists that may not be available in an emergency basis. In patients that receive anti-coagulation medication, the preferred therapy is JJ stent placement whereas in the case of urosepsis, percutaneous nephrostomy placement is the gold standard therapy. In obstructive uropathy due to cancer, there may be difficulties during the insertion of a JJ stent. After the management of the obstruction, polyuria may happen, especially in cases of bilateral obstruction or obstruction in a solitary kidney. Polyuria is due to a significant decrease in the receptor transport and because of reduced sodium reabsorption from the descending limb of the Henle loop. Usually, polyuria resolves when fluid and electrolyte homeostasis is achieved. Monitoring the level of consciousness and the vital signs, electrolyte supplementation and a gradual reduction of the administered intravenous fluids are essential (11).

### **Discussion:-**

A prospective study by Khalaf IM et al 2004 included 91 consecutive adult patients with the diagnosis of unilateral obstructive uropathy and a normal contralateral kidney. All patients had a nonequivocal cause of obstruction that was successfully relieved after treatment. All patients underwent plain abdominal x-ray, gray-scale ultrasonography, Doppler ultrasonography, excretory urography, and technetium-99m-diethylenetriamine pentaacetic acid radioisotope renography before and after treatment. Patients were seen regularly at 3, 6, and 12 months for a mean duration of 13 +/- 6 months (range 6 to 36). At each visit, ultrasonography and renography were performed, and excretory urography was performed at least once during follow-up. The study showed that On univariate analysis, the factors that significantly affected the recoverability of renal function after the relief of obstruction included preoperative renographic GFR, renal perfusion, parenchymal thickness, parenchymal echogenicity, corticomedullary differentiation, reduction of the renal resistive index of the corresponding kidney, and compensatory hypertrophy of

the contralateral normal kidney. However, using multivariate analysis, only the preoperative selective renographic GFR and renal perfusion of the corresponding kidney sustained their statistical significance as independent factors affecting renal functional recovery. A preoperative GFR value of 10 mL/min/1.73 m<sup>2</sup> was estimated as the cutoff point that can determine the best prediction of stabilization or improvement of renal function after the relief of obstruction(10).

### Conclusion:-

The absolute most regular reason for obstructive uropathy as far as we can tell is ureteral pressure because of a gravid uterus. Decision treatment much of the time is moderate treatment. At the point when regardless of moderate treatment signs and indications persevere; urinary by-go with anti-infection prophylaxis must be performed. Ureterorenoscopy as an indicative and helpful methodology ought to be thought about in pregnant ladies with ureteral lithiasis. Frequency of pre-term work was not higher than normal.

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### RESEARCH ARTICLE

#### MEASUREMENT OF OXIDANT- ANTIOXIDANT MARKERS IN PREMATURE NEWBORN WITH RESPIRATORY DISTRESS SYNDROME.

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#### Abstract

**Background:** Respiratory distress syndrome (RDS) is still an important problem in treatment of preterm infants. The imbalance between the oxidative forces and the antioxidant defense systems was suggested to predispose the lungs to the development of RDS. The present study aimed to investigate the alterations in biochemical parameters of oxidant/antioxidant and its role in development of neonatal RDS.

**Methods:** This case control study included 40 premature neonates with RDS and 50 healthy premature newborns. Quantification of levels of malondialdehyde (MDA), thiobarbituric acid reacting substances (TBARS) along with total antioxidant capacity (reduced glutathione, and superoxide dismutase SOD) in cord blood of healthy premature newborns compared with those with RDS.

**Results:** Status of markers of oxidative stress (MDA, and TBARS) showed a significant increase with depleted levels of total antioxidant capacity of reduced glutathione and SOD in neonatal RDS when compared to healthy newborns.

**Conclusion:** The study concluded oxidative damage and diminished antioxidant defenses in newborns with RDS that was evidenced in severe cases of RDS. This could be of clinical significance in studying the pathophysiology of neonatal RDS.

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#### Introduction:-

Respiratory distress syndrome of newborn also called Infant respiratory distress syndrome (IRDS), previously called hyaline membrane disease (HMD), is caused by lung immaturity and insufficient production of surfactant during development. IRDS affects about 1% of newborn infants and is the leading cause of death in preterm infants (Rodriguez et al., 2002).

A fully developed lung is protected with defense lines that increase resistance to high O<sub>2</sub> tensions. On contrast premature lung is affected by insufficient/dysfunctional surfactant resulting in collapsed alveoli, atelectasis, ventilation-perfusion mismatching, and subsequent hypoxemia and respiratory acidosis. The poorly developed

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peripheral airways and immaturity of cells important for lung maturation are the major causes of poor surfactant production by type II cells and inadequate antioxidant responses to increased ambient oxygen (Gleason et al., 2012). In addition to prematurity, premature neonates could be complicated by diminished antioxidant stores and antioxidant enzymes production. Oxidative stress is oxidant/antioxidant imbalances that resulting in production of free radicals. Adequately mature and healthy infants are able to tolerate this drastic change in the oxygen concentration. A problem occurs when the intrauterine development is incomplete or abnormal. Preterm infants are typically of this kind (Rahal et al., 2014; Marseglia et al., 2014). After birth, sudden increase in oxygen supply lead to overproduction of ROS and depletion of antioxidants. Oxidant stress promote expression of cytokines and the inflammatory process (interleukin-6, interleukin-8, and tumor necrosis factor- $\alpha$ ) (Gitto et al., 2004; Mutinati et al., 2014).

Oxidative stress in infants is implicated in the pathogenesis of the major complications of prematurity including respiratory distress syndrome (RDS), necrotizing enterocolitis, chronic lung disease, retinopathy of prematurity and intraventricular hemorrhage (Mutinati et al., 2014).

Newborns and especially pre-term infants are probably more prone to oxidative stress than are children and young adults as they are exposed to high oxygen concentrations, have infections or inflammation, have reduced antioxidant defense, and have free iron which enhances the Fenton reaction leading to production of highly toxic hydroxyl radicals (Saugstad, 2003; Saugstad, 2005). Phagocytes such as neutrophils are activated when stimulated by microorganisms or other means which increase their oxidative metabolism. If these toxic products are not inactivated, cell injury and respiratory cell death will induce (Esteban et al., 1999). Under these conditions, a surfactant deficiency may be aggravated by inactivation of the small amount of endogenous surfactant that is produced (Boda et al., 1998). Furthermore, if exogenous surfactant is given this may also be destroyed (Ikegami et al., 2000; Huertas et al., 1998).

For instance, the superoxide dismutase (SOD) activity appears in the developing lungs concomitantly with the surfactant synthesis by type II pneumocytes. So, the current study investigated the alterations in the biochemical parameters of oxidant/antioxidant by quantification of levels of malondialdehyde (MDA), TRBAS along with total antioxidant capacity in cord blood of healthy premature newborns compared with those with RDS. Umbilical cord blood provides valuable information regarding the status of the infant at birth that gives early predictors of some of the metabolic disorders in future adult life.

### **Patients and methods:-**

A total of 90 neonates were included in this case-control study. They were recruited from Neonatology department of King Abdul Aziz specialist Hospital (KAASH) Taif, Saudi Arabia, between August 2015 and September 2016. This study was approved by the Institutional Ethics Committee, and written informed consent for participation was obtained from the parents.

Cord blood samples were collected at the time of the delivery. The study group consisted of 40 preterm born < 33 weeks gestational age or of low birth weight < 1500 g with diagnosis of RDS. The control group was composed of 50 preterm low birth weight newborns. Exclusion criteria of the study were infection, congenital malformations, metabolic disorder and newborns with history of difficult delivery, genetic disorder, severe intraventricular hemorrhages, congenital hemolytic diseases caused by blood-type incompatible pregnancies, diseases requiring surgical treatment, and a gestational age of 22 wk.

RDS was diagnosed on the presence of typical clinical and radiological signs of the disease in the preterm infants. Newborns were considered to have RDS if they have tachypnea; grunting and cyanosis with several hours of birth required mechanical ventilation and typical radiographic findings on the chest X-ray. The diagnosis was established from the clinical symptoms and needed for oxygen treatment. RDS neonates were classified into mild, moderate and severe categories based on severity of oxygenation compromise.

Maternal age, date of last menstrual period, medical history and reproductive history were obtained from the hospital record.

Four mL of heparinized venous blood sample was collected from the umbilical cord just after delivery of the studied neonates and processed for the isolation of erythrocytes and plasma. The red cells were stored at 4°C and all serum

samples at  $-20^{\circ}\text{C}$  until analysis. The red cell samples were processed within 12 hours. For reduced glutathione determination erythrocyte mass was used, superoxide dismutase activity was determined in erythrocyte lysate (add 3 ml 0.9 % NaCl to 500  $\mu\text{l}$  of blood and centrifuge 660 g/10 min at  $4^{\circ}\text{C}$ , remove supernatant and repeat 4 times; after final removal of supernatant add 1.5 ml of chilled distilled water, leave for 20 min and freeze).

The following oxidant/antioxidant markers were measured

**Serum malondialdehyde (MDA)** marker of lipid peroxidation was measured using the colorimetric method described by Satoh *et al.* (1978), based upon the reaction of thiobarbituric acid (TBA) with MDA, one of the aldehyde products of lipid peroxidation. The absorbance of the MDA-TBA adduct thus produced was measured at 532 nm wavelength using a spectrophotometer.

**serum superoxide dismutase (SOD)** in erythrocytes was determined by the method described by **Marklund and Marklund (1974)** as modified by Nandi and **Chatterjee (1988)**, which is based on the inhibition of pyrogallol autoxidation brought about by SOD.

**Reduced glutathione (GSH)** was estimated by a method based on the development of yellow color with 5, 5' dithiobis-2-nitrobenzoic acid (DTB), which was measured at 432 nm using a spectrophotometer (**Beutler et al., 1963**).

#### Statistical analysis:-

Descriptive analysis was performed for demographic and clinical characteristics of the patients. MDA, TBRAS, reduced glutathione and superoxide dismutase levels were expressed as mean  $\pm$  SD. The levels were compared between the Study and Control groups by student's t-test or Mann 2 Whitney U test was used for comparison of numeric variables between two groups. Comparison between RDS group was determined by one-way analysis of variance (ANOVA) followed by Tukey post hoc test for multiple comparisons. Probability values (P) less than 0.05 were considered to be statistically significant.

#### Results:-

##### Characteristics of the studied groups:

The study included 40 premature neonates with RDS and 50 healthy premature neonates. 75% of RDS group were delivered by cesarean and 57.5% of them were infant of diabetic mothers. 65% of RDS group and 42% of control group were male table (1).

**Table (1):-**Characteristics of the studied neonates and their mothers: data are presented as number(percentage) and mean  $\pm$  SD

	RDS group n=40	Control group n=50
Maternal history N (%)		
Mode of delivery		
Vaginal	10 (25%)	23 (46%)
Cesarean	30 (75%)	27 (54%)
Maternal history of diabetes		
Maternal history of hypertension	23 (57.5%)	4 (8%)
	5 (12.5%)	6 (12%)
Sex N (%)		
Male	26 (65%)	21 (42%)
Female	14 (35%)	29 (58%)
mean $\pm$ SD		
Gestational age (weeks)	29.6 $\pm$ 1.5	30 $\pm$ 2.6
Birth weight (g)	1054 $\pm$ 356	1324 $\pm$ 199
Apgar score		
1 minute	6.75 $\pm$ 1.34	8
5 minutes	7.94 $\pm$ 1.12	9

**Difference in oxidative markers between RDS and control groups:**

High significant changes in mean  $\pm$  SD of oxidative markers between both groups were observed. Significant increase in oxidant markers (MDA, TBRAS) was detected in RD group when compared with control group and significant decrease in antioxidant markers (GHS, SOD) table (2).

**Table (2):-oxidative stress markers of all studied groups**

	MDA Nmol/ml	TBRAS $\mu$ mol/l	Reduced GSH $\mu$ mol/gHb	SOD $\mu$ /gHb
RDS group (n=40)	4.39 $\pm$ 0.97*	3.49 $\pm$ 2.6*	2.73 $\pm$ 1.63*	348 $\pm$ 45.1*
Control group (n=50)	2.26 $\pm$ 0.26	1.93 $\pm$ 2.5	4.78 $\pm$ 1.6	806 $\pm$ 50.7

Data are presented as means  $\pm$  SD; n = number of cases in each group. Statistical analysis was done using student's t-test. \*, P < 0.05 versus control

**Difference in oxidative stress markers according to severity of RDS:**

Mean  $\pm$  SD levels of oxidant markers MDA, and TBRAS were significantly increased in moderate and severe cases of RDS when compared with mild cases. Also, the antioxidant markers GSH, and SOD were significantly decreased in severe/moderate cases when compared with mild cases p<0.05.

**Table (3):-measurement of oxidative markers in mild, moderate and severe cases of RDS.**

	MDA Nmol/ml	TBRAS $\mu$ mol/l	Reduced GSH $\mu$ mol/gHb	SOD $\mu$ /gHb
Mild RDS (n=15)	3.9 $\pm$ 0.89	1.86 $\pm$ 1.9	4.01 $\pm$ 0.2	460.1 $\pm$ 20.5
Moderate RDS (n=12)	4.4 $\pm$ 0.2	4.2 $\pm$ 2.1	3.42 $\pm$ 1.9	390 $\pm$ 29
Sever RDS (n= 13)	5.21 $\pm$ 0.1	5.1 $\pm$ 1.2	1.9 $\pm$ 1.7	387 $\pm$ 19.8
P value	0.00*	0.00*	0.001*	0.00*
F	19.136	12.559	7.968	44.945

Data are presented as means $\pm$  SD; n = number of cases in each group. Statistical analysis was done using one-way ANOVA followed by Tukey post-hoc test for multiple comparisons. \*, P < 0.05

**Discussion:-**

The imbalance between reactive oxygen species (ROS) and enzymes needed for removal of free radicals is called oxidative stress. This process involved in the activation of a complex array of genes involved in inflammation, coagulation, fibrinolysis, cell cycle and signal transduction resulting in consequence on fetal structure. The rapid transition of the fetus from a relatively hypoxic to a relatively hyperoxic environment at birth gives rise to oxidative stress. However, oxidant defense mechanisms are induced late in gestation. Management of oxidative stress is a great challenge for both researchers and clinicians (Frank, 1991; Dizdar et al., 2011).

In the present study, we detected evidence of oxidative stress in cord blood of premature neonates suffering from RDS that was prominent with severe cases. Most of RDS cases in the present work were delivered by Caesarean section and some of them were infants of diabetic mothers. Substantial increased levels of oxidant markers MDA and TBARS in our study were accompanied with significant decreased levels of GSH and SOD.

Many authors have demonstrated that there is the same degree of fetal oxidative stress in vaginal delivery as that resulting from Caesarean section (Fogel et al., 2005; Hracsko et al., 2007). It is unclear whether oxidative stress is related to delivery itself or whether it reflects a pre-existing fetal level of oxidative status. Laurie et al. (2007) demonstrated that distressed fetuses delivered by emergency Caesarean section exhibited increased MDA concentrations, an indicator of lipid oxidative damage, and enhanced glutathione peroxidase (GPX), an antioxidant enzyme, in amniotic fluid and umbilical cord blood compared with non-distressed fetuses delivered by vaginal delivery. These findings are suggestive of elevated fetal oxidative stress (Georgeson et al., 2002; Laurie et al., 2007).

Orhan et al. (2003) implies that TBARS is one of the promising clinical markers of oxidative stress. They detected increased TBARS and decreased GSH levels in infant of diabetic mother and concluded the concept of oxidative

stress in diabetic pregnancies. These conclusions were in line with our results where most of RDS group were infant of diabetic mother but it is in disagreement with **Kinalski et al. (2001)** who found significantly higher levels of GSH in umbilical cord blood of infants of mothers suffering from diabetes mellitus.

Respiratory distress syndrome is accompanied by inflammatory processes with free radical generation and oxidative stress (**Nemeth, 1994, Krediet, 2006**). The imbalance between the oxidative forces and the antioxidant defense systems was suggested to predispose the lungs to the development of RDS (**Lang et al., 2002**). Many studies have shown increased oxidant stress markers and/or reduced antioxidant defense in preterm infants with RDS (**Ogihara et al., 1996, Miller et al., 1993**).

Malondialdehyde (MDA) is one of the final products of polyunsaturated fatty acids peroxidation. The present study showed increased concentration of MDA in neonates with respiratory disorders than that of control in consonance with the reported study (**Negi et al., 2015**). In addition, preterm infants appear to have deficient quantities of enzymes responsible for scavenging ROS, including superoxide dismutase. Frank, (1987).

ROS potentiate tissue damage by lipid peroxidation (**Saugstad, 2005**). A common site of damage is the basement membrane and other elements of the lung matrix. One consequence of this damage is increased microvascular permeability and vascular leakage, resulting in oedema formation containing protein rich fluid (**Groneck et al., 1994**). This protein rich fluid is considered as an ideal target for oxygen reactive species. In order to initiate the oxidative attack, ROS causes an imbalance in the lung protease-antiprotease system through inactivation of alpha-1 protease [**Saugstad, 2000; Winterbourn, 2001**]. ROS also interact with pulmonary surfactant as well as with other protein and lipid structures, thus delaying the normal functioning of the lung. Therefore, surfactant administration before the initiation of mechanical ventilation diminishes the severity of lung lesions by providing consistent ventilation [**Carty et al., 2000**]. This oxidation process has been proven to contribute to pathogenesis in newborns with RDS [**Buonocore et al., 2000**].

The present study observed reduction in total antioxidant status in newborns with RDS compared to healthy newborns. One study also reported decreased level of total antioxidant activity in newborn with RDS (**Dizdar et al., 2011**). Oxidant-antioxidant balance shifts in favor of the oxidative damage in premature newborns with RDS due to diminished antioxidant activity. Antioxidant defenses of the immature lung will be prepared neither for the hyperoxic environment nor the inflammation found in association with respiratory distress (**Davis and Auten, 2010**). The lung depends on a delicate balance between oxidant and antioxidant systems to maintain normal cellular function. The lungs of prematurely born infants suffering from respiratory distress syndrome may be ill-adapted for protection against ROS. Antioxidants clearly have an important role in the defense against free radical induced lung injury in newborns with RDS (**Negi et al., 2015**).

The present study showed that the elevated level of MDA and TBARS might be risk factor; reduced level of total antioxidant status (reduced GSH and SOD) might lead to the RDS in newborn and control its severity. Total antioxidant status might serve as prognostic marker in newborns with RDS and might help distinguish high risk infants.

### **Conclusion:-**

The result of this study indicates that newborns with RDS were manifested by oxidative stress accompanied by reduced antioxidant defenses which could play a role in the pathogenesis of RDS and affect its degree of severity.

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### RESEARCH ARTICLE

## OCCUPATIONAL NOSOCOMIAL SKIN INFECTIONS AMONG NURSING STAFF IN BAQUBAH TEACHING HOSPITALS.

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Occupational, Nosocomial skin infections,  
 Prevalence, Nursing staff

### Abstract

**Background:** Health care workers especially nursing staff are at risk of acquiring nosocomial skin infections through occupational exposure. Nosocomial skin infections (NCSI) can be caused by viruses, bacteria, fungi and parasite.

**Aims:** To determine the prevalence of occupational nosocomial skin infections among the nursing staff in Baqubah teaching hospitals and to assess the factors responsible for non-compliance of infection control measures amongst nursing staff.

**Patients and Methods:** A cross sectional study was conducted among nurses in two teaching hospitals in Baqubah city from 1<sup>st</sup> September 2015 to 31<sup>th</sup> of March 2016. Special questionnaires were used to determine the prevalence of nosocomial skin infections among 200 nurses who worked at the two hospitals were chosen randomly, and dermatological examination was performed by dermatological specialist.  $p < 0.05$  was considered statistically significant.

**Results:** The prevalence of occupational nosocomial skin infections was (53/200) (26.5%) and it was most common in Baqubah teaching hospital; (68%) in medical ICU and (64%) in surgical departments. The majority of cases were infected with scabies (73.5%), other infections; fungal infection (15%), while pediculosis, warts, molluscum contagiosum each one compose (4%) of infections. High prevalence was among males (62%), with age group more than 35 years old (47%), with bad hand hygiene (41%).

**Conclusions:** We conclude that scabies were the most common occupational nosocomial skin infections among the male nursing staff with age group more than 35 years old, with bad hand hygiene, working in Baqubah teaching hospital.

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### Introduction:-

Nosocomial infections, or hospital-acquired infections are those infections acquired in hospital or healthcare service unit, that first appear 48 hours or more after hospital admission or within 30 days after discharge following in patient care. The Nosocomial infection transmitted by five main routes which includes; contact, droplet, airborne, common vehicle and vectorborne. [1].

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Medical staff move from patient to patient thus providing a way for pathogens to spread, inadequate sanitation protocols regarding uniforms, equipment sterilization, washing and other preventive measures that may either be unheeded by hospital personnel or too lax to sufficiently isolate patients from infectious agents and lastly the routine use of anti-microbial agents in hospitals creates selection pressure for the emergence of the resistant strains of microorganisms. They are unrelated to the original illness that brings patients to the hospital and neither present nor incubating at the time of admission. [2, 3].

Nosocomial infections are classified as infections that are associated with the delivery of health care services in a health care facility. Nosocomial microorganisms may also be acquired by health personnel working in the facility and can cause significant illness and time loss from work [4].

Nosocomial infection continues to be a burden to the world health care system through increased risk to patients and employees. These infections have tremendous health and financial costs with an estimated incidence of 2,000,000 infections per year, 20,000 deaths per year and added costs of billion dollars per year. Effective infection control programs are essential to controlling and preventing nosocomial infection [5,6].

#### Aims:-

To determine the prevalence of occupational nosocomial skin infections among the nursing staff in Baqubah teaching hospitals and to assess the factors responsible for non-compliance of infection control measures among nursing staff.

#### Patients and Methods:-

A cross-sectional study was carried out at two teaching hospitals in Baqubah city (Baqubah and Al-Batool teaching hospitals) over a period from 1<sup>st</sup> September 2015 to 31<sup>st</sup> of March 2016. Special questionnaires were used to determine the prevalence of nosocomial skin infections among 200 nurses who worked at the two hospitals were chosen randomly. The questionnaires were administered by using face-to-face interviews. The questionnaires were designed and constructed by the researcher including (occupational and demographic variables; age, gender, departments, uses of personal protective measures, hand hygiene, risk factors of nosocomial skin infections) and dermatological examination was performed by a dermatological specialist. To describe and analyze the findings of the study, the statistical means used were: Mean, Frequency and percentage as descriptive statistics and Chi-square as inferential statistics. All data were recorded and analyzed using SPSS 20, and  $p < 0.05$  was considered statistically significant.

#### Results:-

The prevalence of occupational nosocomial skin infections was (53/200) (26.5%) and it was most common in Baqubah teaching hospital (68%) in medical ICU and (64%) in surgical departments. The majority of cases were infected with scabies (73.5%), other infections; fungal infection (15%), while pediculosis, warts, molluscum contagiosum each one compose (4%) of infections. High prevalence was among males (62%), with age group more than 35 years old (47%), with bad hand hygiene (41%).

**Table 1** shows that the higher percentage of nosocomial skin infections were among males (62%) and (85%) of them in Baqubah teaching hospital and (15%) of them were in Al-Batool teaching hospital, while the female compose (38%). This result was statically highly significant ( $p < 0.001$ ).

**Table 1:-** Distribution of Nosocomial skin infections (NCSI) in the two hospitals according to the gender.

Gender	Name of hospital				Total		P-value
	Al-Batool		Baqubah				
	No	%	No	%	No	%	
Male	5	15%	28	85%	33	62%	$p < 0.001$ (HS)
Female	12	60%	8	40%	20	38%	
Total	17	32%	36	68%	53	100%	

$df=1, \text{cal}\chi^2 = 37.72, \text{tab}\chi^2 = 3.841, P = < 0.001$ , which is highly significant



Table 2 shows that the percentage of NCSI is higher in the age group more than 35 years old(47%), the result was statically highly significant (p <0.001).

Table 2:- Distribution of Nosocomial skin infections (NCSI) according to the age.

Age	NCSI				Total		p-value
	Yes		NO		No	%	
	No	%	No	%			
<25 yrs	5	10%	47	90%	52	26%	
26-30	18	35%	33	65%	51	25.5%	
31-35	8	16%	42	84%	50	25%	
>35	22	47%	25	53%	47	23.5%	p<0.001(HS)
<b>Total</b>	53	26.5%	147	73.5%	200	100%	

df=3, cal  $\chi^2 = 20.485$ , tab  $\chi^2 = 3.815$ , P=<0.001, which is highly significant

Table 3 show that the prevalence of nosocomial skin infections (53/200) was (26.5%) with high prevalence of scabies (39/53) was (73.5%) and more in medical ICU(68%) and surgery (64%) departments; other infections (15%) fungal infection, while pediculosis, warts, molluscumcontagiosum each one compose (4%).

Table 3 : Distribution of Nosocomial skin infections (NCSI) according to the departments.

Types of NCSI												
Department	Scabies		Fungal infection		Pediculosis		Warts		Molluscum Contagiosum		Total	
	No	%	No	%	No	%	No	%	No	%	No	%
Medicine												
ICU	11	68%	2	12.5	1	6	/	/	2	12.5	16	30
Surgery	11	64%	4	24	/	/	2	2	/	/	17	32
Gynecology	5	100%									5	10
Pediatric	9	75%	2	17	1	8	/	/	/	/	12	23
Orthopedic	3	100%									3	5
<b>Total</b>	39	73.5%	8	15%	2	4%	2	4%	2	4%	53	100%

Table 4 shows that the distribution of NCSI was (28%) among those not using personal protective measures, the result was statically of no significant (p>0.05).

Table 4: Distribution of Nosocomial skin infections (NCSI) according to the use of personal protective measures.

Use of personal protective measures	NCSI				Total		p-value
	YES		NO		No	%	
	No	%	No	%			
USE	3	15%	17	85%	20	10%	p>0.05(NS)
NO USE	50	28%	130	72%	180	90%	
<b>Total</b>	53	26.5%	147	73.5%	200	100%	

df=1, cal  $\chi^2 = 1.1$ , tab  $\chi^2 = 3.841$ , P>0.05, which is of no significant

Table 5 shows that the distribution of NCSI was (41%) in those with bad hand hygiene and this result was statically of high significant p<0.0001.

Table 5:- Distribution of Nosocomial skin infections(NCSI) according to hand hygiene.

Hand Hygiene	NCSI				Total		p-value
	Yes		NO		No	%	
	No	%	No	%			
Good	6	7%	79	93%	85	43%	p<0.0001(HS)
Bad	47	41%	68	59%	115	57%	
<b>Total</b>	53	26.5%	147	73.5%	200	100%	

df=1, cal  $\chi^2 = 111.07$ , tab  $\chi^2 = 3.841$ , P=<0.0001, which is highly significant

**Table 6** shows that (84%) of cases of NCSI are among those working overtime. This result was statically of no significant ( $p > 0.05$ ).

**Table 6 :** Distribution of Nosocomial skin infections (NCSI) according to the risk factors.

NCSI	Presence of risk factor						Total		P-value
	Chronic diseases		working overtime		Obesity				
	No	%	No	%	No	%	No	%	
YES	1	2%	36	84%	6	14%	43	36%	P>0.05(NS)
NO	4	5%	55	71%	18	24%	77	64%	
<b>Total</b>	5	4%	91	76%	24	20%	120	100%	

df=2, cal  $\chi^2 = 2.186$ , tab  $\chi^2 = 5.991$ ,  $P > 0.05$ , which is of no significant

### Discussion:-

This study showed that, The prevalence of nosocomial skin infections was (26.5%) and it was most common in Baqubah teaching hospital (68%). High percentage of cases were infected with scabies (73.5%), mostly among males (62%) and (47%) of them were (>35) years old, with bad hand hygiene (41%). This reflects obviously low awareness of health care, inappropriate and inadequate health services, bad sanitation of hospital environment and bad nursing staff hygiene and not using personal protective measures.

The result of this study shows that the prevalence of scabies (73.5%) was high, which agree with other studies done in Canada, 25% reported cases of scabies among their residents during a 1-year period [7]. Over a 1-year period, 17% of Michigan's nursing homes reported scabies in the facility. In Oslo, Norway three scabies outbreaks occurred in three nursing homes over a period of 6 months [8]. The close contact between staff and residents and between visitors and residents in nursing homes may contribute to a repetitive and prolonged duration of scabies outbreaks. [9–10].

In relation to gender, most of nurses in this study (62%) were male; as the number of nursing staff (mainly of male gender) especially in the night shift, taking care of the patient unit or environment as an important aspect of patient care. This finding comes along with result obtained from study done in Baghdad [11].

The present study explores that high prevalence of hospital acquired skin infections were in medical ICU and surgical department more than other departments. This study agree with studies done in India, Serbia, Switzerland and Spain [12-15].

This study show that the prevalence of nosocomial skin infections was higher among the nursing staff not using the personal protective measures, disagree with the findings of a study done by Okechuku, in Nigeria which revealed that health care workers always used gloves when they anticipated contact with body fluids, non-intact skin and mucus membranes [16].

The result on lack of knowledge of hand washing among nurses for the prevention of nosocomial skin infections. The above result agree with study conducted by Idang N. Ojonget al in Nigeria [17].

This study shows the risk factors of nosocomial skin infection was not statistically significant, disagree with study done in Kampala, Uganda [18].

### Conclusions:-

We conclude that scabies were the most common occupational nosocomial skin infections among the male nursing staff with age group more than 35 years old, with bad hand hygiene, those working in Baqubah teaching hospital.

### Recommendations:-

1. Training and re-training is necessary to increase nurses' knowledge toward nosocomial skin infections, immunization, improved hygiene, particularly hand washing.

2. *Infection control should be incorporated into the curriculum of medical/dental students, student nurses and other paramedical. Enhance or develop the qualification of nursing staff.*
3. *further research in the health care providing especially nursing staff are directed to prevent and control the acquisition of nosocomial skin infections.*

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**Conflicts of Interest:** None.

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### RESEARCH ARTICLE

#### NETWORK LIFETIME EXTENSION SCHEME USING MULTIPATH ROUTING IN FLOODING ATTACK DETECTION OF WIRELESS SENSOR NETWORKS.

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Wireless sensor networks, Network security, Multipath routing

#### Abstract

A malicious attacker can exploit a vulnerability of a sensor node within a wireless sensor network to easily create a compromised node and attack the sensor network. The main purpose of a flooding attack, which is one kind of denial of service (DoS) attack, is to shorten the lifetime of the sensor network by exhausting the energy of the compromised node and of other sensor nodes along the path to the base station (BS). Existing security schemes to protect against flooding attacks do not take into account the amount of energy remaining in each sensor node. Therefore, in the case where the sensor network was installed long ago and its nodes have little remaining energy, such schemes are unsuitable because they are likely to completely drain individual nodes. In this paper, we propose a security scheme that includes multipath routing to reduce the load on each sensor node and thereby increase the sensor network lifetime. Experimental results herein confirm that the proposed scheme extends the network lifetime, increasing the energy efficiency of one sensor node included in the path by 40% compared with an existing scheme and reducing the number of exhausted sensor nodes by more than 60%.

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#### Introduction:-

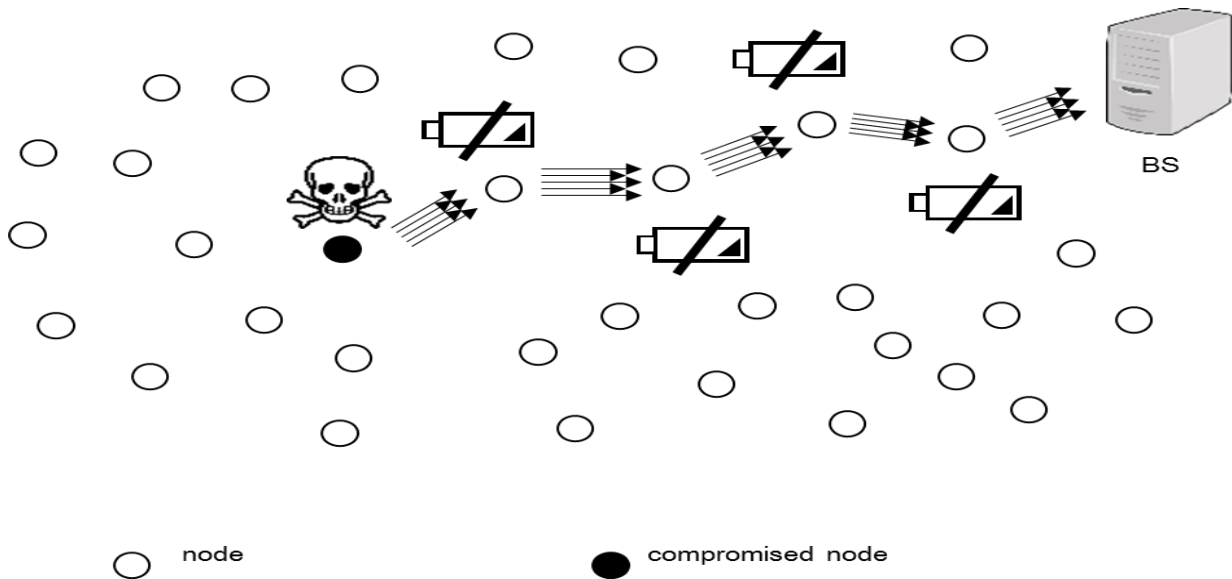
A wireless sensor network (WSN) consists of a number of small sensor nodes that detect events and a base station (BS) that receives and analyzes data collected by the sensor nodes. WSNs are deployed in areas that are hard to reach or where information needs to be received in real time. When a relevant event occurs in the region where the WSN is deployed, the sensor node located closest to the region is selected as the source node, and the event is detected. The source node collects the detected event information, generates an event packet, and transmits the event packet to the BS [1]. However, sensor nodes are vulnerable to attack because they have limited computing power, low energy, and use wireless communication. Using these vulnerabilities, an attacker can easily compromise a node. Using a compromised node, attackers can subject the sensor network to various attacks such as eavesdropping or other attacks that do not yield important event messages in the network. Typical attacks include denial of service (DoS), selective forwarding, sybil, sinkhole, and wormhole attacks [2-4]. Security techniques that can detect or prevent attacks continue to be studied. In this paper, we propose the energy efficiency of each node and the lifetime extension of the sensor network when a flooding attack, which is one kind of DoS, attacks the sensor network. The rest of this paper is organized as follows. Section 2 describes flooding attacks and multipath routing. Section 3

explains the proposed scheme including multipath routing, and Section 4 presents experimental results and analysis of the existing and proposed schemes. Section 5 presents our conclusions and future plans for this work.

### Related Works:-

#### Flooding attack:-

WSNs are mainly deployed in open environments. Therefore, a malicious attacker can easily damage a sensor node and attempt various attacks on the sensor network using the compromised node. The flooding attack, which is one kind of DoS attack, is an attack on the network layer of the sensor network. In a flooding attack, a continuous false event is generated to paralyze the network and exhaust the energy of the sensor nodes included in the path, thereby shortening the sensor network lifetime. In general WSN communication, when an event occurs, the sensor node closest to the event area collects data on the event and is selected as the source node. This source node creates a packet containing the event information, selects the shortest path to the BS, and sends the event through the network to the BS. However, in a flooding attack, the malicious attacker uses the compromised node to forward false event packets to the BS. The sensor nodes included in the path send and receive false event packets, thereby consuming energy continuously. The network lifetime is shortened when the energy of a sensor node included in the path is exhausted.



**Fig. 1:-**Flooding attack

After this, even if an important event occurs, a sensor node whose energy is exhausted due to a flooding attack may be included in the path but cannot transmit to the BS.

#### Multipath routing:-

When single-path routing is used, the node included in the path set by the nature of the sensor network carries the load. For this reason, when a flooding attack occurs, the energy of the sensor node can be easily exhausted. One way to solve this problem is to use multipath routing [5-6]. Multipath routing is a method of establishing multiple available routes and forwarding packets to the BS. In this type of routing, packets are routed in a distributed manner that more evenly distributes the load among sensor nodes. In this way, the energy efficiency of each sensor node included in the path is increased, and the lifetime of the sensor network is extended.

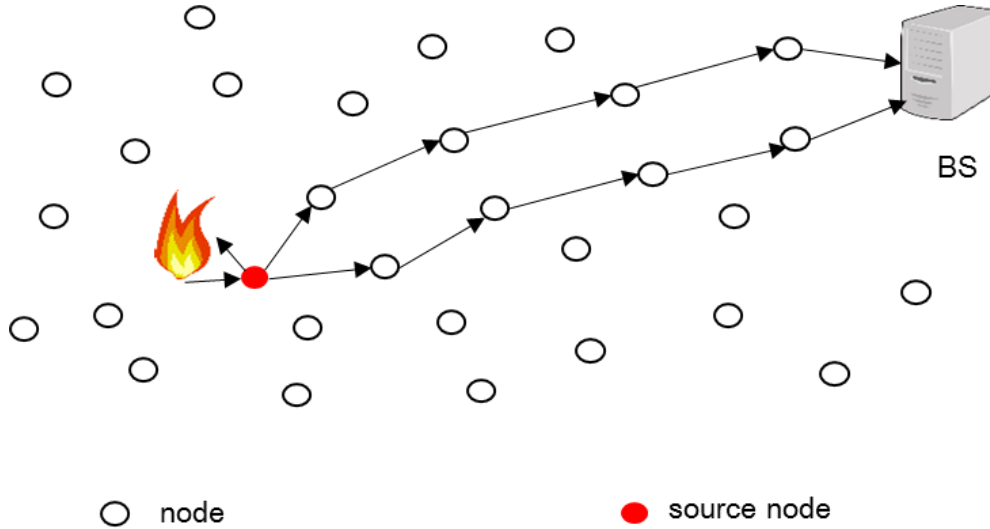


Fig. 2:-Multipath routing

Multipath routing configurations of sensor networks are divided into various types depending on the number of nodes arranged in the sensor field and their density. Typical multipath routing schemes are divided into three types: those based on node-disjoint paths, link-disjoint paths, and partially disjoint paths. In the node-disjoint path scheme, data is transferred using different paths. If a sensor node or link has a problem, only the path to which the corresponding node or link belongs is affected. In the link-disjoint path scheme, backup links exist, but all paths include at least one common sensor node in the path. The problem with this scheme is that the entire path can be affected when a problem occurs in that one common sensor node. Finally, in the partially disjoint path scheme, each data transmission path includes multiple paths resistant to the failure of any single node or link. Multipath routing can be more reliable than single-path routing but also has drawbacks. The number of hops may be greater than in the case of single-path routing. Thus, the network may consume more energy overall when multipath routing is used.

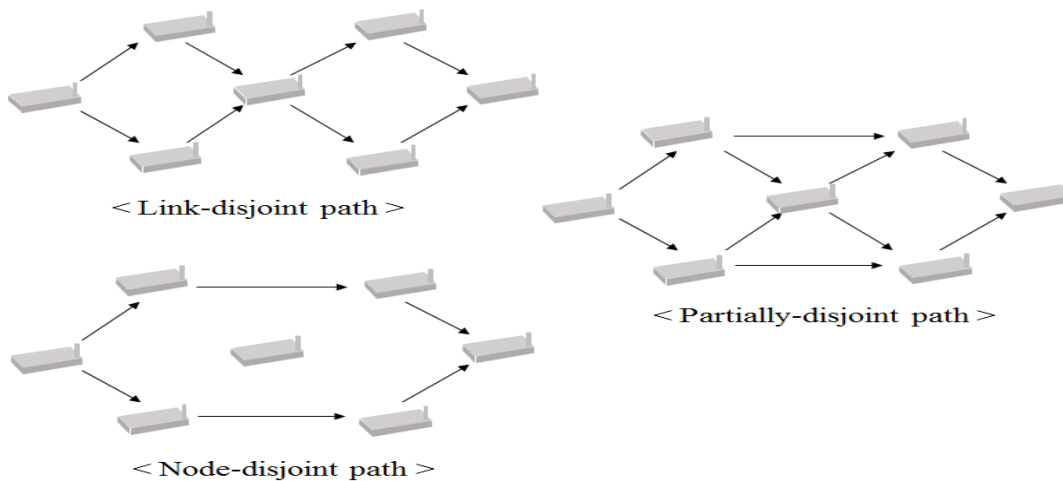


Fig3:-Multipath routing types

**Proposed Scheme:-**

When a WSN is subjected to a flooding attack, a large number of packets are transmitted to the BS, which can allow detection of the attack. However, because many packets are sent in a short time, the nodes in the path may consume a great deal of energy before verification can be completed at the BS. Once a WSN is configured, the sensor nodes are typically not recharged. Thus, the older is the WSN configuration, the less energy there is remaining in each sensor node. For this reason, we propose a multipath routing scheme to increase the energy efficiency of each sensor

node and increase the lifetime of the sensor network. The proposed scheme compares the lifetime of the sensor network in flooding attack occurring in single-path routing and multipath routing and the energy efficiency of the sensor node included in the path.

In the present work, we used a grid-based cluster routing environment to model single-path and multipath WSN routing schemes. The energy of each node in the sensor field was set to 1/100 of the initial energy of the sensor node to indicate that the WSN configuration was out of date. Each node consumed 16.25  $\mu$ J and 12.25  $\mu$ J per byte when transmitting and receiving, respectively. False event packets were large TinyOS packets of 29 bytes each [7]. The chosen detection scheme adapted the algorithm of Flooding Attack Prevention (FAP) to detect a flooding attack in the ad-hoc network for use in the sensor network [8].

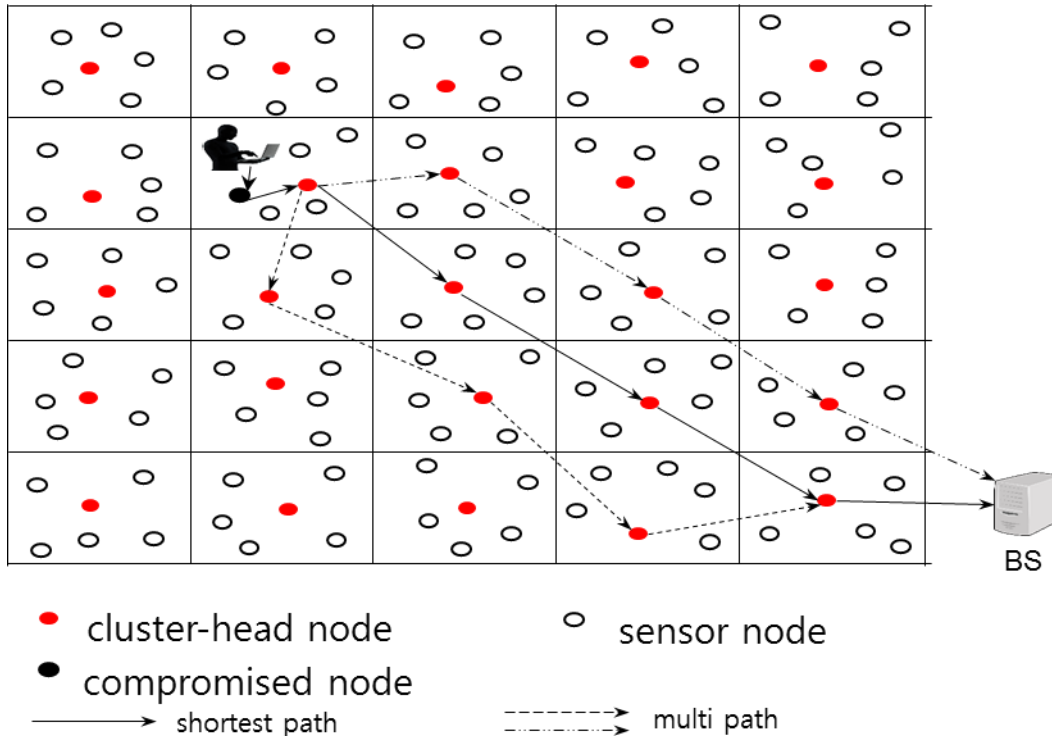


Fig4:- Flooding attack in multipath routing

**Algorithm 1:-** Detection of flooding attack by the BS

- Step 1.** Collect events from the source node.
- Step 2.** Check the source ID in the cluster head node and compare it to source IDs contained in the blacklist.
- Step 3.** Check the forwarding time and source ID of the packet delivered to the BS.
- Step 4.** Increase the flooding attack count (FAC) if the previous and present packets equal source node IDs and the packet arrival times differ by 1 second or less.

**Algorithm 2:-** Attack detection and blocking

- Step 1.** If the FAC exceeds a threshold value, this signals a flooding attack.
- Step 2.** The BS determines the node originating the attack, adds that node's ID to the blacklist, and forwards the blacklist to the cluster head node.
- Step 3.** The cluster head node receives the blacklist from the BS and drops transmissions from any source node on the list.
- Step 4.** The BS resets the FAC to zero.

Fig. 5 shows a flowchart of the overall algorithm.

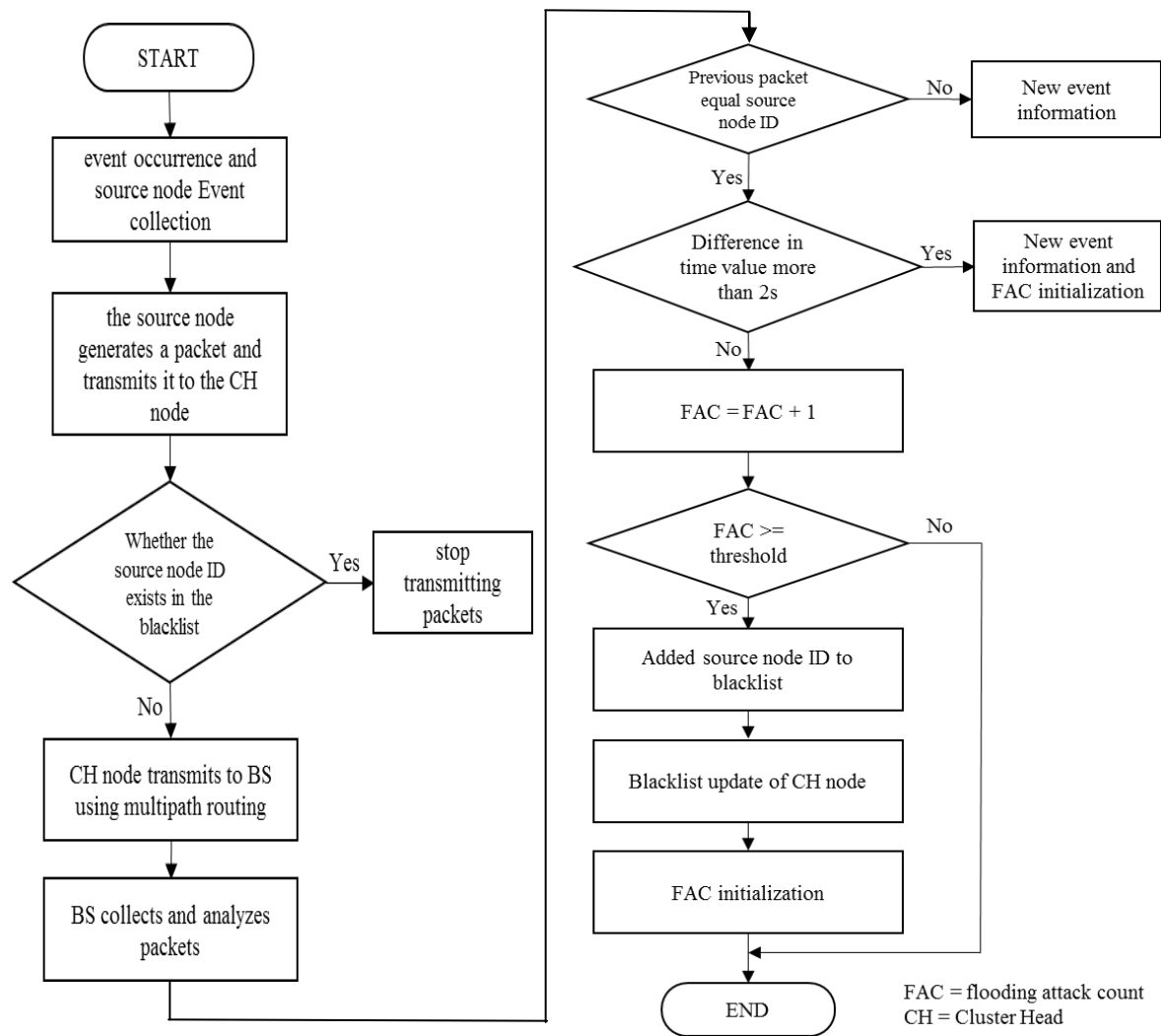


Fig. 5:- Algorithm flow chart

**Experimental Results:-**

The proposed scheme was implemented using C++. Table 1 lists the parameters used in the experiments.

**Table 1:-**Sensor network parameters

Item	Value
Sensor field size	200 × 200
Number of sensor nodes	100
Number of cluster head nodes	25
Sensor node type	Mica2
Transmission range	150m

The FAC threshold of 15 was used in the experiments. Also, the probability of successful packet delivery was set to 96%. The number of flooding attacks was set to 10, 20, and 30. The sensor network lifetime for each case was analyzed based on the results.



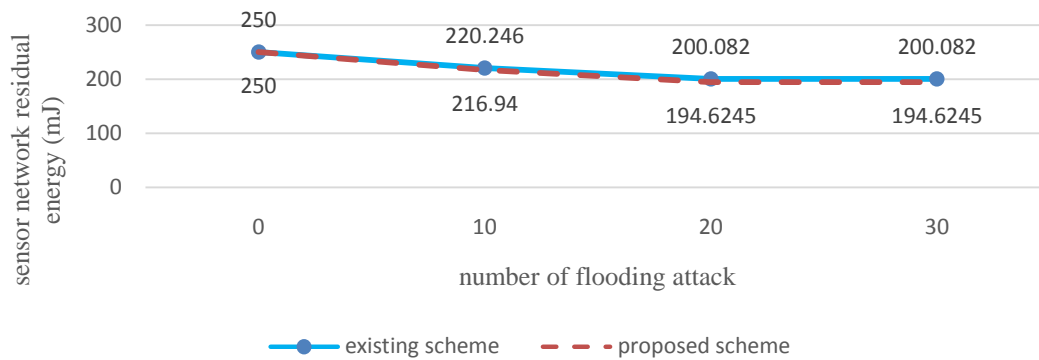


Fig. 6:-Sensor network residual energy after flooding attack

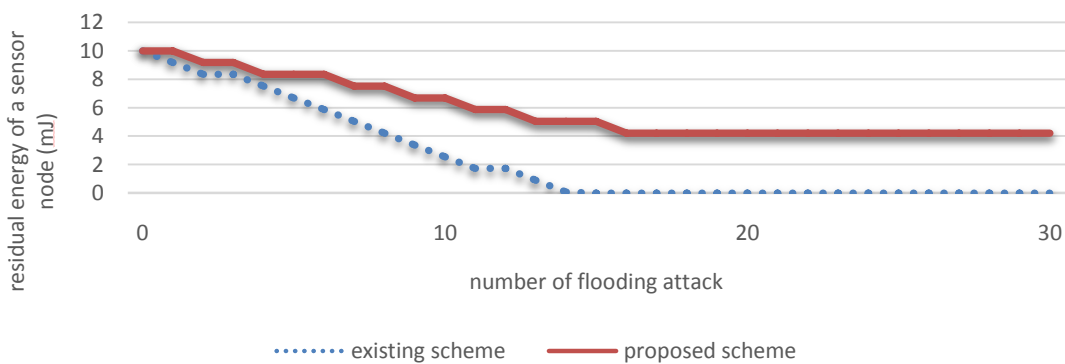


Fig. 7:-Residual energy of one sensor node included in the path after various numbers of flooding attacks

In the modeled flooding attack experiments, the proposed scheme consumed slightly more energy overall throughout the sensor network (Fig. 6). The reason for this is that more hops between the source node and the BS were used in the proposed multipath routing scheme. However, under the proposed scheme, the energy consumption was spread more evenly throughout the network. Thus, the proposed scheme avoided the exhaustion of some single nodes that would have been completely exhausted of energy under the existing scheme during an attack, and flooding attacks of 15 packets and more were detected and stopped, thereby avoiding further energy consumption (Fig. 7).

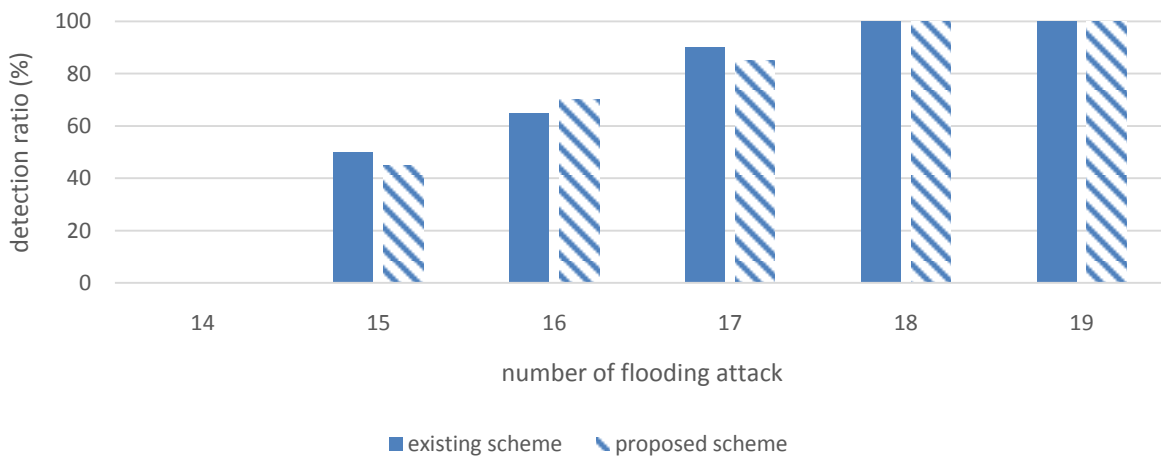


Fig. 8:- Flooding attack detection ratios

The existing and proposed schemes had similar attack detection ratios (Fig. 8). Both schemes detected all flooding attacks numbering 18 or more.

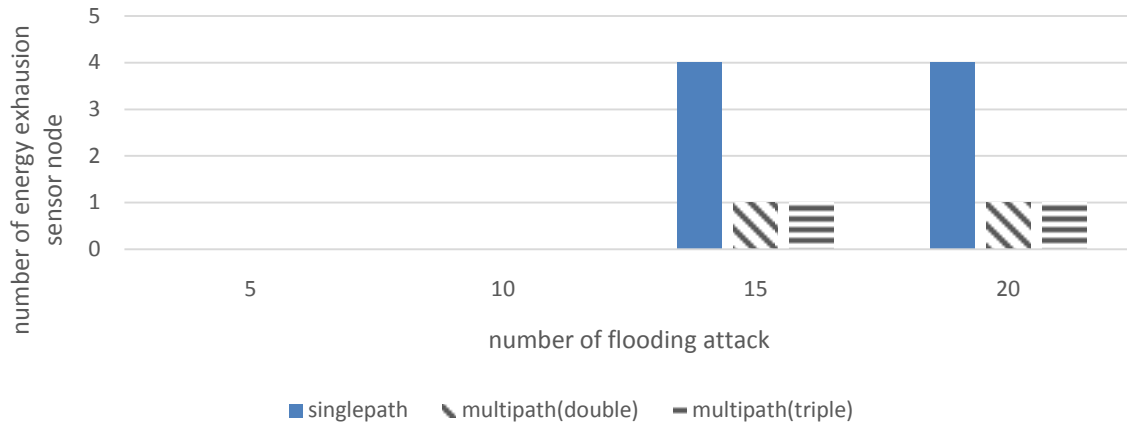


Fig. 9:-Number of exhausted sensor nodes after the flooding attack

Analysis of the experimental results showed that the energy of the cluster head node of the cell containing the compromised node was exhausted in the case applying proposed scheme. In the existing scheme, the proposed scheme includes depleted sensor nodes and additionally depletes the energy of the cluster head nodes included in the path. Therefore, the energy consumption of the sensor node is lower when the proposed scheme is used. The number of sensor nodes that are depleted of energy depends on the location of the compromised node. However, when comparing the existing scheme with the proposed scheme, the proposed scheme reduces the number of exhausted energy sensor nodes. The number of exhausted sensor nodes is the same when using either twopaths orthreepaths (Fig. 9); therefore, double path routing is sufficient for the present detection scheme. When the energy of a cluster head node is depleted, it is replaced with a sensor node having the mostenergy among thoseremaining in the cell. However, if the other sensor nodes in the cell have littleor no remaining energy, the cluster head nodes cannot be replaced. Therefore, other sensor nodes included in the path will be depleted of energy before the flooding attack is detected. Then, even if an important event occurs later, the sensor nodes will be exhausted and thus unable to transmit data.

**Conclusions:-**

In this paper, we proposed a scheme to detect flooding attacks in WSNs, including multipath routing to reduce the load on sensor nodes and extend the network lifetime. In a flooding attack, an attacker uses a compromised node to transmit many false packets to the sensor network, depleting the energy of the sensor nodes included in the path to the BS and shortening the lifetime of the sensor network. Existing schemes to detect flooding attacks include the use of single-path routing, but this results in high energy consumption at individual nodes, which is a problem in old networks whose individual nodes have little remaining energy. The proposed scheme includes multipath routing to distribute the energy consumption among sensor nodes, increasing energy efficiency and thus the overall network lifetime. Future work is needed to reduce the energy consumption of the cluster head nodes located in the same cell as the compromised node and that of cluster head nodes located in other cells along the path to the BS.

**Acknowledgements:-**

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### **RESEARCH ARTICLE**

#### **INTRAVENTRICULAR CENTRAL NEUROCYTOMA- A NEUROSURGICAL ENIGMA.**

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#### **Abstract**

**Introduction:** Almost 30 years after recognition as histologically distinct tumors, neurocytomas remain enigmatic. Central neurocytomas are rare intraventricular tumors that arise from neuronal cells of septum pellucidum and represent 0.1-0.5% of primary brain tumors. Although they are relatively benign tumors, they have been classified as WHO grade 2 tumors.

**Materials and methods:** Here we are reporting 2 cases of this rare enigmatic entity. Case 1: 25 year old female presented with headache, vomiting, giddiness and transient blurring of vision since 1 month. On MRI, lesion was in frontal horn of left lateral ventricle. Patient was operated by trans-cortical transventricular approach and tumor was excised. Histopathology sections revealed features of central neurocytoma. Patient had no recurrence at the end of 12 month follow-up. Case 2: 38 year old male presented with headache, frequent falls, decreased vision and vomiting since 2 months. MRI studies revealed solid cystic lesion in the body of right lateral ventricle. Shunt surgery was performed and followed by trans-cortical transventricular excision of tumor. Histopathology showed features of central neurocytoma with some degree of anaplasia. This patient underwent radio-therapy and there was no recurrence of the tumor at the end of 1.5 year follow-up.

**Conclusion:** Central neurocytomas are rare entities and are classified as WHO grade 2 tumors. Early diagnosis and treatment are imperative as patients with these neoplasms are potentially salvageable.

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#### **Cases:-**

##### **Case 1:-**

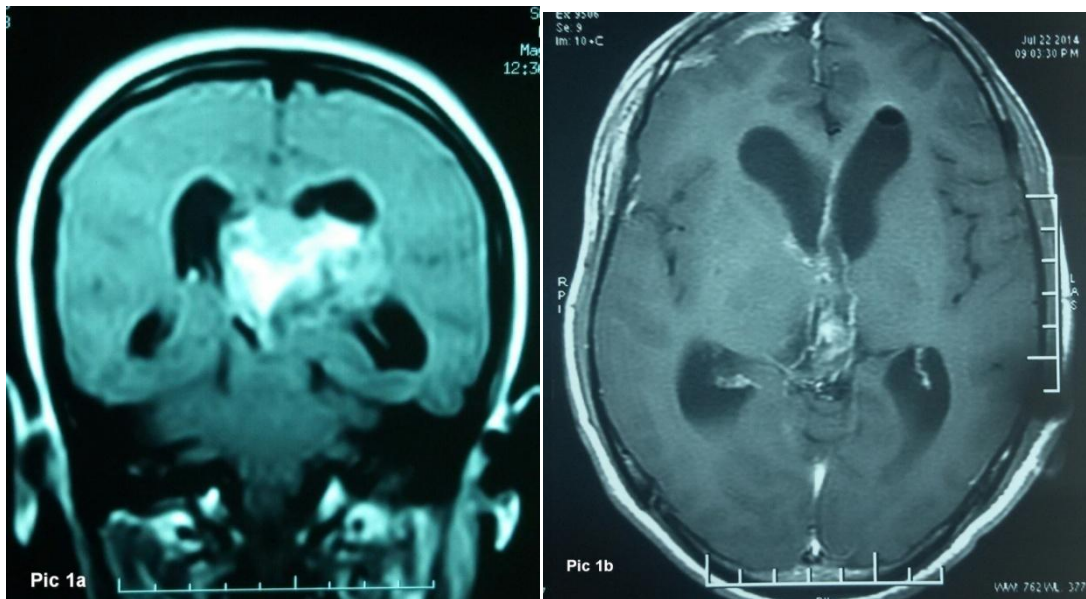
35 year old married right handed female patient presented to us with chief complaints of headache, giddiness, transient blurring of vision of both the eyes and vomiting since 1 month. Headache was dull aching intermittent type and more during morning hours and relieved partially by bout of projectile vomiting. Patient had occasional episodes of blurring of vision in both eyes which was sudden in onset and relieved

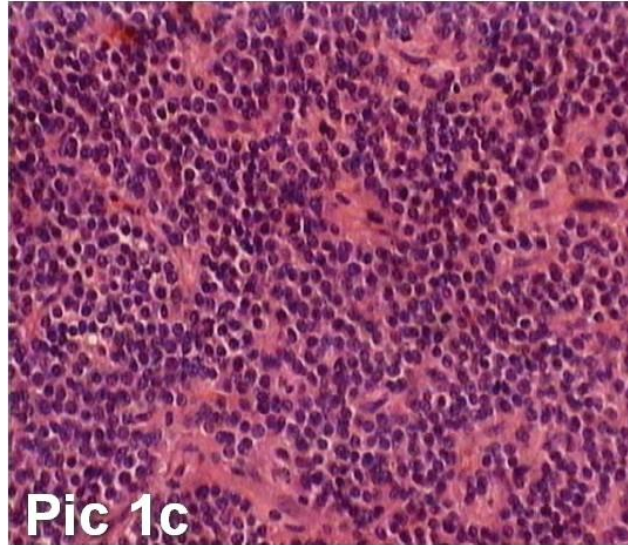
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spontaneously. There was no history of convulsions, ear discharge, loss of consciousness and trauma. no significant past and personal history. On examination, patient was drowsy and not fully oriented to time place and person. Patient was able to follow verbal commands and speech was normal. Ophthalmological evaluation revealed bilateral vision 6/36 and features of early papilloedema were present. There were no cranial nerve deficits. Her motor and sensory examination was essentially normal. Bowel and bladder were continent. Contrast computed tomography study showed well defined inhomogeneously enhancing lesion in left lateral ventricular region measuring 5.9\*4.5\*4.0 cms with areas of calcifications and cystic changes with hydrocephalus. Ventriculo-peritoneal shunt was immediately performed followed by contrast magnetic resonance imaging (Pic 1A) was done which showed 5.7\*5.1\*4.0cms lesion at septum pellucidum extending both in lateral and third ventricle, more in left lateral ventricle which showed patchy dense enhancements with no definite wall or sub-ependymal infiltration of the mass. In this patient left posterior parietal craniotomy was done and under ultra-sound and brain lab guided microscopic assisted trans-cortical trans-ventricular near total excision of tumor was performed. Hisopathology (PIC: 1c) showed ovoid to fusiform cells with cytological atypia. Cells were uniformly monotonous and with single nuclei with perinuclear halo. Delicate fibrillary matrix with plexiform arcade with occasional mitosis and no evidence of necrosis s/o central neurocytoma. This was confirmed by immunohistochemical staining which showed positive for neuron specific enolase, synaptophysin and GFAP antibodies. Postoperative period was uneventful and patient was discharged on 12th post-op day with no residual weakness. Patient was followed up regularly and there was no recurrence of tumor at the end of 1 year follow-up.

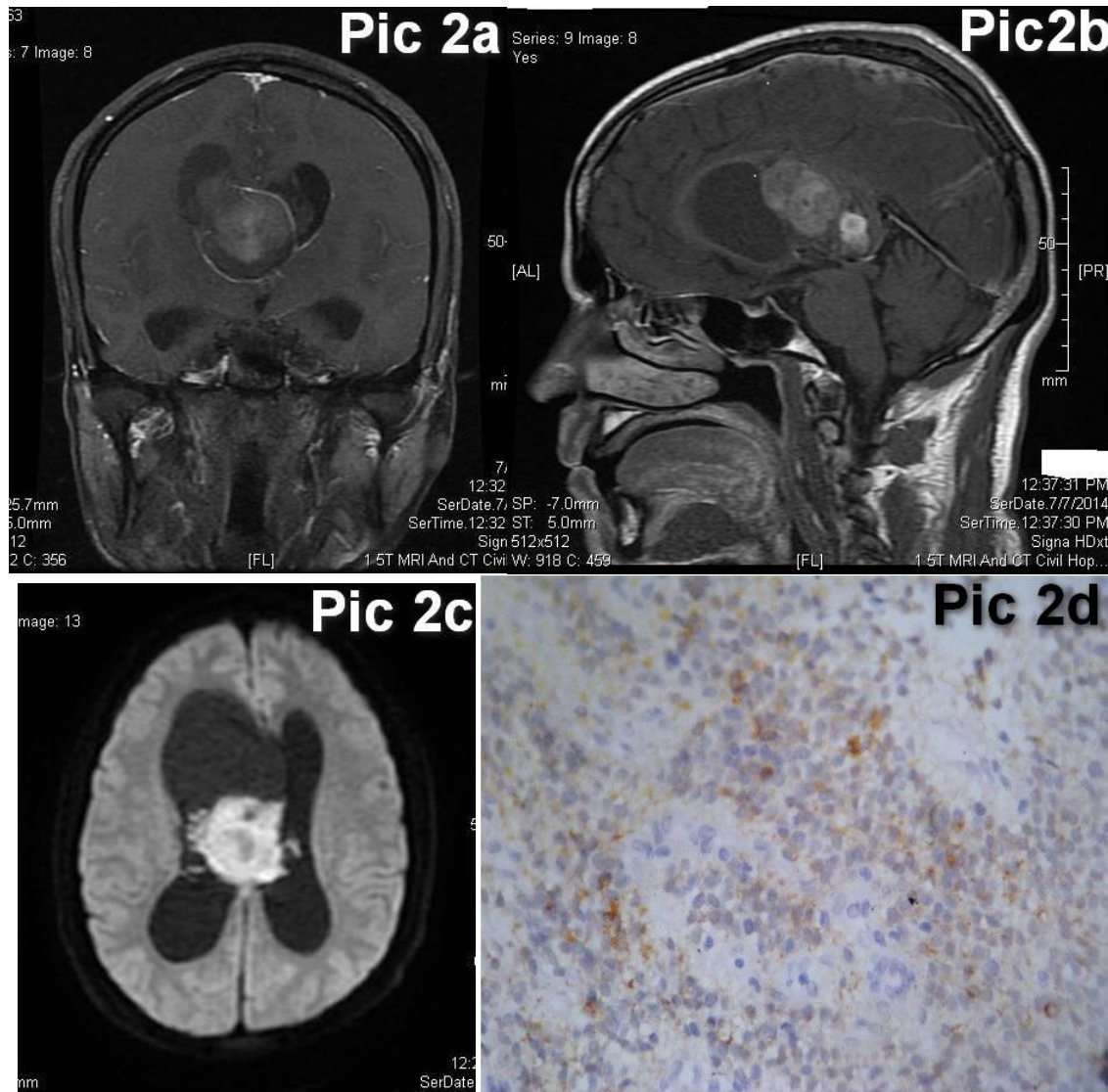
PIC 1A:



**Case 2:-**

38 year old male patient presented with chief complaints of headache, vomiting, convulsions and frequent falls with giddiness since 1 month. Headache was intermittent dull aching type. Patient had 3 episodes of generalized tonic clonic seizures since 1 month. Patient had recurrent attacks of giddiness and blurring of vision and frequent falls since 1 month which increased in past 15 days. On examination patient was drowsy and following verbal commands on repeated asking with slurred speech. Ophthalmological evaluation showed signs of established papilloedema. Cranial nerve examination was normal and there was no sensory and motor deficits. Contrast CT scans showed right lateral ventricle body solid cystic mass lesion abutting septum pellucidum with hydrocephalus. Ventriculo-peritoneal shunt surgery was performed. MRI contrast studies showed 3.3\*3.4\*3.5 cms solid cystic intraventricular lesion in the body of right lateral ventricle abutting septum pellucidum and obstructing foramen of munroe causing ballooning and out-trapped frontal horn of right lateral ventricle(Pic 2a,2b). The lesion showed solid with few internal cystic areas with few foci of internal calcifications with heterogenous contrast enhancements. In This patient right temporo-parietal craniotomy was done and ultra-sound guided microscope assisted near total excision of tumor was performed. Patient had moderate intraventricular hemorrhage in the immediate post operative period for which external ventricular drainage was done for 5 days. Patient had no residual weakness and sensorium improved at the end of 15th post operative day. Histopathology(Pic 2d) showed uniformly round cells with hyperchromatic nuclei and peri-nuclear halo with fibrillary matrix. Few cells showed anaplasia. Immunohistochemical assay showed positivity for synaptophysin and neuron-specific enolase s/o central neurocytoma. Patient was discharged on 5th post operative day and was followed up regularly. In the view of anaplasia , patient was given radiotherapy. Patient had no recurrence at the end of 1.5 year follow-up.





### Discussion:-

Central neurocytomas are a rare intraventricular tumors representing 0.1-0.5% of all primary brain tumours.<sup>1</sup> Almost 30 years after recognition as histologically distinct tumors, neurocytomas remain enigmatic<sup>2</sup>. Because of advanced imaging techniques and developments in immune-histochemical techniques more and more of these tumors are being diagnosed recently. The majority of central neurocytomas grow inwards into ventricles forming intraventricular neurocytomas. This leads to primary symptoms of blurred vision and features of increased intracranial pressure as in our cases. Treatment for a central neurocytoma typically involves surgical removal, with 1 in 5 chance of recurrence<sup>3</sup>. Central neurocytomas are classified as a grade II tumor under world health organization tumour grading<sup>4</sup>.

### Historical perspective:-

Central neurocytoma is an uncommon neuro ectodermal tumor of young adults, usually situated in the lateral ventricles at the foramen of Monroe, and was first individualized by Hassoun et al<sup>5</sup>. In 1985, Wilson had also described a rare case of "differentiated neuroblastoma" in the lateral ventricle that resembles oligodendroglioma on light microscopy. However, the name central neurocytoma was given by Hassoun<sup>6</sup>. Neurocytomas were probably historically misdiagnosed as intraventricular oligodendroglioma or clear cell ependymoma prior to this. With its non-aggressive behavior the tumor has often been called "benign central neurocytoma". It is believed to occur in young adults from the neuronal cells of the septum pellucidum and the subependymal cells of the lateral ventricles.

Initially these were reported to be benign. However, as more information was gathered the name benign central neurocytoma was started to be seen as a double misnomer because these tumors are not always benign nor centrally located. Many recent studies suggest that their location, biological potential and clinical behavior are observed to be more variable than previously thought. Recent studies indicate their uncommon location, aggressive biological behavior and frequent recurrences following after surgical resection have generated significant interest in various treatment modalities and also in their terminology, lineage potential and molecular regulation<sup>6</sup>.

**Epidemiology:-**

CNC represent 0.1-0.5% of primary brain tumours<sup>7</sup>. There is a genetic predisposition of these tumors in people of Asian origin<sup>8</sup>. Central neurocytomas predominantly occur in young adults, most commonly during the second or third decade of life. In our study both the patients presented during 3<sup>rd</sup> decade of life. There is no sex predilection<sup>9</sup>.

**Pathology:-**

Grossly these tumors are grayish in color, resembling the gray matter that comes with areas of hemorrhage. The tumors are soft, lobulated to nodular masses that are generally well circumscribed. Some variants exhibit calcifications<sup>10</sup>.

Tumor samples examined under the microscope revealed that these are well-differentiated tumors with benign histological features. The tumor is composed of uniform, small-to-medium-sized cells with rounded nuclei, finely stippled chromatin and inconspicuous nucleoli, along with scant cytoplasm. These are characterized by perivascular pseudo-rosettes, circular/flower-like arrangements of cells with a small blood vessel at the center, and polygonal small cells with a clear perinuclear halo, sometimes called the 'fried egg' appearance and is clear or slightly eosinophilic. The main differential diagnosis is oligodendroglioma<sup>11</sup>. While the tumor cells are dense in some areas, areas with anuclear, less dense tumor parts were dispersed throughout. The anuclear areas may have a fine fibrillary matrix, like that of neuropil regions. Long, thin-walled, capillary-sized vessels represent the vascularity of these tumors. These vessels are arranged in a linear branching pattern, with an endocrine appearance. Thin-walled dilated vascular channels, as well as foci of calcification, were readily identified in many cases.<sup>10</sup> In our cases both the patients had common feature of uniformly round cells with perinuclear halo with fibrillary matrix. (Figure 1)

Strong immune-staining for synaptophysin has been recognized as the most suitable and reliable diagnostic marker (Figure 2). Typically, synaptophysin immunoreactivity is noted in the neuropil, especially in fibrillary zones and perivascular cell-free areas, and not in the cell bodies of normal neurons<sup>10</sup>. Tumor cells have been reported to express neuron-specific enolase. Immunostaining for synaptophysin and neuron-specific enolase confirm the neuronal nature of the neoplasm. Neuronal nuclear antigen expression is generally associated with tumor cells displaying terminal neuronal differentiation and is often helpful in resolving ambiguous synaptophysin staining. The significance of GFAP reactivity in tumor cells is difficult to explain, but *in vitro* experiments with neurocytomas have shown a shift from synaptophysin to GFAP expression with cell passages<sup>11</sup>. It has been suggested that CN originates from bipotential (neuronal and astrocytic) progenitor cells in the periventricular region that persist into adulthood<sup>11</sup>. In our cases cells stained positive for synaptophysin and neuron-specific enolase thus confirming diagnosis of central neurocytomas.

Yasargil *et al.* reported that 2 of the 8 patients had evidence of anaplasia and were treated with post-operative radiation after total excision. In our cases, one patient had some degree of anaplasia and hence was given radiotherapy. This patient had no recurrence at 1 year and 1.5 year follow-up.

The MRI images of central neurocytoma are usually characteristic. Most of them occur as an exophytic, well circumscribed, globular mass that protrudes into the ventricles. Large tumors are not uncommon. Calcifications are common and easily identified by CT scans. Central neurocytomas that arise in the lateral ventricles typically adhere to the septum pellucidum. Hydrocephalus is common. On T2-weighted image, they are isointense to gray matter. Contrast enhancement is common but variable and it can be intense. From the imaging point of view, the differential diagnoses include heterotopia, oligodendroglioma, ependymoma, subependymoma, subependymal giant cell astrocytoma, choroid plexus papilloma, and intraventricular meningioma.<sup>12</sup> (figure 3,4,5,6,7,8,9)

**Clinical features:-**

There is a wide range of symptoms that patients show. Symptoms can lie dormant, but come about due to obstructive hydrocephalus. These include: Headache, blurring of vision, Vomiting, Lightheadedness, Impaired mental



activity, gait instability. In rare and extreme cases, more severe symptoms can be observed: Memory disturbance, dementia, hemiparesis, seizures and hemorrhage<sup>13</sup>. In our cases both the patients had features of obstructive hydrocephalus.

#### **Treatment:-**

The mainstay of treatment is surgical excision<sup>14</sup>. Two adjuvant therapeutic strategies are stereotactic radiosurgery and fractionated convention radiotherapy (FCRT). Both are highly effective means of treatment<sup>7</sup>.

#### **Surgery:-**

Surgical excision of the central neurocytoma is the primary consensus among practicing physicians. Craniotomy is performed. The ability to remove the tumor and to what extent it is removed is dependent upon the location of the tumor and surgeon experience and preference. The extent of the disease plays a large part in determining the effectiveness of surgery. The main goal of a complete surgical resection, of the tumor, can also be hindered by the adherence of the tumor to adjoining structures or hemorrhages<sup>13</sup>. If there is a recurrence of the central neurocytoma, surgery is again the most notable treatment<sup>14</sup>. In our report, both the patients underwent microscope assisted transcortical trans ventricular near total excision of tumor. In one patient, where tumor was in left lateral ventricle, underwent brain lab and ultra-sound guided excision to prevent motor strip injury.

#### **Radiotherapy:-**

There is not much evidence supporting whether radiotherapy is a beneficial and effective means of treatment. Typically, radiotherapy is used postoperatively in respect to whether or not a partial or complete excision of the tumor has been accomplished<sup>15,16</sup>. It is not clear if tumors with anaplasia have a higher relapse rate or if they need additional treatment. Yet it appears that some cases of CNC may be more aggressive despite benign histological feature<sup>2</sup>. The histopathological features of CNC, neuronal differentiation, low mitotic activity, absence of vascular endothelial proliferation, and tumor necrosis, suggest that the tumor may be resistant to ionizing radiation. However, when radiotherapy is used, whole brain or involved-field treatment is given. This method utilizes a standard fractionation schedule and a total tumor dose of 50-55 Gy<sup>13</sup>. One of our cases who had some degrees of anaplasia on histopathology received post operative radiotherapy and patient had no recurrence at the end of 1.5 year follow up. Gamma knife surgery is a form of radiotherapy, more specifically radiosurgery that uses beams of gamma rays to deliver a certain dosage of radiation to the tumor. Gamma knife surgery is incredibly effective at treating neurocytoma and maintaining tumor control after the procedure when a complete excision has been performed.<sup>17</sup> Some studies have found that the success rate of tumor control is around 90% after the first five years and 80% after the first ten years. Gamma knife surgery is the most recorded form of radiotherapy performed to treat remnants of the CNC tumor after surgery.<sup>17</sup>

#### **Chemotherapy:-**

Chemotherapy is typically limited to patients with recurrent central neurocytoma. The course of chemotherapy used for CNC is one of two platinum-based regimes. The two regimes are:

- Carboplatin + VP-16 + Ifosfamide
- Cisplatin + VP-16 + Cyclophosphamide

Because chemotherapy is used in rare cases there is still information to be gathered as to the efficacy of chemotherapy to treat benign CNC. Therefore recommendations must be viewed as limited and preliminary.<sup>18</sup>

#### **Outcome and Recurrence:-**

The majority of patients can be expected to be cured of their disease and become long-term survivors of central neurocytoma. As with any other type of tumor, there is a chance for recurrence. The chance of recurrence is approximately 20%<sup>3</sup>. Some factors that predict tumor recurrence and death due to progressive states of disease are: high proliferative indices, degree of anaplasia, and disseminated disease with or without the spread of disease through CSF<sup>13</sup>.

Long-term follow up examinations are essential for the evaluation of the outcomes that each treatment brings about. It is also essential to identify possible recurrence of CN. It is recommended that a brain MRI is performed between every 6–12 months<sup>2</sup>. In our study, both the cases had no recurrences and no residual neurological deficits at 6 month and 12 month follow-up.

**Conclusion:-**

Central neurocytomas are rare entities and its early diagnosis and treatment is necessary as patients with these neoplasms are potentially salvageable. Effective surgical treatment and accurate histopathological diagnosis are crucial in proper management of these cases. The role of radiotherapy is yet to be fully established. As some of these tumors show anaplasia and in the event of incomplete excision, radiotherapy can be effective in preventing recurrence.

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### RESEARCH ARTICLE

## A MULTI DIMENSIONAL EFFECT OF PANCHAKARMA IN THE MANAGEMENT OF TRAUMATIC PARAPLEGIA – A CASE STUDY.

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#### Key words:-

Traumatic Paraplegia, Kati basti, Patra Pottali sweda, Panchatikta Ksheer basti.

### Abstract

Aim of this study was to assess neurological improvement after administration of Panchakarma procedures in traumatic paraplegia. On the basis of MRI findings, patient was advised for the surgical intervention. As there is no satisfactory treatment available in biomedicine. The patient was treated with Kati basti, Sarvanga abhyanga nadi sweda Patra Pottali sweda, followed by Panchatikta Ksheera Basti (16 days) and shaman oushadhi upto 3 months Substantial improvement was reported after 3 months of Panchakarma and Shaman oushadhi in existing neurological deficits and in quality of life.

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### Introduction:-

Traumatic Paraplegia is an unanticipated catastrophe in an individual's life, passing a huge economic as well as social burden. The health care does not end with time but it involves multiple personnel and family members. In a developing country like India, where tertiary health care is not universally accessible and acceptable, the consequences of traumatic paraplegia and its complications are unimaginable<sup>1</sup>. The prevalence of traumatic paraplegia in India is estimated 236 per million<sup>2</sup>. It can be correlated with the Abhigatajanya Adharangavata<sup>3</sup>. Ayurvedic intervention in terms of Panchakarma and shaman oushadhi may impart significant recovery from traumatic paraplegia<sup>4</sup>. This case report is of a patient with Traumatic paraplegia with lesion at L4-L5, L5-S1 level with spinal canal stenosis, where we achieved substantial recovery with Panchakarma and shaman Yoga.

### Case Report:-

A 53 years old patient came for consultation in Panchakarma OPD of S.S.V.P. Ayurvedic hospital, Maharashtra, India. He was admitted and thoroughly examined. It was revealed that he was unable to move his both lower limbs. He was fully conscious but he was not able to move his lower part of body. Patient had autonomic dysfunction and was neither able to feel nor control the urge for micturation and defecation.

The patient had a history of trauma due to accidental injury happened in the afternoon when he was going to sell his milk 6 months back. After the accident, patient was unconscious for 1 ½ Hrs. and regained consciousness on the way to hospital. He was admitted in I.C.U. for 8 days with administration of other supportive medication. There also patient had incontinence of urine and stool. Patient's MRI was done. This revealed multiple level prolapsed intravertebral discs with spinal canal stenosis L4-L5 and L5-S1 with disc buldge with ligamentum flavum hypertrophy.

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The patient was not getting any response from the treatment and the patient was advised for surgical intervention by neurosurgeon. Recommended physiotherapy was continued for 3 months, but no improvement was seen in the clinical condition.

After that the patient came to our institute for the needful. He was diagnosed as Abhigatajanya Adharangavata and was treated by the line of treatment of vata vyadhi<sup>5</sup>.

Diagnosis - Abhigatajanya Adharangavata.  
Date of admission - 17/02/2016  
Date of discharge - 28/04/2016

### Principle of Treatment:-

Reduce the pain inflammation, improve the movement, promote blood circulation, increase muscle tone and relax the muscles and improvement in neurological deficits. .

### Treatment Given:-

Panchakarma Procedure	Materials	Dose/day	Duration.
1. Katibasti	Bala ashwagandha taila	100 to 120 ml	20 to 25 min. for 16 days
2. Sarvanga abhyanga	Bala taila	app 60 to 70 ml	20 min. for 16 days
3. Nadi swedana	Dashamoola kwatha	-	10 to 15 min. for 16 days
4. Patra Pottali sweda	Eranda, Arka, Nirgundi, shigru patra, Mustard and Fenugreek powder +lemon juice	App. 400 to 500 gm bolus	20 to 25 min for 16 days
2. Panchatikta Ksheera Basti	Guduchi, Patola, Nimba, Kantakari, Vasa + Panchatikta ghruta	150 to 200 ml.	15 days

### Shaman Yoga:-

Rasaraja Ras(125 mg 1 ratti bd) + Ekangaveera rasa (125 mg 1 ratti bd) + Trayodashanga guggulu(3 gm / day) With Honey + ginger juice and Maharasnadi Kwatha. (20 ml bd) was given for 3 months<sup>6,7</sup>.

### Assesment Criteria:-

1)	Pricking pain	0	-	Absent
		1	-	Mild
		2	-	Moderate
		3	-	Severe
2)	Stiffness	0	-	Absent
		1	-	Mild
		2	-	Moderate
		3	-	Severe
3)	SLR Right	0	-	No Movement
	Left	0	-	No Movement.
4)	Ability to turn on bed		-	Absent
			-	Present
5)	Ability to sit		-	Absent
	With the support		-	Present
6)	Ability to stand		-	Absent
			-	Present
7)	Ability to walk		-	Absent
			-	Present

Signs and symptoms	BT	AT
1. Pricking Pain	2	0
2. Stiffness	3	1
3. SLR Right	0	70 <sup>0</sup>
SLR Left	0	75 <sup>0</sup>
4. Ability to turn on bed	Absent	Present
5. Ability to sit with the support	Absent	Present
6. Ability to stand	Absent	Present
7. Ability to walk	Absent	Can walk more than 300 mtrs in 20 min.
8. Muscles function grade		
Right hip	0	3
Left hip	1	3
Right knee	1	3
Left knee	1	3
Right ankle & toe	2	3
Left ankle and toe	2	3
9. Sensory function	Present	Absent
tingling sensation	Present	Absent
Numbness	Present	Reduced
10. Reflexes		
Right knee jerk	2	1
Left knee jerk	2	1
Right ankle jerk	2	1
Left ankle jerk	1	1
Superficial abdomen reflex	1	1
Plantar reflex	Absent	Present
11. Muscle tone right lower limb	Spastic	Less spastic
Muscle tone left lower limb	Spastic	Less spastic
12. Bowel activity	Incontinance	Normal
13. Bladder activity	Incontinance	Normal

### Discussion:-

As patient with traumatic Paraplegia, was correlated with abhigatajanya Adharangavata. The general line of treatment for vatavyadhi was adopted to treat this condition.

The mulasthanana of this disease locates at Katipradesha. Kati basti was selected as a bahi parimarjana chikitsa with bala – ashwagandha taila to reduce inflammation, stiffness and to give nourishment to dhamani i.e. nerves. Sarvanga abhyanga and Nadi swedana was recommended which acts as passive exercise which brings relaxation in spinal musculature of both lower limbs and reduced the spasticity.

As patient was admitted, in afternoon time, Patra pottali sweda was given to reduce pain, swelling and to improve the muscle tone.

Basti is the best treatment of vata. Pakwashaya is the main site of vata and basti mainly passes vata shamana property.

### Mode of Action of Panchatikta Ksheera Basti:-

Considering the involvement of Asthi dhatu, majja dhatu, mamsa dhatu in Katipradesha and predominantly dosha as vyan vata Karmahani, Panchatikta Ksheera Basti was given.

Tikta rasa has vayu and akasha mahabhuta in dominance. Hence it has got affinity towards the body elements like Asthi dhatu.

Most of the ingredients of Panchatikta Ksheera Basti have tikta rasa, ushna virya madhura rasa and katu vipaka and shothagna property which helps to increase dhatwagni. So the nutrition of all dhatus will be increased. Ghrita is

vatapittashaman, balya, agnivardhaka, madhura, soumya, sheet, vayusthapan so acts as a nourishment to pacify the vitiated vata.

Initially there was no retention of basti. Bowel evacuation was found only after Basti administration. The shaman yoga is helpful in vatika roga and showed balya and rasayana effect.

### **Conclusion:-**

Sarvanga abhyanga, Nadi swedana, Katibasti, Patra pattali sweda, Dashamoola niruha and Pancha tikta Ksheera basti has given a miraculous results in this patient.

The patient was admitted for 2 months and 11 days and completely recovered from functional disability, pain and stiffness etc. The over all effect of all panchakarma procedures with shaman yoga showed a marked improvement in this patient. This approach may be useful for clinical practices and further studies also .

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## RESEARCH ARTICLE

### SERUM TOTAL CALCIUM, MAGNESIUM, SODIUM AND POTASSIUM IN SUDANESE WOMEN WITH PREECLAMPSIA.

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#### Abstract

Preeclampsia is characterized by new-onset hypertension, proteinuria and is responsible for substantial maternal and fetal morbidity. The electrolytes like sodium, potassium and chloride contribute significantly in the functioning of the vascular smooth muscles and may play an important role in hypertension.

This study was carried out to measure serum levels of sodium, potassium, magnesium and calcium in preclamptic women. Sixty blood samples were collected from patients in period between June to October 2016, chosen from Omdurman Maternal hospital (thirty of them used magnesium sulfate as supplement and thirty not used supplement) and sixty normal pregnant women as control.

Serum sodium and potassium were measured by using ion selective electrode (Easylyte), while serum magnesium and serum calcium were measured by using Mindray 380

The study showed that, women with preeclampsia had significantly lower levels in means serum total calcium, magnesium, and potassium ( $7.34 \pm 0.51 \text{ mg/dL}$ ) vs. ( $8.58 \pm 0.71 \text{ mg/dL}$ )  $P < 0.05$ , ( $1.29 \pm 0.23 \text{ mmol/L}$ ) vs ( $1.83 \pm 0.32 \text{ mmol/L}$ ), and ( $3.08 \pm 0.24 \text{ mmol/L}$ ) vs  $3.55 \pm 0.34 \text{ mmol/L}$  p value  $< 0.05$  respectively. There was significant increase in mean of serum sodium in women with preeclampsia compared to control group ( $144.57 \pm 3.93 \text{ mmol/L}$ ) vs ( $138.27 \pm 3.8 \text{ mmol/L}$ ) p value  $< 0.05$

There was significantly positive correlation between serum magnesium in preclamptic women used magnesium sulfate and preclamptic women not used magnesium sulfate ( $r = 0.3 / p = 0.049$ ), while there were weak negative correlations between serum calcium and potassium in these two groups.

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#### Introduction:-

Hypertensive disease of pregnancy (HDP) is one of the most common complications of pregnancy, occurring in 5-8% of the pregnancies<sup>(1)</sup>. Hypertensive disorders are the second most common cause of maternal deaths worldwide<sup>(2)</sup>. There are several major categories of hypertensive disorders in pregnancy ranging from mild to moderate rise in blood pressure without proteinuria (usually called pregnancy induced hypertension (PIH)), preeclampsia (hypertension with proteinuria), severe preeclampsia and eclampsia<sup>(3)</sup>. Maternal hypertension, even of the mild to

moderate category, can lead to adverse perinatal outcomes like low birth weight, pre-maturity, stillbirth and intrauterine growth retardation <sup>(4)</sup>.

Hypertension results primarily from the interplay of internal derangements (primarily in the kidney) and the external environment. Sodium, the main extracellular cation, has long been considered the pivotal environmental factor in the disorder. Numerous studies show an adverse effect of a surplus of sodium on arterial pressure <sup>(5, 6)</sup>. By contrast, potassium, the main intracellular cation, has usually been viewed as a minor factor in the pathogenesis of hypertension. However, abundant evidences indicates that potassium deficit has a critical role in hypertension and its cardiovascular development <sup>(7,8)</sup>.

Calcium plays a critical role in the function of the cardiac and vascular smooth muscles. It is known that the deficiency of calcium may lead to irritable nervous muscular symptoms, even tetanic convulsions, bleeding diathesis, capillary haemorrhages, tissue exudation and osteomalacia. These features have got some resemblance to the clinical manifestations and pathological findings in pregnancy induced hypertension (PIH), particularly eclampsia. Increase in the intracellular calcium causes vasoconstriction, increase in the peripheral resistance and therefore, an increase in the blood pressure <sup>(9)</sup>. Magnesium modulates the cardiovascular effect of sodium and potassium and it is the cofactor for the sodium potassium ATPase activity <sup>(10)</sup>. Since the electrolytes: calcium, magnesium, sodium and potassium contribute significantly in the functioning of the vascular smooth muscles, the present study was designed to evaluate the role of these electrolytes in the genesis of PIH.

### **Materials and Methods:-**

**Study Population:** The study was carried out at College of Medical laboratory Sciences, and the subjects were recruited from Omdurman Maternal hospital, in Khartoum(Sudan) from June to October 2016. A total of 120 pregnant women were enrolled in this study ; divided into three groups, 60 healthy normotensive pregnant women (Control group), 30 pregnant women with preeclampsia , and 30 women with preeclampsia under magnesium sulfate as treatment. The study was approved by hospital's ethics committee. Informed consent was obtained from patients before blood sampling.

### **Inclusion criteria:-**

Patients with an onset of hypertension more than 140/90 mmHg during the second or third trimester of pregnancy, Excretion of more than 300 mg of urinary Protein per 24 hrs, edema, Patients with or without convulsions .

**Control-** pregnant women with normal Blood Pressure , absence of proteinuria and without any other systemic or endocrine disorder and age-matched with the cases. All subjects included were in their third trimester (gestational age of  $\geq 24$  weeks).

**Exclusion criteria** Patients with congestive heart failure, Diabetes mellitus, kidney disease, thyroid and parathyroid disorders, cirrhosis of the liver , alcoholics and any other systemic disease were excluded from the study.

### **Blood sample and Analysis:-**

About 2ml of venous blood was collected from the antecubital vein by taking aseptic precautions. Care was taken to prevent venous stasis during the sample collection. The blood was allowed to clot and the serum was separated by centrifugation. The estimation of the parameters was carried out within 4-6 hrs. The samples were analyzed for serum total calcium by the O-Cresolphthaleincomplexone method <sup>(11)</sup>, serum magnesium by the calmagite dye method <sup>(12)</sup> and for serum sodium and potassium by Electrolyte analyzer (**easlyte**). The internal control sera of two different levels were used to calibrate the instruments.

Data was analyzed using SPSS computer program, the mean and standard deviation were obtained and the independent 't.test' used for comparison (p value of  $\leq 0.05$ ) was considered significant.

### **Results:-**

The mean age of the preeclamptic patients was  $29.4 \pm 5.2$  years (range 19-40) , while in preeclamptic group under magnesium sulfate treatment with magnesium sulfate was  $29.2 \pm 4.9$  year, and in control group was  $29.6 \pm 4.6$  years with p value (0.89, 0,78 respectively) .



In comparison with the controls, women with preeclampsia had significantly lower in means of serum total calcium, magnesium, and potassium (7.34±0.51mg/dL) vs. (8.58± 0.71mg/dL) P<0.05, ( 1.29±0.23mmol/L) vs (1.83±0.32 mmol/L), and (3.08±0.24 mmol/L) vs 3.55±0.34 mmol/L) p value <0.05 respectively . There was significant increase in mean of serum sodium in women with preeclampsia compared to control group (144.57±3.93 mmol/L) vs (138.27±3.8 mmol/L) p value <0.05 as in table 1.

**Table1:** means comparisons of serum calcium, magnesium, sodium and potassium in preeclamptic women compared to control group.

Variable	Patients (mean ± SD) N=60	Control (mean± SD) N=60	P-value
Calcium (mg/dL)	7.34± 0.51	8.5± 0.71	0.000
Magnesium(mg/dL)	1.29±0.23	1.83±0.32	0.032
Sodium(mmol/L)	144.57±3.93	138.27±3.80	0.000
Potassium(mmol/L)	3.08±0.24	3.55±0.34	0.041

Results expressed as Mean ±SD and significant differences considered as p-value ≤0.05.

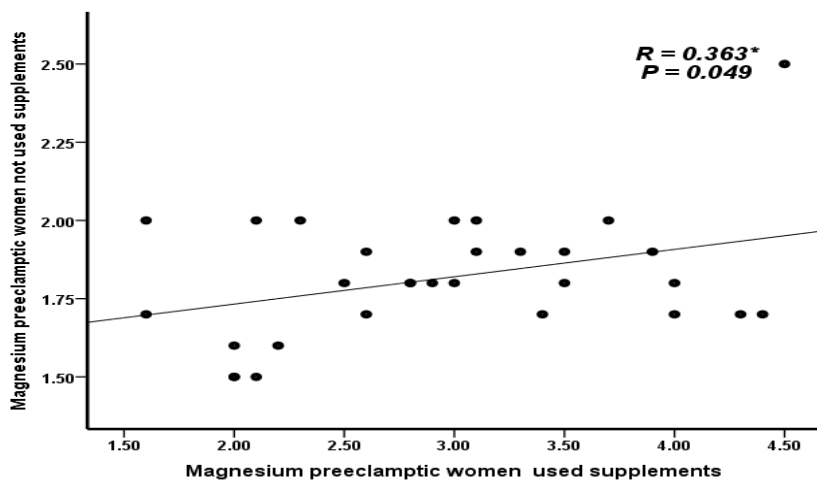
**Table 2:** means comparisons of serum total calcium, magnesium, sodium and potassium in preeclamptic women used magnesium sulfate compared to preeclamptic women not used magnesium sulfate.

Variable	Preeclamptic women used magnesium sulfate N=30	preeclamptic women not used magnesium sulfate N=30	P-value
Calcium (mg/dL)	7.3± 0.5	8.01± 1	0.000
Magnesium(mg/dL)	3.0 ± 0.8	1.3± 0.2	0.000
Sodium(mmol/L)	136.4± 4.7	144.7 ±3.9	0.02
Potassium(mmol/L)	3.3 ± 0.3	3.08 ± 0.2	0.04

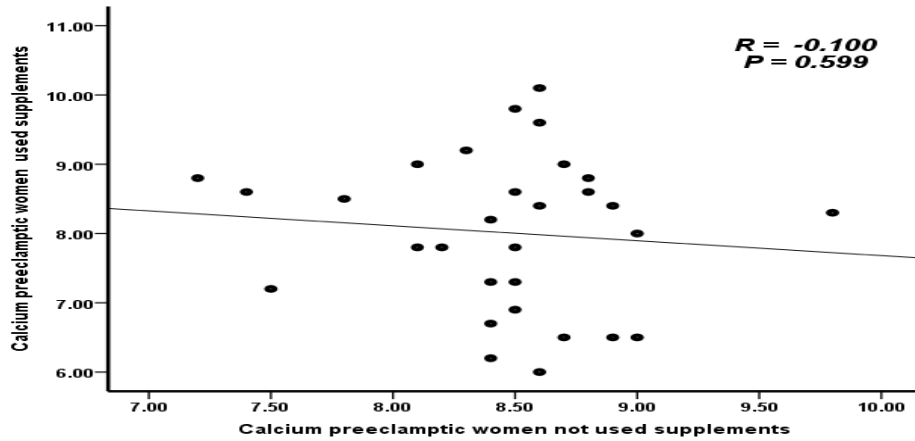
Results expressed as Mean ±SD and significant differences considered as p-value ≤0.05.

In comparison with preeclamptic women used magnesium sulfate with preeclamptic not used magnesium sulfate there was significantly increased in serum magnesium (3.0 ± 0.8 mg/dL) vs (1.3± 0.2 mg/dL) with p value (0.00), while there were significantly decrease in serum sodium, and calcium as in table 2

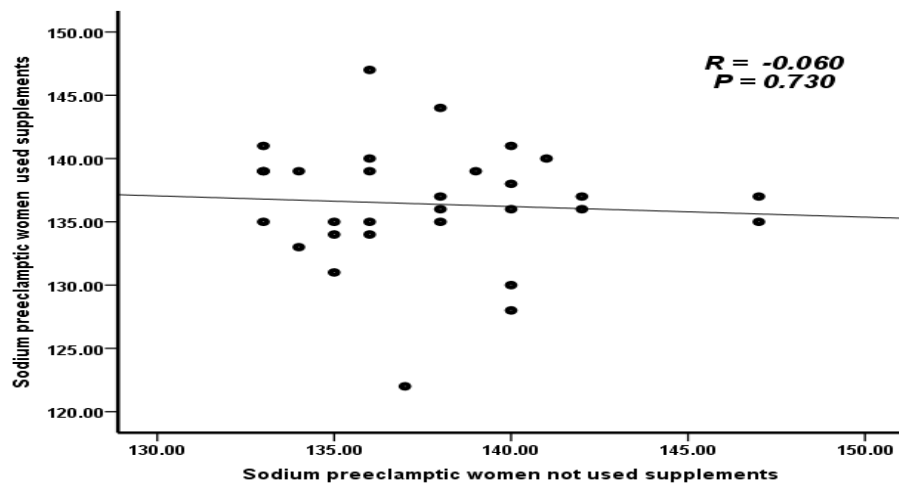
There was significantly positive correlation between serum magnesium in preeclamptic women used magnesium sulfate and preeclamptic not used magnesium sulfate ( r= 0.3 / p= 0,049) as in fig 1, while there were weak negative correlations between serum calcium and potassium as in fig ( 2, 3)



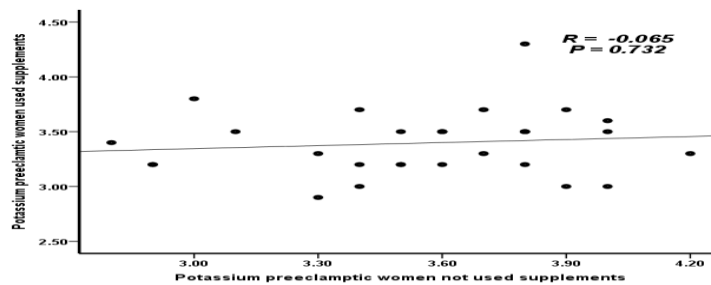
**Figure 1:-** Correlation between Mg level in Preeclamptic women used and not used magnesium sulfate. P-value <0.05 consider as significant.



**Figure 2:-** Correlation between serum calcium level in Preeclamptic women used and not used magnesium sulfate. *P-value*<0.05 consider as significant.



**Figure 3:-**Correlation between Na<sup>+</sup> level in Preeclamptic women used and not used supplement. *P-value*<0.05 consider as significant.



**Figure 4:-** Correlation between K level in Preeclamptic women used and not used supplement. *P-value*<0.05 consider as significant.

**Discussion:-**

Preeclampsia is a multi-factorial process and multi organ dysfunction with no individual factor strictly essential or sufficient for causing it. The numerous complications associated with it have triggered a phobia in pregnant women (13).

From the finding of this study it appears that serum levels of calcium, magnesium and potassium were significantly decreased and the serum level of sodium was significantly increased in preeclamptic women group compared to control group (p, value=0.000). This result agreed with study carried by many authors<sup>(14,15,16,17)</sup>, which showed that; Low serum calcium may cause high blood pressure by stimulating parathyroid hormone and rennin release which in turn increases intracellular calcium in vascular smooth muscle. This causes vasoconstriction, increase of vascular resistance and rise in blood pressure in preeclamptic women. Magnesium is known to increase the prostacyclin release from the endothelial cells of blood vessels, which acts as potent vasodilator. Like Calcium ion, lowered Mg<sup>2+</sup> levels are thought to potentiate contractile response of vascular smooth muscle to vasopressor. An increase in renal clearance during pregnancy may contribute to the reduction in serum Mg<sup>2+</sup>. In addition Mg<sup>2+</sup> depletion increases the vasoconstrictor effect of angiotensin II and noradrenaline. Mg<sup>2+</sup> also has a substantial beneficial effect in preeclampsia for the prevention and treatment of convulsions. Potassium deficit in body is as a result of inadequate conservation of potassium by kidney and alimentary canal, fecal potassium losses can exceed even urinary losses.<sup>(18)</sup> Hypokalemia in preeclampsia may be due to abnormality in the transport of sodium and potassium across the vascular smooth muscle cell membrane, which is normally responsible for the maintenance of blood pressure.<sup>(19)</sup>

The precise mechanism of sodium retention in preeclampsia is not clear, though the retention is likely due to vasoconstriction leading to reduction of glomerular filtration rate and stimulation of rennin-angiotensin-aldosterone mechanism. The net effect is decreased intracellular fluid and increased extracellular fluid volume.<sup>(20)</sup>

Also the findings of this study showed that, there was significant increase in blood pressure in preeclamptic women not used magnesium sulfate compared to preeclamptic women used magnesium, (p value=0.000). This result was in agreement with another study<sup>(22)</sup> which finding confirmed that, Systolic and diastolic blood pressures were significantly decreased during MgSO<sub>4</sub> treatment in preeclamptic patients (p < 0.0001).

Serum magnesium was significantly increased in preeclamptic women used magnesium sulfate as supplement compared to the levels in preeclamptic women not used supplement (p, value =0.000). The results were in agreement with another studies carried by Handwerker,<sup>(21)</sup> showed there is over a 100% increase in venous serum levels of ionized Mg during intravenous MgSO<sub>4</sub> therapy of preeclamptic patients.

**Conclusion:** According to the results of this study it is concluded that the serum levels of calcium, magnesium and potassium are significantly decreased, while the level of sodium is significantly increased in preeclamptic women compared to control group. Magnesium sulfate supplement increase the level of serum magnesium in preeclamptic women.

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### RESEARCH ARTICLE

#### ANTIMICROBIAL ANALYSIS OF SCHIFF BASE LIGANDS PYRAZOLE AND DIKETONE METAL COMPLEX AGAINST PATHOGENIC ORGANISMS.

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#### Abstract

Schiff base are flexi-dentate ligands, which are important to expand the Schiff base complexes. These complexes form excellent catalytic reaction by forming stable complex with metal ions and producing the biological activity against antibacterial, antifungal, anticancer and anti-malarial activities. In this study, we have explore the Minimum Inhibitory Concentration (both liquid & Disc method) of schiff base ligand such as Pyrazole, diketone and their metal (Ni, Cu, Co, Mn, Vn, Ca, Zn) bound complexes against various microbial pathogens. Minimum Inhibitory Concentration (MIC both liquid & disc method) were analyzed for the various human microbial pathogens such as *Pseudomonas aeruginosa*, *Escherichia coli*, *Klebsilla pneumonia*, *Staphylococcus aureus*. The sensitivity towards the various commercial antibiotics (Rifampicin, Streptomycin, Ampicillin, Gentamicin, Neomycin, Bacitracin, Erythromycin & penicillin) for the selected microbial human pathogens were also evaluated and compared. The MIC values indicate the most of the complexes have higher antimicrobial activity than the free ligand. The variation in the antimicrobial activity of different metal complexes against different microorganism depends on their impermeability of the cell or the differences in ribosomes in microbial cells. The lipid membrane surrounding the cell favours the passage of any lipid soluble materials and it is known that lipo solubility is an important factor controlling antimicrobial activity. The presence of low activity of some metal complexes is may be due to their low lipophilicity, because of which penetration of the complex through lipid membrane was decrease and neither block nor inhibit the growth of the microorganism.

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#### Introduction:-

Heterocyclic compounds are cyclic compounds, which has two different types of functional elements in the ring. Syntheses of heterocyclic compounds consist of potential pharmaceutical relevant properties and medical importance; therefore, these compounds have huge industrial application (Bhava et al., 2013; Tharmaraj et al., 2009) for the biological products. Schiff-base ligands are derived from an amino and carbonyl group of compounds typically

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importance class of ligand in chemistry for the development of Schiff base complexes. Due to this, Schiff-base ligands are potentially capable of forming stable complexes with metal ions via C=N azomethine nitrogen group for the biological activities such as antibacterial, antifungal, anticancer and anti-malarial activities (Lippard and Berg, 1995; Naeimi et al., 2007). The terms of bidentate and tridentate ligands, they are simultaneously coordinated with metal in the centre of ligand for the synthesis of homo and hetero metallic complexes with different stereochemistry. Among the many different dinucleating ligands, the phenol-based compartmental ligands had drawn particularly wide attention of scientific community. Over the decade, several reported studies on the application exists in the homogenous and heterogeneous catalysis, hence this work mainly enlighten the catalytic activity of Schiff base complexes (Dickson and Robson, 1974; Lippard and Berg, 1995; Naeimi et al., 2007). Syntheses of such compounds are highly importance in the pharmaceutical and chemists are focused in this area for the industrial application to develop the pharmaceutical products to human health. Schiff-base compound has donors imine group in the structure, which has structure similarities with neutral biological systems that are utilized to elucidating the mechanisms of transformation in the biological system (Gibson et al., 1970). This ligand formation requires some conditions that are not very stringent, necessitating in the method of dry solvent or a removing the water produced in the reaction between an aldehyde/ketone and an amine. Precisely, the lone pair on the nitrogen atom of the imine moiety in the Schiff base compounds offers an appropriate donor atom for coordination with metal ion. Therefore, these compounds are highly active with adept at binding transition metal ions, in the diverse range of uses to catalysts biological mimics (Creaven et al., 2010). Schiff bases are utilized as initial source in the synthesis of industrial products and are regarded as privileged ligands. Depending on their binding mode with transition metal ions in the living system have been of quite interesting in this field. In addition, metal bound complex of schiff bases have been reported to be high enzyme inhibitors and pharmacological applications (Pervez et al., 2016). These compounds would pave the antitumor effect against some Gram-negative bacteria and are used to be distinct in the field of microbiological testing for the tumour chemotherapy. Moreover, Copper coordination complexes have oxidation state of the copper ion in +1 or +2 with most stable conformation. The Copper (II) metal ion complexes derived from S-benzylthiocarbamate and saccharinate consist of anticancer properties against the leukemic cell line. Nickel (II) complexes have different variety of geometries that may vary from octahedral to square planar including the tetrahedral coordination modes. Consequently, in this work, Schiff-base ligands Pyrazole, diketone and their metal bound complexes were analyzed against anti-microbial activity. The activities of the standard drugs such as Rifampicin, Streptomycin, Ampicillin, Gentamicin, Neomycin, Bacitracin, Erythromycin and Penicillin were taken for comparative studies with pyrazole, diketone and their metal bound complexes.

## **Materials:-**

### **Physical Measurement:-**

All the reagents are AR grade chemicals used from commercial sources with well purification. Nutrient broth, Potato Dextrose Agar, Muller Hinton Agar, Tris base, sodium chloride, hydrogen peroxide and other chemicals were purchased from SRL, India.

### **Preparation of Metal complexes:-**

The compounds Co (II), Cd (II), Ni(II), Zn(II), Mn(II), Vn (II) and Cu(II) were reacted and formed using an ethanolic solutions of metal halides/nitrates. The mixture was heated in the water bath for 2-3 hrs. The mixture of metal ions was mixed with pyrazole and diketone ligands solution for metal complexes.

### **Collection, Identification and Cultivation of Microbial Pathogens:-**

The various microbial pathogens such as *P. aeruginosa*, *E. coli*, *K. pneumoniae*, *S. aureus*, were cultivated in nutrient agar medium. The grown pathogenic cultures were further identified based on morphological, microscopy and biochemical test.

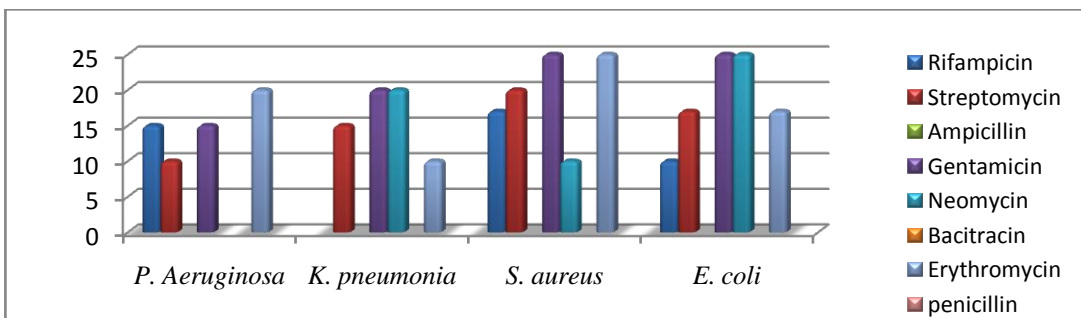
### **Antibiotic sensitivity assay:-**

The sensitivity towards the various antibiotics such as (Rifampicin, Streptomycin, Ampicillin, Gentamicin, Neomycin, Bacitracin, Erythromycin, Pencillin) against the pathogenic microorganism was analyzed. Sterile 50 ml nutrient broths were prepared and inoculated with *P. aeruginosa*, *E. coli*, *K. pneumoniae*, *S. aureus*,). The flasks were incubated in shaker for 24 hours at 37°C. Sterile Muller Hinton agar plates were prepared and were aseptically inoculated with the pathogenic cultures after 5 minutes the different antibiotic standard discs (Rifampicin, Streptomycin, Ampicillin, Gentamicin, Neomycin, Bacitracin, Erythromycin, Pencillin) were placed over the culture plate (Nomiya et al., 2000). After 5 minutes the different antibiotic standard disc (Nystatin) were placed over the culture plate. The plates were incubated at 37°C for 24 hours. The Minimal inhibitory concentration (MIC) in various

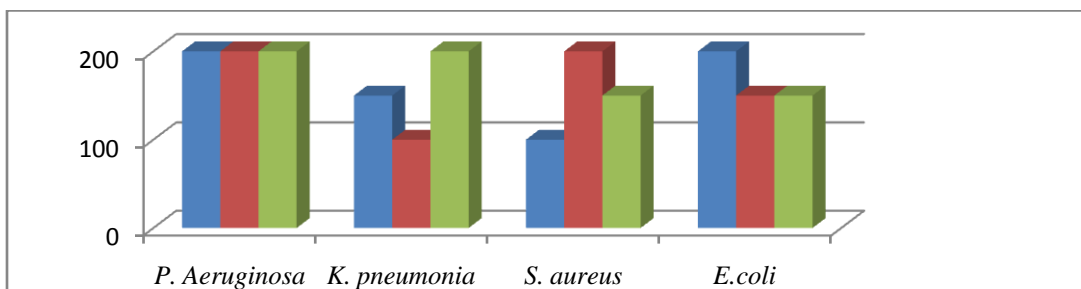
antibiotic susceptibility discs were tested (Fig. 1). The antimicrobial activity of metal ligand complex by disc method were analyzed as referred(Rafi et al., 2016). The sterile disc with metal and ligand was prepared with the minimum inhibitory concentration. All the selected complexes and the parent ligand were screened for their activity against the test organisms.

**Minimum Inhibitor concentration:-**

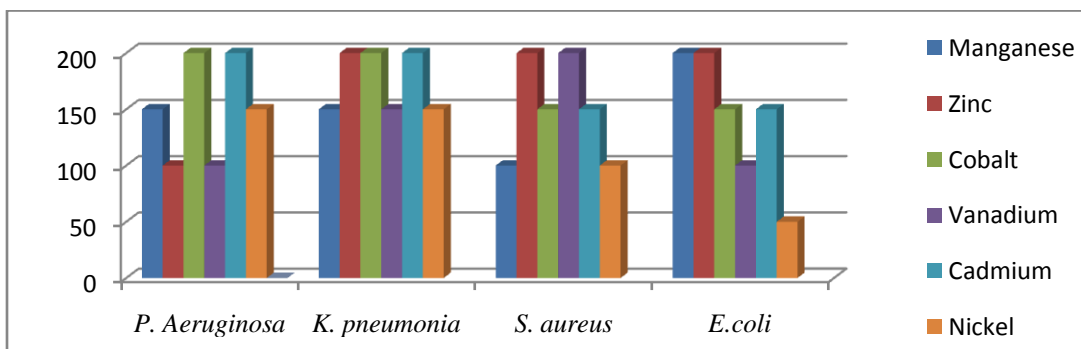
The MIC of the various metal ligand complex and ligand were analyzed as referred(Andrews and Andrews, 2001). 9ml of sterile Muller Hinton broth medium was prepared, and added with various metal ions such as Copper, Zinc, Cobalt, Manganese, Vanadium, and Nickel with the various concentration 50,100,150,200,250µ/ml by dissolving with 1ml of dimethylsulfoxide solution. After preparation of 10ml of Muller Hinton, broth in that 100µl was discarded and added with 100µl of culture. (*P. aeruginosa*, *E. coli*, *K. pneumoniae*, *S. aureus*). After incubation, the tubes were incubated in shaker incubator for 24 hours at 37°C. The Minimum inhibitory concentration of growth was determined.



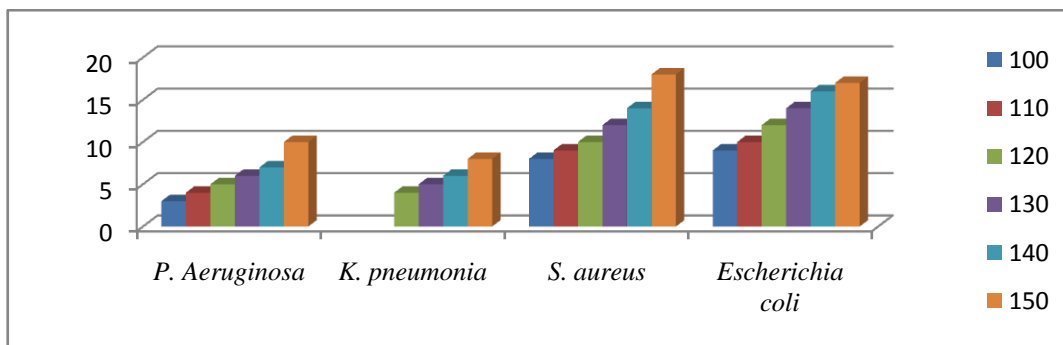
Figures 1:- Zone Formation in Various antibiotic susceptibility discs.



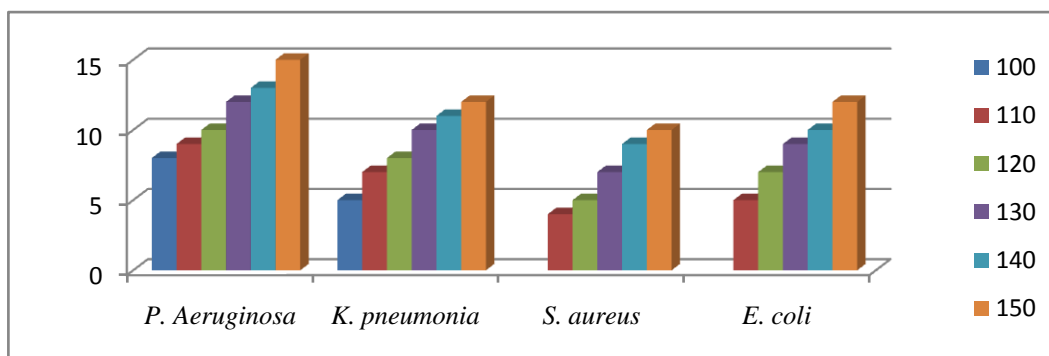
Figures 2:- Minimal inhibitory concentration (MIC) with metal – Pyrazole complex.



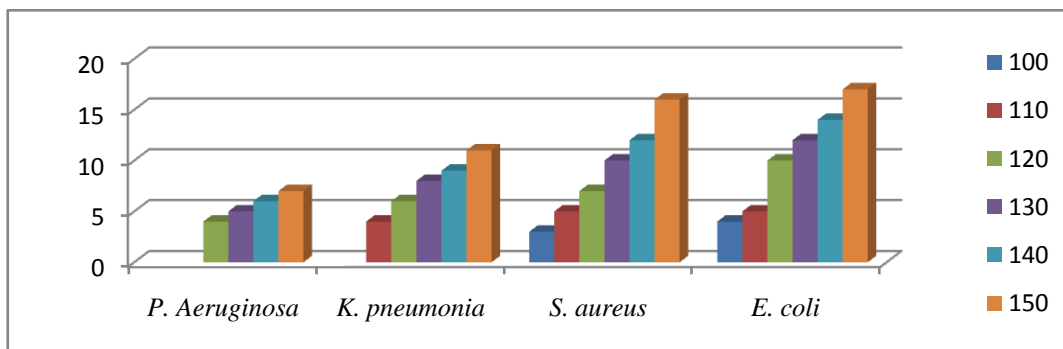
Figures 3:- Minimal inhibitory concentration (MIC) with metal – Diketones complex



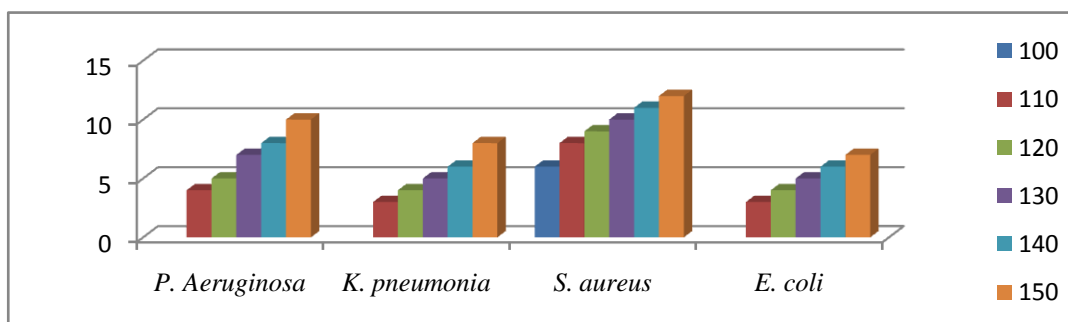
Figures 4:- Microbial inhibition study by disc method using Nickel-Pyrazole complex.



Figures 5:- Microbial inhibition study by disc method using Copper-Pyrazole complex.

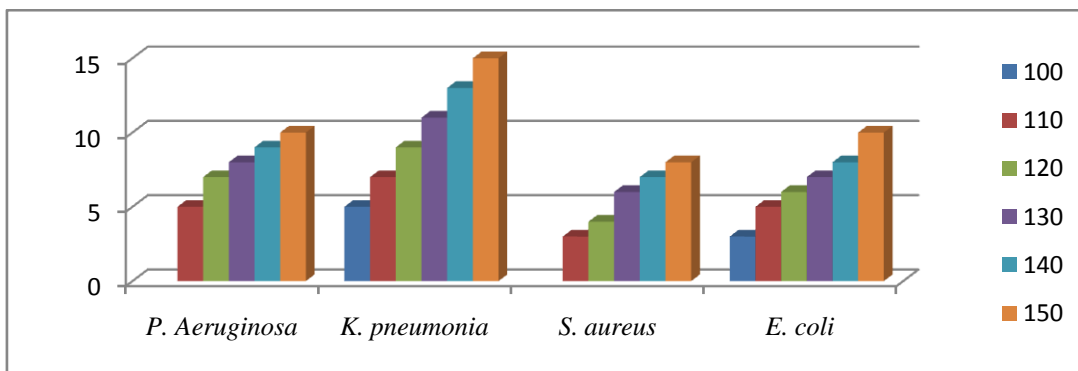


Figures 6:- Microbial inhibition study by disc method using Cobalt-Pyrazole complex.

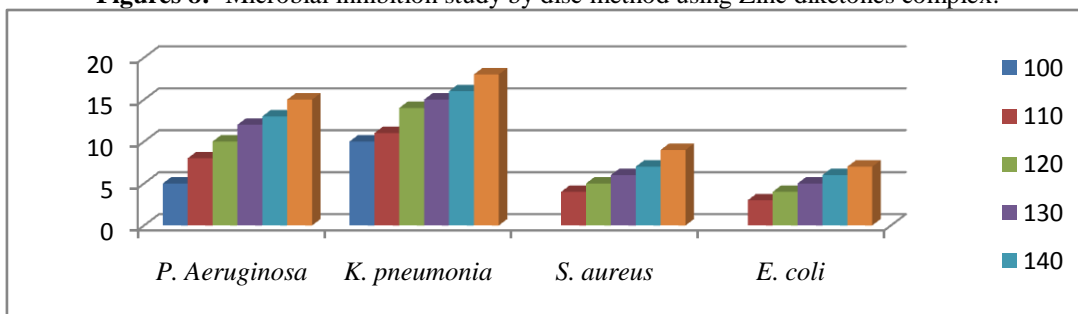


Figures 7:- Microbial inhibition study by disc method using Manganese-diketones complex.

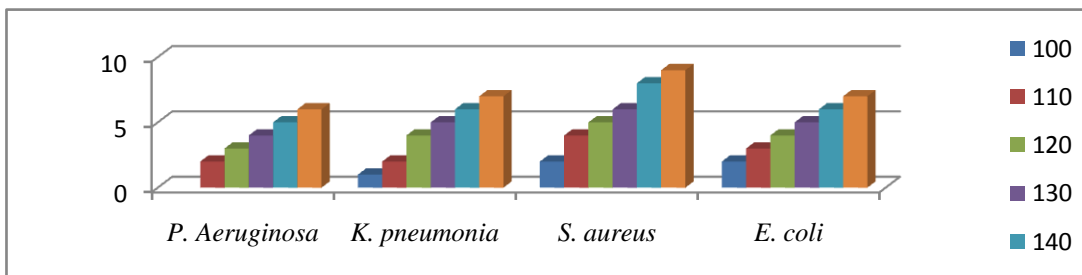




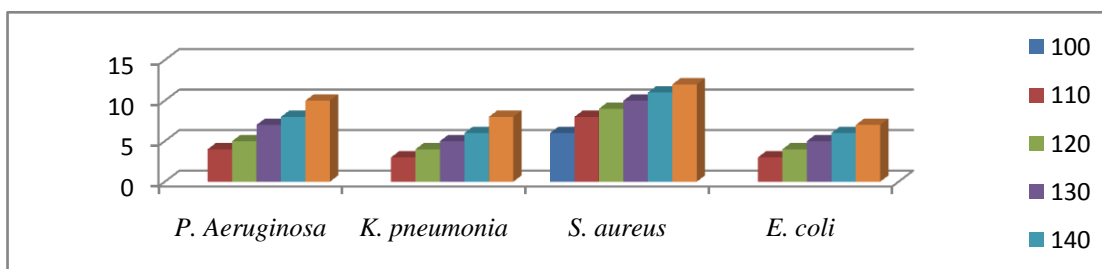
Figures 8:- Microbial inhibition study by disc method using Zinc diketones complex.



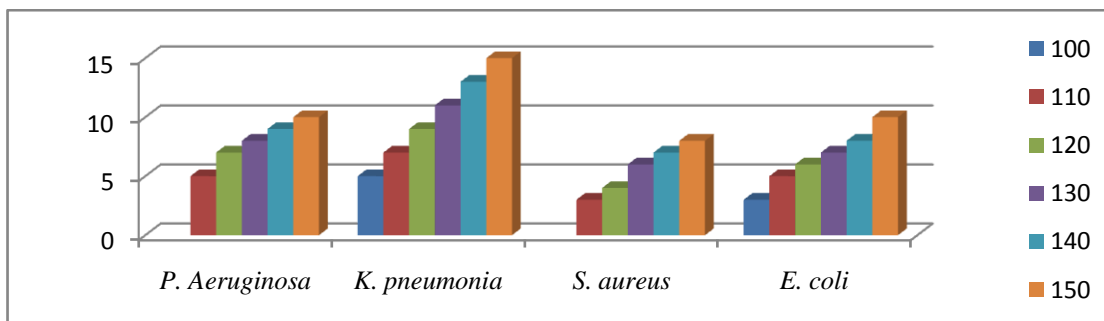
Figures 9:- Microbial inhibition study by disc method using Cobalt-diketones complex.



Figures 10:- Microbial inhibition study by disc method using Vanadium-diketones complex.



Figures 11:- Microbial inhibition study by disc method using Cadmium-diketones complex.



**Figures 12:-** Microbial inhibition study by disc method using Nickel-diketones complex.

### Results and Discussion:-

Among the observations in the MIC of metal bound pyrazole complex and metal free pyrazole, Ni-Pyrazole complex showed MIC activity of 100  $\mu\text{g/ml}$  against *S. aureus*; 150  $\mu\text{g/ml}$  against *K. pneumoniae*; and 200  $\mu\text{g/ml}$  against *E. coli*. The Cu pyrazole complex has shown 100  $\mu\text{g/ml}$  of MIC activity against *K. pneumoniae*; 150  $\mu\text{g/ml}$  of MIC against *E. coli*; 200  $\mu\text{g/ml}$  MIC against *S. aureus* and *P. aeruginosa*. In metal free pyrazole, it shows MIC of 150  $\mu\text{g/ml}$  against *P. aeruginosa*, *S. aureus*; 300  $\mu\text{g/ml}$  against *E. coli*; 350  $\mu\text{g/ml}$  against *K. pneumoniae* (Bhattarai et al., 2012). The metal complex such as Nickel and copper showed very good MIC of 100  $\mu\text{g/ml}$  against *S. aureus* and *K. pneumoniae* respectively (Fig. 2).

In magnesium diketone complex, 100  $\mu\text{g/ml}$  against *K. pneumoniae* and *P. aeruginosa*; 200  $\mu\text{g/ml}$  against *E. coli*. The zinc diketone complex it shows, MIC of 100  $\mu\text{g/ml}$  against *P. aeruginosa*, 200  $\mu\text{g/ml}$  against *E. coli*, *S. aureus*, and *K. pneumoniae*. The cobalt diketone complex it shows MIC of 150  $\mu\text{g/ml}$  against *E. coli*, *S. aureus*; 200  $\mu\text{g/ml}$  against *P. aeruginosa*, *K. pneumoniae*. The vanadium diketone complex it shows MIC of 100  $\mu\text{g/ml}$  against *E. coli*, *P. aeruginosa*; 150  $\mu\text{g/ml}$  against *K. pneumoniae*; 200  $\mu\text{g/ml}$  against *S. aureus*. The cadmium diketone complex shows MIC of 150  $\mu\text{g/ml}$  against *E. coli*, *S. aureus*; 200  $\mu\text{g/ml}$  against *P. aeruginosa*, *K. pneumoniae*. Nickel diketone complex it shows MIC of 50  $\mu\text{g/ml}$  *E. coli*, 100  $\mu\text{g/ml}$  against *S. aureus*; 150  $\mu\text{g/ml}$  against *P. aeruginosa*, *K. pneumoniae*. In diketones shows MIC of 150  $\mu\text{g/ml}$  against *S. aureus*, 200  $\mu\text{g/ml}$  against *Escherichia coli*, *P. aeruginosa*, *K. pneumoniae*. (Yadav et al., 2013) Comparative results of MIC activity of diketone alone and diketone-metal bound complex, the metal complex shown very good MIC activity than the pyrazole complex alone (Fig. 2).

### Antimicrobial activity of the Metal ligand complexes by Disc Method:-

The disc method of microbial inhibition study was performed using nickel-pyrazole complex with the concentration ranges from (180, 190, 200, 210 and 220  $\mu\text{g}$ ) against the *E. coli*. The MIC activity showed 17 mm high zone of inhibition in the concentration of 200  $\mu\text{g}$  against *E. coli*. In *P. aeruginosa*, the various concentration ranges (180, 190, 200, 210, 220  $\mu\text{g}$ ) were performed and the MIC activity shows high zone of inhibition 7 mm against the concentration 200  $\mu\text{g}$ . In *S. aureus*, MIC activity of 20 mm zone of inhibition against the 100  $\mu\text{g}$ . In *K. pneumoniae*, the MIC of 6 mm zone of inhibition against the 150- $\mu\text{g}$  concentration (Fig. 4).

In copper-pyrazole complex, the effect of the complex was analyzed with various concentration in the range of (130, 140, 150, 160, 170  $\mu\text{g}$ ) against *E. coli*. The MIC activity showed 12 mm high zone of inhibition in the concentration of 150  $\mu\text{g}$  against *E. coli*. In *P. aeruginosa*, the various concentration ranges (180, 190, 200, 210, 220  $\mu\text{g}$ ) were performed and the MIC activity shows high zone of inhibition 15 mm against the concentration 200  $\mu\text{g}$ . In *S. aureus*, MIC activity of 20 mm zone of inhibition against the 100  $\mu\text{g}$ . In *K. pneumoniae*, the MIC of 7 mm zone of inhibition against the 150- $\mu\text{g}$  concentration (Fig. 5).

In cobalt-pyrazole complex, the effect shows the concentration ranges from 130, 140, 150, 160, 170  $\mu\text{g}$  against *E. coli*. The MIC activity showed 17 mm high zone of inhibition in the concentration of 150  $\mu\text{g}$  against *E. coli*. In *P. aeruginosa*, the various concentration ranges (180, 190, 200, 210, 220  $\mu\text{g}$ ) were performed and the MIC activity shows high zone of inhibition 15 mm against the concentration 150  $\mu\text{g}$ . In *S. aureus*, MIC activity of 24 mm zone of inhibition against the 150  $\mu\text{g}$ . In *K. pneumoniae*, the MIC of 14 mm zone of inhibition against the 200- $\mu\text{g}$  concentration (Fig. 6).

While analyzing all above, the maximum zone was absorbed in MIC of 150  $\mu\text{g}$  with 24 mm in *S. aureus*. In ligand pyrazole, the effect shows the concentration from (280, 290, 300, 310, 320  $\mu\text{g}$ ) performed in *E. coli* the MIC of 300

$\mu\text{g}$  shown the zone which was obtained as 14 mm. *P. aeruginosa* the concentration from (130, 140, 150, 160, 170  $\mu\text{g}$ ) was performed, the MIC of 150  $\mu\text{g}$  shown the zone which was obtained as 7 mm. In *S. aureus* the concentration from (130, 140, 150, 160, 170,  $\mu\text{g}$ ) was performed, the MIC of 150  $\mu\text{g}$  shown the zone which was obtained as a mm. In *K. pneumoniae* the concentration from (330, 340, 350, 360, 370  $\mu\text{g}$ ) was performed the MIC of 350  $\mu\text{g}$  shown the zone which was obtained as 9 mm. Resulting from the above, the maximum zone was obtained for nickel-pyrazole 200  $\mu\text{g}$  with 17 mm zone of inhibition in *E. coli*, for copper pyrazole 200  $\mu\text{g}$  with 15 mm in *P. aeruginosa*, for 14 mm in *E. coli*.

In Magnesium-diketone complex the effect shows the concentration from (180, 190, 200, 210, 220  $\mu\text{g}$ ) in *E. coli* was performed, the MIC of 200  $\mu\text{g}$  shown the zone which was obtained as 5 mm. In *P. aeruginosa* the concentration from (130, 140, 150, 160, 170  $\mu\text{g}$ ) was performed the MIC of 150  $\mu\text{g}$  shown the zone which was obtained as 10 Mm. In *S. aureus* the concentration from (80, 90, 100, 110, 120  $\mu\text{g}$ ) was performed the MIC of 100  $\mu\text{g}$  shown the zone which was obtained as 12 mm. In *K. pneumoniae* the concentration from (130, 140, 150, 160, 170  $\mu\text{g}$ ) was performed, the MIC of 150  $\mu\text{g}$  shown the zone which was obtained as 8 millimeter (Fig. 7).

In Zinc-diketones complex shows the concentration (180, 190, 200, 210, 220  $\mu\text{g}$ ) in *Escherichia coli* was performed, the minimal inhibition concentration of 200  $\mu\text{g}$  shown the zone which was obtained as 10 mm. In *P. aeruginosa* the concentration from (80, 90, 100, 110, 120  $\mu\text{g}$ ) was performed, the MIC of 100  $\mu\text{g}$  shown the zone which obtained 9 mm. In *S. aureus* the concentration from (180, 190, 200, 210, 220  $\mu\text{g}$ ) was performed, the MIC of 200  $\mu\text{g}$  shown the zone which was obtained as 6 mm. In *K. pneumoniae* the concentration from (180, 190, 200, 210, 220  $\mu\text{g}$ ) was performed, the MIC of 200  $\mu\text{g}$  shown the zone which obtained as 20 mm (Fig. 8).

In cobalt-diketones complex the concentration from (130, 140, 150, 160, 170  $\mu\text{g}$ ) in *E. coli* was performed, the MIC of 150  $\mu\text{g}$  shown the zone which was obtained as 7 mm. In *P. aeruginosa* the concentration from (180, 190, 200, 210, 220  $\mu\text{g}$ ) was performed, the MIC of 200  $\mu\text{g}$  shown the zone which was obtained as 15 mm. In *S. aureus* the concentration from (130, 140, 150, 160, 170  $\mu\text{g}$ ) was performed, the MIC of 150  $\mu\text{g}$  shown the zone which was obtained as 9 mm. In *K. pneumoniae* the concentration from (180, 190, 200, 210, 220  $\mu\text{g}$ ) was performed, the MIC of 200  $\mu\text{g}$  shown the zone which was obtained as 7 mm (Fig. 9). In vanadium-diketone complex the concentration from (80, 90, 100, 110, 120  $\mu\text{g}$ ) was performed, the MIC of 100  $\mu\text{g}$  shown the zone which obtained as 7 mm. In *P. aeruginosa* the concentration from from (80, 90, 100, 110, 120  $\mu\text{g}$ ) was performed, the MIC of 100  $\mu\text{g}$  shown the zone which was obtained as 6 mm. In *S. aureus* the various concentration from (180, 190, 200, 210, 220  $\mu\text{g}$ ) was performed, the MIC of 200  $\mu\text{g}$  shown the zone which was obtained as 9 mm. In *K. pneumoniae* the concentration from (130, 140, 150, 160, 170  $\mu\text{g}$ ) was performed, the MIC of 150  $\mu\text{g}$  shown the zone which was obtained as 7 mm (Fig. 10). In cadmium-diketone complex the concentration from (130, 140, 150, 160, 170  $\mu\text{g}$ ) in *E. coli* was performed, the MIC of 150  $\mu\text{g}$ , shown the zone which was obtained as 7 mm. In *P. aeruginosa* the concentration from (180, 190, 200, 210, 220  $\mu\text{g}$ ) was performed, the MIC of 200  $\mu\text{g}$  shown the zone which was obtained as 7 mm. In *S. aureus* the concentration from (130, 140, 150, 160, 170  $\mu\text{g}$ ) was performed, the MIC of 150  $\mu\text{g}$  shown the zone which was obtained as 9 mm. In *K. pneumoniae* the concentration from (180, 190, 200, 210, 220  $\mu\text{g}$ ) was performed, the MIC of 200  $\mu\text{g}$  shown the zone which was obtained as 7 mm (Fig. 11). In Nickel-diketone complex the concentration from (30, 40, 50, 60, 70  $\mu\text{g}$ ) in *E. coli* was performed, the MIC of 50  $\mu\text{g}$  shown the zone which was obtained as 25 mm. In *P. aeruginosa* the concentration from (130, 140, 150, 160, 170  $\mu\text{g}$ ) was performed, the MIC of 150  $\mu\text{g}$  shown the zone which was obtained as 9 mm. *S. aureus* the concentration from (80, 90, 100, 110, 120  $\mu\text{g}$ ) was performed, the MIC of 100  $\mu\text{g}$  shown the zone which was obtained as 7 mm. In *K. pneumoniae* the concentration from (130, 140, 150, 160, 170  $\mu\text{g}$ ) was performed, the MIC of 150  $\mu\text{g}$  shown the zone which was obtained as 8 mm (Fig. 12).

In ligand diketone the concentration from (180, 190, 200, 210, 220  $\mu\text{g}$ ) in *E. coli* was performed, the MIC of 200  $\mu\text{g}$  shown the zone which was obtained as 12 mm. In *P. aeruginosa* the concentration from (180, 190, 200, 210, 220  $\mu\text{g}$ ) was performed, the MIC of 200  $\mu\text{g}$  shown the zone which was obtained as 12 mm. In *S. aureus* the concentration from (130, 140, 150, 160, 170  $\mu\text{g}$ ) was performed, the MIC of 150  $\mu\text{g}$  shown the zone which was obtained as 20 mm. In *Kelbsilla pneumoniae* the concentration from (180, 190, 200, 210, 220  $\mu\text{g}$ ) was performed, the MIC of 200  $\mu\text{g}$  shown the zone which was obtained as 12 mm.

Results shows the maximum zone was obtained 150  $\mu\text{g}$  with 10 mm in *S. aureus*, 200  $\mu\text{g}$  with 20 mm in *K. pneumonia*, 200  $\mu\text{g}$  with 15 mm in *P. aeruginosa*, 200  $\mu\text{g}$  with 9 mm in *S. aureus*, 50  $\mu\text{g}$  with 25 mm in *E. coli*. Antibiotic susceptibility test of streptomycin, it consists of 17 mm (sensitive) in *E. coli* when compared to the metal ion concentration of 200  $\mu\text{g}$  it was obtained as 17 mm (Sensitive), the zone formation is sensitive. In *S. aureus* it

consists of 20 mm (sensitive) when compared to metal ion concentration 100 µg is 20 mm sensitive. Antibiotic susceptibility test of Gentamicin, the highest zone in *S. aureus* and *E. coli* as 25 mm (Sensitive) when compared to metal ion it gives the 25 mm (Sensitive) in Nickel complex. Antibiotic susceptibility test of Neomycin in *E. coli* consists of zone is 25 mm sensitive as like the Nickel complex. Antibiotic susceptibility test of Erythromycin in *S. aureus* consists of zone is 25 mm sensitive as like the ligand diketones.

### Conclusion:-

The various metals Nickel, Copper, cobalt, Zinc, Magnesium vanadium, cadmium and ligand bound metal complexes (Schiff base) ligands such as pyrazole and diketones were prepared. The various microbial pathogens such as *Pseudomonas aeruginosa*, *Escherichia coli*, *Klebsilla pneumoniae* *Staphylococcus aureus*, were cultivated in nutrient agar medium. The sensitivity towards the various antibiotics such as Rifampicin, Streptomycin, Ampicillin, Gentamicin, Neomycin, Bacitracin, Erythromycin and penicillin was analyzed the activity against the pathogenic microorganism. Result enlightens that, the minimal inhibitory concentration (MIC) values found to have higher antimicrobial activity with ligand bound complexes than the free ligands compared with antibiotics. Moreover, in the pyrazole bound complex, the maximum zones were obtained in nickel-pyrazole complex in the concentration of 200 µg with 17 mm zone of inhibition against *E. coli*, copper-pyrazole complex in the concentration of 200 µg with 15 mm in *P. aeruginosa*. In the case of diketone complex, the maximum zone was obtained 150 µg with 10 mm in *S. aureus*, 200 µg with 20 mm in *K. pneumonia*, 200 µg with 15 mm in *P. aeruginosa*, 200 µg with 9 mm in *S. aureus* and 50 µg with 25 mm in *E. coli*. Overall from this study, the prepared Schiff base compounds showed higher activity against the pathological microorganism and potential to inhibit the growth of organisms.

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### RESEARCH ARTICLE

#### RELATIONSHIP BETWEEN DIET AND ACNE AMONG RESIDENTS OF AL-MADINAH AL-MUNWARAH, SAUDI ARABIA.

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#### *Abstract*

**Background:** Acne vulgaris is one of the most and common chronic inflammatory skin diseases, which affects people in both developing and developed countries. This study aimed to investigate and define the relation between diet and acne among residents of Al-Madinah Al-Munawwarah, Saudi Arabia.

**Methodology:** This cross-sectional study was conducted between October 2016 and January 2017 where all the participants were from Al-Madinah Al-Munawwarah. Participation was done on a voluntary basis and all the participants filled an electronic questionnaire.

**Results:-** There was a significant association between acne and irregular menstruation ( $p=0.008$ ), while no significant association was found between acne and other diseases. The belief in the ability of certain kinds of food (junk food, sweets, chocolate, soda, chips and spicy foods) to aggravate acne severity was significantly higher among participants with acne compared with participants with no acne ( $p<0.001$ ,  $p<0.001$ ,  $p<0.001$ ,  $p=0.01$ ,  $p<0.001$  and  $p<0.001$ ), respectively.

**Conclusion:-** The present findings suggest a positive association between some food and acne vulgaris in the Saudi context. An interventional dietary study will be required to further ascertain the effects of these foods on acne vulgaris.

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#### **Introduction:-**

Acne vulgaris is one of the most and common chronic inflammatory skin diseases, which affects people in both developing and developed country, (1,2), it affects particularly teenagers between 15-17 years and about 15-20% of young adults (3,4). It can persist to adult life where several studies addressed that there is increased prevalence of adult having acne (3,5). It is characterized by "sebum overproduction, follicular hyperkeratinization, and increased release of inflammatory-mediating chemicals along with androgens and other pathogenic influences". (1)

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Several studies indicate that having acne can be a huge deterrent to adequate growth and self-confidence of young university students who represent the future of our country (1,6) where physical appearance is one of the most sensitive aspects of our society and plays a vital role in our social and physiological well-being. It has a direct impact on our self-esteem and ability to function with confidence. One of the most intriguing facts of physical appearance is acne and it is a phenomenon which has affected all of us at some point in our lives (7-12). This aspect is of particular importance to teenagers and young adults who are constantly influenced by media to have a certain physical appearance in order to be accepted by their peers and society. (7-12)

Despite having such a pervasive impact, there are certain areas of this topic that are not given the attention they rightfully deserve. There have been extensive amount of research done on medication and other remedial actions to cure acne. There are numerous factors that contribute to the occurrence of acne in human body rather than a single cause. It is believed diet plays one of the more significant contributing factors directly and otherwise in acne existence. However, inadequacy in investigating the relationship between diet and acne is to say the least, alarming where the lack of attention given to this relationship is primarily due to the absence of a correlation between diet and acne found in earlier studies. However, more recent studies have shown a strong relation between diet and acne contrary to the common belief held in the past. (13)

Historically, the relationship between diet and acne has been highly debated, where in 19<sup>th</sup> and first half of 20<sup>th</sup> centuries, the relation between diet and acne was addressed strongly and all dermatologists recommended avoiding certain kinds of food (chocolate, fats, and sweets), then during the second half of 20<sup>th</sup> century several studies were conducted and dismissed the relationship between diet and acne and considered it as a myth. However, during the last two decades, the relationship appeared on the surface again and a lot of studies were conducted that addressed the correlation between diet and acne. Those latest studies depended on several factors e.g. glycemic Index (GI) and glycemic load (GL). More understanding of acne pathogenesis, the role of endocrine mechanisms in acne pathogenesis and the necessary duration of time for a given treatment to influence acne development is needed (6,14,15).

Our study aimed to investigate and define the relation between diet and acne among residents of Al-Madinah Al-Munawarah, Saudi Arabia.

### **Methodology:-**

This cross-sectional study was designed and conducted between October 2016 and January 2017, the participants were from Al-Madinah Al-Munwarah community, Saudi Arabia. Participants were between 16 to 40 years, and the participation was on a voluntary basis. An ethical approval was obtained from the ethical committee in the College of Medicine, Taibah University and all participants provided informed consent before filling the questionnaire. All eligible participants were asked to fill an electronic questionnaire, which consisted of two parts: the first part is demographic and anthropometric data (age, gender, weight, height, BMI, acne severity, acne medication, chronic illness and, history of oral contraceptive use), and the second part was regarding diet habits and food-aggravated acne beliefs. This questionnaire was presented to dermatologist for validation. The researchers divided the participants to four groups depending on acne severity (no acne, mild acne, moderate acne and severe acne).

All statistical analyses were performed using SPSS version20, categorical data was presented as numbers and percentages, and parametric data was presented as means and standard deviations (SDs). Chi square test was used to compare between acne severity groups regarding food habits and beliefs and to find the relation between acne severity and diet habits. p values <0.05 were considered significant.

### **Results:-**

Total of 580 adults (106 males, 474 females), half of them from the age group (21-30) joined the study. Two hundred ninety-one participants (50.2%) reported no acne, 238 (41.0%) reported mild acne, and 51 (8.8%) reported moderate to severe acne. There were no differences in sex, BMI, and number of meals per day between groups. Participants with mild acne were significantly higher in groups age 16-25 (61.8%) compared with participants with no acne or moderate to severe acne (53.2%) (p=0.001). Similarly, participants with mild acne were significantly higher (72.6%) in receiving medication for treating their acne compared with participants with no acne or moderate to severe acne (27.4%) (p=0.001). There was a significant association between acne and irregular menstruation (p=0.008), while no significant association was found between acne and other diseases (**Table 1**).

Participants with acne compared with participants with no acne reported a greater consumption of the following kinds of food per day: milk, rice, pasta, cheese, soda, sweet, coffee and tea with no significant difference, while there was significant difference in the consumption of the following food type: oil-butter, chips and white bread. Conversely, participants with no acne (compared with participants with acne) reported a greater consumption of the following kinds of food per day: fruits, vegetables, meat, egg, peas, yogurt and low fat milk with no significant difference, while there was a significant difference in the consumption of fish and nuts. On the other hand, the consumption of skimmed milk and brown bread were equal between both groups (**Table 2**).

A greater percentage of participants in the acne groups reported diet to influence acne severity (88.2%) compared with participants with no acne (11.8%) ( $p < 0.001$ ). The results showed that the belief in the ability of some kinds of food (junk food, sweets, chocolate, soda, chips and spicy foods) to aggravate acne severity was significantly higher among participants with acne compared with participants with no acne ( $p < 0.001$ ,  $p < 0.001$ ,  $p < 0.001$ ,  $p = 0.01$ ,  $p < 0.001$  and  $p < 0.001$ ), respectively. Moreover, the belief in the ability of some kinds of food (fruits, vegetables, fish, brown bread and yogurt) to decrease acne severity was significantly higher among participants with acne compared with participants with no acne ( $p < 0.001$ ,  $p < 0.001$ ,  $p = 0.002$ ,  $p = 0.007$  and  $p < 0.001$ ), respectively (**Table 3**).

**Table 1:-** Demographic data and medical characteristics:

characteristics	Overall (n=580)	No acne (n=291)	Mild acne (n=238)	Moderate to severe (n=51)	P value
<b>N (%)</b>					
<b>Age</b>					
less than 16	21 (3.6%)	7 (2.4%)	12 (5.0%)	2 (4.2%)	<b>0.0001*</b>
16-20	88 (15.2%)	34 (11.6%)	48 (20.2%)	6 (12.5%)	
21-25	187 (32.2%)	82 (27.9%)	87 (36.6%)	18 (37.5%)	
26-30	109 (18.8%)	55 (18.7%)	47 (19.7%)	7 (14.6%)	
31-35	78 (13.4%)	47 (16.0%)	22 (9.2%)	9 (18.8%)	
36-40	60 (10.3%)	39 (13.3%)	16 (6.7%)	5 (10.4%)	
more than 40	37 (6.4%)	30 (10.2%)	6 (2.5%)	1 (2.1%)	
<b>Gender</b>					
Male	106 (18.3%)	61 (20.7%)	36 (15.1%)	9 (18.7%)	<b>0.2</b>
Female	474 (81.7%)	233 (79.3%)	202 (84.9%)	39 (81.3%)	
<b>Meals</b>					
One meal	11 (1.9%)	3 (1.0%)	6 (2.5%)	1 (2.1%)	<b>0.8</b>
Two meals	265 (45.7%)	129 (44.3%)	117 (49.2%)	9 (39.6%)	
Third meals	238 (41.0%)	130 (44.7%)	86 (36.1%)	20 (41.7%)	
More than 3 meals	66 (11.4%)	29 (10.0%)	29 (12.2%)	8 (16.7%)	
<b>Do you think there is a relation between diet and acne?</b>					
no	82 (14.3%)	52 (17.7%)	25 (10.5%)	5 (10.4%)	<b>0.03*</b>
yes	497 (85.7%)	241 (82.3%)	213 (89.5%)	43 (89.6%)	
<b>Receiving medication for treating acne</b>					
no	379 (65.7%)	278 (94.6%)	92 (38.7%)	9 (18.8%)	<b>0.0001*</b>
yes	201 (34.7%)	16 (5.4%)	146 (61.3%)	39 (81.2%)	
<b>Contraceptive use (n=474)</b>					
No	436 (92.0%)	217 (90.8%)	179 (96.2%)	40 (93.8%)	<b>0.04*</b>
yes	38 (8.0%)	27 (9.2%)	8 (3.8%)	3 (6.2%)	
<b>Chronic illness</b>					
No	360 (%)	186(51.7%)	148(41.1%)	26(7.2%)	0.329
Hypertension	26 (%)	16(61.5%)	8(30.8%)	2(7.7%)	0.352
Diabetes	15 (%)	9(60.0%)	5(33.3%)	1(6.7%)	0.504
Obesity	83 (%)	44(53.0%)	31(37.3%)	8(9.6%)	0.883
Polycystic ovarian syndrome	39 (%)	17(43.6%)	19(48.7%)	3(7.7%)	0.511
Thyroid disease	18 (%)	7(38.9%)	8(44.4%)	3(16.7%)	0.174
Irregular menstruation	69 (%)	25(36.3%)	35(50.7%)	9(13.0%)	0.008*
<b>Mean± SD</b>					
<b>BMI</b>	25.3±6.3	<b>25.8±6.5</b>	<b>24.7±6.1</b>	<b>24.5±5.7</b>	<b>0.2</b>

**Table 2:-** Association between food and acne severity

Variables (1 per day)	Acne severity		P value
	No acne	Acne	
White bread	58(49.6%)	67(58.4%)	0.03*
Brown bread	44(50.0%)	44(50%)	0.3
Rice	53(43.1%)	70(56.9%)	0.3
Pasta	6(33.3%)	12(66.7%)	0.7
Fruits	46(59.0%)	32(41%)	0.05
Vegetables	55(48.7%)	58(51.3%)	0.1
Meat	38(49.4%)	39(50.7%)	0.4
Fish	4(57.1%)	3(42.9%)	0.02*
Egg	24(60.0%)	16(40.0%)	0.1
Peas	9(60.0%)	6(40%)	0.9
Nuts	14(63.6)	8(36.4%)	0.009*
Yogurt	53(57.0%)	40(43%)	0.3
Skimmed milk	9(50.0%)	9(50%)	0.5
Low fat milk	18(56.3%)	14(44.8%)	0.7
Milk	24(46.2%)	28(53.8%)	0.2
Cheese	50(47.2%)	56(52.8%)	0.1
Oil - butter	10(38.5%)	16(61.5%)	0.0001*
Junk food	7(38.9%)	11(61.1%)	0.06
Soda	9(40.9%)	13(59.1%)	0.8
Sweet	70(47.9%)	76(52.1%)	0.3
Coffee - tea	57(49.1%)	59(50.8%)	0.04*
Chips	11(29.7%)	26(70.3%)	0.01*
<b>Water</b>			
1 cup	26(51%)	25(49%)	0.03
2-3 cups	92(43 %)	122(57%)	
4-6 cups	123(55%)	101(45%)	
7-8 cups	33(55.9%)	26(44.1%)	
More than 8 cups	20(64.5%)	11(35.5%)	

**Table 3:-** Beliefs on the ability of some kinds of food to aggravate or decrease acne severity

Variables	Acne severity			P value
	none	mild	moderate & sever	
<b>Food aggravate acne</b>				
None	2(11.8%)	11(64.7%)	4(23.5%)	.000*
Lake of drinking water	34(22.8%)	98(65.8%)	17(11.4%)	.000*
Junk food	34(22.5%)	97(64.2%)	20(13.2%)	.000*
Sweets	31(27.7%)	69(61.6%)	12(10.7%)	.000*
Chocolate	53(25.9%)	129(62.9%)	23(11.2%)	.000*
Soda	22(28.6%)	48(62.3%)	7(9.1%)	.001*
Milk	6(16.2%)	26(70.3%)	5(13.5%)	.000*
White bread	8(28.6%)	17(60.7%)	3(10.7%)	.037*
Chips	22(19.8%)	74(66.7%)	15(13.5%)	.000*
Spicy food	23(24.2%)	60(63.2%)	12(12.6%)	.000*
Pizza	8(24.2%)	19(57.6%)	6(18.2%)	.001*
<b>Food decrease acne</b>				
None	16(17.6%)	59(64.8%)	16(17.6%)	.000*
Fruits	47(25.8%)	117(64.3%)	18(9.9%)	.000*
Vegetables	38(26.2%)	94(64.8%)	13(9.0%)	.000*
Fish	16(26.7%)	39(65.0%)	5(8.3%)	.002*
Tuna	10(28.6%)	23(65.7%)	2(5.7%)	.061
Brown bread	12(26.7%)	29(64.4%)	4(8.9%)	.007*
Low fat milk	32(32.3%)	59(59.6%)	8(8.1%)	.002*
Yogurt	4(11.4%)	24(68.6%)	7(20.0%)	.000*



**Discussion:-**

The relationship between diet and acne was established since the 19th century, and a lot of studies were conducted to detect this relation and the types of food, which were considered as risk factors in developing acne. (16). The classic Saudi diet contains complex carbohydrates, vegetables, meat, and fish. However, in the last few decades, there was a significant increase in the rate of consumption of junk foods, sweets and sugary drinks particularly in the younger populations. In 2013, there was a study by Kumari et al. in which the authors reported the relation between growth hormone (GH), insulin, and insulin-like growth factor-1 (IGF-1) hormones and the increase in sebum production during puberty (16, 17). Moreover, they reported that hyperinsulinemia and insulin resistance were risk factors for acne development (16). Those conclusions and observations had been emphasized and recognized in subsequent studies (13, 18 and 19). In a study in New York in 2014, the authors reported the significant influence of diet with high GI and GL as a main cause that aggravated acne. Similar results were reported by the study of Colidan et al. where the authors reported the absence of acne among Papua New Guinea and Paraguay population due to their low glucose index diet (5,20). Similar results were found in a big randomized control study (20) where the authors reported the positive effect of low glucose load diet on decreasing acne lesion numbers, raising insulin sensitivity and decreasing weight (19,21). The results of the current studies coincide with the previous study, where the results showed significant association between acne and consuming carbohydrate.

Several other studies demonstrated the link between acne and skimmed milk or whole milk but not with cheese (16-18). This link is stronger with skimmed milk more than whole milk due to the fact that the link is not related to fatty substances in the milk but due to protein substance (13,15), where several studies reported that milk has a three- to six-fold higher GL and insulin-trophic response than predicted. This means that the total consumption of milk proteins had a big influence on acne (13,15). However the findings of the current study couldn't demonstrate this link. In contrast to Burris et al. study that was done among young adults in New York and addressed the relation between acne and milk, specially skimmed milk (17). Moreover, the study of Okoro in Nigeria reported higher acne prevalence among people who drink milk daily than those who don't (72.6% vs. 62.0%;  $p = 0.035$ ). Also, they reported that acne has a relation with eating cake more than any other snacks such as biscuits. This may be supported by the fact that cakes need a large amount of milk in the content (18).

Our study found a significant association between acne and consumption of oil, butter and chips where similar results were found in two cross sectional studies conducted in 2010 in which the authors reported a link between acne development and increased consumption of fried foods (17, 22, and 23). In contrast, the authors in the Nigerian study didn't find this association (18).

Compared with the "no acne group", the consumption of fish was less among acne group. This coincided with the previous studies (15,17,18). This negative effect on acne may be due to the fact that fish had a large amount of omega-3 fatty acids, which exhibit anti-inflammatory properties and help in decreasing IGF-1 levels. In 2012, a case-control study was conducted by Di Landro and colleagues where the authors determined the negative association between eating fish and acne severity (OR 0.68) and they concluded that frequent consumption of fish which is rich with n-3 fatty acids have a protective effect on acne (15,24). However, few studies focused on this link but still there is a lack of evidence on this kind of association (17).

The current study didn't find any significant association between acne and yogurt, cheese, pasta, sweet and soda. However there was a significant association between drinking water and acne, where the group of "no acne" drink water more than the acne group. This is consistent with the belief that shortage in drinking water is a reason for aggravating acne. Regarding the beliefs of aggravation of acne by some kinds of food, most of the participants either from the "acne group" or the "no acne" group reported that soda, chips, pizza, sweets, spicy food and chocolate are related to an increase in acne. Similar results were found in New York study where the authors reported that there is no enough study about the relation between acne and chocolate. Further studies are recommended to detect this relation (17).

**Limitations:-**

The difference in the portion sizes of milk and fish consumed among groups is relatively small. Thus, the clinical relevance is questionable. Also, the nature of the study (cross-sectional) design may make the interpretations of the results limited where the results cannot be used to determine causation.

**Conclusion:-**

The present findings suggest the presence of associations between some kinds of food and acne in the Saudi context, where the milk and saturated fat became on the top of risk factors. Fish consumption showed positive effects in reducing acne. Whenever the food is low in glucose load, low in saturated fat, and rich in grains, vegetables, fruits and Omega-3 fatty acids, the best effect on health and acne is achieved. An interventional dietary study will be required to further establish the effects of those foods on acne vulgaris.

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**Disclosure statement:-**

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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### RESEARCH ARTICLE

#### ASSESSMENT OF PLATELET COUNT AND PLATELET INDICES IN PREGNANCY INDUCED HYPERTENSION.

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PIH, Thrombocytopenia, MPV, PDW.

#### Abstract

Hypertensive disorders of pregnancy complicate up to 10% of pregnancies worldwide, constituting one of the greatest causes of maternal and perinatal morbidity and mortality. The basic pathology of pregnancy induced hypertension (PIH) is poor placentation, and vasospasm of vessels along with alteration of hematological profile. The study was conducted in Dr. D. Y. Patil Hospital and Research institute, Kolhapur, on 50 patients clinically diagnosed as PIH, and 50 normotensive pregnant women both with gestational age  $\geq 20$  weeks. In the present study of the 50 PIH cases 22 cases (44%) had severe PIH (diastolic BP  $\geq 110$ mmHg) and 28 cases (56%) had mild PIH (diastolic BP  $\leq 100$ mmHg) PIH was found to be common in young primigravidas. Thrombocytopenia was the most common haematological aberration seen in PIH. In the present study thrombocytopenia ( $<1.5$  lakhs) was seen in 12 (24%) of total PIH cases. We made a conclusion that simple and routine tests like CBC with platelet count and platelet indices are highly helpful in suspecting deranged coagulation early in courses of disease and have a crucial role in reducing mortality and morbidity of both mother and fetus.

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#### Introduction:-

Hypertensive disorders of pregnancy, including preeclampsia complicate upto 10% of pregnancies worldwide, constituting one of the greatest causes of maternal and perinatal morbidity and mortality worldwide. The term hypertensive disorders of pregnancy includes a heterogeneous collection of disease complicating pregnancy and form one of the deadly triad along with haemorrhage and infection.

The diagnosis of pregnancy induced hypertension is made in women whose blood pressure reaches 140/90mmHG or greater for first time at  $\geq 20$  weeks of gestation. Preeclampsia is characterized by hypertension (Blood pressure of 140/90 mmHg or greater), proteinuria ( $>0.3$ g/dl), edema and new signs of end organ dysfunction and begins as early as 20<sup>th</sup> gestational week. Eclampsia is occurrence of seizures in women with preeclampsia which develops before, during or after labour.<sup>1</sup>

The basic pathology of preeclampsia is endothelial dysfunction, poor placentation, and vasospasm of vessels along with alteration of hematological profile<sup>2</sup>. Out of all hematological abnormalities that occur in PIH, thrombocytopenia is the most common seen in 11-29% of patients. These pregnancies also are associated with

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qualitative changes suggesting increased platelet production and destruction. There is shortened life span, increased number of megakaryocytes in bone marrow and an increase number of immature platelets seen in peripheral smear<sup>4</sup>. Walker J.J. et al showed that in pregnancy induced hypertension there are changes in platelet number, platelet survival and mean platelet volume, which have been interpreted as evidence of increased platelet consumption<sup>9</sup>. The MPV and PDW were elevated proportionally with the severity of pre-eclampsia when compared with the normotensive control group. There is a gradual increase in MPV from normotensive pregnant women to pre-eclampsia and eclampsia. This increase in MPV in pre-eclampsia and eclampsia probably indicate hyperdestruction of platelets due to shorter platelet half-life<sup>11</sup>. There was an increase in PDW from normotensive pregnant women to pre-eclampsia and eclampsia in the study conducted by Tygart et al. This probability reflects increased platelet turnover which would support the idea that platelet survival time is decreased resulting in increased destruction of platelets<sup>12</sup>. Clinically, platelet indices can be a useful screening test for early identification of pre-eclampsia and eclampsia. Also platelet indices can assess the prognosis of PIH in pregnant women.

### Methodology:-

After ethical approval one year prospective study was carried out in D Y Patil Hospital and Research Institute during the period of June 2015 to May 2016. This study was undertaken in Department of Pathology with collaboration of department of Obstetrics and Gynecology, Dr D Y Patil Hospital and Research Institute Kolhapur. The present study includes 50 patients aged 18-35 years clinically diagnosed as pregnancy induced hypertension with gestational age  $\geq 20$  weeks attending outpatient department or admitted in antenatal ward/labour room in department of OBG, Dr. D. Y. Patil Hospital and Research institute, Kolhapur. Fifty normotensive pregnant women in the age group of 18-35 years with gestational age  $\geq 20$  weeks were included in the control group. CBC values were determined by Mindray BC- 3000 Plus hematology analyser which is a fully automated three part hematology analyser. Platelet count, mean platelet volume(MPV), platelet distribution width(PDW) estimation was compared between the normotensive pregnant women with PIH patients. The statistical analysis used was mean, standard deviation and students t-test. The p value  $< 0.05$  was accepted as significant.

### Results:-

PIH is common in young primigravidas, in the present study mean age was  $23.8 \pm 3.56$  years and primigravidas constituted the majority of patients (68%). Thrombocytopenia is the most common haematological aberration seen in PIH. In the present study thrombocytopenia ( $< 1.5$  lakhs) was seen in 12 (24%) of total PIH cases. The mean platelet count in mild PIH was  $2.23 \pm 0.64$  lacs/cumm and that in severe PIH was  $1.67 \pm 0.55$  lacs/cumm. The mean platelet count in normotensive control was  $3.14 \pm 0.80$  lacs/cumm. (Table No. 1)

**Table 1:-** Table showing mean platelets count in mild and severe PIH and control cases

	Mean platelet count $\pm$ SD (lacs/cumm)
Control(n=50)	$3.14 \pm 0.80$
Mild PIH(n=28)	$2.23 \pm 0.64$
Severe PIH(n=22)	$1.67 \pm 0.55$

### Mean Platelet Volume and Platelet distribution width (PDW):-

In the present study MPV ranged from 7.6 femtolitre to 12.6 fl in mild PIH & 7.8 fl to 13.6fl in severe PIH. Mean MPV in PIH was significantly higher ( $10.57 \pm 2.67$  fl) compared to that in control group ( $7.74 \pm 0.92$  fl) p  $< 0.05$  significant. In the present study mean PDW in PIH cases was  $13.2 \pm 1.97\%$  whereas it was  $11.82 \pm 1.52\%$  in control. Mean PDW was significantly increased (p $< 0.05$ ) in PIH group compared to control (Table No. 2)

**Table 2:-** Table showing mean MPV in PIH and control cases

	Mean MPV $\pm$ SD (fl)	Mean PDW $\pm$ SD (%)
PIH (n=50)	$10.57 \pm 2.67$	$13.2 \pm 1.97$
Control (n=50)	$7.74 \pm 0.92$	$11.82 \pm 1.52$

### Discussion:-

Women with severe pre-eclampsia develop a variety of hematological aberrations. These hematological aberrations have an impact on the outcome of delivery of these patients so that aggressive therapy can be initiated to prevent maternal and neonatal morbidity and mortality.

Thrombocytopenia is the most common haematological aberration seen in PIH. It is caused by increased platelet destruction as shown by decreased platelet lifespan, increased number of megakaryocytes in the bone marrow and an increased proportion of young, oversized platelets (megathrombocytes) in the peripheral blood film. Thrombocytopenia is associated with progressive disease & also with disease severity. Thrombocytopenia occurs in 15% of patients with pre-eclampsia. A significant reduction in platelet count is seen frequently during and even before the onset of disease<sup>13</sup>.

Kelton J. G, et al<sup>4</sup> in their study observed that 34% of patients had thrombocytopenia, Thomas A, et al in their study reported that 16% had thrombocytopenia<sup>14</sup>. Vrunda J K. reported 41% thrombocytopenia, Ruchi Verma et al reported 31% thrombocytopenia in their studies. In the present study 24% had thrombocytopenia (Table no. 3).

**Table 3:-** Table showing comparison of percentage of PIH patients having thrombocytopenia in different studies.

Authors	Thrombocytopenia(%)
Kelton J. G, et al <sup>4</sup> (n=26) (1985)	34%
Thomas A. et al <sup>14</sup> (n=80) (1998)	16%
Vrunda JK <sup>15</sup> (n=72) (2004)	41%
Ruchi Verma et al <sup>16</sup> (n=35) (2015)	31%
Present study (n=50)(2016)	24%

Severity of PIH and thrombocytopenia are closely correlated which indicates that thrombocytopenia is directly proportional to severity of PIH. The mean platelet count in present study were: 3.14 lacs/cumm in normotensive pregnant women and 2.23 lacs/cumm in mild PIH and 1.67 lacs/cumm in severe PIH cases. When mean platelet count was compared between control and PIH cases, a significant decrease in platelet number was observed and correlated well with the values of other studies. ( Table No-4)

**Table 4:-** Table showing comparison of mean platelet count in normotensive and varying degree of PIH and correlation with other studies

Authors	Mean Platelet volume (lacs/cumm)		
	Control	Mild PIH	Severe PIH
Kulkarni and Sutharia <sup>20</sup> (n=90) (1983)	2.5	1.84	1.19
Srivastava M <sup>17</sup> (n=119) (1995)	1.94	1.79	1.64
Vrunda Jk <sup>15</sup> (n=122) (2004)	2.2	2.01	1.4
Jambhulkar et al <sup>18</sup> (n=194) (2001)	2.38	2.30	1.70
S Mohapatra <sup>19</sup> (n=90) (2007)	2.38	2.23	1.82
Ellora Devi et al <sup>21</sup> (n=60) (2012)	2.44	1.82	1.42
Present study (n=100) (2016)	3.14	2.23	1.67

The normal range for MPV is 8.63±0.87 fl in many studies and distribution of platelet sizes is related to PDW. Platelet size and platelet distribution width are both increased in pre-eclamptic patients even with normal platelet counts. Rise in MPV & PDW can predict the haemostatic abnormality in them<sup>7</sup>.

Walker J. J. et al<sup>9</sup> has indicated that rising MPV can be used as a marker for intervention in pre-eclamptic patients. Stubbs et al has reported increased MPV of 11.5fl in his study of PIH patients compared to control subjects (9.7fl). Similar observation was made by various other authors and also in present study. (Table no. 5).

**Table 5:-** Table showing comparison of mean MPV in present study with other studies.

Authors	Mean Platelet Volume(fl)	
	Control	PIH
Stubbs et al <sup>7</sup> (n=20)(1986)	11.5	9.7
Giles et al <sup>10</sup> (n=550) (1987)	8.7	9.9
Ahmed et al <sup>22</sup> (1993)	9.6	10.2
Vamseedhar et al <sup>11</sup> (n=182) (2011)	8.2	10.2
Fahmi E M et al <sup>23</sup> (n=70) (2013)	9.5	10.6
Present study(n=100) (2016)	7.7	10.7

Increased mean platelet distribution width of 13.2% in PIH case compared to 11.82% in control cases was observed in present study. Similar observation was made by various other authors (Table No:6)

**Table 6:-** Table showing comparison of mean platelet distribution width (PDW) in present study with other studies

Authors	Mean PDW (%)	
	Control	PIH
Giles et al <sup>10</sup> (1987) (n=550)	12	16
Vamseedhar et al <sup>11</sup> (2011)(n=182)	11.07	15.51
Fahmi E M et al <sup>23</sup> (2013)(n=70)	11.2	13.99
Present study(n=100) 2016	11.82	13.2

### Conclusion:-

Pregnancy induced hypertension is the most common complication of pregnancy and remains a leading cause of maternal and fetal morbidity & mortality. As a result of the haemostatic aberrations in PIH, postpartum hemorrhages sometimes so severe as to lead to maternal death may occur. Fetal growth retardation is more frequent in the thrombocytopenic groups. This study gives an outline of the investigations to be done in cases of PIH which can alert the physician of the severity of disease so that appropriate and timely management can be initiated. The estimation of platelet count and platelet indices is a reliable method. In this study an attempt has been made to assess the role of platelet count and platelet indices like MPV and PDW in PIH patients.

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### RESEARCH ARTICLE

#### A CASE STUDY ON SOLITARY RECTAL ULCER SYNDROME TREATED WITH ERANDAMULADI BASTI FOLLOWED BY GUDAPICHU WITH JATYADI TAILAM.

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#### Abstract

Solitary Rectal Ulcer Syndrome is most common in young adults and occurs on the anterior rectal wall. It is thought to result from localized chronic trauma or ischaemia associated with disordered puborectalis function and mucosal prolapse. Symptoms include minor bleeding, mucus per rectum, tenesmus, perianal pain with severe constipation. A 42 years old male patient who presented with complaints of severe constipation, shirashoola, perianal pain, H/o – minor bleeding per rectum only once and colonoscopy shows the impression as Solitary Rectal Ulcer Syndrome. Considering the vitiation of Apana vata, patient was treated with snehana, swedana, Erandamuladi Basti and Gudapichu with Jatyadi taila. This management showed significant result in the above case study, such as relief in parianal pain, straining at defecation, passage of mucus per rectum, bleeding per rectum as well as Healing of an Ulcer in colonoscopy after treatment.

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#### Introduction:-

Solitary Rectal Ulcer Syndrome is the most common in young adults and occurs on the anterior rectal wall. It is throughout to result from localized chronic trauma or ischaemia associated with disordered puborectalis function and mucosal prolapse.

The ulcer is seen at colonoscopy and biopsies show a characteristic accumulation of collagen. Symptoms include minor bleeding, mucus per rectum, tenesmus, perianal pain and severe constipation. Treatment is often difficult but avoidance of straining at defecation is very important and treatment of constipation may help or else surgical intervention is the next line of treatment for this condition<sup>1</sup>

The symptomatology of patient suggestive of vitiation of Apana vata due to Purishvaha strotodusthi. In first stage patient was C/o severe constipation(Purishasanga), abdominal distension (Adhamana). Sometimes abdominal pain (Pakwashaya shoola) due to H/o Suppression of natural urges i.e. Vegavarodha<sup>2</sup>. Which in turn leads to severe constipation, perianal pain, mucous per rectum, minor bleeding per rectum etc. and showed the impression as colonoscopy revealed a solitary rectal ulcer syndrome.

Considering Purishavaha Sroto dushti, vitiation of Apana vata and Vegavarodha as main causation, this condition can be correlated with Purisha vegavarodhajanya Udavarta leading to Gudagata vrana.<sup>3</sup> Acharya Sushruta stated the symptoms of Purisha vegavarodhajanya udavarta as Abdominal distension (Adhamana and atopa); severe constipation (Purisha sanga), Perianal pain (Parikartana), Belchings (Urdhwa vata) etc. which may lead to local

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ulcer formation due to chronic traumatic injury due to severe constipation.<sup>4</sup> Acharya Sushruta stated the treatment of Udavarta with Vata predominance is snehana, swedana and Asthapan Basti.<sup>5</sup>

Erandamuladi Basti was selected for this case which is indicated in Purisha and Vayu graham.<sup>[6][7]</sup> and wound healing procedures described by Sushruta still holds its place today. The faster the wound healing, the faster is the recovery of the patient enabling him to resume his daily routine. So for local application (ropana) Jatyadi taila was selected for Guda-pichu as Guda-gata vrana comes under Sukharopaniya Vrana<sup>8</sup>

### Case Report:-

A 42 years old male patient came Panchakarma OPD of Government Ayurved College, Nanded, Maharashtra, India presented with the complaint of an ulcer on anterior rectal wall associated with severe constipation, perianal pain, mucus per rectum, Sometimes abdominal distension, Pain in calf muscles (Pindikodweshtanam) and H/o minor bleeding per rectum once only – 3 months back.

Before one year patient was alright then, later on he was suffering with severe constipation (Purishasanga), belchings(urdhva vata), abdominal pain (Pakwashaya shoola), Head ache (shirashoola) etc. due to H/o Suppression of urges as past history of medical illness.

After medication, some symptoms were relieved. But since 4 months again patient was suffering with the same symptoms.

### On examination:-

General condition – moderate, afebrile

Pulse rate - 70 / min, Regular

BP – 100/70 mmHg

No H/o HTN/DM/Any major illness/Surgery.

H/o – Suppression of urges due to workload,

H/o - occasionally drinking .

Family H/o Nothing specific.

### Investigation:-

Routine haematology – (Hb, TC, DC, ESR, RBS, Platelet count) and urine investigations were done and were within normal limits.

### Colonoscopy:-

**Rectum:-** Small superficial ulcer with few erosions.

**Impressions:-** Solitary rectal ulcer syndrome

**Biopsy report:-** Non specific mild chronic inflammation. No definitive feature of Solitary Rectal Ulcer Syndrome seen given biopsy.

Patient had received treatment for it but there was no relief in symptoms so came to Ayurvedic hospital for the needful.

As Sushruta has described the treatment for Purishavegavarodhajanya Udavarta and guda-gata vrana is Snehana, Swedana, Asthapan basti and for guda-gata vrana – ropana was planned.

### Treatment Given:-

Patient was treated with Snehana, swedana, and Erandamuladi Nruha Basti and Guda-pichu with Jatyadi taila.

Procedure	Medication	Dose	Duration.
Sarvanga abhyanga	With Muchitaila taila	approx 60 ml	25-30 min per day 8 days
Nadi swedana	Dashamoola Kwatha	-	10-15 min/day for 8 days Twice daily for 8 days
Guda-pichu	Jatyadi taila	3 to 5 ml.	
Pradhan Karma Yoga Basti	Anavasan with Prasarini taila	80 ml	Start with Anvasana Alternate day
	Asthapana with Erandamuladi basti	Approx 480 ml	8 days

## Ingredients of Erandamuladi Basti.

	Drug	Quantity
Honey	Makshika	20 gm
Rocksalt	Lavana	10 gm
Sahachara taila	Sneha	100 ml
Yastimadhu	Kalka	30 gm
Erandamujladi	Kwatha	320 ml
	Approximate	480 ML.

Anuvasan with -> Prasarini taila – 80 ml daily

Niruha -> Kalka -> yasthimadhu – 30 mg

Kwatha -> Erandamoola – 3 parts + Palasha + Laghupanchamoola + Rasna +

Aswagandha + Atibala + Guduchi + Punarnava + Araogawadha + Devadaru – each 1 part & Madanphala – 1 part.

**Preparation:-** The process for preparation was followed as described by Sharangadhara in Hina matra.

**Assesment Criteria:-**

1)	Perianal pain (Parikartanam)	0	-	Absent
		1	-	Mild
		2	-	Moderate
		3	-	Severe
2)	Constipation (Purisha sanga)	0	-	Absent
		1	-	Mild
		2	-	Moderate
		3	-	Severe
3)	Headache (Shirashoola)	0	-	Absent
		1	-	Mild
		2	-	Moderate
		3	-	Severe
4)	Abdominal distension (Pindikodweshtanam)	0	-	Absent
		1	-	Mild
		2	-	Moderate
		3	-	Severe
5)	Pain in Calf Muscles (Adhaman)	0	-	Absent
		1	-	Mild
		2	-	Moderate
		3	-	Severe
6)	Mucous per rectum	0	-	Absent
		1	-	Mild
		2	-	Moderate
		3	-	Severe

Signs and symptoms	BT	AT
1. Periamal Pain	2	0
2. Constipation	3	0
3. Headache	2	0
4. Abdominal distension	1	0
5. Pain in calf muscles	3	1
6. Mucous per rectum	1	0
Colonoscopy	Solitary ulcer syndrome	Healing rectal ulcer

**Discussion:-**

The symptomatology of Solitary Rectal Ulcer Syndrome denotes the apana vayu dushti due to vegavarodhajanya hetu, again leads to vata prakopa. Severe constipation leads to trauma producing the ulceration at superficial rectal wall.

Basti is the main line of treatment for vataprakopa and Erandamuladi Basti helps in malnirharana and vatunolamana.

Madhu is vranaropaka and used as catalyst. The fatty acids present in honey stimulates peristalsis.

Saindhava due to its sukshma and tikshna property helps the basti dravya to reach up to microcellular level.

- Yashtimadhu helps for vatanulomana and acts as vranaropana.
- Eranda is Kaphavatahara acts as rechana and shoolahara. Palasha as deepana and bhedana, Laghupanchamoola as shothahara and Rasna as amapachana and shoolahara.

Prasarini taila is Kaphavatahara and does vatanulomana. Punarnava is shothhara Ashwagandha as Balya, rasayana, Atibala as balya and brumhana, Argawadha as rechana and Madanaphala and Devdaru as vatanulomana helps Erandamuladi basti to reduce strotorodha.

Prasarini taila also kaphavatahara and does vatanulomana.

So in this case study, patient got relief in perianal pain, constipation, headache, abdominal distension, mucous per rectum and healing of an ulcer was reported in colonoscopy after completion of treatment.

### Conclusion:-

Basti acts through systemic correction and regulation of doshas which involves in the formation i.e. Apana vata dushti in solitary rectal ulcer syndrome.

Erandamuladi Niruha Basti showed very good result in reducing the symptoms as well as in healing the ulcer.

From the above study, it can be said that Erandamuladi Basti and ropana with Jatyadi taila might prove beneficial to the patients with Severe constipation leading to Solitary rectal ulcer syndrome.

It was an attempt made to provide safe and effective management with least expenditure.

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### RESEARCH ARTICLE

#### PRELIMINARY PARAMETERS OF HEMATOLOGIC VALUES IN BARBARY SHEEP (*AMMOTRAGUS LERVIA* PALLAS, 1777).

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#### Abstract

The deficiency of information and updates related to normal haematological and biochemical parameters study of certain species, such as the case of *Ammotragus lervia* species (Barbary sheep), generates the need for further research in this area. Therefore, in this work were used five animals of the *Ammotragus lervia* species, one male and four females, to the preliminary study of its hematological parameters. All quantitative and qualitative determinations were established by conventional techniques, and used the same techniques of domestic ruminants. Haematological values obtained for the average *Ammotragus lervia* species were: RBC  $13.17 \times 10^6/\text{mm}^3$ ; 14.02 hemoglobin g/100 ml; PCV 42.20%; MCV 32.38 fl; MCH 10.72 pg; MCHC 33.18%; WBC  $9.92 \times 10^3/\text{mm}^3$ ; Basophils 0%; Eosinophils 3%; Band Neutrophils 3%; Segmented Neutrophils 66%; Lymphocytes 27%; Monocytes 1%. In the statistical analysis was determined just the average of the variables, just like standard deviation and confidence intervals, due to the small number of individuals and of inequality between the number of males and females. Standard techniques used in the preparation of haematological exams for the domestic ruminants are effective for *Ammotragus lervia* species. Haematological values obtained for the *Ammotragus lervia* species exhibit a variability regarding the data of hematological values described in the literature. The discoid biconcave format and the smaller size of the red blood cells observed in this study for the *Ammotragus lervia* species are equal to the shape and size of the cells described in the literature for the same species.

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#### Introduction:-

Currently, the use of laboratory examinations in veterinary medicine complements the clinical work, as it often can facilitate the observation of some physiopathological changes arising from any illness. The correct evaluation of the physiological state of an animal, the extent of the damage to the tissues and organs and the response of the defense

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mechanism of the patient depends directly from the appropriate analysis of the results of laboratory tests, physical examination and clinical history (Coles, 1984; Tibbo et al., 2004).

In the clinical pathology of wild animals field, few studies have been developed, mainly related to hematological and biochemical normal parameters of certain species. There is deficiency of information and many of the available studies in the literature are old or the variables used in this studies, have changed a lot since the preparation of some parameters, as climate, geographic distribution, eating habits and destruction of natural habitats. According to Peinado et al. (1999) there are several studies on the Hematology of Artiodactylas, but these are very incomplete and there are still several gaps in this area.

The species *Ammotragus lervia* (Barbary sheep, Aoudad) of the order Artiodactyla is of African origin, which occurs in Highlands in desert areas and semi-deserts areas of Morocco and Western Sahara to the Egypt and the Sudan (Wilson and Reeder, 2005), is small, with a frizzy hair and both sexes feature a large fringe on throat and chest region extending to the lower parts of the forelimbs. Its coloration varies between the brown sand color, being the lowest parts of moderately clear coloring, features prominent horns, strong and full of pleats, and the horns of adult males are larger and more prominent than the females (Casinello, 1998; Nowak, 1999).

The *Ammotragus lervia* is the wild sheep more common captive-breed, as it is the only one that adapts quickly (Tumbleson et al., 1970; Wallach and Boever, 1983; Jessup, 1999). In addition, there is a great ecological interest in this species, since many of these specimens were removed from their natural habitats and transferred mostly to the Americas with the aim of its use for the practice of sport hunting (Boever, 1986; Nowak, 1999).

The great interesting in the study of *Ammotragus lervia* species is due to the fact that this is considered at risk of extinction, the category of vulnerable species (VU C1) as the IUCN Red List of Threatened Species classification (IUCN, 2016), as well as in Appendix 2 of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora) (Shackleton, 1997; Casinello, 1998; Nowak, 1999; CITES, 2016).

According to Tumbleson et al. (1970) the *Ammotragus lervia* species has great tendency to the natural occurrence of atherosclerosis and the study of their values of serum biochemical and haematological parameters can help establish this species as model animal for studies of the disease.

This work aims to contribute with preliminary standards haematological parameters for *Ammotragus lervia* species in order to decrease the existing shortcomings in the literature, improving knowledge of data in the area of wild ruminants.

### **Material and Methods:-**

It was studied five animals of the *Ammotragus lervia* species, from the livestock of Rio Zoo Foundation/R.J., one male and four females, clinically healthy.

The females were marked with numbered rings in his ears, and the male did not present any markup. This work was not taken into consideration the age of the animals.

### **Hemogram:-**

From each animal was taken 3 ml of blood sample by external jugular vein puncture using a 5 ml disposable syringe (BD brand) and a disposable needle (25x7) as recommended by Peinado et al. (1999), Tumbleson et al. (1970), Wallach and Boever (1983), Kitchen (1986) and Fowler (2003).

Immediately after venipuncture were made three smears with the blood sample, without any contact with the anticoagulant, and later the blood was transferred to a tube containing EDTA (Vacutainer EDTA 26 BD brand). After the homogenization of the sample with the anticoagulant and air-drying of smears, with their respective IDs, the samples were immediately processed in own laboratory of Rio-Zoo Foundation.

All of the following quantitative and qualitative determinations were established by conventional techniques according to Schalm et al. (1975):

- a) Erythrogram: Red blood cell (RBC - hemocytometer), Hemoglobin concentration (Hb - cyanometahemoglobin – spectrophotometry), Packed cell volume (PCV -microhematocrit). Mean corpuscular volume (MCV), Mean

corpuscular hemoglobin concentration (MCHC), and Mean corpuscular hemoglobin (MCH) were calculated according to the following formula:

$$\text{MCV} = \frac{\text{PCV}}{\text{RBC}} \times 10; \text{MCH} = \frac{\text{Hb}}{\text{RBC}} \times 10 \text{ e } \text{MCHC} = \frac{\text{Hb}}{\text{PCV}} \times 10.$$

- b) Leukogram: white blood cell count (WBC - hemocytometer) and differential leukocyte count, as well as May-Grünwald-Giemsa stain blood smears (MGG) for qualitative analysis of red and white cells (Rullier, 1968).

On statistical analysis of hematological values of the five animals of the *Ammotragus lervia* species was determined only the average of the variables studied, as well as the values of standard deviation and confidence interval (lower and upper limit), due to the small number of individuals and of inequality between the number of males and females, which made it impossible for a more specific statistical survey on the difference between these averages.

### Results:-

It was not necessary the use of tranquilizers on animals of Rio-Zoo Found by the fact that, in addition to these animals are already accustomed to the daily management of their handlers, the speed of the process and the low nuisance which is caused to animals (Fig. 1), offering a final result of the analysis of the material without interference from medication.



**Fig. 1:-** Mechanical restraint of a specimen of the *Ammotragus lervia* species blood collection

In relation to the shape and size of the blood cells of the *Ammotragus lervia* species, it was observed that the red blood cells present a discoid biconcave format in the proportion sizes as the domestic goats and sheep cells.

The individualized results obtained from peripheral blood samples of the five animals of the *Ammotragus lervia* species (Barbary sheep) are described in tables 1 and 2, respectively.

**Table 1:-**Erythrogram values in *Ammotragus lervia* species (n = 05)

Animal	Sex	Date	RBC	Hb	PCV	MCV	MCH	MCHC
N° 1	F	14/12/06	16,45	15,6	47	28,5	9,4	33,1
N° 2	F	14/12/06	11,71	16,6	50	42,6	14,1	33,2
N° 3	F	14/12/06	14,53	13,6	41	28,2	9,3	33,1
N° 4	F	14/12/06	12,21	14,3	43	35,2	11,7	33,2
N° 5	M	14/12/06	10,94	10,0	30	27,4	9,1	33,3
<b>RBC</b> Red Blood Cells x 10 <sup>6</sup> /mm <sup>3</sup>			<b>MCV</b> Mean Corpuscular Volume fl					
<b>Hb</b> Hemoglobin g/dl			<b>MCH</b> Mean Corpuscular Hemoglobin pg					
<b>PCV</b> Packed Cells Volume %			<b>MCHC</b> Mean Corpuscular Hemoglobin Concentration					

**Table 2:-**Leukogram values in *Ammotraguslervia* species (n = 05)

Animal	Sex	Date	WBC	Bas	Eos	Band	Seg	Lym	Mn
N° 1	F	14/12//06	7,20	0	7 (504)	0	69 (4968)	24 (1728)	0
N° 2	F	14/12/06	12,70	0	3 (381)	2 (254)	80 (10160)	13 (1651)	2 (254)
N° 3	F	14/12/06	11,50	0	4 (460)	1 (115)	45 (5175)	50 (5750)	0
N° 4	F	14/12/06	8,80	0	2 (176)	3 (264)	63 (5544)	29 (2552)	3 (264)
N° 5	M	14/12/06	9,40	0	0	11 (1034)	71 (6674)	17 (1598)	1 (94)
<b>WBC</b> White Blood Cells x 10 <sup>3</sup> /mm <sup>3</sup>							<b>Seg</b> Segmented Neutrophils % e (mm <sup>3</sup> )		
<b>Bas</b> Basophils % e (mm <sup>3</sup> )							<b>Lym</b> Lymphocytes % e (mm <sup>3</sup> )		
<b>Eos</b> Eosinophils % e (mm <sup>3</sup> )							<b>Mn</b> Monocutes % e (mm <sup>3</sup> )		
<b>Band</b> Band neutrophils % e (mm <sup>3</sup> )									

The mean Haematological values of the eritrograms and leucograms of the five animals of the *Ammotraguslervia* species studied are described in table 3, as well as the values of standard deviation and confidence interval (lower and upper limit).

**Tabela 3:-** Mean values of erythrogram and leukogram in *Ammotraguslervia* species (n = 05)

Variable	Mean	Standard deviation	Range	
			Lower limit	Upper limit
<b>RBC</b>	13,17	2,27	10,90	15,44
<b>Hb</b>	14,02	2,53	11,49	16,55
<b>PCV</b>	42,20	7,66	34,54	49,86
<b>MCV</b>	32,38	6,51	25,87	38,89
<b>MCH</b>	10,72	2,17	8,55	12,89
<b>MCHC</b>	33,18	0,08	33,10	33,26
<b>WBC</b>	9,92	2,19	7,73	12,11
<b>Bas</b>	0,00	0,00	0,00	0,00
<b>Eos</b>	3 (304)	3 (212)	1 (93)	6 (516)
<b>Band</b>	3 (333)	4 (406)	-1 (-73)	8 (740)
<b>Seg</b>	66 (6504)	13 (2147)	53 (4357)	79 (8651)
<b>Lym</b>	27 (2655)	14 (1773)	12 (882)	41 (4428)
<b>Mn</b>	1 (122)	1 (130)	0 (-8)	3 (252)
<b>RBC</b>	Red Blood Cells x 10 <sup>6</sup> /mm <sup>3</sup>		<b>WBC</b> White blood cellsx 10 <sup>3</sup> /mm <sup>3</sup>	
<b>Hb</b>	Hemoglobin g/dl		<b>Bas</b> Basophils % e (mm <sup>3</sup> )	
<b>PCV</b>	Packed Cells Volume %		<b>Eos</b> Eosinophils % e (mm <sup>3</sup> )	
<b>MCV</b>	Mean Corpuscular Volume fl		<b>Band</b> Band Neutrophils % e (mm <sup>3</sup> )	
<b>MCHC</b>	Mean Corpuscular Hemoglobin Concentration %		<b>Sg</b> Segmented Neutrophils % e (mm <sup>3</sup> )	
<b>MCH</b>	Mean Corpuscular Hemoglobin pg		<b>Lym</b> Lymphocytes % e (mm <sup>3</sup> )	
			<b>Mn</b> Monocytes % e (mm <sup>3</sup> )	

### Discussion:-

It was possible to observe the existence of similarity between the results described in the literature for the *Ammotraguslervia* species, with few differences in relation to some variables for both the highest values of the parameters as to the lower values of the parameters. This is according to Peinado et al. (1999) that report be, the occurrence of these differences, probably due to the effects of climate, captivity, age, methodology used in the preparation of the samples and biological agents as was noted during the preparation of this species.



**Eritrogram:-**

The results determined on this study show average values for Red blood cells (RBC) ( $13.17 \times 10^6/\text{mm}^3$ ) were lower compared to the values reported by Tumbleson et al. (1970) and Huisman et al. (1968), respectively  $15.27 \times 10^6/\text{mm}^3$  and  $17.32 \times 10^6/\text{mm}^3$ .

The values for the limits of the confidence interval for Red Blood Cells (RBC) obtained in this work ( $10.90$  to  $15.44 \times 10^6/\text{mm}^3$ ) were lower than those found by Tumbleson et al. (1970) studying the blood samples of twenty-one copies of *Ammotragus lervia* ( $11.25$  to  $23.42 \times 10^6/\text{mm}^3$ ), despite the average value ( $13.17 \times 10^6/\text{mm}^3$ ) of this work is within the confidence interval reported by the authors.

Haematological values obtained for Red Blood Cells (RBC) on this work for the *Ammotragus lervia* species present significant difference compared to haematological values described by Kitchen (1986) and Fowler (2003), both for the higher values and the lower values. The values found by the authors for the average and the limits of the confidence interval of RBC are much smaller ( $5.8 \times 10^6/\text{mm}^3$  –  $5.38$  to  $6.2 \times 10^6/\text{mm}^3$ ) in relation to the same variables of this study ( $13.17 \times 10^6/\text{mm}^3$ - $10.90$  to  $15.44 \times 10^6/\text{mm}^3$ ), including the average value ( $13.17 \times 10^6/\text{mm}^3$ ) obtained in this work are within the limits of the confidence interval described by two authors ( $5.38$  to  $6.2 \times 10^6/\text{mm}^3$ ).

For the hemoglobina values, the present research found ( $14, 02 \text{ g/dl}$ ), lower value compared to the values reported by Huisman et al. (1968) ( $15, 3 \text{ g/dl}$ ) and Tumbleson et al. (1970) who found  $14.3 \text{ g/dl}$ , for 21 animals, but within the limits of the confidence interval of the same ( $11.7$  to  $16.2 \text{ g/dl}$ ), established by Tumbleson et al. (1970). However, the value determined in this study was higher than the values found for Peinado et al. (1999), Wallach and Boever (1983), Kitchen (1986) and Fowler (2003).

The average Packed Cells Volume (PCV) of this work ( $42.20\%$ ) was higher than the average PCV obtained by Tumbleson et al. (1970) in 21 animals of *Ammotragus lervia* ( $41.25\%$ ) species, and than Wallach and Boever (1983), Kitchen (1986), Peinado et al. (1999) who studied six specimens, and Fowler (2003) and than Huisman et al. (1968) in four animals. As to the limits of the confidence interval found on this work ( $34.54$  to  $49.86\%$ ), the upper limit was above those found by Tumbleson et al. (1970) and Wallach and Boever (1983) which was  $47.5\%$ , and for Kitchen (1986) and Fowler (2003) who found  $37.2\%$ , as Peinado et al. (1999) which registered  $46.0\%$ .

On the other hand, the value of the lower limit of the confidence interval of the PCV obtained by the work ( $34.54\%$ ) is higher than that found by Tumbleson et al. (1970) and Wallach; Boever (1983) ( $32.3\%$ ) and Peinado et al. (1999) which registered  $22.5\%$  and lower than the value reported by Kitchen (1986) and Fowler (2003) ( $35.7\%$ ).

The same occurs with the values of the Mean Corpuscular Volume (MCV) obtained at this work which are higher ( $32.38 \text{ fl}$ - $25.87$  to  $38.89 \text{ fl}$ ) then the values reported by Huisman et al. (1968) ( $27.3 \text{ fl}$ - $18.1$  to  $34.9 \text{ fl}$ ), but the average value ( $32.38$ ), is within the limits of the confidence interval described by the authors.

About the values obtained for Mean Corpuscular Hemoglobin (MCH) on this work, the values of the averages and the lower limit of the confidence interval were higher ( $10.92 \text{ pg}$  and  $8.55 \text{ pg}$ ) than Tumbleson et al. (1970) and Wallach and Boever (1983) that were  $9.6 \text{ pg}$  for the average and  $6.2 \text{ pg}$  for the lower limit, and Peinado et al. (1999) which were, respectively,  $9,79 \text{ pg}$  and  $8,51 \text{ pg}$ . The value of the upper limit of the confidence interval found in our research ( $12.89 \text{ pg}$ ) was similar to Tumbleson et al. (1970), which featured  $12.3 \text{ pg}$ , but higher than Peinado et al. (1999) which was  $10, 7\text{pg}$ .

Finally, analyzing the results obtained for the values of the Mean Corpuscular Hemoglobin Concentration (MCHC) by Tumbleson et al. (1970) for the average and for the upper limit of the confidence interval ( $35.2\%$  and  $36.7\%$ ) and by Peinado et al. (1999), respectively ( $39.1\%$  and  $44.8\%$ ) that are higher than the values of this work ( $33.18\%$  and  $33,26\%$ ) and the value for the lower limit of the confidence interval found by Tumbleson et al. (1970) ( $32.8\%$ ) is lower than the value of the MCHC of this work ( $33.10\%$ ), but within the limits of the confidence interval ( $32.8$  to  $36.7\%$ ) reported by the same authors. However, Peinado et al. (1999) determined higher value ( $35.6$ ) and, in this case, our value is outside the confidence interval.

**Leucogram:-****White blood cells:-**

The value for the White blood cells (WBC) obtained for the upper limit of the confidence interval of five animals of *Ammotraguslervia* species ( $9.92 \times 10^3/\text{mm}^3$  and  $12.11 \times 10^3/\text{mm}^3$ ) on this study were below the values reported by Tumbleson et al. (1970), for twenty-one animals of *Ammotraguslervia* species, that was  $11.2 \times 10^3/\text{mm}^3$  for average and  $17.0 \times 10^3$  to  $5.21/\text{mm}^3$  for confidence interval, lower, too, that was published by Kitchen (1986) and Fowler (2003) ( $92 \times 10^3/\text{mm}^3$  13.2 and  $14.8 \times 10^3/\text{mm}^3$ ), but were higher when compared with the findings of Peinado et al. (1999) working with six animals ( $3.70 \times 10^3/\text{mm}^3$  and  $6.0 \times 10^3/\text{mm}^3$ ).

Although the value obtained for the lower limit ( $7.73 \times 10^3/\text{mm}^3$ ) of the confidence interval, in this work is higher than the value obtained by Tumbleson et al. (1970) to the lower limit ( $5.21 \times 10^3/\text{mm}^3$ ) and Peinado et al. (1999) ( $1.85 \times 10^3/\text{mm}^3$ ), but lower than the values quoted by Kitchen (1986) and Fowler (2003) that was  $11.6 \times 10^3/\text{mm}^3$ .

**Differential leukocyte count:-**

During the study of the differential leukocyte counts for *Ammotraguslervia* species values obtained for Segmented Neutrophils were average of 66% and for its limits of the confidence interval 53% to 79%, values similar to those described by the authors Peinado et al. (1999), Tumbleson et al. (1970), Wallach;Boever (1983), Kitchen (1986) and Fowler (2003).

The study on the values of the Band Neutrophils for *Ammotraguslervia* species in five animals evaluated in this research had as 3% average and the limits of the confidence interval of 1 to 8%. Peinado et al. (1999), Tumbleson et al. (1970), Wallach;Boever (1983), Kitchen (1986) and Fowler (2003), in its publications, did not report any value for the Band Neutrophils.

The values described by the authors Peinado et al. (1999), Tumbleson et al. (1970), Wallach; Boever (1983), Kitchen (1986) and Fowler (2003) for Lymphocytes to *Ammotraguslervia* species are quite similar to the values obtained for this variable in this study (27%). However, when we compare the results of the values of the literature consulted, we found that the values of Peinado et al. (1999) are higher (43.45%) than the values of others.

The results obtained for Monocytes to *Ammotraguslervia* species of five animals in this work for the average (1%) and for the limits of the confidence interval (0-3%) are similar to values reported by Peinado et al. (1999), Tumbleson et al. (1970), Wallach; Boever (1983) although Kitchen (1986) and Fowler (2003) did not report any value for this variable in their work to the same species.

The values determined for Eosinophils to *Ammotraguslervia* species, by Peinado et al. (1999), Tumbleson et al. (1970), Wallach; Boever (1983), Kitchen (1986) and Fowler (2003) are similar to the values found in this work for the average (3%) and to the limits of the confidence interval (1 to 6%) for the five animals of *Ammotraguslervia* species in this work, having only just above the upper limit of the values described by the authors.

The result given to the values of Basophils to *Ammotraguslervia* species in this work was 0%, which is consistent with the results reported to the values of Basophils by Peinado et al. (1999), Tumbleson et al. (1970), Wallach; Boever (1983), Kitchen (1986) and Fowler (2003) did not determined any value for this variable.

**Conclusions:-**

The results obtained in this study are likely to minimize the difficulties faced by Veterinarians who specialize in wildlife, and technicians who work in Zoological Parks. The continuation of research not only with haematological parameters, but also with biochemical, enzymological and genetic studies that in future will provide subsidies for a better evaluation of the sick animals of this *Ammotraguslervia* species, particularly regarding the vulnerabilities of the species to diseases that before had no contact, including zoonoses, that concerns of the human population and public health.

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### RESEARCH ARTICLE

## ROLE OF SERUM LACTIC ACID LEVEL IN DIAGNOSING MESENTERIC BOWEL ISCHEMIA WITH THE AID OF THE CT ANGIOGRAM.

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#### Abstract

**Background:** Acute mesenteric ischemia is a syndrome caused by inadequate blood flow through the mesenteric vessels, resulting in ischemia and eventual gangrene of the bowel wall; it is a potentially life-threatening condition. This study aimed to identify the specificity and sensitivity of using lactic acid serum level in early detection of bowel ischemia.

**Method:** This is a retrospective study conducted at King Abdulaziz University Hospital from August to October, 2016, enrolled all patients admitted with diagnosis of acute mesenteric bowel ischemia.

**Result:** Out of the 192 cases included in the study, 54.2% of them were males, and 45.8% were females, with mean age score  $60.9 \pm 17.3$ , 46 patients (24%) were positive for bowel ischemia and 21 cases out of them (45.7%) had an operative notes Correlated with CT findings. 2 (1%) cases had no correlation with CT findings, and the rest reported no operation. Less than quarter 44 patients (22.9%) reported suffering from only bowel Ischemia without any risk factors or comorbidity, while 34 patients (17.7%) reported a coexisting several risk factors and other diseases. Approximately 107 patients (55.7%) had high lactic acid level. There was significant relation between lactic acid rang and CT scan findings where more than two third of the cases with positive CT had high lactic acid level (69.6% high vs 30.4% normal,  $p=0.02$ )

**Conclusion:** Further studies are needed to be conduct on the base of serial measurements of lactic acidosis and on a base combining serum lactate with other biomarkers such as intestinal fatty acidbinding protein to increase the accuracy of diagnosis.

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#### Introduction: -

Acute mesenteric ischemia (AMI) define as " syndrome caused by inadequate blood flow through the mesenteric vessels, resulting in ischemia and eventual gangrene of the bowel wall". Although relatively rare, it is a potentially life-threatening condition (1). There are several diseases related to AMI such as acute arterial mesenteric ischemia, acute venous mesenteric ischemia, non-occlusive mesenteric ischemia, ischemia/reperfusion injury , ischemic colitis (2).

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There is high mortality rate due to AMI, ranging between 50–90%, early diagnosis and treatment are essential to improve the outcome of Acute mesenteric ischemia (AMI) accounts for about 1:1000 acute hospital admissions. Untreated, AMI will cause mesenteric infarction, intestinal necrosis, an overwhelming inflammatory response and death, Early diagnosis and prompt treatment are the goals of modern therapy, but there are no randomized controlled trials to guide treatment and the published literature contains a high ratio of reviews to original data. Much of that data comes from case reports and often small, retrospective series with no clearly defined treatment criteria. (3)

Acute bowel ischemia has a wide range of possible clinical and pathological presentations since it can be caused by a variety of different conditions and presents with various clinical and radiological findings. Therefore, it may easily be missed or misinterpreted initially. (4) primarily because the diagnosis is usually based on nonspecific clinical symptoms. In spite of massive tissue necrosis, clinical symptoms are often atypical or lacking, many researchers have attempted to find a simple laboratory test that could identify ischemic bowel before irreversible damage occurs. (5)

Catheter angiography is unequivocally the gold standard imaging modality for the evaluation of AMI, However, it is invasive, expensive and time consuming, Color Doppler is also another helpful diagnostic tool but may be technically difficult in patients with AMI due to bowel gas. The introduction of spiral Computed Tomography (CT) improved the ability of CT to image the mesenteric vessels and the bowel wall but it still was not sensitive (64%) for the early detection of AMI. (6)

Many potential serological markers have been investigated over the last decades, and several clinical reviews have been published. In general, these reviews are narrative, prone to the selection bias, and do not provide a comparison of diagnostic accuracy. (7)

The performance of the currently available serological markers is suboptimal for routine clinical use, but novel markers of intestinal ischemia such as D-lactate, glutathione S-transferase (GST), and intestinal fatty acidbinding protein(I-FABP) may offer improved diagnostic accuracy. (8)

Traditionally, the serum marker which clinicians frequently rely on is serum lactate. Still, the discrepancy between the common usage of serum lactate and the certainty of diagnosing acute mesenteric ischemia is extremely wide. The ideal marker for acute mesenteric ischemia should therefore not only have a higher sensitivity and specificity, but – most importantly – also enable earlier diagnosis. (9)

Several studies were conducted to investigate the relation between serum lactate and acute mesenteric ischemia, where the results showed that the level of no single serum marker, including serum lactate, is elevated early and specifically enough in the serum to diagnose acute mesenteric ischemia. (7,8)

Since that early diagnosis of intestinal ischemia remains a challenge, a further research is required to identify improved serological markers and to demonstrate their clinical utility in the individual patient (6) Our aim in this study is to identify the accuracy of using lactic acid in for early detection of bowel ischemia.

### **Methodology: -**

This was a retrospective study conducted at King Abdul-Aziz University Hospital from August to October, 2016, enrolled all patients admitted with diagnosis of AMI (all types). The study protocol was reviewed and approved by King Abdul-Aziz University Hospital Health and Research Ethics. Inclusion criteria: patients aged more than 18 who underwent CT abdomen and pelvic without/with IV contrast and serum lactic acid to rule out bowel ischemia. The exclusion criteria include incomplete CT abdomen or missing serum lactic acid data. A total of 227 files were reviewed during the period, and only 192 files matching the inclusion criteria and enrolled in the study, while the rest were excluded for several reasons, 2 cases were less than the age of 18, and 33 cases hadn't complete information of serum lactic acid level. The Data were retrieved from patients' files and radiology PACS system using a data collection sheets included patient (age, gender, CT findings, operative notes, affected segment, type of bowl ischemia, duration of symptoms, other chronic illness, lactic acid level, examination time).

### **Statistical analysis:-**

The collected data were analyzed using the SPSS statistical software package, version 20. Parametric data are presented as mean and standard deviations (minimum and maximum) and categorical data were presented as number

(percentage). Relation between lactic acid range and other categorical variables was made using Chi – square test. Pearson's correlation between lactic acid and age was done.  $P$ -value  $<0.05$  was considered significant.

### Results: -

Out of the 192 cases included in the study, 54.2% of them were males, and 45.8% were females, with mean age score  $60.9 \pm 17.3$  range (20-96) years. (Table 1 & Figures 1 & 2)

More than threequarter of CT scan reports 146 patients (76%) were negative for bowel ischemia and other diagnosis such as inflammatory bowel disease and infectious colitis were confirmed, while 46 patients (24%) were positive for bowel ischemia, from these cases 21 (45.7%) had operative notes Correlated with CT findings. Only 1 patient (2.2%) had no correlation with CT findings, and the rest reported cases did not undergo an operation. (Tables 2 & 3 & Figures 3 & 4)

Regarding affected segment, type and symptoms duration, the majority of the cases 146 patients (76%) reported no evidence of bowel ischemia while only 37 patients (19%) reported multiple affected segments, on the other hand several types were reported in this study with different rate, 17 patients (8.9%) reported as (Non occlusive intestinal ischemia.), follow by 9 patients (4.7%) with chronic intestinal ischemia and 12 patients (6.2%) are seen in acute superior mesenteric artery occlusion & acute superior mesenteric vein occlusion. There are more than two third of the patients 133 patients (67.8%) had the symptoms for less than 1 week, followed by 25 patients (12.8%) cases had the symptoms for 2 weeks to 1 month. (Tables 4, 5 & 6 & Figures 5, 6 & 7)

Less than quarter 44 patients (22.9%) reported suffering from only bowel Ischemia without any other diseases, while 34 patients (17.7%) cases reported suffering from several comorbid diseases, 15 patients (7.8%) cases reported organ failure, 12 patients (6.35%) cases had lower limb ischemia. 22 patients (11.4%) divided equally between Other causes of acute abdomen & Malignancy of other organs. There are 14 patients (7.2%) divided equally between cholecystitis & bowel obstruction., and only 4 patients (2.1%) had Cholelithiasis. (Table 7 & Figure 8)

Regarding lactic acid and INR ranges and day & night shifts at the time of the diagnosis, more than half (107-55.7%) had high lactic acid level and almost half had high INR range (95- 49.5%), in respect to the shifts 122 (63.5%) cases reported positive during day shift while 70 (36.5%) cases reported positive during night shift. (Tables 8 & 9 & Figures 9, 10, 11 & 12)

There was significant relation between lactic acid range and CT scan findings where more than two third of the cases with positive CT had high lactic acid level (69.6% high vs 30.4% normal,  $p=0.02$ ), also there was significant relation between lactic acid range and type ( $p=0.03$ ), on the other hand the results showed high level of lactic acid among male than female, and also among patients who had duration of symptoms less than one week rather than patients who had the symptoms for almost a month with no significant difference. (Table 10)

Pearson correlation showed non-significant positive correlation between lactic acid and age.

**Table 1:-**Demographic data :

variables	Mean $\pm$ SD	(Min-Max)
Age	60.9 $\pm$ 17.3	(20-96)
Variables	N	%
Gender		
Male	104	54.2
Female	88	45.8

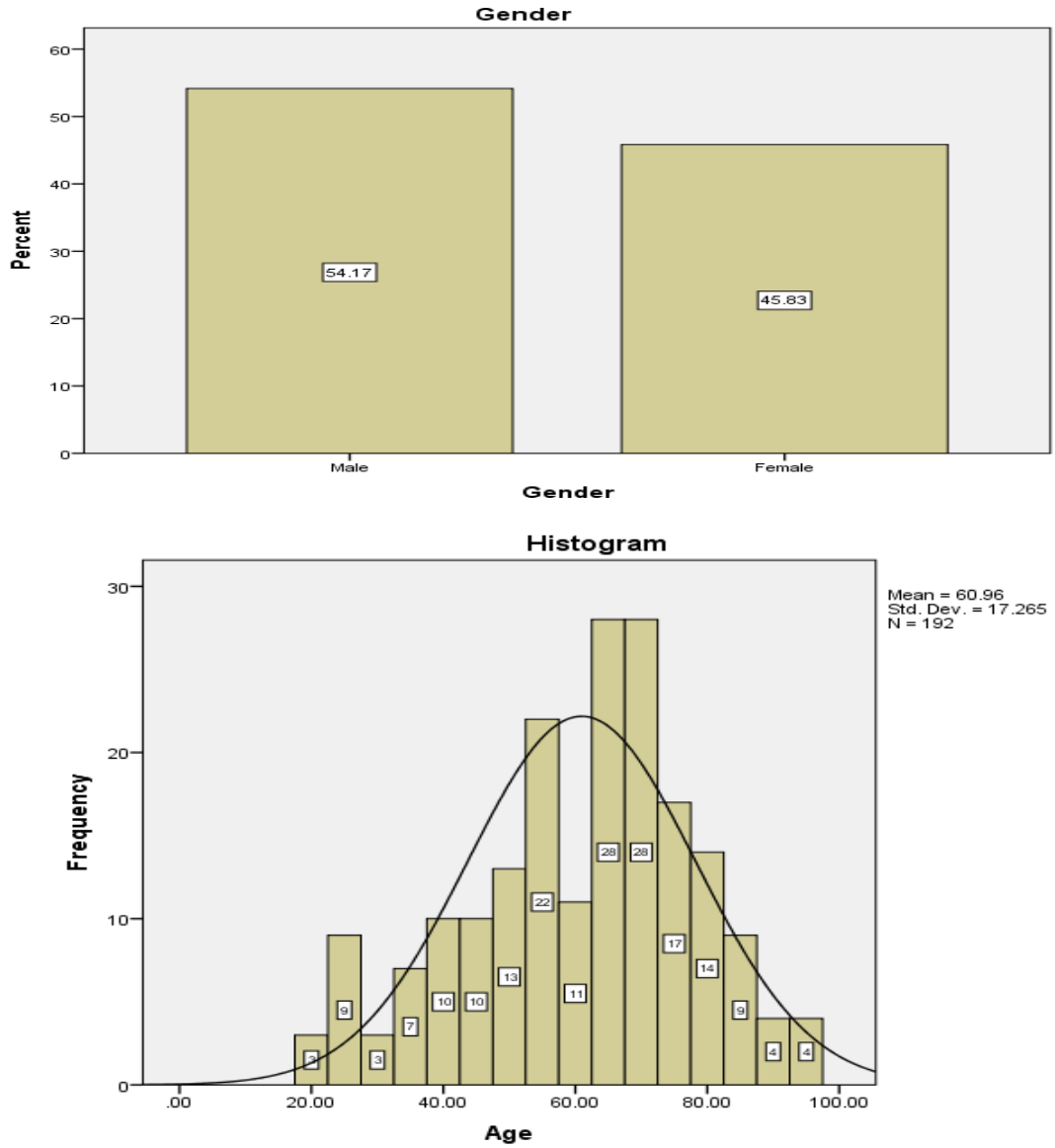
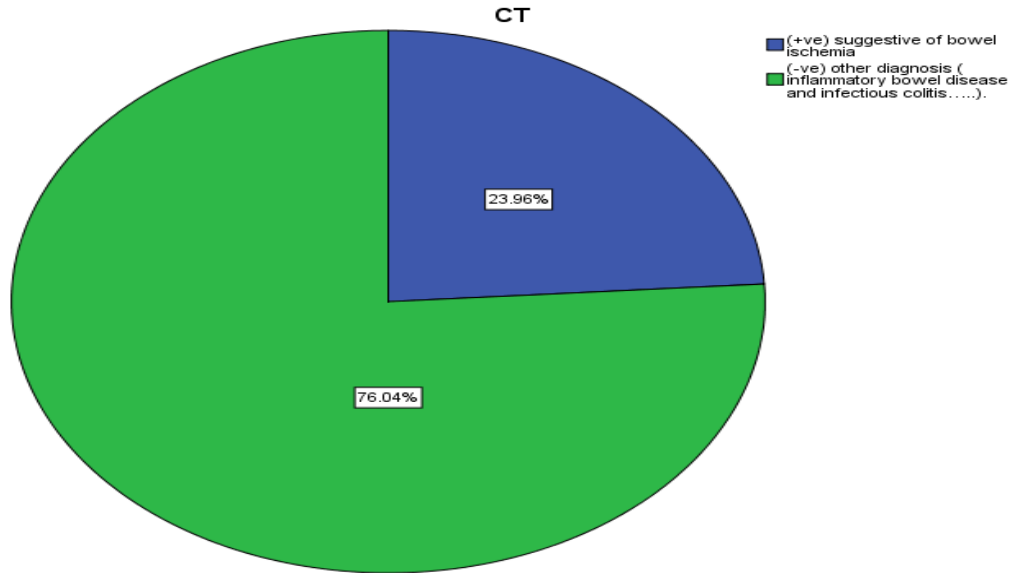


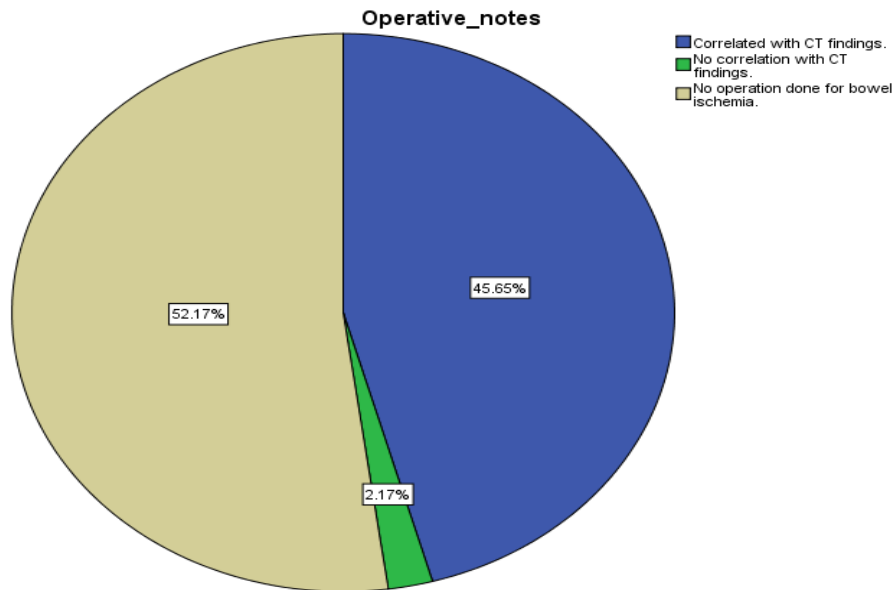
Table 2:-CT:

Variables	N	%
(+ve) suggestive of bowel ischemia	46	24.0
(-ve) other diagnosis (inflammatory bowel disease and infectious colitis.....).	146	76.0



**Table 3:-** Operative notes.

Variables (N=46)	N	%
Correlated with CT findings.	21	45.7
No correlation with CT findings.	1	2.2
No operation done for bowel ischemia.	24	52.1



**Table 4:-**Affected segment.

Variables	N	%
No segment affected	146	76.8
Duodenal segment	1	.4
Jejunul segment	3	1.4
Iliul segment	3	1.4
Multi	37	19.0
Unknown	2	1



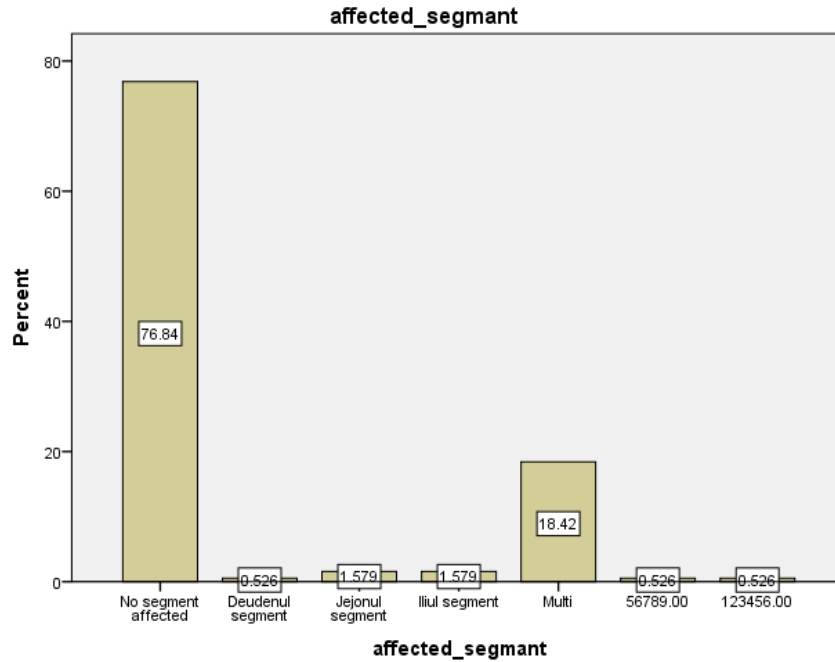
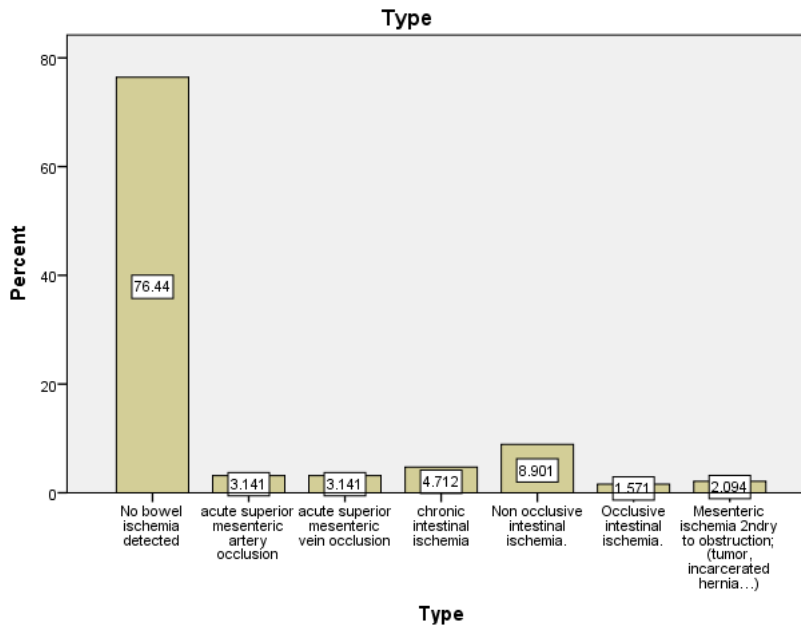


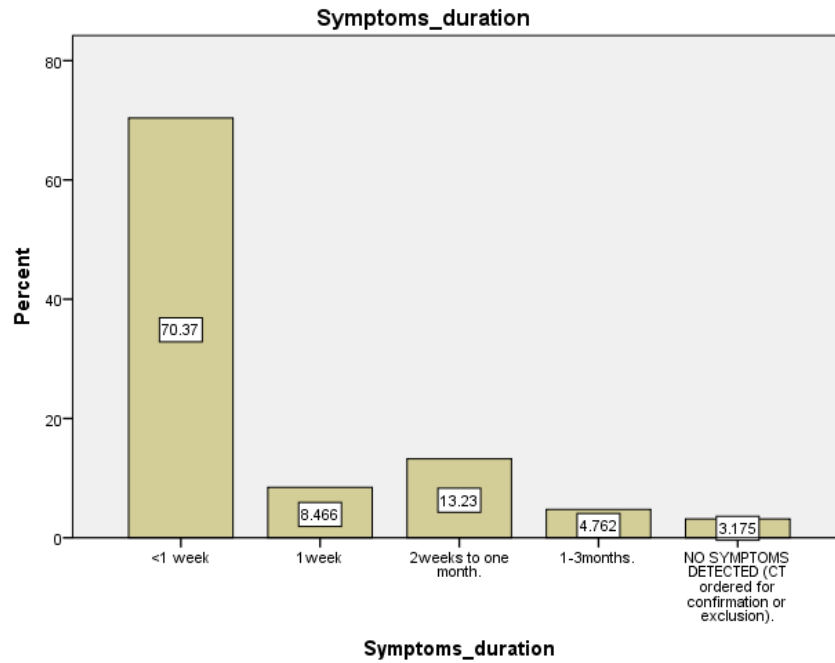
Table 5:- Type.

Variables	N	%
No bowel ischemia detected	146	76.0
acute superior mesenteric artery occlusion	6	3.1
acute superior mesenteric vein occlusion	6	3.1
chronic intestinal ischemia	9	4.7
Non-occlusive intestinal ischemia.	17	8.9
Occlusive intestinal ischemia.	3	1.6
Mesenteric ischemia 2ndry to obstruction; (tumour, incarcerated hernia...)	4	2.1
Unknown	1	0.5



**Table 6:-**Duration of symptoms.

Variables	N	%
<1 week	133	67.8
1 week	16	8.2
2weeks to one month.	25	12.8
1-3months.	9	4.6
NO SYMPTOMS DETECTED (CT ordered for confirmation or exclusion).	6	3.1
unknown	3	1.5



**Table 7:-**Other differential diagnosis:

Variables	N	%
Bowel ischemia.	44	22.9
cholecystitis	7	3.6
Cholelithiasis.	4	2.1
Small or large bowel obstruction.	7	3.6
Other causes of acute abdomen ; Pancreatitis, peptic ulcer disease, appendicitis, bowel volvulus	11	5.7
Systemic and autoimmune diseases; SLE	2	1.0
Multiple morbidities ( ESRD, HTN, CHF....)	4	2.1
Malignancy of other organs; liver, pancreas...	11	5.7
Blood disorders ; anaemia, DIC...	3	1.6
Shock	6	3.1
Ischemic disorders in the peripheries and organs other than the intestine (brain, heart, lung, liver, stroke....)	12	6.3
Hernia	3	1.6
Infectious disease; sepsis,TB, pseudomonas colitis....	17	8.9
Renal disorders ; calculus of kidney, hydronephrosis, ureteral stones...	6	3.1
Organ failure; heart, renal, liver...	15	7.8
Unspecified diagnosis.	6	3.1
Multi	34	17.7

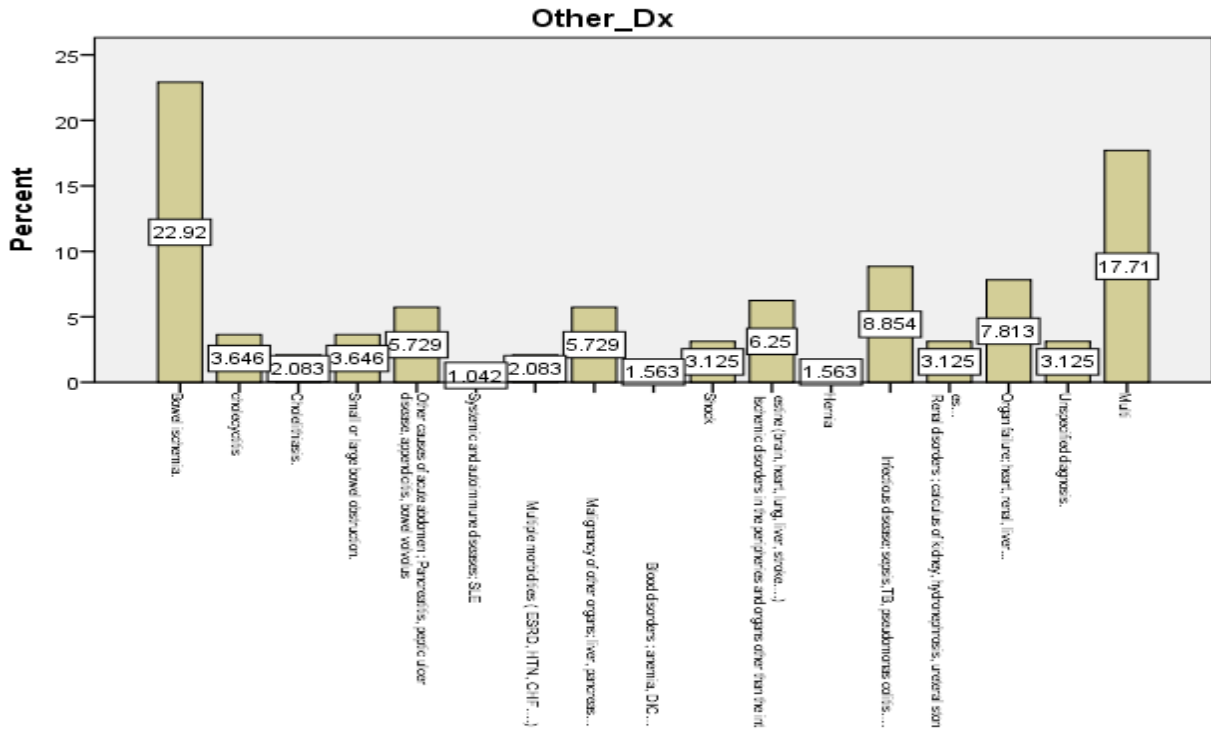
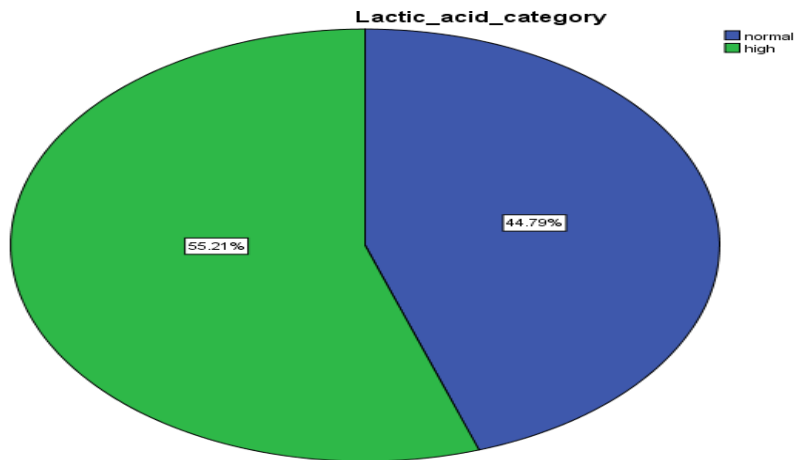
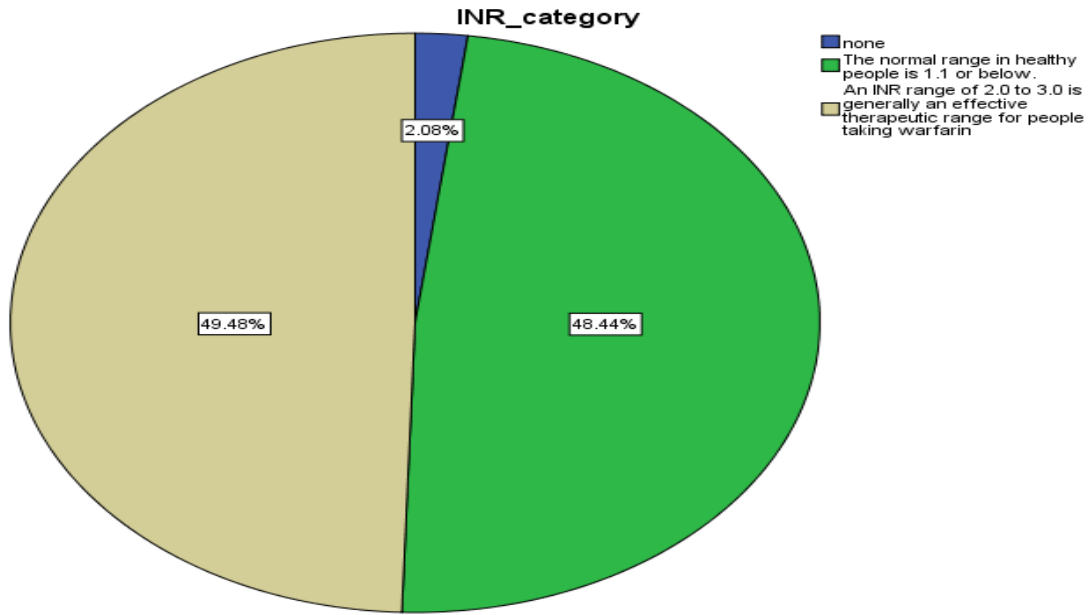


Table 8:-Lactic acid and INR range.

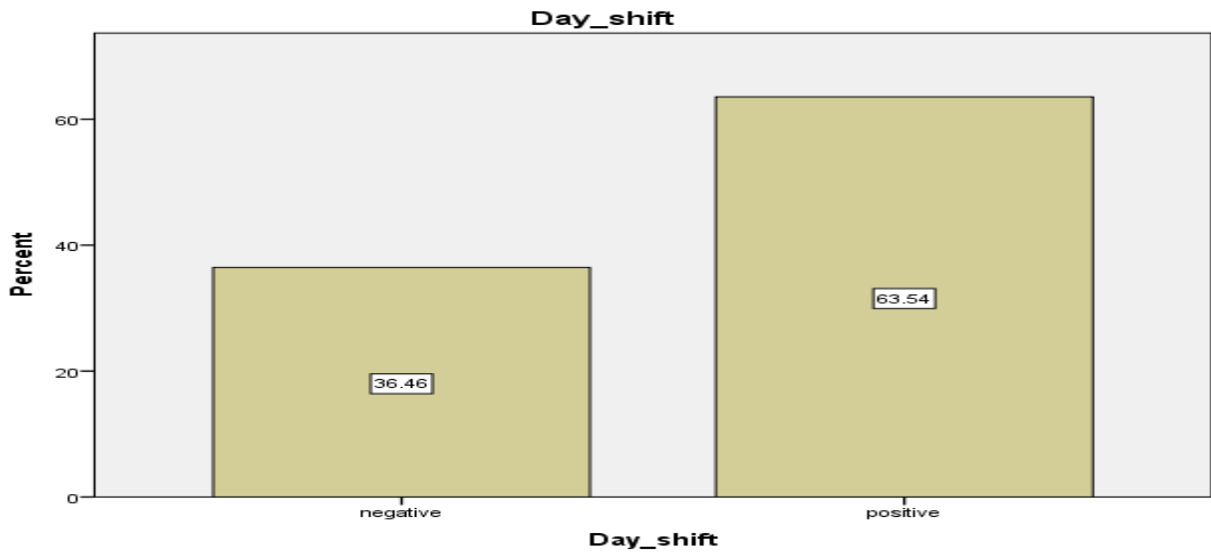
Variables	N	%
<b>Lactic acid range</b>		
Normal	85	44.3
High	107	55.7
<b>INR range</b>		
None	4	2.1
The normal range in healthy people is 1.1 or below.	93	48.4
An INR range of 2.0 to 3.0 is generally an effective therapeutic range for people taking warfarin	95	49.5

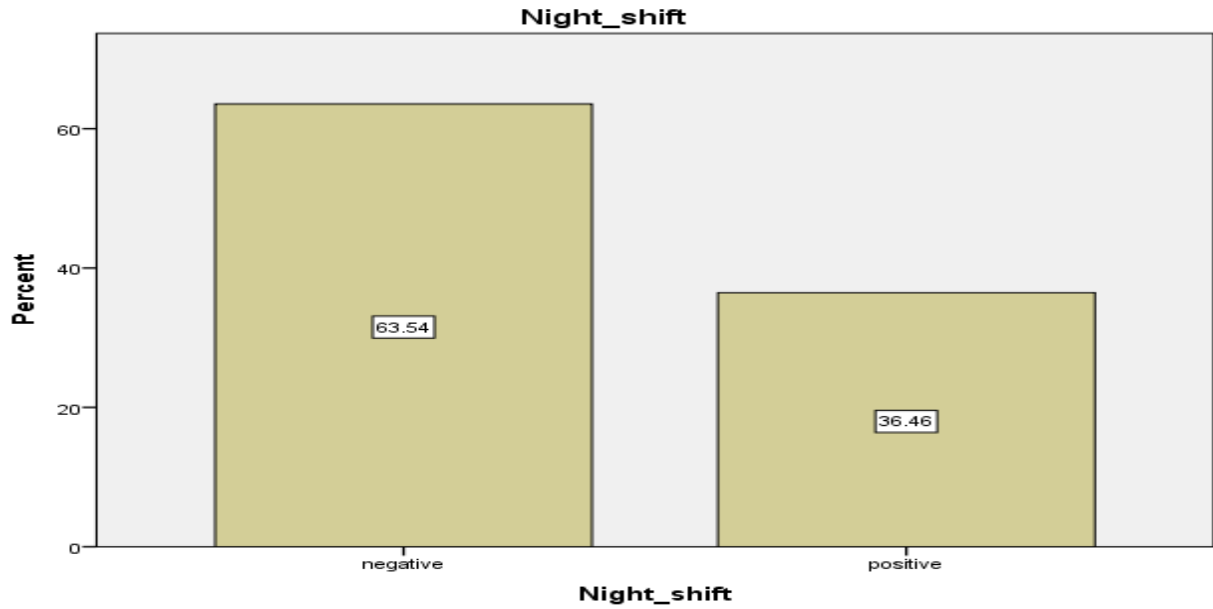




**Table 9:-**Day and night shifts :

Variables	N	%
<b>Day shifts</b>		
negative	70	36.5
positive	122	63.5
<b>Night shifts</b>		
negative	122	63.5
positive	70	36.5





**Table 10:-**Relation between lactic acid and several factors :

variables		Lactic acid range		P value
		Normal	High	
Gender	Male	43	61	<b>0.58</b>
		41.3%	58.7%	
	Female	42	46	
		47.7%	52.3%	
CT	(+ve) suggestive of bowel ischemia	14	32	<b>0.02*</b>
		30.4%	69.6%	
	(-ve) other diagnosis (inflammatory bowel disease and infectious colitis.....).	71	75	
		48.6%	51.4%	
Affected segment	No segment affected	70	76	<b>0.76</b>
		83.3%	72.1%	
	Duodenal segment	0	1	
		0.0%	1.0%	
	Jejunul segment	1	2	
		1.2%	1.9%	
	Iliul segment	1	2	
		1.2%	1.9%	
	Multi	12	25	
		14.3%	23.1%	
Type	No bowel ischemia detected	71	75	<b>0.03*</b>
		83.5%	71.2%	
	acute superior mesenteric artery occlusion	2	4	
		2.4%	3.8%	
	acute superior mesenteric vein occlusion	2	4	
		2.4%	3.8%	
	chronic intestinal ischemia	6	3	
	7.1%	2.9%		
	Non-occlusive intestinal ischemia.	1	16	
		1.2%	14.4%	
	Occlusive intestinal ischemia.	1	2	
		1.2%	1.9%	

	Mesenteric ischemia 2ndry to obstruction; (tumour, incarcerated hernia...)	2 2.4%	2 1.9%	
Symptoms duration	<1 week	57 67.9%	76 72.8%	<b>0.76</b>
		10 11.9%	6 4.9%	
	1 week	10 11.9%	15 14.6%	
		4 4.8%	5 4.9%	
	2weeks to one month.	3 3.6%	3 2.9%	
	1-3months.			
NO SYMPTOMS DETECTED (CT ordered for confirmation or exclusion).				
Operative notes	Correlated with CT findings.	15 17.6%	15 14.3%	<b>0.42</b>
		1 1.2%	1 1.0%	
	No correlation with CT findings.	69 81.2%	91 84.8%	

**Table 11;-** Correlation between lactic acid and age and INR :

		Age	Lactic acid	INR
Age	Pearson Correlation	1	.012	-.164*
	Sig. (2-tailed)		.864	.025
	N	192	192	188
Lactic acid	Pearson Correlation	.012	1	.207**
	Sig. (2-tailed)	.864		.004
	N	192	192	188
INR	Pearson Correlation	-.164*	.207**	1
	Sig. (2-tailed)	.025	.004	
	N	188	188	188

**Discussion: -**

AMI consists of two varied pathophysiological existence diagnostic & treatment , while the treatment consist of instrumental arterial reperfusion and resection of necrotic bowel segments, still the diagnosis had several challenges & difficulties due to the fact that patients could be admitted to the ER without specific symptoms of abdominal pain , (2,10) In two thirds of the cases the cause of intestinal ischemia were "arterial embolism or thrombosis with blood flow impairment in the superior mesenteric artery (SMA) distribution affecting all or portions of the small bowel and right colon" which increase CT-scandisparity , (2)

The fact that there is diagnostic uncertainty regarding variety in the results of symptoms, laboratory tests, and radiological imaging demonstrate the essential need to find an early dependable diagnostic tool in order to diagnoseintestinal ischemia as soon as possible to reduce the mortality rate motivate a lot of researchers to investigate more and more to find this tool. A study conducted in 2009 by Evennett et al, the authors recommended the use of serological markers such as D-lactate, GST, andI-FABPand study their accuracy in diagnosis (2,11)

Where the pathophysiology of acute mesenteric ischemia is the decreasing in mesenteric blood flow which induce cells dying, these necrotic cells in the gut wall release chemical substances to the blood , by detecting these substances which serum lactate is one of them , doctors could diagnose acute mesenteric ischemia early, however this hypothesis didn't take to the account the other causes of increasing serum lactate level such as damaged liver or kidney function in sepsis and shock, agents that can uncouple oxidative phosphorylation ( toxins, drugs) or underlying disorders change lactate metabolism (congenital mitochondrial disorders, diabetes, malignancies). (7)

several studies (case series, experimental and prospective) since 1970s conduct to investigate the effectiveness of using serum lactate levels changes as a reliable biomarker of AMI. (12,13)

One of the early case series study to detect the relation between high serum lactate level and AMI was the study of Janda et al in 1984 followed by Nutz and Sommer study in 1987, where the author of both studies demonstrated increasing in the level of serum lactate among AMI patients and explained that by the increasing in demands of blood and oxygen by intestine and increase the depending on anaerobic metabolism causing acidosis and a serum lactic acid increase (lactacidemia), however both studies didn't include time factor between onset of ischemia and time of diagnosis. (7,14,15.) On the other hand, in USA study the authors addressed several factors influence the effectiveness of the markers: site, amount, releasing mechanism, separating from the serum and specificity for the intestine. (16) These kinds of studies continue during the 21<sup>st</sup> century where some studies confirmed the relation and others didn't confirm the relation. (17,18)

Several experimental studies were conduct with debatable findings and without providing conclusive evidences of the efficacy of using serum lactate level as marker for AMI, in study on rabbits by Nutz et al, the authors observed increasing in the level of serum lactate among the subjects with occlusion of the superior mesenteric artery, these results couldn't be confirmed in 1995 study on pigs conducted by Schlichting and Lyberg, (19,20) In addition to that several experimental studies during the first decade of 21<sup>st</sup> century concluded that serum lactate level is not a specific and early diagnostic marker for AMI. (13,21,22)

Several prospective clinical studies on lactate levels and acute mesenteric ischemia were conduct, from these studies the two studies conduct 1994 and 1997 by Lange and Jackel and also Lange and Toivola where the authors concluded that even with the high sensitivity of serum lactate the specificity was low which mean that doctors couldn't rely on serum lactate as specific markers. (7,23,24), during the last few years the number of prospective studies comparing the accuracy of several biomarkers were increased and demonstrated the fact that that none of the using biomarkers had the level of accuracy to be used alone as diagnostic markers. (25,26), in 2015 a study was conduct to assess the accuracy of repeated measurement of serum lactate as a marker and the authors reported that there are several factors influenced this accuracy. (12) The results of current study consistence with previous study results that serum lactate is not accurate as the doctors want and need to be combine with other markers to diagnose AMI, however still a lot of doctors rely on serum lactate as diagnostic tool due to the facts that there is no good biomarkers could replace it, it is easy to measure in any laboratory hospital and easy to repeat it. (7,12)

During 2009 Evennett et al conduct a comparative analysis study of all major serum markers of acute mesenteric ischemia and they demonstrated D-lactate as the best markers, (6,7) after that in 2015 study conducted by the authors reported that the D-lactate is a good markers for sever cases with high level of specificity, and recommend to combine it with I-FABP which has high sensitivity and low specificity. (11)

### **Conclusion: -**

In the second decade of 21<sup>st</sup> century, still there is a serious difficulty to find dependable diagnostic biomarker to diagnose acute mesenteric ischemia in early stage, this fact led doctors to rely on serum lactate level as a marker of acute mesenteric ischemia even that the evidence showed that it is unspecific marker for early detection. However, this study depends on measuring lactate level of one time only, further studies need to be conduct on a base of serial measurements of lactic acidosis and on a base combining serum lactate with other biomarkers to increase the accuracy of diagnosis.

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### RESEARCH ARTICLE

#### HISTOPATHOLOGICAL STUDY OF TUBERCULAR ENDOMETRITIS IN PATIENTS OF PULMONARY TUBERCULOSIS WITH CLINICAL CORRELATION IN A TERTIARY REFERRAL UNIT OF ODISHA.

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Pulmonary Tuberculosis, Tubercular Endometritis, Histopathology, Z-N staining AFB .

#### Abstract

##### Background:-

After tuberculosis has been declared as Global emergency it has reawakened the interest of doctors. Genital Tuberculosis has been a subject of keen interest because it has impact on female infertility. Here this study aims at to study the Histo-pathological outcome of endometrial biopsy in diagnosed cases of Pulmonary Tuberculosis.

##### Methods:-

62 females Cases of diagnosed PTB of age Group 15-45 years having history of genital tuberculosis were enrolled in this study. The endometrial tissues of each patients collected and subjected to Histo-pathological examination and wherever required for bacteriological examination i.e. Z-N staining for AFB.

##### Results:-

Among 62 patients, highest incidence (59.68%) belong to 21-30 years age group and presented with in 1<sup>st</sup> year of development of PTB. Secondary amenorrhea, list of vaginal discharge and cervical erosion were observed in 24.19% and 25.81% of cases respectively, Eight (8) cases (12.90%) had histological finding of chronic endometritis. Out of them Four (4) cases (6.45%) were AFB positive on Z-N staining of endometrial tissue.

##### Conclusion:-

Endometrial tuberculosis though rare in pulmonary tuberculosis cases, bacteriological and histo-pathological examination of endometrial tissue should be done for early diagnosis and treatment.

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#### Introduction:-

The World Health Organization in 1993 declared tuberculosis, a common infectious disease in the Indian subcontinent, as "a Global emergency". (Talib et al, 1993) India, the world's second most populous country, accounts for a quarter of the world's annual incidence of TB. Every year, around two million people develop TB in India and 300,000 die of TB. Over 15 million patients have been treated and three million cases were cured in last decade. (VK Arora et al 2017, MOHFW, Govt of India, 2017). Endometrial tuberculosis though rare in developed countries it is still common in developing and poor countries. (Khan Nawaz, 2005) It is almost secondary to a primary focus elsewhere in the body. Fallopian tubes are commonly the initial site of involvement and is affected

mostly. (Nabamber, 2001) From primary site of tubercular infection it spreads to genital tract initially to the tubes and in most cases through the blood stream. (Kajal B Punyashetty, 2012) Female genital tuberculosis accounts to be 5–15% of infertility cases among Indian women. (Kriplani et al 2017) In India, the incidence of genital tuberculosis in infertility has been reported in 19% cases and among them 41% have tubal cause. (Tripathy and Tripathy 2002) As genital tuberculosis has a tremendous impact on the reproductive health in our country, in present scenario it has been a subject of keen interest. Many studies have been undertaken in this context (Kemal Güngördük, 2007). With this background this study aimed to find out the histopathological features of endometrium of infertility cases associated with pulmonary tuberculosis, so that early diagnosis and treatment with anti-tubercular drugs may be helpful in patients of genital tuberculosis.

### **Materials and Methods:-**

This observational study was carried out from 2013 to 2016 in the department of Pulmonary Medicine in collaboration with department of Obstetrics and Gynecology at a tertiary care hospital of Odisha. The ethical clearance was obtained from Institutional Ethics Committee. Written informed consent form was obtained from all the willing participants fulfilling the inclusion criteria. (Jai B Sharma et al, 2014)

As per the inclusion criteria, 62 females in the reproductive age group (15-45 years) diagnosed as pulmonary tuberculosis (RNTCP, 2012) along with some gynecological problems who were on with or without anti-tubercular treatment were enrolled. The gynecological problems included amenorrhoea, menorrhagia, dysmenorrhoea and other menstrual irregularities. The females with primary or secondary infertility cohabiting with their husbands were also included. (Kriplani et al 2017) The women with extrapulmonary tuberculosis and genital infection with other non tubercular infection were excluded from the present study.

A detailed history was undertaken and general physical examination; respiratory system as well as pelvic examination was carried out on all subjects. Pervaginal examination was performed on all women to observe any abnormality in vagina, cervix and uterus or adnexal mass if any. In all selected subjects the endometrial samples were taken for microscopic examination for AFB and histopathological examination. The patients were kept on antitubercular treatment under RNTCP.

The basic characteristics, clinical findings, radiological observations and laboratory data were noted in a case record form. The data were analysed using MS Excel.

### **Results:-**

Among total 62 women with pulmonary tuberculosis in the study sample, 59.68% (n=37) were in the age group of 21-30 years. (Table-1) Among them 51.61% (n=32) had far advanced pulmonary lesion on chest X-ray (radiological status, table-2) As mentioned in table-3 the menstrual irregularities in most of the women were secondary amenorrhoea (48.39%; n=30) However menorrhagia and irregular cycle were two other commonest presentations next to secondary amenorrhoea observed in 16.13% (n=10) and 14.52% (n=9) patients respectively. Dysmenorrhoea was also one of the complain in 6.45% (n=4) patients. Maximum number of the study population presented with secondary amenorrhoea were in the first year of development of pulmonary tuberculosis. (0-6 months: n=9 and 7-12 months: n=14) The women with irregular cycle were also observed within 0-6 months (n=6) and 7-12 months (n=2).

On per vaginal examination the vaginal discharge was observed in 24.19% (n=15) of patients. Cervical lesion including erosion (25.81%; n=16) and ulceration (12.09%; n=8) were also noted. (Table-4) The uterine size was normal in 25.81% (n=16) and small in 16.13% (n=10) females. Adnexal mass was also found in 9.68% (n=6) women. (Table-4)

In our study population, the maximum histological pattern with the proliferative endometrium was observed in 38.71% (n=24) females. The secretory endometrium was seen in 25.81% (n=16) women. When the endometrial tissues of both histological patterns were subjected for Z-N staining for AFB, all were found to be negative. (Table-5) The endometrial reaction is said to be present when there is local infiltration of lymphocytes intermingling with stroma or well defined lymphocytic aggregation or presence of plasma cells. In this study 12.90% (n=8) cases were taken as chronic endometritis due to endometrial reaction. In histopathological examination of endometrium, the non caseating granuloma and caseation alone were taken as the surest evidence of tubercular endometritis. 4 cases (6.45%) showed evidences of tubercular endometritis on histopathological examination and were also found to be

AFB positive on Z-N staining of endometrium. All cases of histologically proved endometritis occurred within 1 year of development of symptoms of pulmonary tuberculosis.

**Table No. I :-** Distribution of cases according to age groups

Age in Years	No. of cases	Percentage
15-20	10	16.13
21-25	17	27.42
26-30	20	32.26
31-35	7	11.29
36-40	5	8.06
41-45	3	4.84
<b>Total</b>	<b>62</b>	<b>100.00</b>

**Table No 2:-** Distribution of cases according to radiological status of lungs in pulmonary tuberculosis

Radiological Status	No. of Cases	Percentage
Minimal Lesion	5	8.06
Moderately advanced	25	40.32
Far Advanced	32	51.61
<b>Total</b>	<b>62</b>	<b>100.00</b>

**Table No. 3:-** Menstrual pattern and its relation to duration of pulmonary tuberculosis

Menstrual pattern	No. of cases	Percentage	Duration of pulmonary tuberculosis (In months)				
			0-6	7-12	13-18	19-24	24+
Normal Cycle	5	8.06	1	-	3	1	-
Primary amenorrhoea	-	0	-	-	-	-	-
Secondary amenorrhoea	30	48.39	9	14	2	1	4
Oligomenorrhoea	4	6.45	1	3	-	-	-
Menorrhagia	10	16.13	-	5	1	2	2
Irregular cycle	9	14.52	6	2	1	-	-
Dysmenorrhoea	4	6.45	3	1	-	-	-
<b>Total</b>	<b>62</b>	<b>100.00</b>	<b>20</b>	<b>25</b>	<b>7</b>	<b>4</b>	<b>6</b>

**Table No. 4:-** Results of vaginal examination of all cases studied

Results	No. of cases	Percentage
(1)Vaginal discharge	15	24.19
(2)Cervical lesion		
(a) Erosion	16	25.81
(b) Ulceration	8	12.09
(3)Uterine size of Length		
(a) Normal	16	25.81
(b) Small	10	16.13
(4)Adnexal mass	6	9.68

**Table No .5:-** Histopathological pattern and z-n staining of endometrium in cases of pulmonary tuberculosis

Histological pattern	No. of cases	Percentage	Z-N staining status	
			+ve	-ve
Secretory	16	25.81	-	16
Proliferative	24	38.71	-	24
Tubercular endometritis	4	6.45	4	-
Chronic endometritis	8	12.90	-	8
No endometrium	10	16.13	-	10
<b>Total</b>	<b>62</b>	<b>100.00</b>	<b>4</b>	<b>58</b>

**Discussion:-**

Pulmonary tuberculosis is a communicable disease usually involves the lungs but may involve the other organs particularly genital organs though rare. Genital TB occurs mostly secondary to pulmonary tuberculosis, commonly spreads by the haematogenous route in a manner similar to spread to other extra-pulmonary sites like urinary tract, bones and joints etc. The fallopian tubes are affected in almost 100% of the cases of genital tuberculosis followed by the endometrium in 50%, ovaries in 20%, cervix in 5% cases. Also vagina and vulva are other commonly involved sites. (Weerakalet et al, 1999) Endometrial tuberculosis though uncommon, still an important clinical entity in developing countries like India. (Hassimoto A et al, 1994, Haider P et al, 1992, Hunter B et al, 1998, Jhon M et al, 1999)

In the present study, it was observed that 59.68% patients of pulmonary tuberculosis associated with gynaecological problems were in the age group of 21-30 years. Our study observations corroborate with that of Nawaz et al, 2005 who reported the TB endometritis is more common in the reproductive age group mostly between 20-45 years.

In this study sample, the commonest menstrual disorder was observed to be secondary amenorrhoea (48.39%) and the patients had it in the first year of development of pulmonary tuberculosis. Menorrhagia was another symptom which was found in patients with far advanced lesion of lungs in pulmonary tuberculosis (16.13%) and dysmenorrhoea in 6.45% of cases. In an earlier study, Samal *et al.* reported that the patients of genital TB had oligomenorrhoea in 54%, menorrhagia in 19.0%, and amenorrhoea in 14.3% of cases.

Histopathological observations of endometrial tissue in our study revealed proliferative endometrium in 38.71% cases but when these endometrium were subjected to Z-N staining for AFB, came out to be negative. The endometrial tissue obtained in secretory phase (25.81% of cases) and chronic endometritis (12.90% cases) were also negative for AFB in Z-N staining. Tubercular endometritis was seen in 6.45% of cases and all these endometrium obtained in these females were bacteriologically positive for AFB in Z-N staining. But in the study of Butt et al., 2003. microscopic examination by Z- N staining revealed absence of AFB in all endometrial tissues even in a larger sample size.

**Conclusion:-**

As endometrial tuberculosis is one of the causes of infertility and other gynecological complications, the bacteriological examination of endometrium with Z-N staining for AFB should be done along with histopathological evaluation for early diagnosis. As tuberculosis is amenable to modern drug treatment, the importance of early diagnosis becomes more relevant.

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### RESEARCH ARTICLE

## INFLUENCE OF AMINO ACID DOPANTS ON THE GROWTH AND PROPERTIES OF POTASSIUM HYDROGEN PHTHALATE SINGLE CRYSTALS FOR NONLINEAR OPTICAL APPLICATIONS

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NLO material, Crystal growth from solution, Amino acid dopant, SHG efficiency,

#### Abstract

Undoped and the impact of amino acid dopants such as L-Glutamic acid (LGA), L-Asparagine (LAS) and L-Serine (LS) on the growth process and properties of potassium hydrogen phthalate (KHP) single crystal by slow evaporation solution growth technique have been examined. The unit cell parameters of the grown crystals have been affirmed by means of single crystal X-ray diffraction analysis. The crystallinity of the title materials was examined by powder X-ray diffraction. The FT-IR spectral studies identify the presence of expected functional groups of the grown crystals. The optical transmission of the grown crystals has been recorded using UV-Vis spectral analysis. The thermal stability of the grown crystals has been analyzed by TG-DTA studies. Microhardness mechanical studies show that hardness number increases with the load for the grown crystals by Vickers microhardness method. The nonlinear optical (NLO) properties were analyzed utilizing Kurtz and Perry powder technique.

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#### Introduction:-

Alkali metal hydrogen phthalate crystals which includes Potassium hydrogen phthalate (KHP) or Potassium acid phthalate (KAP), Sodium hydrogen phthalate (NaHP) or Sodium acid phthalate (NaAP), Rubidium acid phthalate (RbAP), Cesium acid phthalate (CsAP) and Lithium acid phthalate (LiAP) are semi-organic materials extensively recognized for their utility in the long-wave X-ray spectrometers and requirements within the volumetric analysis [1].

Currently, for a deposition of thin films of organic nonlinear materials, alkali metal hydrogen phthalate crystals have been hired as substrates. Specifically, a single orientation of thin poly (diacetylene) films is prepared by epitaxial growth on organic crystals consisting of alkali metal salts of phthalate and having a lower degree of symmetry than alkali halides [2] and those crystals are crystallized as noncentrosymmetric rhombic structures. Crystals of alkali metal hydrogen phthalates have covalent (intramolecular), ionic (cation-anion), Van-der Waals (among neighboring molecules) and intermolecular hydrogen bonds O-H...O (H-bonds among anions in chains) and for this reason they may be ascribed to strong H-bonds for which might be feasible the fermi-resonance interactions of stretching vibrations  $\nu(\text{O-H})$  with combinations of bending in-plane ( $\beta(\text{O-H})$ ) and out-of-plane ( $\gamma(\text{O-H})$ ) vibrations due to intraanionic anharmonicities.

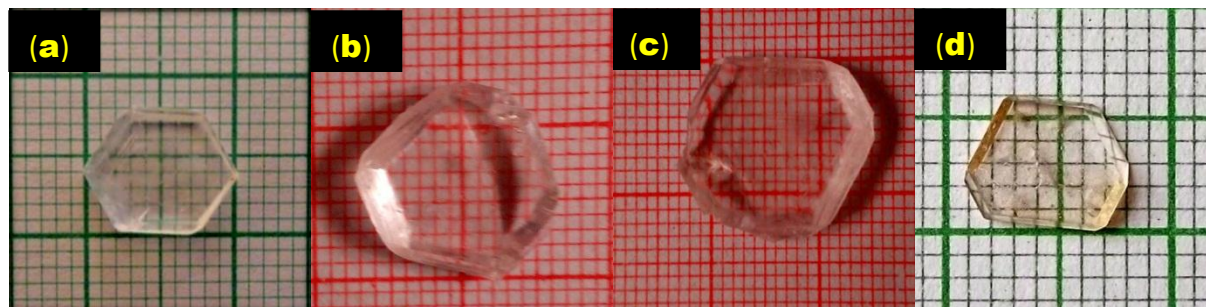
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Potassium hydrogen phthalate (KHP) are widely hired in the subject of x-ray spectroscopy as a monochromator and additionally as an analyzer. KHP exhibits pyroelectric, piezoelectric, elastic, nonlinear optical (NLO) properties, elasto-optic [3] and electro-optical studies on a sequence of alkali substituted hydrogen phthalate crystals which included it [4] and it crystallizes in an orthorhombic crystal structure with space group  $Pca2_1$  [5]. KHP has platelet morphology with perfect cleavages alongside the (010) plane. The usage of the periodic bond chain evaluation, the morphology of KHP has been decided [6]. Presently, for the growth of highly oriented thin films of conjugated polymers with nonlinear optical susceptibility, KHP crystals have been hired as substrates [7,8]. KHP is taken as the model compound due to its well-evolved surface pattern on the (010) face inclusive of high and very low growth steps which can be distinct without difficulty located by using optical microscopy [9,10] and it is extensively hired as Q-switches for Nd:YAG, Nd:YLF, Ti:Sapphire and Alexandrite lasers. In view of this, a series of crystalline salts of amino acids doped KHP have been investigated [11-15]. In this manuscript, single crystals of amino acids doped KHP were successfully obtained by introducing additives inclusive of LGA, LAS and LS adding in pure KHP solution. The crystal structure of the grown crystals has been confirmed by single crystal X-ray diffraction analysis and the grown crystals were characterized by various instrumentation techniques such as powder X-ray diffraction (PXRD) analysis, spectral, optical, thermal, mechanical and NLO analysis in order to check its suitability for device fabrications. An attempt was made to impact of amino acids dopant single crystals in the pure KHP and their characterizations.

### Experimental details:-

All high-purity commercially available reagents have been purchased and used without in addition purification. The commercially obtainable raw material of Potassium hydrogen phthalate (E-Merck) and L-Glutamic acid (E-Merck), L-Asparagine (E-Merck) and L-Serine (E-Merck) were used to synthesize the grown crystals. The double distilled water was used to prepare the aqueous solution of the grown crystals. The calculated amount of pure KHP is first dissolved in double distilled water and stirred continuously for 4 hours to yield a homogenous solution. After filter the solution by Whatman filter paper, it was kept in temperature controlled water bath (accuracy  $\pm 0.1^\circ\text{C}$ ) by means of slow evaporation at ambient temperature. After a span of 21 days, the crystal with good transparency and well-defined shape were harvested shown in the Fig. 1a.



**Figure 1:-** As grown crystals of (a) Undoped KHP (b) LGA doped KHP crystal (c) LAS doped KHP crystal (d) LS doped KHP crystal

Amino acids doped KHP crystals were obtained by the calculated amount of 0.5 mole % of LGA, LAS and LS were slowly dissolved separately using different beakers in the pure KHP solution. The reactants have been stirred continuously for 4 hours to yield a homogenous mixture of the solution. The prepared solutions were filtered through Whatman filter paper. To grow the crystal of high quality, the prepared solutions were kept in the temperature controlled water bath. In the course of the slow evaporation, well-defined, colourless single crystals of LGA doped KHP, LAS doped KHP and LS doped KHP with good transparency were obtained in the duration of 32 days, 34 days and 37 days respectively. The photograph of the as-grown crystals is shown in Fig. 1b, Fig. 1c and Fig. 1d.

### Results and Discussion:-

#### Single crystal X-ray diffraction:-

The single crystal XRD data of the grown crystals have acquired using an ENRAF NONIUS CAD 4 diffractometer with  $\text{MoK}\alpha$  radiation ( $\lambda=0.71073 \text{ \AA}$ ) to identify the unit cell parameters. The grown crystals crystallize in an orthorhombic symmetry with a space group of  $Pca2_1$ . The obtained unit cell parameters for undoped and amino



acids doped KHP crystals are presented in Table 1. From Table 1, the grown crystals have been confirmed by examining the presently calculated lattice parameters values with already reported values [16] which give the close agreement.

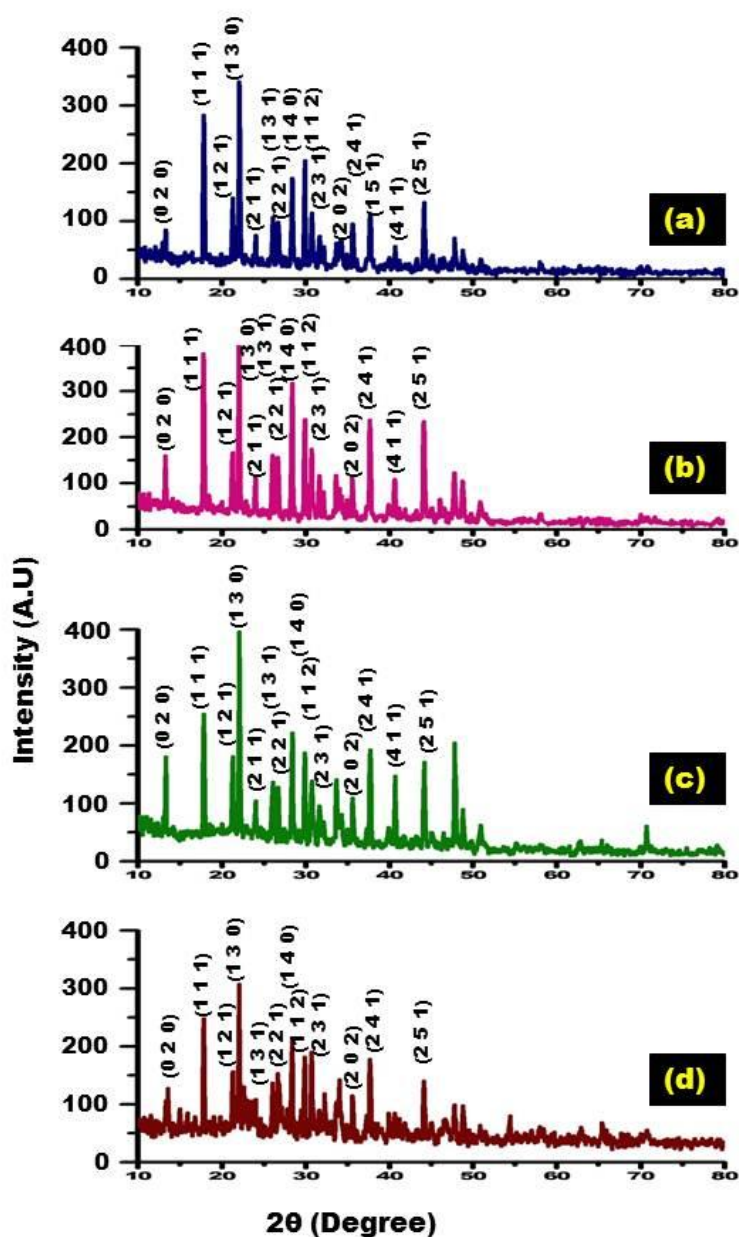
**Table 1:-** Unit cell parameters of undoped and amino acids doped KHP crystals

Unit cell parameters	Reported value KHP [16]	Undoped KHP Present work	LGA doped KHP	LAS doped KHP	LS doped KHP
a	6.48 Å	6.56 Å	6.53 Å	6.44 Å	6.51 Å
b	9.61 Å	9.60 Å	9.52 Å	9.58 Å	9.48 Å
c	13.37 Å	13.38 Å	13.42 Å	13.48 Å	13.41 Å
$\alpha = \beta = \gamma$	90°	90°	90°	90°	90°
Volume (Å) <sup>3</sup>	832.58	842.61	834.26	831.65	827.59

**Powder x-ray diffraction:-**

The grown crystals were finely powdered and subjected to powder XRD analysis with a X'pert PRO powder X-ray diffraction (40 kV) using Cu-K $\alpha$  radiation of wavelength  $\lambda = 1.5406$  Å. The powder XRD patterns of undoped KHP, LGA doped KHP, LAS doped KHP and LS doped KHP crystals are shown in Fig. 2a, Fig. 2b, Fig. 2c and Fig. 2d. All the detectable peaks could be indexed by using standard reference data (JCPDS card no: 31-1855 for pure KHP).





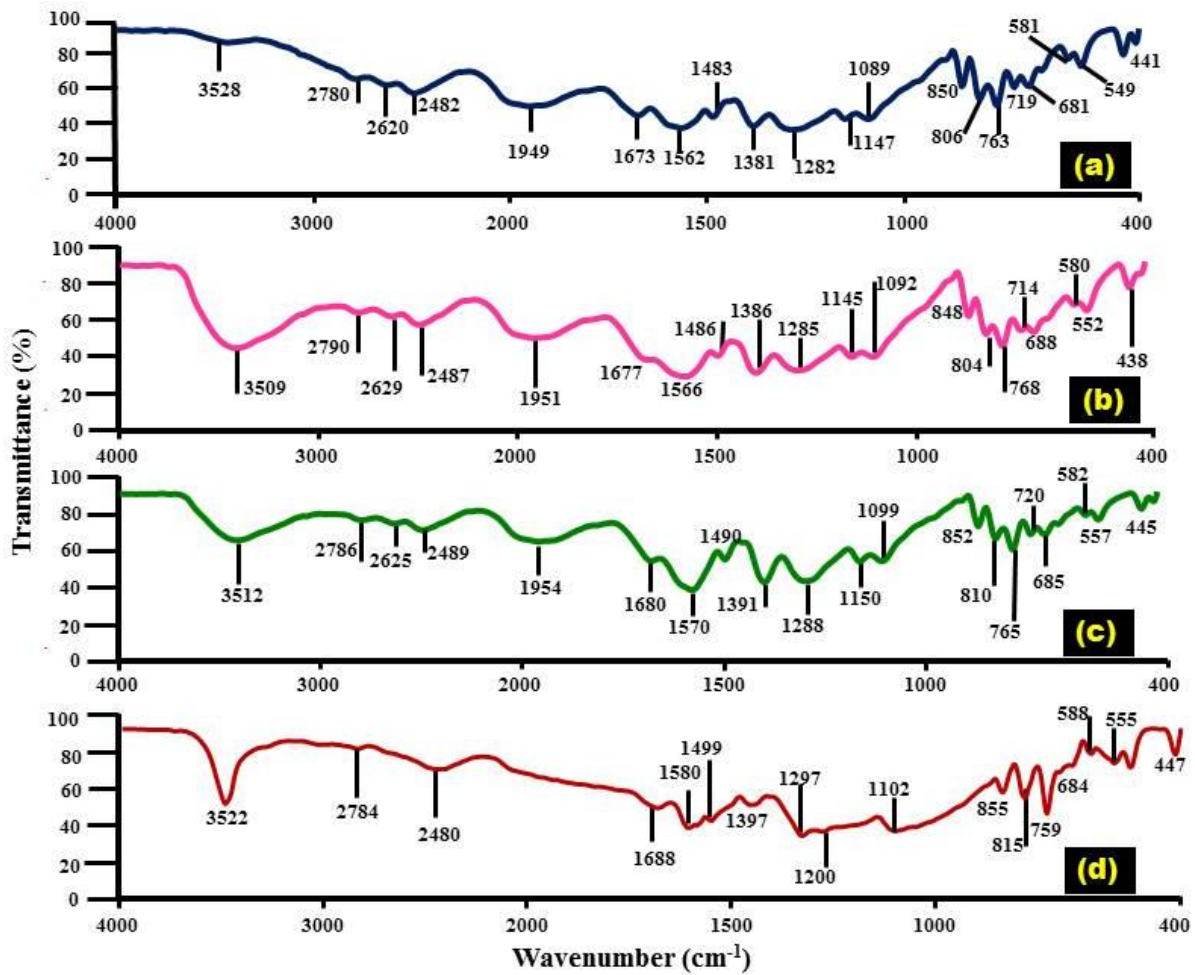
**Figure 2:-** Powder XRD pattern of (a) Undoped KHP (b) LGA doped KHP crystal (c) LAS doped KHP crystal (d) LS doped KHP crystal

**Spectral analysis:-**

FTIR spectra of the grown crystals were recorded in the range  $400 - 4000 \text{ cm}^{-1}$  using KBr pellet in a Perkin-Elmer spectrometer. The FTIR spectra of undoped KHP, LGA doped KHP, LAS doped KHP and LS doped KHP are shown in Fig. 3a, Fig. 3b, Fig. 3c and Fig. 3d.

**Figure 3:-** FTIR spectrum of (a) Undoped KHP (b) LGA doped KHP crystal (c) LAS doped KHP crystal (d) LS doped KHP crystal

To establish the presence of amino acids within the lattice of undoped KHP, the O-H stretching vibration of KHP is considered because the O-H stretching vibration is greater touchy to hydrogen bonding interaction with the doped



amino acids. The band assignments of the grown crystals are given in Table 2.

**Table 2:-** Vibrational Assignments of undoped and amino acids doped KHP crystals

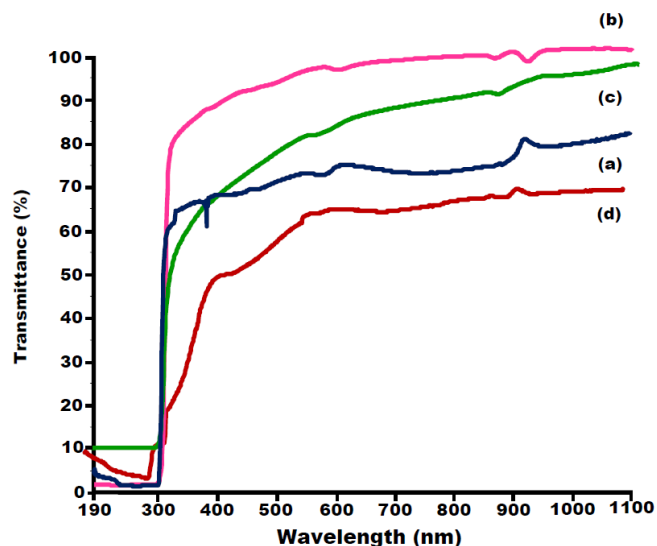
Wavenumbers (cm <sup>-1</sup> )				Tentative Assignments
Pure KHP	LGA-KHP	LAS-KHP	LS-KHP	
3528	3509	3512	3522	O-H stretching hydrogen bond
2482	2487	2489	2480	C-H aromatic stretching
1949	1951	1954	1957	C=C asymmetric stretching
1673	1677	1680	1688	Carboxylic acid C=O symmetric stretch
1562	1566	1570	1580	C=O carboxylate ion asymmetric stretching
1483	1486	1490	1499	C=C ring stretching
1381	1386	1391	1397	C=O carboxylate ion symmetric stretching
1282	1285	1288	1297	C-O stretching
1147	1145	1150	1155	C-C stretching
1089	1092	1099	1102	C-C-O stretching
850,806	848,804	852,810	855,815	C-H out of plane bending
763	768	765	759	C-C stretching
719	714	720	711	=C-H out of plane deformation
681	688	685	684	C-O wagging
549	552	557	555	C=C-C out of plane ring deformation
441	438	445	447	C=C out of plane ring bending

Considering the phenyl ring vibrations, there's no change observed due to doping in C-C stretching, C-H stretching, C-C skeletal aromatic ring vibrations, C-H aromatic stretching, C-H in-plane bending and C-H out of plane bending for the grown crystals. Considering the carboxylic acid vibrations, a small change is observed due to doping in C=O bending, C-O stretching and O-H stretching. Further, a small change is observed in C=O symmetric stretching in the case of doped crystals. The carboxylate ion (COO<sup>-</sup>) vibrations (C-O and C=O bond symmetric and asymmetric stretching) are modified slightly due to doping. So, the results imply that the dopant molecules have entered into undoped KHP crystals matrix. Also, the amino acid can be present at the O-H stretching of the carboxylic acid due to the fact there is no shift in the phenyl ring. The obtained FT-IR spectra are in excellent agreement with that pronounced in the literature for undoped KHP crystals [17].

#### Optical analysis:-

The optoelectronic efficiency of the NLO material is typically decided by way of the transparency window in the UV-Visible region. The optical transmission spectra of the grown crystals have been showed within the wavelength region from 190-1100 nm using a Perkin-Elmer Lambda 35 UV-Visible spectrophotometer. The lower cut-off

wavelength is observed at 300 nm for the grown crystals. The transmission percentage of undoped, LGA doped KHP, LAS doped KHP and LS doped KHP crystals are 70%, 94%, 82% and 60% respectively (Fig. 4a, Fig. 4b, Fig. 4c & Fig. 4d).



**Figure 4:-** UV-Visible Transmission spectrum of (a) Undoped KHP (b) LGA doped KHP crystal (c) LAS doped KHP crystal (d) LS doped KHP crystal

Of all the four crystals, LGA doped KHP crystal indicates highest transmission percentage. The enhancement in the optical transmission is the direct outcome of the improvement in the crystal quality in the LGA doped KHP crystal in compared to other three crystals. The obtained results were compared with the reported work [12].

#### Thermal analysis:-

The grown crystals become analyzed by way of subjecting it to TG/DTA analysis in a closed chamber with controlled nitrogen flow atmosphere under 1000 °C at a heating rate of 20 K/min using a Perkin-Elmer thermal analyzer STA 409 PC. The thermal behaviors of a crystal have a significant role in a crystal growth and its applications. Thermal behaviors like thermal expansion, specific heat and thermal conductivity are basic properties for lasers, especially for high power systems. When a beam of laser interacts with a nonlinear optical crystal, a locality of its incident energy is regenerate into thermal energy resulting in a temperature gradient inside the crystal and if the NLO crystal exhibits large specific heat, then the increase in the thermal gradient of the crystal is small. Such a crystal might have large damage threshold and observes application in high power laser systems. TG/DTA curves for undoped, LGA doped KHP, LAS doped KHP and LS doped KHP crystals are shown in Fig. 5a, Fig. 5b, Fig. 5c & Fig. 5d.

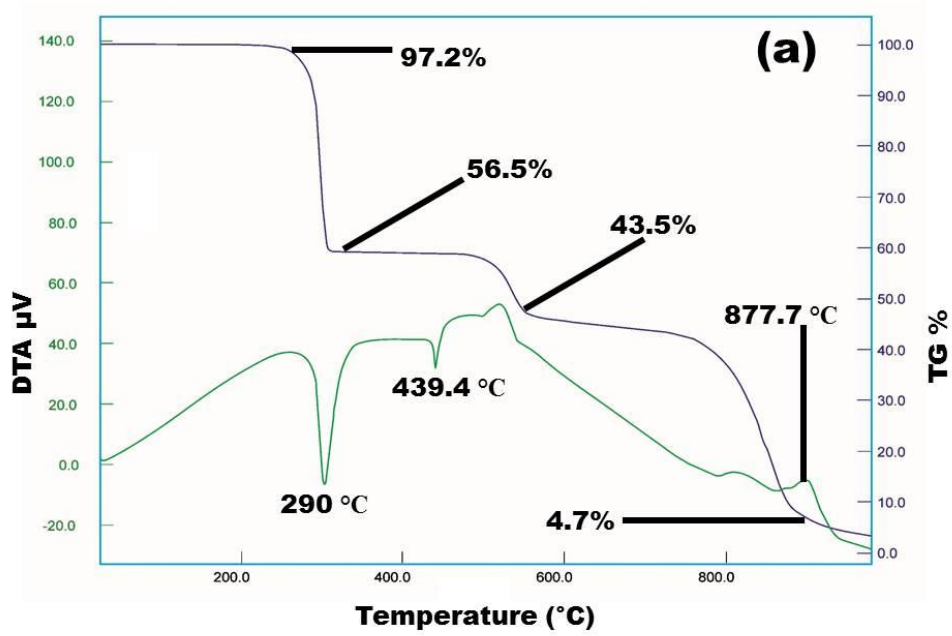


Figure 5:- TG/DTA thermogram of (a) undoped KHP crystal.

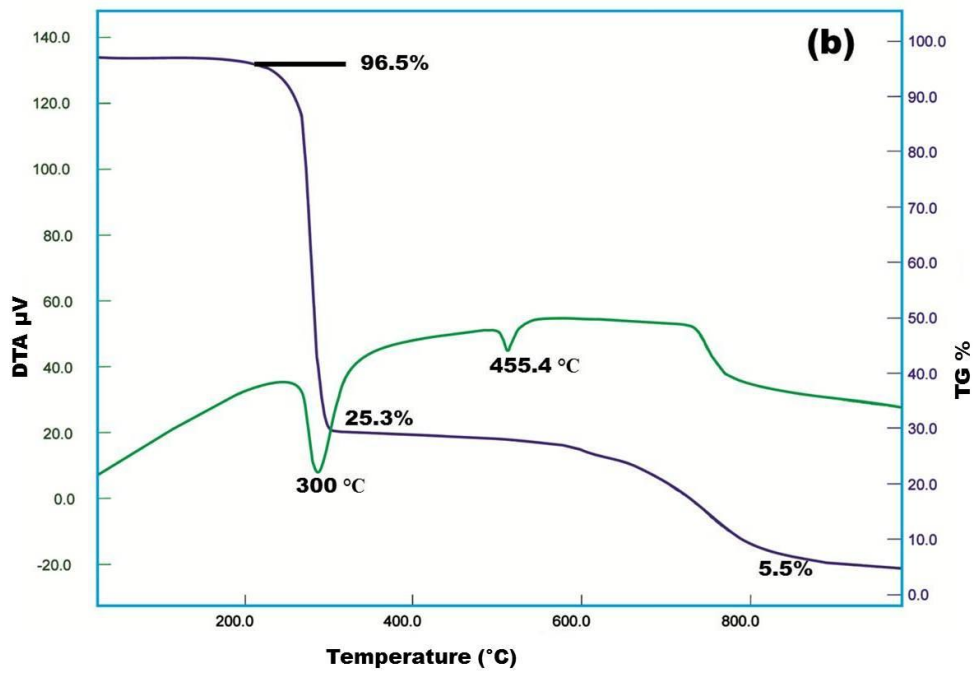


Figure 5:- TG/DTA thermogram of (b) LGA doped KHP crystal

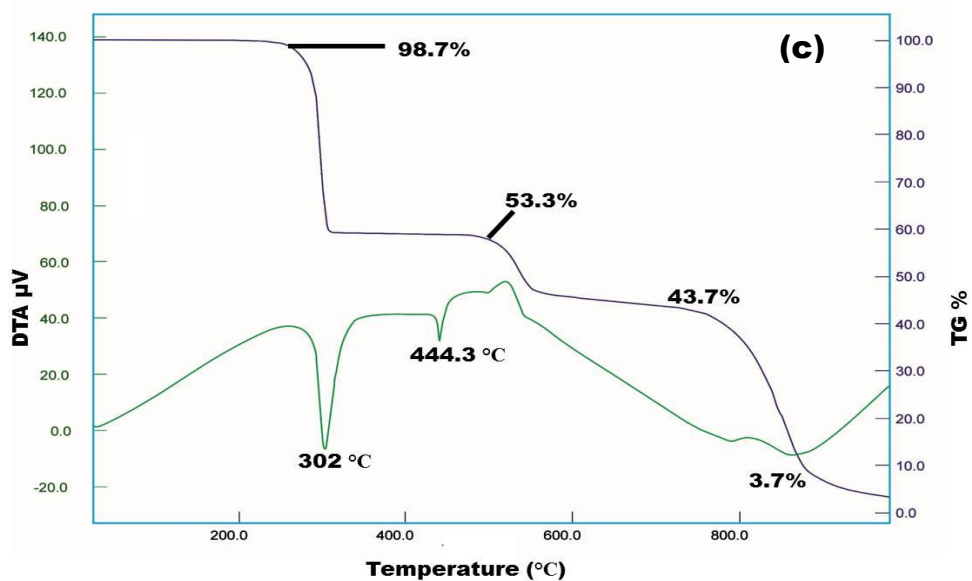


Figure 5:- TG/DTA thermogram of (c) LAS doped KHP crystal

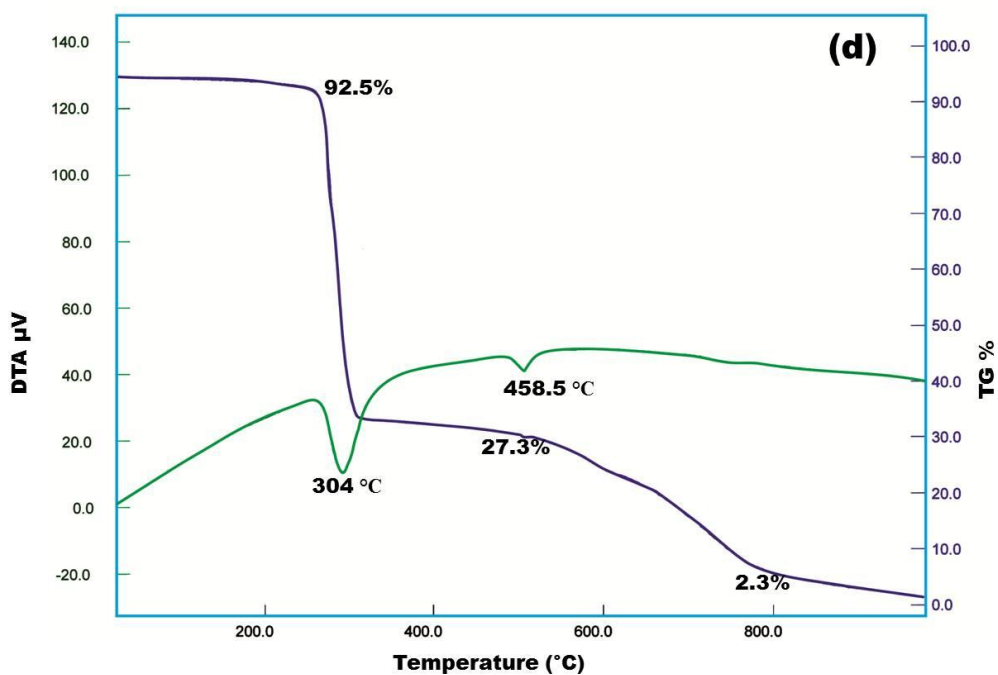


Figure 5:- TG/DTA thermogram of (d) LS doped KHP crystal

From the TG thermogram, undoped KHP crystal showed four stages of weight loss. In undoped KHP crystal, the weight loss starts at around 263.3°C and about 97.2 % of the entire mass loss has come about at some stage in the initial decomposition of undoped KHP crystal. In doped KHP crystals, the weight loss starts at around 265.4°C, 267.6°C and 269.2°C and about 96.5%, 98.7% and 92.5% of the entire mass loss has come about at some stage in their initial decomposition of LGA doped KHP, LAS doped KHP and LS doped KHP respectively. As according to literature survey of Newkirk et al and Belcher et al has reported that the KHP decomposed into  $K_2CO_3$  and char at

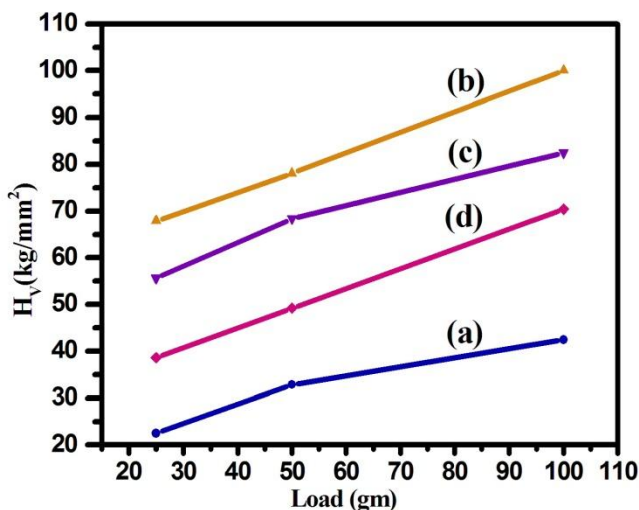
800 °C in the N<sub>2</sub> environment, the prevailing work is of the same opinion properly with these said consequences [18,19]. DTA showed sharp endothermic peak observed at 290°C, 300°C, 302°C and 304°C for undoped, LGA doped KHP, LAS doped KHP and LS doped KHP can be attributed to the decomposition of the grown crystals respectively. Hence, the endothermic peaks above 304.9°C can be due to the formation of volatile fragments. Further, the grown crystals are observed to decompose without melting or phase transformation. As a result, the maximum temperature up to which KHP can be exploited for nonlinear optical applications is limited to 304.9°C.

#### Hardness analysis:-

Vicker's microhardness measurements were carried out the use of Leitz Weitzler hardness tester fitted with a diamond indenter. The mechanical strength of the grown crystals was studied by means of quantifying microhardness because it performs a tremendous position in the fabrication of optoelectronic devices. Vicker's microhardness ( $H_v$ ) is a measure of the hardness of materials calculated from the size of an impact produced under load by the diamond indenter. Hardness value was calculated by the relation

$$H_v = 1.8544 P / d^2 \quad (\text{Kg/mm}^2) \quad \text{----- (1)}$$

Where, P (Applied load in Kg), d (Diagonal length of indentation impression in mm) and 1.8544 (Constant of the geometrical factor for the diamond pyramid). The plot of Vicker's hardness ( $H_v$ ) versus load (P) of the grown crystals is shown in Fig. 6a.



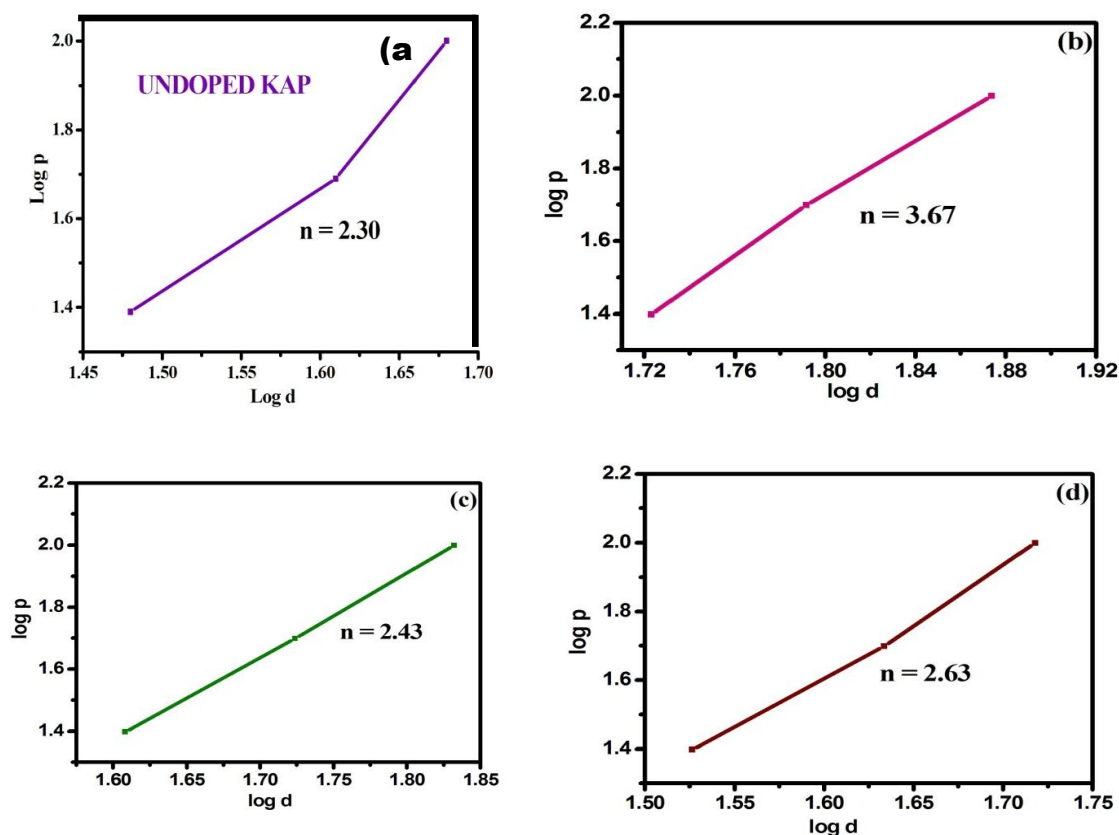
**Figure 6:-** Load P vs  $H_v$  for (a) Undoped KHP (b) LGA doped KHP crystal (c) LAS doped KHP crystal (d) LS doped KHP crystal

From the Fig. 6a, it is seen that hardness value of LGA doped KHP crystal is higher than the hardness value of other three crystals. This is due to the fact the predominant contribution to hardness is ascribed to the high stress required for homogeneous nucleation of dislocation in the small vicinity indented [20]. The presence of cracks shows the decrease in microhardness and it was observed that amino acid doped KHP crystals are highly stable towards the application of mechanical stresses. The noticed changes in the microhardness values of the amino acids doped KHP crystals may be due to the strong interaction of O-H groups of KHP with the COO groups of amino acid [21]. Greater stress is required to form dislocations in an ideal crystal. Hence, the higher hardness value of LGA doped KHP crystal indicates greater stress required to form dislocation which confirms greater crystalline perfection. The work hardening coefficient (n) was estimated by the plot of  $\log p$  vs  $\log d$ . The plot of  $\log d$  vs  $\log p$  for the grown crystals shows a straight line and its slope provides the work hardening coefficient (n)

$$P = K_1 d^n \quad \text{----- (2)}$$



Where  $K_1$  (Standard hardness value which is found from the plot of  $P$  vs  $d^n$ ). The plot of  $\log p$  vs  $\log d$  of undoped KHP (Fig. 7a), LGA doped KHP (Fig. 7b), LAS doped KHP (Fig. 7c) and LS doped KHP (Fig. 7d) depicts that the grown crystals belong to the soft material category.



**Figure 7:-** Log d vs Log p for (a) Undoped KHP (b) LGA doped KHP crystal (c) LAS doped KHP crystal (d) LS doped KHP crystal

#### Second harmonic generation (SHG) analysis:-

The grown crystals have been subjected to a Q-switched Nd:YAG laser beam of wavelength 1064 nm was fired within an input beam energy of 3.2mJ/pulse and pulse width of 8 ns, the repetition rate being 10 Hz. KHP and NaAP crystals are being the phenyl ring and  $\pi$ -electron system that are liable for its NLO efficiency [22]. The estimated SHG efficiencies of undoped, LGA doped KHP, LAS doped KHP and LS doped KHP crystals are found to be 1.5, 1.9, 1.6 and 1.7 times that of the reference material KDP crystal respectively. It genuinely found out that LGA doped KHP crystal which is having SHG efficiency value higher than that of undoped, LAS doped KHP and LS doped KHP crystals.

#### Conclusion:-

Semiorganic single crystals of undoped, LGA doped KHP, LAS doped KHP and LS doped KHP were effectively grown by slow evaporation technique. Single crystal XRD confirmed that the grown crystals have an orthorhombic lattice with  $Pca2_1$  space group for the grown crystals. The powder XRD study confirms that the crystalline perfection of the grown crystals. The presence of functional groups becomes confirmed by means of FTIR spectral analysis. The UV-Visible study implies the optical quality of LGA doped KHP crystal is better than that of undoped, LAS doped KHP and LS doped KHP crystals. The melting and decomposition temperature range of the grown single crystals has been studied by TGA/DTA analysis. In the microhardness analysis, LGA doped KHP crystal has much higher hardness value than undoped, LAS doped KHP and LS doped KHP crystals and it confirms that the grown crystals belong to the soft material. LGA doped KHP crystal is an excellent candidate for SHG applications than LGA doped KHP crystal due to its SHG efficiency value much higher than that of LGA doped KHP. All these properties suggest that LGA doped NaAP crystal may be a promising material for optical applications.



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### RESEARCH ARTICLE

#### TENDON SHEATH FIBROMA OF FORE FOOT A RARE CASE REPORT

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##### Manuscript History

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##### Key words:-

FTS (fibroma of tendon sheath),  
Excision, Biopsy.

#### Abstract

**Background:-**The clinical and pathological features of fibroma of tendon sheath are presented. Fibroma of the tendon sheath is an uncommon soft tissue tumor presenting as a solitary, slow-growing, firm, small nodules, which shows strong attachment to the tendon or tendon sheath. The main presenting symptom was an insidiously growing mass causing mild tenderness or pain. It is usually localized on fingers and hand tendons in adults between the age of 20 and 40 years old but localized on foot is a rare entity.

**Material & methods:-** This case concerns a 40-year-old women presenting with a 3-year history of localized painful swelling on dorsal aspect of right fore foot without history of any trauma, and constitutional symptoms. X ray of right foot was normal. Excision & Biopsy confirmed fibroma of the tendon sheath. Here, we report on a very rare case of fibroma of the tendon sheath arising from Extensor tendon of foot in female, which supports the pathogenetic hypothesis that this tumor may be a reactive process rather than a true neoplasm.

**Result:-** Patient was on regular followed up to 6 months with no signs of recurrence.

**Conclusion:-** Fibroma of tendon sheath of foot is a rare occurrence. Excision of mass gave us excellent result. Excisional biopsy confirmed the diagnosis.

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#### Introduction:-

Fibroma of the tendon sheath (FTS) is a rare, benign soft tissue tumor<sup>1</sup>. The tumor usually presents as a single, slow-growing, firm, pain full, localized swelling, which strongly attaches to the tendon sheath and it is often localized on the hand, particularly on the thumb<sup>1,2</sup>. It usually occurs in males between the age of 20 and 40 years old<sup>1,2</sup>. Histopathologically, it is characterized by a well-demarcated nodule that consists of haphazardly-arranged, fibroblast-like spindle cells embedded in a dense collagenous matrix<sup>2</sup>.

A few cases of FTS have been described in the literature<sup>1-7</sup>. However, FTS arising concurrently on dorsum of foot in female has not yet been reported. Here, we report on the unusual presentation of FTS.

#### Case Report:-

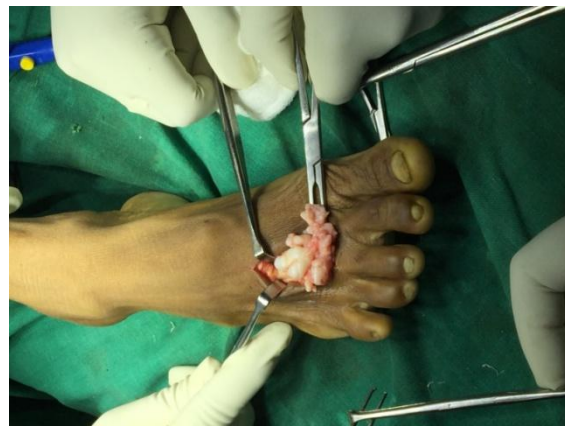
A 40-year-old woman presented with approximately a three-year history of palpable, firm and localized painful swelling on dorsum of fore foot. She recognized the skin lesion on her right dorsum of fore foot area after she felt discomfort and pain upon walking. The lesions have increased in size over the last three years on dorsum of foot. He

complained from time to time of stiffness and numbness on his feet. There was no recollection of associated trauma. His family history and past medical history were unremarkable.



**Pre-op clinical pic No.1:-**

As the nodules were deeply located, visible, & palpable. No limitation of foot or toe motion was observed. No joint swelling or other specific skin lesions were found.



**Intra-op clinical pic No.2:-**

Laboratory tests, including blood cell count and blood chemistry, were all within normal ranges. Foot X-ray showed no remarkable findings. For histological diagnosis, a 4\*2.5\*2cm mass was performed from the lesion on the right



foot. Histopathological findings showed relatively well-circumscribed nodules of extensively collagenized tissue with spindle and stellate cells, that are very few and far apart which appears paucicellular.

Based on these clinical and histological findings, he was diagnosed as FTS. She has been followed up on 12 days of post op for suture removal then 2 months & last followed up on 6 months and her pain and numbness relieve. The FTS has since remained stationary.

<b>CLINICAL DIAGNOSIS:</b>	Foot swelling
<b>SPECIMEN:</b>	Excision Biopsy
<b>GROSSING:</b>	Received irregular multinodular mass measuring 4x2.5x2 cm. External surface is nodular. Cut surface shows whitish homogenous nodules of varying sizes. 142,A-D/17: Whitish nodular area
<b>MICROSCOPY:</b>	142,A-D/17: The sections show well circumscribed nodules of extensively collagenized tissue with spindle and stellate cells, that are very few and far apart. The lesion therefore appears paucicellular. There are many cleft-like vascular spaces.
<b>COMMENT:</b>	The overall features are those of fibroma of tendon sheath.

**Histopathology Report pic. No 3:-**



**Last follow up at 6month:-**

### **Discussion:-**

Chung and Enzinger first defined FTS as an entity in 1979<sup>11</sup>. This rare tumor has been reported mainly in the orthopedic field and generally occurred as a solitary nodule on the fingers, feet, elbows, and knees, and, rarely, intra-articular areas<sup>1-7</sup>.

The pathogenesis of FTS has not been clearly established with regard to whether the origin is a neoplasm or reactive fibrosing process. Dal Cin et al<sup>10</sup>. reported that the presence of clonal chromosomal abnormality characterized by a

t(2:11)(q31-32;q12) in ten out of 20 karyotyped cells suggested that this proliferation is not a reactive fibrosing process, but a neoplasm. Others have found that the right hand was more frequently affected than the left, and most cases occurred in the palm of hand and in the plantar region of the foot<sup>11</sup>. This finding suggests that the origin of FTS may be a reactive process by trauma, stimulation, or inflammation. This case also favored the reactive pathogenesis in formation of FTS. Skin lesions developed on foot and are consistently affected by prolonged pressure and motion. Her symptoms of morning stiffness and numbness showed moderate improvement with administration of oral anti-inflammatory agents. Since we placed her on oral anti-inflammatory agents, the number and size of FTS have been maintained. From these findings, sustained inflammation and stimulation may play an important role in FTS.

The majority of patients with FTS are between the ages of 20 and 40 years and the male: female ratio has been described as 1.5~3:1<sup>7,11</sup>. Most patients do not complain of any symptoms. However, 31% of cases present with tenderness and mild pain due to compression of nerves underlying FTS<sup>11</sup>. Numbness and morning stiffness were observed in this case also. Although her symptoms were controlled by oral anti-inflammatory agents, the possibility of compression of nerve on foot cannot be excluded. Therefore, even though it is practically difficult to excise out all FTSs, removal of the tumor is necessary, which provokes pain. Surgery for local excision should be performed carefully, because the recurrence rate is 24% and all of the cases are in the hands and finger<sup>7</sup>.

Differential diagnosis should be made with an epidermal cyst, mucinous cyst, neuroma, leiomyoma, nodular fasciitis, and giant cell tumor of the tendon sheath (GCTTS)<sup>12</sup>. In particular, clinical features of GCTTS are similar to those of FTS. However, FTS is distinguished from GCTTS by histopathology features, which include the fact that GCTTS are less hyalinized and more cellular, and with histiocytes and monocytes as well as multinucleated giant cells, foam cells, and hemosiderin-laden macrophages<sup>12</sup>. Regarding multiple nodules on the palmar area, Dupuytren's contracture should be considered as a differential diagnosis. It is the best known multiple palmar fibromatosis<sup>13</sup>. Clinical manifestation usually showed flexural contracture of the hand, particularly the ring and little finger area. This patient did not show any limitation of foot or toe movement; therefore, diagnosis of Dupuytren's contracture was easily ruled out in the clinical setting.

We herein report on a very rare case of FTSs on the foot. This case implies that FTS may not be a true neoplasm but a reactive process provoked by sustained inflammation and stimulation.

### **Conclusion:-**

Fibroma of tendon sheath of foot is a rare occurrence. Excision of mass gave us excellent result. Excisional biopsy confirmed the diagnosis.

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### RESEARCH ARTICLE

#### AN ANTHROPOMETRIC PROFILE AMONG THE KORAGA TRIBE OF UDUPI DISTRICT, KARNATAKA STATE

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##### Key words:-

Koraga, PVTG, Skinfold Thickness,  
 MUAC, Nutritional Status,  
 Anthropometry and Udupi

#### Abstract

The present study was carried out to evaluate the Skinfold Thickness, Height for age, Weight for age, BMI, and MUAC of Koraga tribal people representing three taluks of Udupi district, Karnataka State. In Karnataka, Koraga tribes are identified as PVTG. The data or information was recorded through interview schedule and a survey was conducted. Total 500 individuals were studied from twenty hamlets in three taluks of Udupi District. The foregoing study reveals that among the total samples 90.8% (454) of them are suffering from different grades of Chronic Energy Deficiency.

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#### Introduction:-

As per the 2011 census, the tribal population is 8.6% of the total population. 89.9% of them reside in rural areas and 10.0% in urban areas. Whereas in Karnataka, as per 2011 census the total tribal population is 6.95% of the total population with 19.27% of them residing in urban and rest of 80.72% of the peoples are found in rural parts. Few studies in India provide detailed descriptions of the tribal community. Good nutrition is a basic element of health. A healthy person leads thenation in abettermanner. Most of the tribal people of India have their own geographically isolated lifestyle. Inadequate food habits along with traditional socio-cultural and biological activities may lead to a high proportion of child undernutrition (Balgir et al. 2002; Rao et al. 2006). Most of the tribal people are exposure to different kinds of diseases and suffering from malnutrition. Good nutrition of the people is avital component of healthy life. The Indian tribal people are deprived economically.

Tribal peoples are recognized to avery close relationship with the ecology and the environment because of their fulfillment of daily nutritional requirements with food foraged from nature. They are dependent on the forest. But after the forest act tribal are not allowed to collect forest produces due to this reason tribal are not getting any nutritional supplements. The government has providing nutritional supplements to the tribes, but most of them are not aware of the food and they are not using. This leads to malnutrition. Inadequacies in nutritional intake or under-nutrition can be considered a major source of many adverse effects on the growth and health of individuals (Gordon et al., 1968).

Most of the tribal community in India is addicted to alcohol consumption and they don't care about their health. They have their strong traditional beliefs and practices of healing the diseases. They have their own ethno

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medicines. Still, most of them are practicing their own tradition to heal of the disease. The present study shows the anthropometric description of the tribal people to know their nutritional status.

Anthropometry is a key component to assess the nutritional status. This is the study of measurements and proportion of the human body using different anthropometric instruments. MUAC is the circumference of the left upper arm, measured at the mid-point between the tip of the shoulder and the tip of the elbow (Olecranon process and the Acromium).

### **Material and Method:-**

For the present study a total of 500 subjects which 243 male, 257 female were selected during the study. Fieldwork was conducted during the month of March to August. The Data were gathered from different hamlets of Koraga tribes in three taluks of Udipi District. Anthropometric measurements were taken using the standard procedure. The anthropometric measurements (*Height, Weight, Mid Upper Arm Circumference and Skinfold Thickness at Triceps*) of Koraga tribal people were recorded using techniques given by Jelliffe (1966). The height was measured with the help of Anthropometric rod, weight was measured with the help of a digital weighing machine and it was measured to the nearest 0.1 kilogram., MUAC was measured with the aid of tape to the nearest 0.1 cm. and skinfold thickness was measured to the nearest 0.1 millimeters with the help of futubaskin fold calliper.

### **BMI was computed using the following standard equation:-**

$BMI = \text{weight (in Kg)} / (\text{height})^2$  (in meters). Nutritional status was evaluated using internationally accepted BMI guidelines (WHO 1990: 854). The following cut-off points were used: CED BMI <18.5, normal: BMI= 18.5–25.0, overweight: BMI  $\geq$  25.0-30.0 and above (PujarA et.al., 2016).

The data was analysed with the use of Statistical Package for Social Science 22.0 Version software.

### **Koraga Tribe:-**

In Karnataka, totally 50 tribes are scheduled under the list of Schedule Tribes. Among them, two tribes are identified as Particularly Vulnerable Tribal Groups (PVTG, earlier it called as PTG-Primitive Tribal Groups) who has a low level of literacy rate, the pre-agricultural level of technology and declining population. Koraga is one among them. Most of the Koraga population resides in coastal regions of Karnataka that is Dakshina Kannada and Udipi district. According to the 2011 census, their population in these two districts is 14,794. As the census of India, Koraga tribal population is drastically declining over the period of time. They are skillful in making baskets using creepers (Beelu), canes, and bamboos by splitting and weaving them artistically. Basketry is the main source of income of Koraga tribal community. But then nowadays majority of them working as daily wage laborers in panchayat, municipality, hotels, and hostels etc. Physically they are very quiet and inoffensive race, small and slight, the men seldom exceeding five feet six inches, black skinned, thick-lipped, noses broad and flat, high cheek bones and sloping foreheads and with wavy dark rough hairs and very distinct eyes and lips. They speak Koraga language, which is the mixture of Tulu and Kannada, but while communicating with others they speak the Kannada language. In three taluks of Udipi district, Koraga tribes speak a different dialect. These taluk people culture, tradition is also differed each other.

### **Results and Discussion:-**

A total of five hundred individual's height, weight, MUAC and skinfold thickness at triceps were recorded with the help of anthropometric instruments. A total 500 individuals comprising 48.6% males and 51.4% were females (Table 1, Fig: 1).

Table no. 2 (Fig:2) shows that maximum number of individuals 36.4% (182) were suffering from CED Grade-II (16.0-17.0) type of malnutrition following 34.8% (174) respondents were suffering from Grade-III (<16.0) type of malnutrition and 19.6% subjects were suffering from Grade-I (17.0-18.5) type of malnutrition. Totally, out of 500 respondents, 454 subjects were suffering from different grades of Chronic Energy Deficiency.

In the 4-6 years age group there was a slight difference in the mean height of males ( $97.5 \pm 11.38$ ) and females ( $96.1 \pm 13.4$ ). In the 7-18 years age group also, there was no much difference in the mean height of males and females. 19-60+ years of age group there was a huge difference in mean height found. In the age group of 4-15 years of age group, there was slight differences in weight of male and females, whereas above 16 years upto 60+ age

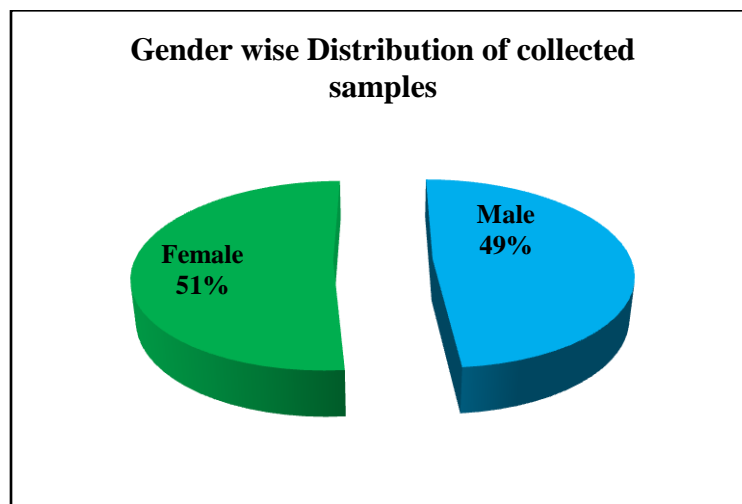


group female were shorter by about 6-7 kg lighter as compared to themale of the same age group. The tribal peoples were shorter and lighter when compared with the NCHS and ICMR standards(Table No-3, Fig-3).

In the 7-9 years age group there was much difference in the mean MUAC of male ( $14.80 \pm 2.34$ ) and females ( $18.39 \pm 14.2$ ).In the age group of 13-15 years,there was also much difference in the mean mid-upper arm circumferencesin males ( $17.6 \pm 2.76$ ) and females ( $22.0 \pm 2.93$ ).In remaining age group there 1-2 cm differences found between male and females.In the 10-12 years age group there was much difference in the mean Triceps skinfold thickness of male ( $9.38 \pm 2.66$ ) and females ( $7.79 \pm 2.86$ ). In remaining age group, there were 1 mm differences found between male and females (Table No-4, Fig-4).

**Table 1:-** Gender wise distribution of the sample

Gender	Frequency	Percent
Male	243	48.6
Female	257	51.4
Total	500	100



**Fig 1:-** Gender wise distribution of the collected sample

**Table 2:-** Distribution of BMI according to gender

BMI Grades	Male	%	Female	%	Total	%
CED III (<16.0)	82	33.7	92	37.8	174	34.8
CED II (16.0-17.0)	93	38.2	89	36.6	182	36.4
CED I (17.0-18.5)	52	21.3	46	18.9	98	19.6
Low weight normal (18.5-20.0)	09	3.70	19	7.81	28	5.6
Normal (20.0-25.0)	05	2.05	09	3.70	14	2.8
Obese (25.0-30.0+)	02	0.82	02	0.82	04	0.8
<b>Total</b>	<b>243</b>	<b>48.6</b>	<b>257</b>	<b>51.4</b>	<b>500</b>	<b>100</b>

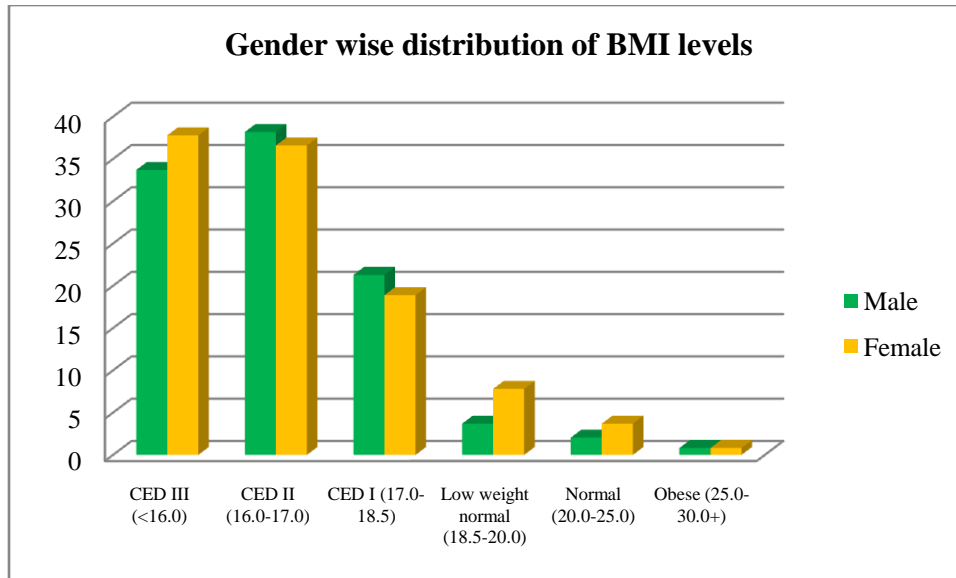


Fig 2:- Gender wise distribution of BMI levels

Table 3:- Distribution of Height (cm) and Weight (kg) of Koraga tribes according to age and gender

Age Group	Height (cm)				Weight (kg)			
	Male		Female		Male		Female	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4-6	97.50	11.387	96.18	13.415	12.36	2.37	11.27	2.19
7-9	112.60	5.739	111.50	8.726	17.00	2.66	15.67	3.71
10-12	126.50	6.761	132.29	11.612	22.13	3.94	23.00	6.07
13-15	141.20	15.631	138.09	14.321	31.00	8.66	30.18	10.05
16-18	153.77	9.175	150.10	6.688	39.96	8.37	40.60	8.61
19-24	162.88	8.467	150.00	5.451	48.59	7.22	42.52	9.19
25-30	161.39	6.609	151.24	5.122	49.36	6.24	42.69	7.83
31-40	160.52	7.525	150.97	5.015	49.32	9.21	44.80	9.34
41-50	159.23	7.727	148.69	5.058	50.33	10.09	44.07	7.36
51-60	156.70	4.296	148.39	5.903	51.80	10.05	42.56	6.39
60+	161.05	8.416	147.28	5.245	47.11	10.33	41.67	9.27

Table 4:- Distribution of MUAC (cm) and Triceps (mm) of Koraga tribes according to age and gender

Age Group	MUAC (cm)				Triceps (mm)			
	Male		Female		Male		Female	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
4-6	14.46	1.19	13.91	.944	4.36	1.64	4.73	2.41
7-9	14.80	2.34	18.39	14.2	5.90	1.59	6.11	3.23
10-12	17.13	1.45	19.50	3.32	9.38	2.66	7.79	2.86
13-15	17.67	2.76	22.00	2.93	10.80	3.59	11.36	4.00
16-18	21.73	2.69	21.55	4.09	9.54	2.67	9.70	2.77
19-24	24.09	11.2	22.31	3.65	8.56	3.60	10.03	3.68
25-30	23.45	1.75	24.14	2.88	9.03	2.58	9.59	3.56
31-40	22.89	3.47	24.62	8.21	8.00	3.14	9.22	2.91
41-50	23.13	2.41	22.97	3.66	9.37	2.76	10.00	3.78
51-60	23.20	2.15	22.72	2.82	8.10	4.17	8.72	4.90
60+	21.32	3.03	21.78	4.16	7.58	3.11	6.28	2.02

**Conclusion:-**

Healthcare is one of the most important of all human endeavours to improve the quality of life especially of the tribal people (Balgir, 1995, 2000, 2005 & 2007). Health problems and health practices of tribal communities have been profoundly influenced by the inter- play of complex social, cultural, educational, economic and political practices (Balgir 2005). Most of the tribal population in India suffering from malnutrition because their general customs, traditions, values, beliefs and practices associated with their health and disease and it has been closely related to the treatment of diseases. In most tribal communities, there is a wealth of folklore associated with health belief and tribal people are mainly depend upon the forest products after the forest act (2006) implemented tribal are restricted to enter in to the forest and this is one of the important factor that tribal are suffering from malnutrition.

In Karnataka Koraga tribes identified as *Particularly Vulnerable Tribal Groups (PVTG)*. The present study reveals that the only 8.4% and 0.8 % are respectively falling in normal and obese categories remaining all are suffering from different grades of malnutrition. This is also a prime reason for community stagnancy or decline in population. The finding reveals precautionary actions are desirable to progress the health and nutritional condition of the Koraga tribe in the state.

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### RESEARCH ARTICLE

#### ISOLATED CUNEIFORM TUBERCULOSIS A RARE CASE REPORT

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#### Abstract

**Background:** Skeletal tuberculosis accounts for 1 to 3% of extra pulmonary tuberculosis of which 10% involve foot and ankle, which is 0.1 to 0.3% of extra pulmonary tuberculosis. Spine is the most common site and involvement of foot is rare for tuberculosis. The bones involved are usually the calcaneum, talus, first metatarsal, navicular and lateral and intermediate cuneiforms. Because of rare occurrence, diagnosis of tuberculosis of foot remains a dilemma especially when confined to a single bone without articular involvement.

**Material & Method:** A 9 year old girl presented to us with swelling, gradual increasing pain in right foot more so on weight bearing from last six months. There was no history of constitutional symptoms or trauma. There was no family history of tuberculosis.

On examination there was a swelling on dorsal aspect of right mid foot with tenderness. There was no other positive finding.

The x-ray shows a lytic lesion of Lateral cuneiform with sequestrum with normal tarso-metatarsal and inter-tarsal joints of right foot.

Routine blood investigations were normal. The lesion was addressed by dorsal approach and curettage biopsy was done. After through curettage, the lesion was packed with cancellous bone grafts. The histopathology confirmed it to be tuberculosis. The Foot -ankle was immobilized by below knee plaster slab for 8 weeks and then patient was gradually mobilized.

**Result:** Patient was followed up for 1<sup>1/2</sup> year with no signs of recurrence.

**Conclusion:** Isolated tuberculosis of cuneiform bone is a rare occurrence. The curettage and bone grafting gave us excellent result, which is the treatment of choice.

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#### Introduction:-

Tuberculosis is a challenging infectious health problem for both developed and developing countries. Skeletal tuberculosis accounts for 1 to 3% of extra pulmonary tuberculosis. The spine is most commonly affected, and foot and ankle involvement is rare, accounting for about 10%<sup>1</sup> in which Calcaneum is the most common bone involved.<sup>2</sup> Diagnosis of tuberculosis of the foot remains a dilemma because of its rarity in lower limb, especially when confined to a single bone with or without articular involvement. Hence, the chance of misdiagnosis and delay in diagnosis may add to morbidity.<sup>3</sup>

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Some diseases like chronic pyogenic osteomyelitis, fungal osteomyelitis, Madura mycosis and some bone tumours may mimic tuberculosis of foot.<sup>4</sup> Presumptive diagnosis can be made on the basis of X-ray, MRI and histopathology of the pathological tissue.

Here we are reporting a case of 9 year old girl with swelling and pain over a right mid foot diagnosed as tuberculosis of cuneiform on subsequent X-ray, MRI and biopsy.

### Case Report:-

A 9 year old girl presented with complaints of pain and swelling over right foot for last 6 months. Swelling and pain was progressive in nature. It has increased over the last 2 months such that the patient had difficulty in walking due to pain. Associated history of dry cough since 25 days. There was no history of fever, weight loss, and loss of appetite, any infective foci or any contact of tuberculosis.

On examination, there was swelling of dorsal aspect of the foot. There was exfoliation of skin over the dorsum of foot. There was tenderness over mid foot. The temperature was mildly raised as compared to the other foot. There was inguinal lymphadenopathy.



**Figure 1:-** Pre op clinical photograph and x-rays

On blood investigation, ESR was 50 mm after one hour. Mantoux reaction was positive. Rest routine investigation was normal.

X-ray of right foot (ap and oblique view) showed a lytic lesion of the lateral cuneiform and ill-defined sclerotic margin. [Figure-1]. There was also sign of osteopenia and coarsened primary trabeculation. Chest radiograph appeared normal.

Surgical intervention was done by debridement and curettage of the lateral cuneiform with bone grafting. Intraoperatively soft tissue surrounding lateral cuneiform was unhealthy and the cavity inside it contained unhealthy granulation tissue. Tissue and pus was sent for Gram staining, Ziehl Nielsen staining, KOH mount, culture for fungi, pyogenic organisms, and mycobacterium tuberculosis and for histopathological examination.



**Figure 2:-** Post op. X-rays

Ziehl Nielsen staining revealed acid fast bacilli and culture on Lowenstein Jensen media grew mycobacterium colonies.

Histopathology revealed fibro connective tissue showing many epithelioid granuloma with central neutrophilic microabscesses surrounded by small area of caseous necrosis with multinucleated Langhan's type of giant cells.

Diagnosis of tuberculosis of lateral cuneiform was made and anti-tubercular therapy was advised for 9 months and below knee slab was applied. Nonweight bearing walk was started. At 6 weeks followup, the splint was removed and physiotherapy of ankle was started. Partial weight bearing was started when pain reduced and progressively increased as tolerated.

The patient was followed for one and a half year. Painless normal range of motion was present with normal skin condition [Figure-3]. Radiograph showed sclerosis and mineralization of surrounding bones.



**Figure 3:-** Followup x-rays

### **Discussion:-**

Musculoskeletal tuberculosis is difficult to diagnose. The classic presentation of localised pain, fever and weight loss is rarely seen. Radiological features of musculoskeletal

tuberculosis may include bone marrow oedema, osteoporosis, lytic lesions or may be nonspecific. The surrounding tissue may show synovitis, joint effusions, tenosynovitis or abscess.

Isolated tubercular involvement of foot bones with an osteolytic defect is a rare entity.<sup>5</sup>

Dhillon et al studied 92 cases of foot tuberculosis over 20 years, 23 were of osteolytic variety out of which 2 had lesions in the cuneiform.<sup>5</sup> Tuberculosis of cuneiform is rare and may mimic fungal osteomyelitis, Madura mycosis, chronic pyogenic osteomyelitis and bone tumours. ESR is almost always elevated in case of tuberculosis.<sup>6</sup> In our case there was a positive Montoux test, raised ESR, histopathology of the tissue specimen, Ziehl Nielsen staining and isolation of Mycobacterium on Lowenstein Jensen media, which finally lead to diagnosis. Treatment should not be delayed as delay in treatment may result in less than optimal outcome.<sup>7</sup> The aim of anti-tubercular treatment is to eradicate the organism and to obtain a supple, pain free weight bearing functional foot. With treatment radiological changes do take place and cavities may persist for years, which have no clinical significance.<sup>7</sup>

### **Conclusion:-**

It is concluded that isolated cystic tuberculosis of lateral cuneiform is rare. Open biopsy, curettage with bone grafting and histopathology, Ziehl Nielsen staining and culture for mycobacterium tuberculosis confirms the diagnosis. Anti-tubercular therapy for a period of 9 months should be given for better prognosis and to prevent recurrence.

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### RESEARCH ARTICLE

#### NUMERICAL SIMULATION ON PERFORMANCE OF A LOW SPEED CENTRIFUGAL COMPRESSOR.

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##### Key words:-

Centrifugal compressor, Partial shroud,  
 Flow Coefficient, Tip Clearance.

#### Abstract

The present computational investigation deals with performance improvement of a low speed centrifugal compressor by inexpensive partial shroud near the rotor blade tip. Computational study of centrifugal compressor is carried out with finite volume method upwind scheme using ANSYS CFX-15.0 software are carried for four flow coefficients  $\phi=0.12, 0.18, 0.28$  and  $0.34$  at three values of tip clearance, viz.  $\tau = 2.2\%, 5.1\%$  and  $7.9\%$  of rotor blade height at the exit. Performance tests are carried out for a total of two configurations. From these measurements, partial shroud is found give best performance. The improvement in the compressor performance may be due to the reduction of tip leakage flows by the small extension of partial shroud (2 mm on the pressure surface side). The axial distribution of static and total pressure coefficient at rotor exit for the four flow coefficients, clearly indicate increase in total pressure in the rotor tip region for the configuration with PS compared to that for the basic configuration (without PS). Similar increase is observed in the static pressure distribution at the rotor exit for the higher values of clearance. The mass averaged total and static pressures at the rotor exit for both configurations at the three values of tip clearances clearly show that partial shrouds are beneficial in improving the pressure rise of the compressor.

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#### Notation:-

$C_u$  = Tangential velocity       $m$  = Non-dimensional meridional distance  
 $P_s$  = Static pressure       $P_{atm}$  = Atmospheric pressure  
 $P_0$  = Total pressure       $R$  = Non-dimensional radius  
 $u_2$  = Rotor tip speed =  $(\pi d_2 N / 60)$  (m/s),  $x$  = Non-dimensional axial distance  
 $\phi$  = Flow coefficient       $\rho$  = Density of air ( $\text{kg/m}^3$ )  
 $\tau$  = Tip clearance

$\Psi_0$ =	Total pressure coefficient = $2P_0 / u_2^2$
$\Psi_s$ =	Static pressure coefficient = $2P_s / u_2^2$

$\gamma$  = Power coefficient

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$\eta$  = Efficiency (defined in the text)

*Superscript:*

Circumferentially averaged quantity = Mass averaged quantity

*Subscript:*

- 1. Inlet of compressor
- 2. Outlet of compressor

**Introduction:-**

The tip leakage flow thus would have dominant effect on the performance of a compressor. A comprehensive review of tip clearance effects in centrifugal compressors is given by Pampreen (1983). Senoo and Ishida (1987) gave analytical expression to quantify the tip clearance effects in centrifugal blowers Hayami (1997) has found from his experiments that axial movement of the casing has better efficiency over the movement of casing in radial and axial directions. Tip clearance in centrifugal compressor causes the leakage of high pressure fluid from pressure surface to suction surface of the impeller blade, making the flow field highly complex and effecting the performance. The tip clearance studies are conducted to understand the flow behavior in order to minimise the effect of tip clearance. Pampreen (1973), Mashimo et al. (1979), Sitaram and Pandey (1990) have conducted experimental studies and suggested that by reducing the tip clearance gap size, the tip clearance effect can be minimised. The required tip clearance can be obtained by shifting the casing in radial or axial or combined radial and axial directions.

**Computational Details and Methodology:**

**Table 1:-** Design Details of the Rotor

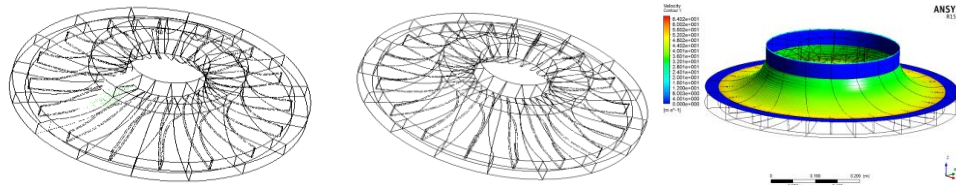
Total pressure rise, $\Delta p$ :	300 mm WG		
Volume flow rate, $V$ :	1.12 m <sup>3</sup> /s		
Speed of rotation, $N$ :	2000 rpm		
Shape number, $N_{sh}$ :	0.092		
No. of rotor blades, $Z$ :	16		
Inducer hub diameter, $d_{1h}$ :	160 mm		
Inducer tip diameter, $d_{1t}$ :	300 mm		
Rotor tip diameter, $d_2$ :	500 mm		
Blade height at the exit, $h_2$ :	34.74 mm		
Blade angle at inducer tip, $\beta_{1t}$ :	35°		
Blade angle inducer hub, $\beta_{1h}$ :	53°		
Blade angle at exit, $\beta_2$ :	(a) At hub:	75°	
(b) At mean section: 90°	(c) At tip:	105°	

Rotor

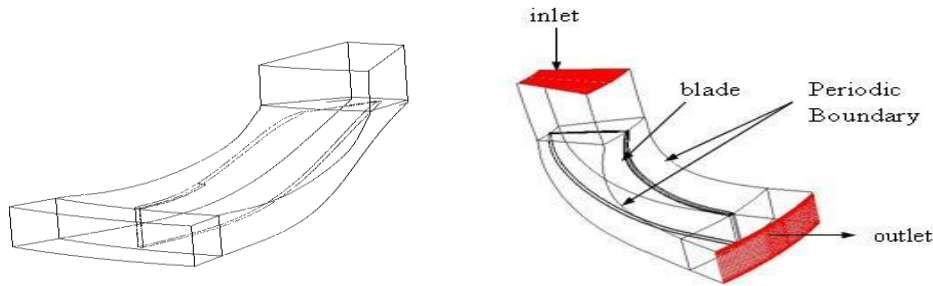
Basic Configuration Configuration with PS  
**Fig. 1:-** Details of Configurations

All the angles are measured w. r. t. tangential direction

**Partial Shroud:-** The partial shrouds are made of stainless steel of 0.1 mm thickness. The stainless steel sheet is cut to the shape of rectangle pieces of 50 mm x 5 mm size. These rectangle pieces are attached to the tip of the blades using araldite. The configurations tested (basic configuration without partial shroud and configuration with partial shroud) are shown in Fig. 1.



**Fig. 2:-** Centrifugal compressor without and with partial shroud



**Fig. 3:-** Computational domain of single passage with and without partial shroud.

Geometry and mesh: The geometric model used for the computational simulation of impeller with PS and without PS configuration consists of single passage impeller blades. These are done with the assumption that flow is periodic in each vane passage. This avoids the necessity of modeling the entire centrifugal compressor stage thereby saving enormous computational time and resources. The geometric model used for the computational simulation of Centrifugal impeller with above specifications with 2mm thickness throughout the blade for generation of three dimensional blades was done as shown in **Fig.2**. A single passage of the impeller with inlet at 50mm ahead of the impeller and outlet at a distance of 35mm downstream of impeller is shown in **Fig. 3**. Casing is designed with 0.7mm clearance throughout the blade height. Three tip clearances of 2.2%, 5.1% and 7.9% of trailing edge blade height are obtained by moving the casing axially. ANSYS CFX 15.0 version software is used for obtaining the solution and standard the SST  $k-\omega$  model was applied to obtain turbulent quantities, assuming that the flow in the compressor is fully turbulent. The design rotational speed was 2000rpm. The total pressure, total temperature, and flow direction were specified at the impeller inflow boundary ( $P01 = 101300$  Pa and  $T01 = 288.15$  K), and the mass flow rate was specified at the diffuser outflow boundary. In CFX we have to use turbo mode for this problem statement, with respective to this stationary, rotating components are defined. The density going to vary compressible fluid with pressure fluid properties kept as air ideal gas. Rotating domain interface used as Stage. The stage averaging at the frame change interface incurs a one-time mixing loss. Physical Time scaling value was observed to be taken as  $10^{-3}$  s. Accuracy criteria of RMS solution was decreased to  $10^{-5}$  for better accuracy.

#### Validations for tip clearance:-

Prior to comparing the performance of the test cases, the numerical result for the three values of tip clearances ( $\tau=2.2\%$ ,  $5.1\%$  and  $7.9\%$ ), was validated with the experimental data. Experimental results were validated by comparing the computed characteristic curves of the efficiency and energy coefficient with the experimental data, static pressure coefficient, and total pressure coefficient, mass-averaged static and total pressures at outlet of the blade with the computational data. The CFD results showed satisfactory agreement with the experimental results over the full range of operating conditions. The overall flow structure predicted by the numerical simulations, including the jet-wake flow pattern, was qualitatively well captured, as observed by comparison with the experimental results. Improved results may be obtained with PS.

#### Results And Discussions:-

PERFORMANCE CHARACTERISTICS: Effect of Configuration: The result of the computational investigations revealed that **Figure 4** shows the performance characteristic in terms of efficiency,  $\eta$  vs. flow coefficient,  $\phi$  for four flow coefficients  $\phi=0.12, 0.18, 0.28$  and  $0.34$  and at the tip clearance  $\tau = 2.2\%$ , for both configurations. At the value  $\tau = 2.2\%$ , of tip clearance, PS gives higher value of efficiency compared to that without PS due to reduced tip leakage flows. In fact the efficiency of the rotor with PS even at the highest value of tip clearance observed is higher than the efficiency of the rotor without partial shroud at the lowest value of tip clearance. Experimental and Simulation results can be concluded that partial shroud is very beneficial to the performance of the compressor. In the present both investigations, partial shroud with a very small extension of 2 mm on the pressure surface side of the impeller blade is provided. The effect of the two configurations on the performance of the centrifugal compressor in **Figure 5** shows the performance characteristic in terms of energy coefficient,  $\psi$  vs. flow coefficient,  $\phi$  for the three values of tip clearance  $\tau = 2.2\%$ ,  $5.1\%$  and  $7.9\%$  for the both configurations. The value of  $\phi$  where  $\psi_{\max}$  occurs is reduced, thereby increasing stable operating range.

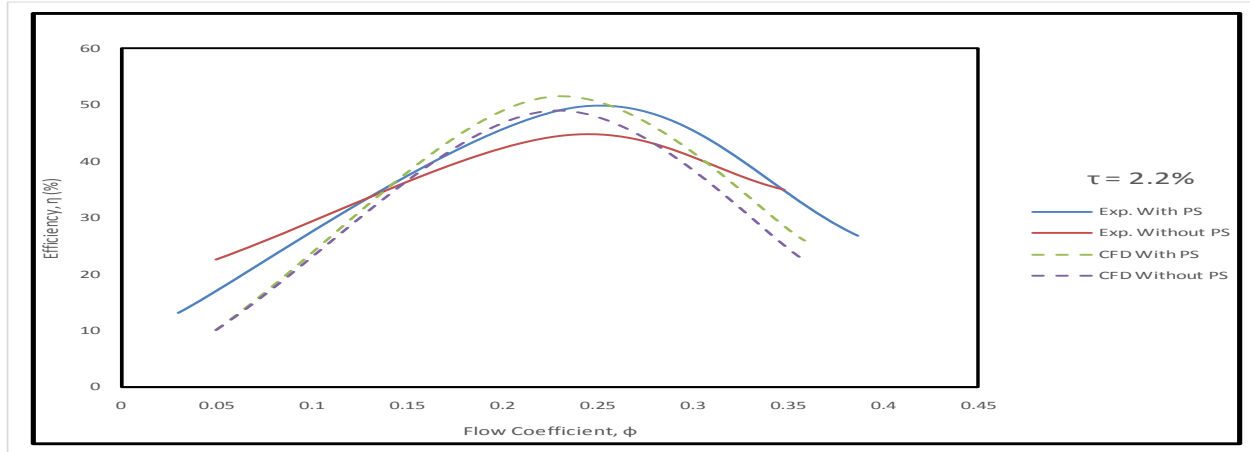


Fig. 6:- Performance of the centrifugal compressor:  $\eta$  vs.  $\phi$

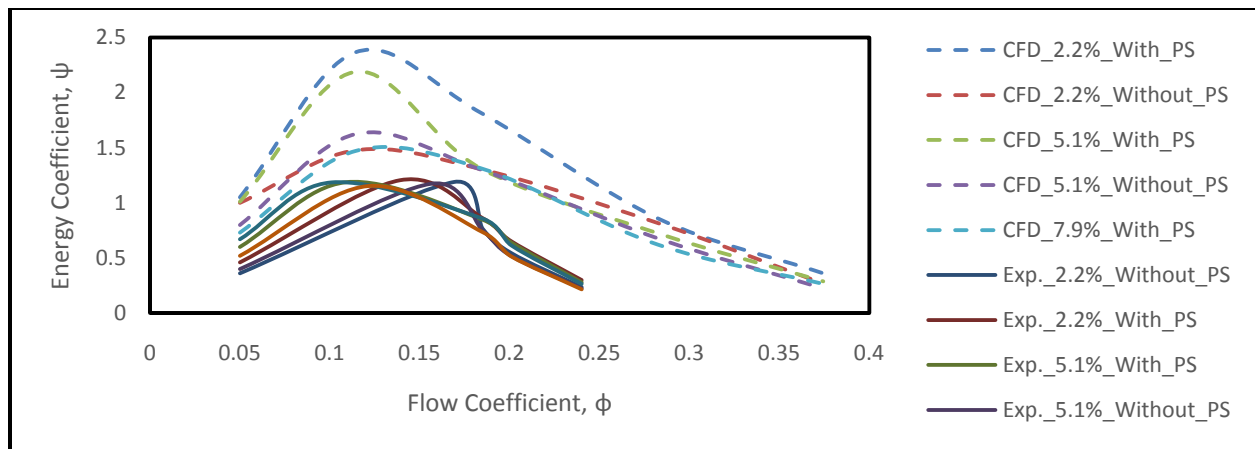


Fig. 5:- Performance of the centrifugal compressor:  $\psi$  vs.  $\phi$

Impeller Exit Flow Measurements

**Total Pressure Coefficient,  $\psi_{02}$**

Distribution of total pressure coefficient at the rotor exit for both configurations for four flow coefficients  $\phi=0.12, 0.18, 0.28$  and  $0.34$  and for the three values of tip clearance  $\tau= 2.2\%, 5.1\%$  and  $7.9\%$  for both configurations is shown in Fig. 6. From the figure, it can be clearly seen that rotor with partial shroud (PS) shows increased total pressure coefficient, compared to basic configuration for all the flow coefficients at the tip clearance ( $\tau=2.2\%$ ). From the figure, it can be seen that the extent of region of improvement increases with reduction in flow coefficient. That means the higher the loading more is the benefit due to the partial shroud. For the tip clearance  $\tau=5.1\%, 7.9\%$  the benefits of PS are reduced. For all the flow coefficients it is seen that the total pressure coefficient decreases with increase in tip clearance. At larger flow coefficients the reduction in total pressure coefficient with tip clearance is high. It can also be observed that, the total pressure coefficient increases as the flow coefficient decreases for all the tip clearances. From the figure, it can be seen that the exit of region of improvement increases with reduction in flow coefficient. At larger flow coefficients the reduction in total pressure coefficient with tip clearance is high. The total pressure coefficient difference for 2.2% to 7.9% tip clearance is increasing with flow coefficient increase.

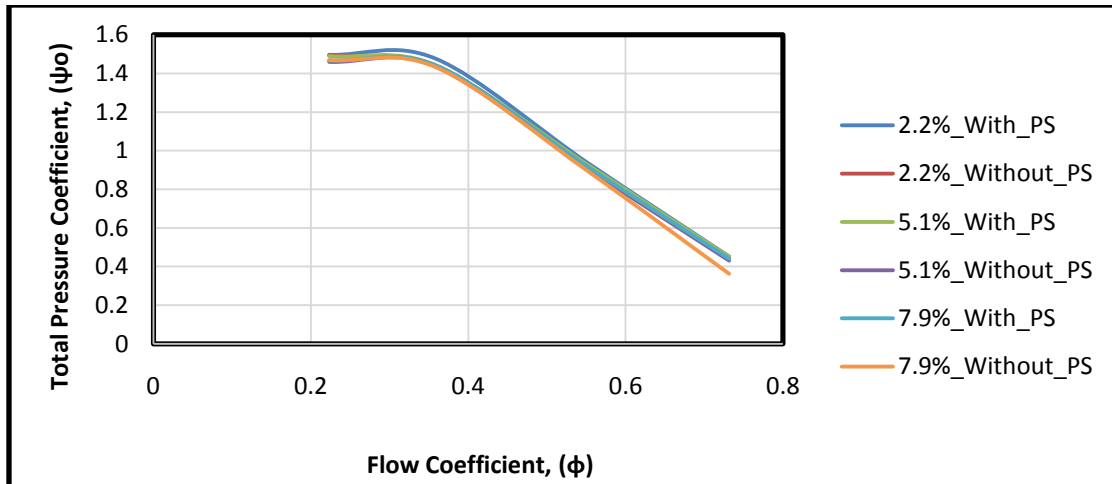


Fig. 6:- Total Pressure coefficient variation at the impeller exit

#### Static Pressure Coefficient, $\psi_{s2}$

The static pressure coefficient distribution at the impeller exit for four flow coefficients  $\phi=0.12, 0.18, 0.28$  and  $0.34$  and for the three values of tip clearance  $\tau=2.2\%, 5.1\%$  and  $7.9\%$  for both configurations is shown in **Figs.7**. From this figure, it can be clearly observed that impeller with partial shroud (PS) shows increased static pressure coefficient, compared to basic configuration for all the flow coefficients at the three values of tip clearances ( $\tau=2.2\%, 5.1\%$  and  $7.9\%$ ). Static pressure for a larger extent from the shroud, as the flow coefficient decreases. It can also be observed that, the static pressure coefficient is increasing as the flow coefficient increases for all the tip clearances. This may be attributed to the partial shrouds attached to the tip of the blades restricting the tip leakage flow. Trend of the static pressure coefficient is almost same for both configurations at three values of tip clearances. The static pressure coefficient drop with increment in tip clearance is more for higher flow coefficient.

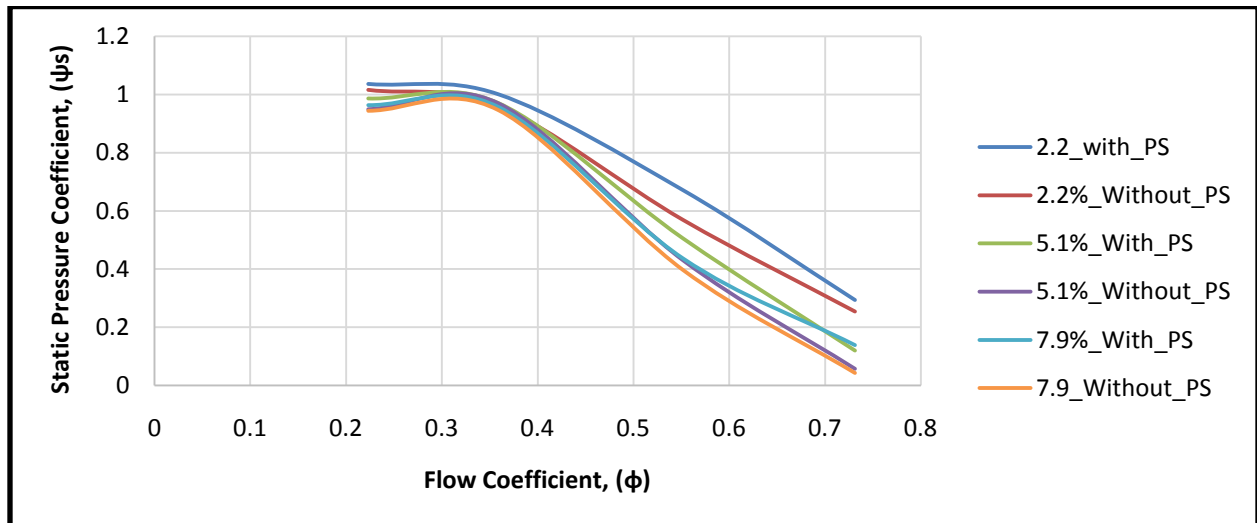


Fig. 7:- Static Pressure coefficient variation at the impeller exit.

#### Mass Averaged Flow Performance Of Impeller:-

The mass averaged values of total pressure coefficient ( $\bar{\psi}_0$ ) and static pressure coefficient ( $\bar{\psi}_s$ ) at the rotor exit for four flow coefficients  $\phi=0.12, 0.18, 0.28$  and  $0.34$  and for the three values of tip clearance  $\tau=2.2\%, 5.1\%$  and  $7.9\%$  for both configurations is show in **figure 8**. In the present both investigations, partial shroud with a very small extension of 2 mm on the pressure surface side of the impeller blade is provided at the tip of the blade region along the axial direction away from the shroud was over analyzed by CFD due to a higher intensity tip clearance flow. The static pressures over the entire operating range for all blades with partial shroud reduced tip clearances were higher than those in the basic configuration case, indicating that reductions in the tip clearance at the tip of the blade

improved the static pressure rise. The exit of the impeller total pressure also increased for the impellers with reduced tip clearances. With partial shroud had the highest static and total pressures as compared with the basic configuration, because the tip clearance was reduced at the tip of the blade.

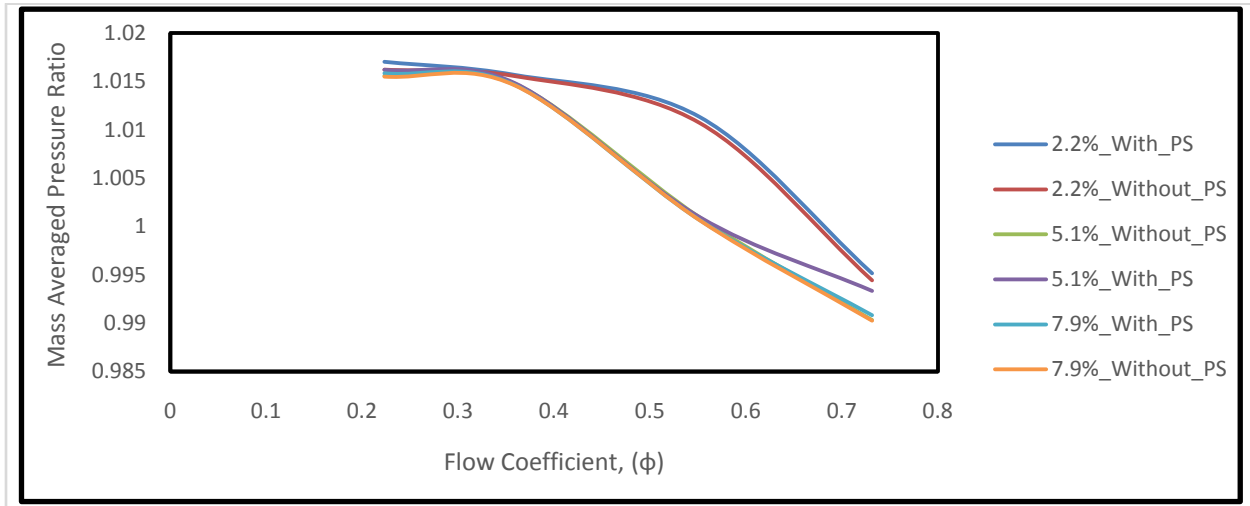


Fig. 8:- Mass averaged performance

**Static pressure Contours at Meridional Plane:-**

Pressure contours at a meridional plane for four flow coefficients  $\phi=0.12, 0.18, 0.28$  and  $0.34$  and for the tip clearance  $\tau= 2.2\%$  for both configurations is shown in **figure 9**. The contours show high pressure on pressure side (PS) of the blade, low pressure on suction side (SS) of the blade. Fluid flow with PS on tip of the blade a slight pressure drop is observed on suction side. Fluid flow without PS on tip of the blade, significant reduction in pressure on suction side is observed.

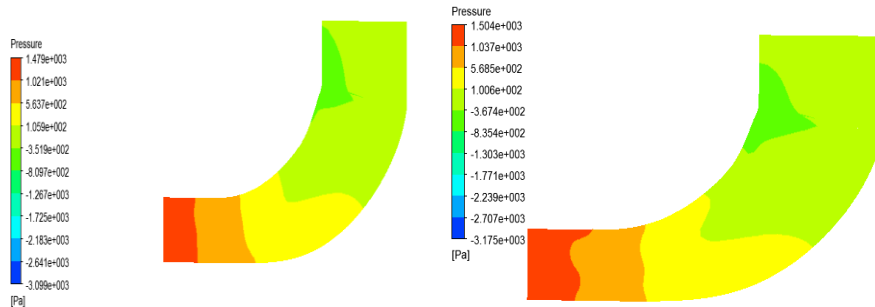
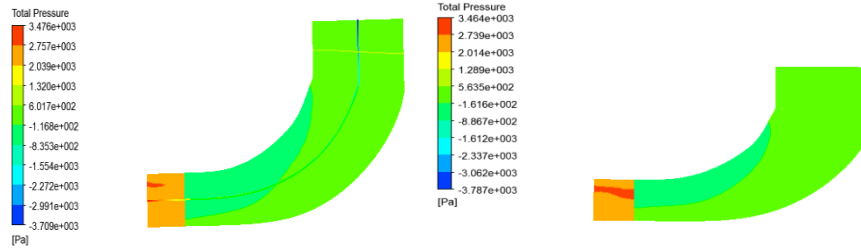


Fig. 9:- Static Pressure contours at Meridional Plane for the tip clearance  $\tau= 2.2\%$  at without and with PS at mass flow rate  $0.087\text{kg/sec}$ .

**Total Pressure Contours at Meridional Plane:-**

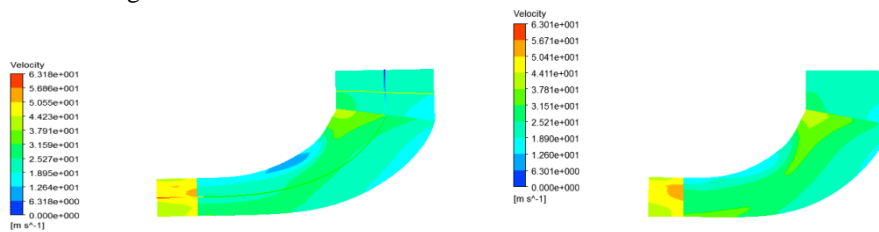
Total pressure contours on meridional plane for four flow coefficients  $\phi=0.12, 0.18, 0.28$  and  $0.34$  and for the tip clearance  $\tau= 2.2\%$  for both configurations is shown in **figure 10**. Fluid flow without PS on tip of the blade, on suction side near tip region, low total pressure area caused due to passage wake is observed. With PS on tip of the blade, low total pressure area of passage wake is reduced. The leakage flow from the PS is interacting with passage wake. With PS on tip of the blade for  $2.2\%$  clearance, total pressure is higher at pressure side shroud corner due to the rotation and meridional curvature and low total pressure is observed near the suction side shroud corner because of the boundary layer on stationary domain.



**Fig. 10:-** Total Pressure contours at Meridional Plane for the tip clearance  $\tau= 2.2\%$  at without and with PS at mass flow rate 0.087kg/sec.

**Velocity Contours at Meridional Plane:-**

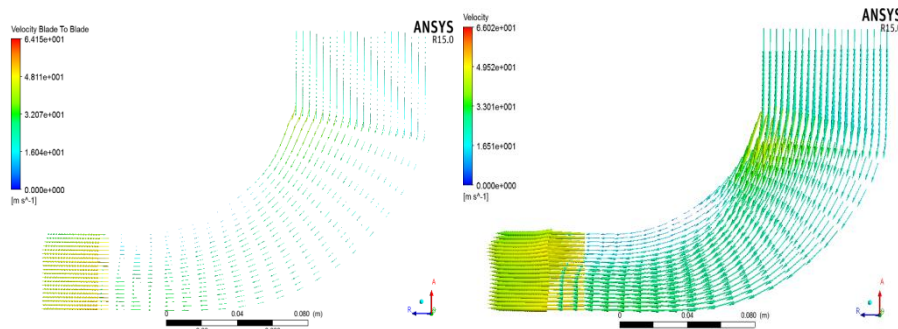
Velocity contours on meridional plane for four flow coefficients  $\phi=0.12, 0.18, 0.28$  and  $0.34$  and for the tip clearance  $\tau= 2.2\%$  for both configurations is shown in **figure 11**. The contours show improved velocities on suction side with PS. The low velocity passage wake area on suction side of the blade is reducing with without PS on tip of the blade. However, the velocity in passage wake region is much lower with without PS on tip of the blade as more leakage flow is interacting with the main flow.



**Fig. 11:-** Velocity contour on meridional plane for the tip clearance  $\tau= 2.2\%$  at without and with PS at mass flow rate 0.087kg/sec.

**Velocity Vectors at Meridional Plane:-**

Velocity vectors on meridional plane for four flow coefficients  $\phi=0.12, 0.18, 0.28$  and  $0.34$  and for the tip clearance  $\tau= 2.2\%$  for both configurations is shown in **figure 12**. Passage wake with low velocity is observed on suction side near casing of the blade. With PS on tip of the blade, reduction in passage wake area is observed. Fluid flow with PS on tip of the blade for 2.2% tip clearance, a circulating flow near the suction surface is observed due the strong centrifugal forces. For other clearances, wake growth is altering the flow pattern. At higher clearances, increase in leakage flow observed.

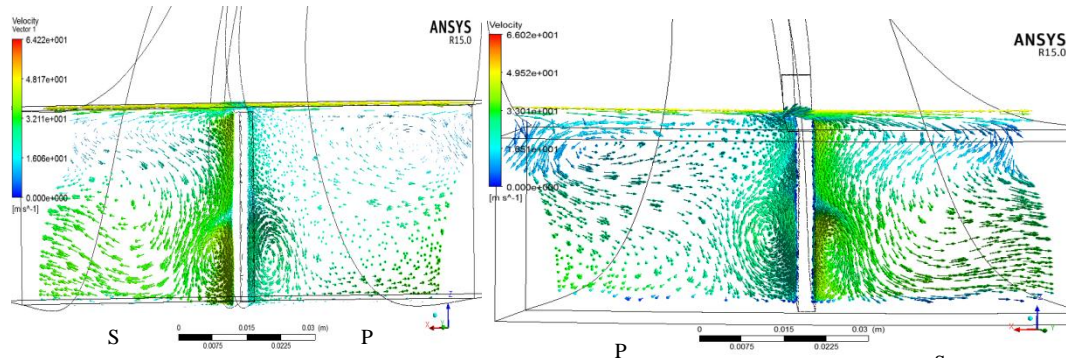


**Fig. 12:-** Velocity vectors on meridional plane for the tip clearance  $\tau= 2.2\%$  at without and with PS at mass flow rate 0.087kg/sec.

**Velocity Vectors at Outlet:-**

A velocity vector at the exit of the impeller for four flow coefficients  $\phi=0.12, 0.18, 0.28$  and  $0.34$  and for the tip clearance  $\tau= 2.2\%$  for both configurations is shown in **figure 13**. The fluid flows with PS on tip of the blade velocities are high on suction surface than pressure surface because of blade curvature. With increase in tip clearance, the velocity on both pressure side and suction side is decreasing. For 2.2% and 5.1% clearance, high velocity of the fluid above the blade from pressure side to suction side through tip clearance is clearly seen.

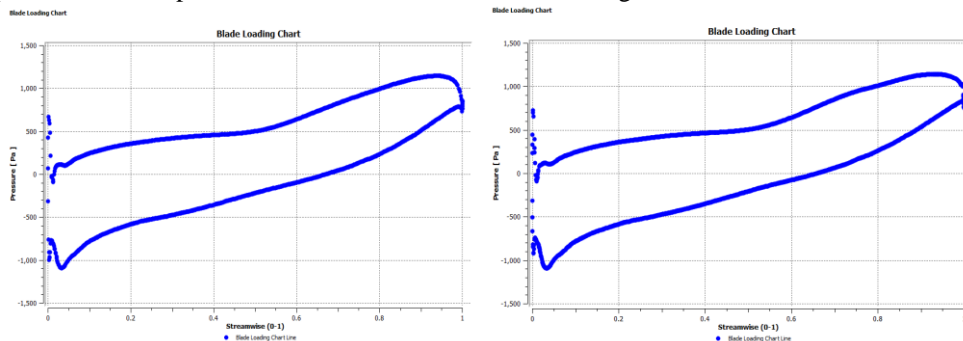




**Fig. 13:-** Velocity vectors at exit of the blade for 2.2% tip cle: : for without PS and with S t mass flow rate 0.087kg/sec.

#### Blade loading chart:-

Blade loading curve for 2.2% tip clearance at without PS and with PS were shown in **figure 14**. Fluid flow without PS and with PS on tip of the blade, significant change in pressure on suction side is observed. Low static pressure on suction and high pressure on pressure side of the blade is observed. With increase in tip clearance for 2.2% to 7.9%, static pressure on both pressure side and suction side are reducing.



**Fig.14:** Blade loading for 2.2% clearance at without and with partial shroud at mass flow rate 0.087kg/sec.

#### Conclusions:-

A low speed centrifugal compressor for four flow coefficients  $\phi=0.12, 0.18, 0.28$  and  $0.34$  and for the three values of tip clearance  $\tau=2.2\%, 5.1\%$  and  $7.9\%$  for both configurations are analysed. The results are compared with the without partial shroud. With partial shroud on tip of the blade, velocity at the meridional section at with the partial shroud is increased; the pressure at outlet is reduced because of more leakage of flow with the basic configuration. With partial shroud on tip of the blade, flow passage wake, the velocity and total pressure improvement is observed. Also with partial shroud on tip of the blade, static pressure rise at outlet is observed for all coefficients.

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### RESEARCH ARTICLE

#### COMPARISON OF EARLY RESULTS BETWEEN ON-PUMP AND OFF-PUMP CABG IN PATIENTS WITH PREOPERATIVE MILD TO MODERATE RENAL IMPAIRMENT.

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CABG, Cardiac surgery, OFF pump,  
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#### Abstract

**Objective:** to compare the early results of isolated CABG, using on-pump and off-pump, in patients with preoperative mild to moderate elevation of serum creatinine (1.6 to 2.5 mg/dl) level whom do not require maintenance dialysis to support renal function.

**Methods:** This prospective non-randomized study included 60 patients who complained of symptoms of Coronary Artery Disease and subsequently underwent myocardial revascularization at National Heart Institute of Egypt, from July 2013 till May 2014.

**Results:** no statistically significant difference between the two groups except for:

- The Hemoglobin, which is lower in on-pump group due to hemodilution effect of CPB
- The troponin, as we discussed before, the 6 patients who had recent infarction we preferred to do them on-pump.
- Kidney function tests

**Conclusions:** In general, there is no single accurate investigation that can surely predict renal function outcome after cardiac surgery.

- □ General Measures to prevent renal dysfunction after Cardiac Surgery should be utilized in all patients with special attention to those with preoperative renal dysfunction.
- □ Regarding postoperative renal dysfunction and need for dialysis, results were in favor of the off-pump technique.

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#### Introduction:-

The development of cardiac surgery in the last 30 years is directly related to the improvement of the techniques of Cardio-Pulmonary Bypass (CPB). However, CPB utilization constitutes one of the primary causes of perioperative complications.[1] In an attempt to avoid the above-mentioned complications, recently, there was a renewal interest in the performance of Coronary Artery Bypass Grafting (CABG) without using CPB, (off-pump).[2] Despite the improvements in surgical techniques, CPB circuit and postoperative patient care, renal dysfunction is still a major complication in patients undergoing cardiac surgery with CPB. It has been reported that acute renal failure requiring dialysis develops in 2-7% of cardiac surgery patients and is strongly associated with postoperative morbidity and mortality.[3] Although, the cause is multi-factorial and depends on the patient's clinical status, age, type I diabetes, recent exposure to nephrotoxic drugs, etc., yet the CPB-related events, such as hypotension, hypoperfusion, loss of pulsatility, hemolysis and release of proinflammatory substances, may contribute significantly to this condition.[4] In addition the duration of CPB has a considerable negative influence on alterations of kidney function integrity.[5]

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Although multiple risk factors have been entertained, the most consistent preoperative risk factor for developing renal insufficiency is preexisting renal insufficiency.[6] This is not surprising, because the incidence of postoperative acute renal failure in patients with previously normal renal function is less than 1%.[7] Thus an elevated preoperative serum creatinine concentration (1.5 mg/dl) is an important independent risk factor for mortality and morbidity rates after cardiac surgery suggesting that mild elevations in serum creatinine concentrations are a red flag for bad outcome both before and after cardiac surgery.[8] Mild to moderate elevation of creatinine (1.6 to 2.5 mg/dl) adds moderate risk, but preoperative values higher than 2.5 mg/dl are associated with markedly increased risk of postoperative dialysis and in-hospital mortality.[9] At least some of the factors that precipitate renal dysfunction after cardiac surgery are relatively well known. Haemodynamic changes probably play a major role, specifically vasoconstriction of the renal arterioles and the redistribution of blood flow within the kidneys, which leave parts of the renal parenchyma underperfused and thus hypoxic. Prolongation of this vasoconstricted state leads to permanent cellular damage; shorter periods result in transient dysfunction. Among the well known causes for renal vasoconstriction that are frequent in cardiac surgery are hypovolaemia, dehydration, and many other alterations of systemic haemodynamics. There are also hormonal changes that may adversely affect renal function, such as increased vasopressin, catecholamines, aldosterone, angiotensin, and decreased atrial natriuretic factor and nitric oxide.[10] In an attempt to reduce the incidence of this complication, several therapeutic strategies, such as pulsatile perfusion, hemofiltration, natriuretic hormone, have been investigated and used. Nevertheless, because there has been a trend in operating on higher risk patients with preoperative comorbidities, the development of this complication is still an important and challenging problem.[4] Advances in surgical instruments for the stabilization and visualization of an optimal surgical field have facilitated CABG without CPB.[4] Once the safety of off-pump coronary procedures had been established, the use of beating heart surgery has focused on improving operative outcome by eliminating the morbidity of cardiopulmonary bypass. Operative mortality rate, postoperative length of stay, and perioperative blood usage were improved by the use of off-pump CABG when compared with on-pump CABG.[11] The avoidance of CPB use may also provide beneficial effects on perioperative renal function by preserving pulsatility, and by preventing the adverse side effects of CPB.[4]

### **Patients and Methods:-**

This prospective non-randomized study included 60 patients who complained of symptoms of Coronary Artery Disease and subsequently underwent myocardial revascularization at National Heart Institute of Egypt, from July 2013 till May 2014.

### **Inclusion Criteria:-**

Any patient submitted to isolated elective CABG within the mentioned time interval with: A) Preoperative mild to moderate elevation of serum creatinine levels between 1.6 to 2.5 mg/dl. Level who do not require maintenance dialysis to support renal function. AND B): 1- Multi-vessel coronary artery disease. 2- Patients undergoing isolated on-pump (conventional) surgery. 3- Patients undergoing isolated off-pump (Beating Heart) surgery. 4- Controlled risk factors e.g.: hypertension, diabetes mellitus, hyperlipidemia, and smoking.

### **Exclusion Criteria:-**

1- Patients with normal serum creatinine levels. 2- Patients with single-vessel disease. 3- Patients undergoing emergency surgery. 4- Left ventricular ejection fraction < 30%. 5- Patients planned for OPCAB and reverted to on pump due to hemodynamic instability. 6- Patients for redo CABG.

### **Aim of the work:-**

In this study we compared the early results of isolated CABG, using on-pump and off-pump, in patients with preoperative mild to moderate elevation of serum creatinine (1.6 to 2.5 mg/dl) level whom do not require maintenance dialysis to support renal function. We examined if off-pump coronary revascularization offers a superior renal protection when compared with conventional coronary revascularization with cardiopulmonary bypass.

### **Methodology:-**

Patients were submitted for either group according to the surgeon's preference as follows: •□ Group A patients (the on-pump group): included those who underwent conventional myocardial revascularization by means of LIMA on LAD grafts plus additional SVGs. •□ Group B patients (the offpump group): included those who underwent off-

pump myocardial revascularization by means of LIMA on LAD grafts plus additional SVGs. The 2 groups were similar with respect to age, sex and preoperative variables.

#### Statistical analysis:-

Data was analyzed by Microsoft Office 2003 (excel) and Statistical Package for Social Science (SPSS) version 16. Parametric data was expressed as mean , SD, and non parametric data was expressed as number and percentage of the total.\* P value  $\leq 0.05$  is considered significant.

#### Results:-

**Table 1:-** showing demographic data among studied groups

Demographic Data	On - Pump		Of – Pump		P value
<b>Age</b> years	73.40	6.38	72.87	9.62	<b>0.801</b>
<b>Wt</b> kg	83.13	12.68	79.47	8.92	<b>0.201</b>

**Table 2:-** showing Gender distribution among studied groups.

Gender	On - Pump		Of – Pump	
	Number	%	Number	%
<b>Females</b>	5	<b>16.67</b>	7	<b>23.23</b>
<b>Males</b>	25	<b>83.33</b>	23	<b>76.67</b>

**Table 3:-** showing risk factors among studied groups.

	On - Pump		Off – Pump	
	Number	%	Number	%
<b>Smoking</b>	8	<b>26.67</b>	9	<b>30.00</b>
<b>Hypertension</b>	27	<b>90.00</b>	24	<b>80.00</b>
<b>D.M.</b>	16	<b>53.33</b>	14	<b>46.67</b>
<b>Dyslipidemia</b>	24	<b>80.00</b>	24	<b>80.00</b>
<b>Previous MI</b>	16	<b>53.33</b>	12	<b>40.00</b>

**Table 4:-** showing previous MI among studied groups.

Gender	On - Pump		Of – Pump	
	Number	%	Number	%
<b>Recent MI</b>	6	<b>20</b>	0	<b>0</b>
<b>Old MI</b>	10	<b>33.33</b>	12	<b>40.00</b>
<b>Previous MI (Total)</b>	16	<b>53.33</b>	12	<b>40.00</b>

**Table 5:-** showing Comparison between preoperative laboratory data of the studied groups.

Preoperative	On-pump		Off-pump		P value
	Mean	SD	Mean	SD	
Hb g/dl	12.97	1.43	13.54	1.21	0.101
Ck-MB U/i	22.20	7.27	22.27	6.95	0.973
Troponin U/i	0.76	1.64	0.07	0.08	0.028*
RBS mg/dl	118.40	32.02	114.87	64.87	0.790
ALT U/i	28.03	10.90	31.70	10.77	0.195
AST U/i	26.20	9.43	27.90	7.47	0.442
Bil.(Total) mg/dl	0.73	0.34	0.64	0.26	0.293
K mmol/l	4.47	0.40	4.79	0.51	0.009*
Na mmol/l	140.53	2.96	141.27	3.86	0.412
Cl mmol/l	103.40	4.08	101.80	4.80	0.170
Mg mmol/dl	0.98	0.17	1.01	0.29	0.561
BUN mg/dl	34.77	16.58	31.20	11.07	0.332
Creat mg/dl	1.87	0.24	1.87	0.22	0.933
Creat Cler ml/min	40.43	8.63	39.41	9.48	0.665
Preop Albuminuria g/24h	1.367	1.180	1.33	1.20	0.902

**Table 6:-** showing Comparison between preoperative echocardiographic data of the studied groups.

Echocardiography	On-pump		Off-pump		P value
	Mean	SD	Mean	SD	
Mean EF	0.52	0.13	0.52	0.09	0.972

**Table 7:-** showing preoperative vital signs among the studied groups

Preoperative		On-pump		Off-pump		P value
		Mean	SD	Mean	SD	
BP mmHg	SBP <sub>mmHg</sub>	114.83	11.33	111.83	7.48	0.232
	DBP <sub>mmHg</sub>	58.67	8.30	60.67	8.17	0.351
HR/min		88.37	9.72	72.27	11.04	0.000*
CVP <sub>mmHg</sub>		11.00	2.68	10.07	3.14	0.221

**Table 8:-** showing Abdominal and Pelvic U/S findings among studied groups.

Abdominal US	On-pump		Off-pump	
	Number	%	Number	%
Chronic renal insufficiency	4	13.33	2	6.67
Chronic renal insufficiency grade I	1	3.33	-	0.00
Chronic renal insufficiency grade II	3	10.00	2	6.67
Chronic renal insufficiency grade III	2	6.67	-	0.00
Chronic renal insufficiency, Rt renal cyst	1	3.33	-	0.00
Compansated renal insufficiency	1	3.33	-	0.00
Diabetic nephropathy	2	6.67	8	26.67
Diabetic nephropathy, Chronic renal insufficiency grade II	1	3.33	-	0.00
Non functioning shrunken Lt kidney	1	3.33	-	0.00
Rt partial renal resection	1	3.33	-	0.00
Rt Renal artery stenosis, Chronic renal insufficiency grade II	1	3.33	-	0.00
Normal	10	33.33	10	33.33

**Table 9:-** showing operative data

Preoperative	On-pump		Off-pump		P value
	Mean	SD	Mean	SD	
Total pump Time min	111.30	36.64			
Total ischemic Time min	67.50	24.18			
Total OP Time min	234.60	57.54	273.77	43.07	0.004*
No of Distal anasomoses.	3.50	0.94	3.63	0.81	0.558

**Table 10:-** showing need for inotropes and IAB

IABP	On - Pump		Of - Pump	
	Number	%	Number	%
	3/30	<b>10.00</b>	2/30	<b>6.67</b>
Inotropes	On - Pump		Of - Pump	
	Number	%	Number	%
	29	<b>96.67</b>	27	<b>90.00</b>

**Table 11:-** showing post operative laboratory data

Postoperative	On-pump		Off-pump		P value
	Mean	SD	Mean	SD	
Hg g/dl	9.62	1.10	10.35	0.89	0.006*
Ck-MB <sub>U/i</sub>	45.61	24.07	45.27	27.78	0.960
Troponin <sub>U/i</sub>	4.26	4.57	1.77	1.48	0.007*
RBS <sub>mg/dl</sub>	155.43	57.27	133.73	39.91	0.095
ALT <sub>U/i</sub>	26.63	16.74	30.73	12.09	0.282
AST <sub>U/i</sub>	65.40	35.19	59.83	32.98	0.530
Bil.(Total) <sub>mg/dl</sub>	0.79	0.46	0.90	0.29	0.289
K <sub>mmol/l</sub>	5.22	0.62	5.06	0.38	0.236
Na <sub>mmol/l</sub>	146.40	4.61	144.80	5.67	0.235
Cl <sub>mmol/l</sub>	109.93	4.73	110.67	5.36	0.577
Mg <sub>mmol/dl</sub>	1.32	0.30	1.22	0.25	0.170
BUN <sub>mg/dl</sub>	48.07	15.36	32.40	15.33	0.000*
Creat <sub>mg/dl</sub>	2.60	0.87	1.96	0.65	0.002*
Creat Cler ml/min	31.57	11.04	39.94	13.68	0.012*
Post op Albuminuria <sub>g/24h</sub>	1.079	0.828	1.32	1.23	0.370

**Table 12:-** showing post operative vital signs

postoperative		On-pump		Off-pump		P value
		Mean	SD	Mean	SD	
BP	SBP <sub>mmHg</sub>	123.00	16.64	125.00	11.96	0.595
	DBP <sub>mmHg</sub>	57.67	8.17	63.67	8.90	0.009*
HR/min		90.87	12.21	84.23	7.90	0.016*
CVP <sub>mmHg</sub>		10.17	4.44	9.33	3.20	0.408

**Table 13:-** showing comparison between need for drug support

postoperative	On-pump		Off-pump		P value
	Mean	SD	Mean	SD	
Vasopressor (Noradrenalin) ug/kg/min	0.08	0.09	0.05	0.08	0.195
Diuretics (Frusimide) mg	63.70	41.52	38.75	25.76	0.012*
Bl. Trnsfusion ml	735.33	495.71	480.00	238.90	0.087
Urine Output ml/24	3938.33	1056.07	3918.33	1512.11	0.953

**Table 14:-** showing ICU stay in days

	On-pump		Off-pump		P value
	Mean	SD	Mean	SD	
ICU stay (days)	4.667	3.367	3.70	2.15	0.191

**Table 15:-** showing complications between groups

	On-pump		Off-pump	
	Number	%	Number	%
MI	3	10.00	3	10.00
Arrhythmias	7	23.33	9	30.00
Re-opening	2	6.67	5	16.67
Dialysis	6	20.00	3	10.00

**Table 16:-** showing Preoperative and postoperative kidney functions in On-pump group.

Patient Number	preOp. Creat.	PostOp. Creat.	PreOp. Creat.Clear.	PostOp. Creat.Clear.	PreOp. BUN	PostOp. BUN	PreOp. Alb.	PostOp. Alb.
	Mg/dl	Mg/dl	ml/min	ml/min	mg/dl	mg/dl	g/24h	g/24h
1	1.66	1.88	48	42.4	23	38	0.56	0.54
2	1.79	1.28	40	56	27	22	0.39	0.53
3	1.7	3.13	30.6	16.6	26	52	2.01	1.12
4	1.99	1.98	29.7	29.8	38	41	1.21	1.17
5	2.14	2.8	40	30.5	32	61	2.41	2.03
6	2.06	3.34	42	25.9	31	65	2.82	1.94
7	1.61	3.4	50.7	24	23	66	3.31	1.76
8	1.75	2.76	51.5	32.7	24	52	3.42	1.81
9	2.07	1.79	25.6	29.6	46	42	1.26	1.34
10	1.91	2.56	30.23	22.5	39	46	0.3	0.41
11	2.3	2.45	41.2	38.7	99	57	2.3	2.18
12	1.6	1.61	32.9	32.8	29	35	1.7	1.89
13	1.7	1.39	51.3	62.7	27	26	2.7	2.96
14	1.64	1.68	45.8	44.7	21	34	0.9	0.98
15	1.61	1.67	46.5	44.8	27	23	0.22	0.44
16	1.93	2.1	36.1	33.4	29	31	0.017	0.02
17	2.28	3.14	31.9	23.22	62	80	0.41	0.47
18	1.78	2.23	42.4	33.8	37	42	0.11	0.19
19	1.64	2.87	33.1	18.9	27	50	1.62	1.09
20	1.94	2.53	34.8	26.7	39	46	0.46	0.4
21	1.85	3.1	41.2	24.6	26	51	2.6	1.57
22	1.87	2.32	36.3	29.3	35	42	1.96	1.59
23	1.64	2.95	45.27	25.2	19	49	0.03	0.1
24	1.64	1.69	45.73	44.37	13	26	0.05	0.04
25	1.7	4.27	36.1	14.38	23	63	0.019	0.014
26	2.02	4.44	67.8	30.8	42	70	3.7	1.99
27	2.1	4.16	39.3	19.8	58	57	0.39	0.3
28	2.5	3.99	36	22.55	49	63	1.82	1.29
29	2.01	2.03	35.2	34.9	46	39	2.29	2.2
30	1.77	2.56	45.7	31.6	26	73	0.02	0.018

**Table 17:-** showing Preoperative and postoperative kidney functions in Off-pump group.

Patient Number	preOp. Creat.	PostOp. Creat.	PreOp. Creat.Clear.	PostOp. Creat.Clear.	PreOp. BUN	PostOp. BUN	PreOp. Alb.	PostOp. Alb.
	Mg/dl	Mg/dl	ml/min	ml/min	mg/dl	mg/dl	g/24h	g/24h
1	2.4	4.85	31.25	15.46	71	93	1.42	0.96
2	1.84	1.95	39.9	37.7	22	25	0.11	0.1
3	1.61	1.35	51.5	61.48	18	18	0.02	0.015
4	1.78	1.57	36.86	41.79	26	22	0.31	0.51
5	2.18	2.37	38.7	35.63	35	43	2.01	1.82
6	1.63	1.7	74.13	71	30	27	3.9	3.86
7	1.69	1.58	33.13	35.4	36	29	0.46	0.42
8	1.97	2.21	32	28.5	28	33	2.32	2.13
9	1.76	1.38	48.96	62.44	23	19	3.5	3.86
10	1.85	2.36	31.71	24.8	29	41	2.54	2.15
11	2.05	1.85	36.5	40.5	31	29	1.6	1.94
12	1.86	1.92	34	32.98	27	28	0.1	0.13
13	2.16	2.81	27	20.8	39	49	1.54	1.19
14	1.77	1.72	36	37.13	29	28	0.02	0.017
15	1.66	1.82	43.87	40	26	29	2.66	2.45

16	1.72	1.67	35	36.13	22	20	0.2	0.25
17	1.68	1.74	41.5	40.08	19	19	0.1	0.14
18	1.65	2	19.16	15.8	36	40	0.015	0.01
19	1.78	1.6	42.6	46.86	28	24	0.25	0.3
20	2.23	2.04	41.77	45.66	43	35	2.52	2.84
21	1.98	2.12	35.9	33.54	25	32	1.86	1.79
22	2.35	2.69	45.47	39.7	51	65	2.7	2.43
23	1.76	1.82	34.6	33.4	34	36	1.7	1.58
24	1.62	1.42	40.46	46.16	23	15	0.3	0.38
25	1.82	2.07	41.1	35.6	29	36	2.3	2.17
26	2.1	1.85	35	39.8	34	31	0.4	0.48
27	1.7	1.92	40.27	35.66	18	28	0.61	0.52
28	1.82	1.71	42.43	45.16	25	22	0.2	0.24
29	1.65	1.46	39.56	44.7	30	29	1	1.15
30	1.98	1.39	52	74.2	49	27	3.2	3.91

**Table 18:-**showing Cleveland foundation score for postoperative renal dysfunction patients in on-pump and off-pump groups applied to our study.

Patient Number	Parameters						
	Female gender	EF <35%	IABP	DM	Creat 1.2 to <2.1 Mg/dl	Creat ≥2.1 Mg/dl	Total
<b>On-pump</b>							
3	1	0	0	1	2	0	4
6	0	0	0	1	2	0	3
7	0	1	2	1	2	0	6
8	0	0	0	1	2	0	3
17	0	1	2	0	0	5	8
19	1	0	0	1	2	0	2
21	0	0	0	1	2	0	2
23	0	0	0	0	2	0	2
25	0	0	0	0	2	0	2
26	0	0	0	1	2	0	3
27	0	0	0	0	2	0	2
28	0	0	0	1	0	5	6
30	1	0	0	0	2	0	3
<b>Off -pump</b>							
1	0	0	0	1	0	5	6
13	0	1	0	1	0	5	7
15	1	0	0	1	0	2	7

**Table 19:-** showing Variable risk factors in patients who required dialysis in the on-pump group.

Patient number	Gender	Age	HTN	D.M	M.I	EF	U/S	Creat	Pump time	Vasopressors	M.I	Reopen
3	F	72	Y	Y	Y	63 %	RAS NEPH II	1.7	155	0.04	N	N
7	M	70	Y	Y	Y	30 %	NAD	1.61	210	0.12	N	N
21	M	73	Y	Y	N	60 %	NEPH II	1.85	70	0.24	N	Y
23	M	74	Y	N	N	65 %	NAD	1.64	155	0.04	Y	Y
26	M	55	Y	N	Y	45 %	NEPH II	2.02	90	0.04	Y	N
27	M	80	Y	N	N	70 %	NAD	2.1	120	0.08	Y	N

**Table 20:-** showing Variable risk factors in patients who required dialysis in the off-pump group.

Patient number	Gender	Age	HTN	D.M.	M.I	EF	U/S	Creat	Vasopressors	M.I	Reopen
1	M	80	Y	Y	Y	45%	NEPH II	2.4	0.04	N	Y
13	M	86	Y	Y	Y	35%	NEPH	2.16	0.04	N	N
15	F	71	Y	Y	Y	40%	NAD	1.66	0.02	N	Y

**Discussion:-****Risk Factors other than renal Insufficiency and preoperative data:-**

Analysis of the tables shows no significant difference in preoperative data and in risk factors percentages( smoking, hypertension,DM, Dyslipidemia, and previous MI) in both groups which indicates that no preference was made for any risk factor on aiming at off-pump as long as the patient was fulfilling the inclusion criteria for our study. In our study the percentage of hypertensive patients in both groups are higher by 10 % up to 40 % compared to some papers which as discussed below raised our attention towards the quality of our screening programs for hypertensive patients and recommending more follow up of such patients and these recommendations were raised to mortality and morbidity committee in Measurement of glycosylated haemoglobin [1] (HbA1c) and admission of patients with levels < 6% for the operation, and delaying the operation if HbA1c  $\geq$  6% is recommended. As HbA1c  $\geq$  6% was associated with an increased risk of postoperative superficial sternal wound infections and a trend for higher mediastinitis rate and significantly higher mortality three years after CABG[12]

**Preoperative abdominal and pelvic U/S:-**

Analysis of the preoperative abdominal and pelvic U/S shows there was no statistically significant difference between the two groups as 10 patients had normal U/S examination in both groups. As for the other findings, these are not considered to be risk factors for renal impairment postoperatively as Ultrasound of the kidneys is a useful screening tool for kidney stones, cysts and masses. It can assess complications of obstructive kidneys stones. It provides useful information when a patient is in renal failure or if there is blood found in the urine. It can also provide information for those suffering from repeated urinary tract infections. But it's not considered a renal function test.[13] Analysis of post operative results (as will be discussed later) showed no correlation between preoperative finding of abdomio-pelvic U/S and postoperative renal impairment.

**Operative Data:-**

Pump time: Comparing our pump time to different studies showed that our patients stayed for a longer time on the CPB, however, when this is plotted against number of distal anastomoses we have mean of 3.5 distal anastomoses /

patient compared to Loef, et al [14], Pramodh, et al [15], Vedin [16], and Ascione, et al [17]. that were less than 3. The more prolonged total time of surgery in the OPCAB group can be attributed to the relatively more difficult technical demands of the technique and the fact that before every anastomosis there is some time needed to stabilize the heart without compromising the hemodynamics. It also worth mentioning here that there was no incident of hemodynamic instability at any of our patient of the OPCAB group necessitating conversion to on-pump technique.

#### **Number of distal Anastomoses:-**

Analysis of the table shows no significant difference in number of distal anastomoses in both groups which indicates that no preference was made on aiming at off-pump as long as the patient was fulfilling the inclusion criteria for our study.

#### **Need for IABP:-**

Although slightly more patients in our study needed IABP support but the results are just slightly higher. Noted also that in the mentioned studies, including ours, more patients in the on-pump group needed IABP. In the On-pump group, the 3 patients who needed IABP were: Patient number 7: EF was 30%, Patient number 14: EF was 30%, Patient number 17: EF was 28% In the Off-pump group, the 2 patients who needed IABP were: Patient number 21: EF was 40%, Patient number 24: EF was 45%

So although more patients in the on-pump group needed IABP but these patients were more critical than the patients in the off-pump group with respect to EF criteria.

#### **Need for Inotropes:-**

In our study, few more patients in the on-pump group were put on inotropic support than in the off-pump group, intraoperatively. In other studies much more patients in the on-pump group were put on inotropic support, that may be to overcome periods of stunning after CPB. But there is a huge difference between the percentages of our total number of patients who were put on inotropic support in both groups when compared to other studies; this is due to the anesthesia protocol utilized in our center to transfer the patients on low dose inotropic support to the ICU.

#### **Post Operative Data:-**

Analysis of the postoperative laboratory results among the two groups shows there was no statistically significant difference between the two groups except for: • The Hemoglobin, which is lower in on-pump group due to hemodilution effect of CPB • The troponin, as we discussed before, the 6 patients who had recent infarction we preferred to do them on-pump. • Kidney function tests, this will be discussed separately in details later.

#### **Postoperative Vital Signs:**

Analysis of the postoperative vital signs among the two groups shows there was no statistically significant difference between the two groups except for: • The Heart Rate: lower in the off-pump group, this can be attributed to the usage of higher doses of inotropic support in the on-pump group. • The Diastolic Blood pressure: lower in the on-pump group, this is due to post CPB vasodilatation as the vasoconstriction present during the CPB gives way to vasodilation after CPB has been discontinued, and particularly after the administration of protamine [18]

#### **Postoperative need for blood transfusion:-**

Although there is no statistical significant difference between the two groups, on-pump group patients needed higher amounts of blood transfusion than off-pump patients in our study and in other studies, this is could be attributed to coagulopathic effect of CPB.

#### **Complications other than Dialysis:-**

##### **Re-opening for bleeding:-**

Our results are different from other studies regarding the rate of reopening for bleeding in the off-pump group which is even much higher than in our on-pump group. Moreover, both of our groups had a higher rate of reopening than other studies. We failed to explain this phenomenon. However, and due to these results, more attention were paid to our haemostasis and wound closure techniques.

**IABP post operative:** Apart from patients who needed IABP support intraoperatively:



• In the on-pump group, patient number 23 was complicated with AF and MI resulting in hemodynamic instability necessitating IABP support for 96 hours. • In the off-pump group patient number 10 was complicated with AF and MI resulting in hemodynamic instability necessitating IABP support for 48 hours.

**Myocardial Infarction:** Despite the technical precautions, newly developed postoperative ECG ischemic changes and elevated cardiac enzymes complicated the outcome of 3 patients in the on-pump group and 3 in the off-pump group. The incidence of postoperative MI in our study is comparable to other studies and it is also noted that there was no difference between both on and off-pump groups.

**Arrhythmias:** In the on-pump group 7 patients were complicated with Arrhythmias as follows: o Patient number 2 with 1st degree AV block. o Patients number 5, 7, 15, 19, 23, 27 with Atrial Fibrillation. In the off-pump groups 9 patients were complicated with Arrhythmias as follows: o Patients number 1, 7, 10, 14, 18, 23, 28 with Atrial Fibrillation. o Patient numbers 12, 25 with Ventricular Extra systoles. The incidence of postoperative AF in our study is comparable to other studies and it is also noted that there was no difference between both on and off-pump groups.

**ICU stay:** There is no statistical significant difference in ICU stay between the on-pump group and off-pump group in our study. Also noted that our ICU stay is much longer than other studies, this is due to our ICU protocol of Patient discharge. Comparison between pre and postoperative vital signs in on-pump group.

#### **Renal Dysfunction:-**

According to ACC/AHA 2004 Guideline Update for Coronary Artery Bypass Graft Surgery, the first major multicenter study of renal dysfunction after CABG surgery was published in 1998. This study of 2222 patients who underwent myocardial revascularization with CPB defined postoperative renal dysfunction (PRD) as a postoperative serum creatinine level of greater than or equal to 2.0 mg/dL or an increase in the serum creatinine level of greater than or equal to 0.7 mg/dL from preoperative to maximum postoperative values.[19] In on-pump group According to the criteria mentioned in the guidelines we have 13 patients in the on-pump group Vs only one patient in the off-pump group diagnosed as (PRD) Postoperative Renal Dysfunction. These previous tables and graphs showed that in the 13 patients in the on-pump group and the one patient in the off-pump group who were diagnosed as having PRD, according to the increase between pre and postoperative serum creatinine levels, showed incremental decline in other kidney function tests as noted with levels of BUN and Creatinine clearance but no notable change in albuminuria levels. PRD Patients who required dialysis: In the on-pump group, there were 6 patients who required dialysis. These patients were number: 3, 7, 21, 23, 26, 27 and they were among the group of 13 patients whom were diagnosed as PRD. So the questions is why these 6 patients especially? Another question, can we predict patients who will require dialysis? The same applies for the off-pump group, where only 3 patients required dialysis (patients number 1, 13, 15) but only 1 was diagnosed as suffering PRD so again stay the same questions. To answer these questions we will compare the 6 patients in the on-pump group to the rest of the 13 patients, and we will examine the 3 patients in the off-pump group this will be done via plotting these patients in the Cleveland Clinic Foundation Acute Renal Failure Scoring System[20] Cleveland Clinic Foundation Acute Renal Failure Scoring System: • Female gender--1 • Congestive heart failure-- 2 • LV ejection fraction <35%-- 1 • Preoperative use of IABP-- 2 • COPD-- 1 • Insulin-requiring diabetes-- 1 • Previous cardiac surgery-- 1 • Emergency surgery-- 2 • Valve surgery only (reference to CABG)-- 1 • CABG+ valve (reference to CABG)-- 2 • Other cardiac surgeries-- 2 • Preoperative creatinine 1.2 to < 2.1 mg/dl-- 2 • Preoperative creatinine  $\geq$  2.1-- 5 For the 3 off-pump patients the results came as they were supposed to be and this scoring system was valid to predict postoperative renal dysfunction in this group. BUT, in the on-pump group the results were not accurate in predicting PRD, which could be attributed to the following:[21] 1. There is no parameter in this scoring system to consider the various pathophysiological parameters of the CPB. 2. Throughout the literature there is a strong agreement that multiple risk factors and multiple pathological and physiological factors interact together to affect the kidney functions such as: a. Preoperative factors: i. Lack of renal reserve. ii. Renovascular disease. iii. Prerenal azotemia. iv. Recent diuresis. v. NPO status. vi. Impaired LV function. vii. ACEI / ARB. viii. Nephrotoxins. ix. Intravenous contrast. x. Other medications. xi. Endotoxemia. xii. Inflammation. b. Intraoperative: i. Decreased renal perfusion. ii. Hypotension. iii. Lack of pulsatile flow. iv. Vasoactive agents. v. Anesthetic effects. vi. Embolic events. vii. CPB-induced Inflammation. viii. Nephrotoxins. ix. Hemolysis. c. Post Operative: x. Systemic inflammation. xi. Reduced LV function. xii. Vasoactive agents. xiii. Hemodynamic instability. xiv. Nephrotoxins. xv. Volume depletion. xvi. Sepsis.

Another study suggested also that the following are risk factors: • Age (yr). • Weight (kg). • Preoperative creatinine (mg/dl). • Cardiopulmonary bypass time (minutes).[20]

From the above there is no single accurate investigation that can predict renal function outcome after cardiac surgery in general, and this notion gained acceptance in the literature as we discussed before in the previous chapters of this current study, but still to validate this hypothesis we have to discuss each patient whom required dialysis separately.

The on-pump group patients. Analysis of the previous two tables strongly confirms the interaction of multiple risk factors on the outcome of renal affection. In most of the reviewed studies including ours, renal function is better preserved in patients undergoing off-pump CABG than those undergoing onpump CABG. Also, its notable that, in our study, there is higher percentage of patients who developed PRD requiring dialysis postoperatively than in the other different studies, especially in the on-pump group but this is expected as the criteria of inclusion for all our patients was “patients with preoperative renal impairment (serum creatinine 1.6-2.5 mg/dl)” but some of these studies included patients with normal serum creatinine preoperatively and measured the affection beyond normal renal function, and as we mentioned before the preoperative renal impairment is considered by itself a risk factor for postoperative renal dysfunction.

### **General Measures to prevent renal dysfunction after Cardiac Surgery:-**

**Identification of High-Risk Patients.** In patients who undergo cardiac surgery, identifying patients who are at high risk for ARF is critically important. The important risk factors and scoring systems that can be used for this identification purpose have been discussed before.[21] Optimization of renal perfusion and avoidance of nephrotoxins.[21] Factors that alter renal blood flow and lead to prerenal azotemia should be identified and corrected. Treatment of volume depletion and congestive heart failure before cardiac surgery will increase cardiac output and renal perfusion. Perioperative hydration and the use of hemodynamic monitoring and inotropic agents to optimize cardiac output may be necessary. It is unknown whether intraoperative optimization of bypass flow, perfusion pressure, and oxygen delivery would affect the subsequent development of renal dysfunction, although conceptually this would seem to be a reasonable goal. Medications such as NSAID and other nephrotoxic agents should be discontinued. Whether ACEI and ARB should be discontinued before surgery is not known and is a source of some debate[22]. If radiographic contrast is needed, then newer isosmolar contrast agents may be less toxic.[23] In stable patients, cardiac surgery should be postponed in patients with contrast-induced ARF. Pharmacologic Interventions to Prevent PRD after Cardiac Surgery.[21] Pharmacologic interventions have been attempted with inconsistent results, and at this time, there are no known drugs that have demonstrated conclusively renal protection. The failure of these measures to prevent ARF after cardiac surgery may be related in part to a number of factors. First, the pathophysiology of ARF after CPB is more complex than originally considered and simple approaches to target single pathways are unlikely to succeed. Second, late pharmacologic intervention is likely to meet with failure. Third, patient populations that have been studied are often at low risk for renal dysfunction after CPB, thus potentially masking small beneficial effects of therapies. Last, most clinical trials enroll a small number of patients and are powered inadequately to detect small benefits. Most therapeutic trials in ARF after CPB have been prevention studies in which treatment was initiated before the insult and in the majority of cases have shown no significant benefits. Diuretics may reduce the severity of ARF by preventing tubule obstruction and decreasing oxygen consumption.[24] In a double-blind, randomized, controlled trial, furosemide treatment was found not to be protective as the incidence of ARF was twice that of the dopamine or placebo group.[25] Similar negative results have been seen in other studies[24]. Mannitol has a variety of effects, including the production of an osmotic diuresis with a reduction of tubular obstruction, as well as the capability of scavenging free radicals. It is often added to the prime solution during CPB, with the thought that it may help to maintain urine output during the procedure, minimize tissue edema, and serve as a free radical scavenger.[25] An early study in children who underwent cardiac surgery demonstrated that prophylactic administration of mannitol (0.5 g/kg body wt) was beneficial in the prevention of ARF.[26] Fisher et al.[27] demonstrated that mannitol added to the CPB prime solution was effective at maintaining urine output at varying doses. However, several other studies did not confirm these findings, and the potential role of mannitol remains unclear. In fact, Carcoana et al[28] showed an increased urinary excretion of  $\beta$ -2 microglobulin in patients who received mannitol and dopamine, suggestive of increased tubular injury in this group. Sirivella et al. randomly assigned 100 patients with postoperative oliguric or anuric renal failure to therapy with either intermittent doses of loop diuretics or a continuous infusion of mannitol, furosemide, and dopamine (2 mg/kg per min).[29] Whereas 90% of patients who received the intermittent diuretic required dialysis, only 6.7% of the patients who received the continuous mannitol, furosemide, and dopamine infusion required dialysis. Furthermore, early therapy with this "cocktail" was associated with early restoration of

renal function. Future studies are required before this approach can be broadly recommended. Drugs that Block Inflammation Inflammation is well documented to occur during CPB and has a prominent role in the pathogenesis of ARF and CPB.[30] It thus is an attractive therapeutic target. Pentoxifylline a phosphodiesterase inhibitor, blocks the activation of neutrophils by TNF- $\alpha$  and IL-1 and TNF- $\alpha$  release by inflammatory cells.[31] Pentoxifylline has been demonstrated to reduce cardiac dysfunction and TNF- $\alpha$  release in ischemia-reperfusion models[32]. However, pentoxifylline did not affect renal function in elderly patients who underwent cardiac surgery[33]. Dexamethasone also failed to protect against renal dysfunction after cardiac surgery.[14] A recent study examined the effect of blocking complement activation in patients who underwent CPB. A single-chain antibody specific for human C5 (pexelizumab) was found to block complement activation and postoperative myocardial injury. However, renal function was not an outcome measure of this pilot study.[34] N-acetylcysteine (N-AC) has been shown to block inflammation and oxidant stress in cardiac surgery patients and thus may hold promise as a simple, nontoxic protective measure.[35] However, N-AC has not been used in a prospective clinical trial that examines renal outcomes. N-AC has been studied most extensively in the prevention of radiocontrast-induced nephropathy. In this area, the utility of N-AC has been questioned with the publication of a meta-analysis of 16 controlled studies that demonstrated no protective benefit.[36] Other Strategies. The sympathetic nervous system is activated during and after cardiac surgery and may lead to impairment of renal function through a hemodynamic mechanism. Clonidine (B2 agonist) has been used to attenuate these effects, with improvement in hemodynamic stability during CPB[37]. In a study of 48 normal risk patients who underwent cardiac surgery, preoperative treatment with clonidine prevented the deterioration of renal function in this small trial, with creatinine clearances significantly higher in the clonidine-treated group 24 h after CPB.[38] Diltiazem has been used in clinical trials to prevent ARF after cardiothoracic surgery. Diltiazem has been shown to inhibit some of the inflammatory effects of CPB and is often used to prevent vasospasm of radial grafts.[39] Although diltiazem reduced urinary excretion of markers of tubule injury ( glutathione s-transferase and N-acetyl- $\beta$ glucosaminidase), [40] its effectiveness in the prevention of renal dysfunction was inconsistent.[41] In patients who were at highest risk for PRD, prophylactic hemodialysis has been attempted. In a single study, 44 patients with a baseline serum creatinine  $>2.5$  mg/dl were randomly assigned to either perioperative prophylactic dialysis or dialysis only when postoperative ARF that required the procedure was indicated (control). In the group that received prophylactic dialysis, mortality was 4.8 versus 30.4% in the control group. Furthermore, postoperative ARF that required dialysis was reduced from 34.8% in the control group to 4.8% in the intervention arm. These results will have to be repeated in other randomized, controlled studies before this invasive approach can be broadly recommended.

### Conclusions&Recommendations:-

**From reviewing the literature and from our results in this study we concluded that:-**

- Safety and success of the off-pump CABG surgery along with the new concerns about economics, together with advantages over CPB in avoidances of its recognized risks, added in resurrection of this technique in the past decade.
- Analysis of postoperative results showed no correlation between findings in abdomio-pelvic U/S and postoperative renal impairment.
- Cleveland Clinic Foundation Acute Renal Failure Scoring System does not take in consideration the various patho-physiological parameters of the CPB.
- Throughout the literature there is a strong agreement that multiple risk factors (pre, intra, and postoperative) and multiple pathological and physiological factors interact together to affect the kidney functions.
- In general, there is no single accurate investigation that can surely predict renal function outcome after cardiac surgery.
- General Measures to prevent renal dysfunction after Cardiac Surgery should be utilized in all patients with special attention to those with preoperative renal dysfunction.
- Regarding postoperative renal dysfunction and need for dialysis, results were in favor of the off-pump technique.
- Renal function is better preserved in patients undergoing off-pump CABG than those undergoing on-pump CABG.
- CPB is associated with a higher risk for PRD, and this injury is associated further with substantial morbidity and mortality.
- At present, no pharmacologic interventions have demonstrated conclusively efficacy in the prevention of renal dysfunction after cardiac surgery.
- The pathogenesis of kidney injury during CPB is complex and involves hemodynamic, inflammatory, and other mechanisms that interact at a cellular level.
- Ultimately, a successful therapy will utilize strategies that target these multiple pathways. This integrated strategy would target hemodynamic, inflammatory, and oxidative pathways and act at the points of proximal cellular injury.
- CPB offers an attractive model to study these pathways, because the timing of the insult is known and potentially modifiable.

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### RESEARCH ARTICLE

#### SHORT TERM OUTCOME OF REDO MITRAL VALVE SURGERY: EMERGENCY VERSUS ELECTIVE.

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#### Abstract

**Background:** With advances in medical therapy and life expectancy, reoperation to replace dysfunctional mechanical heart valve prosthesis is an increasingly common procedure and there have been gradual decreases in perioperative risk for redo valve surgery over the past 2 decades

**Aim of the work:** The aim of this study was to investigate the overall outcome of adult patients undergoing redo-mitral valve replacement (redo-MVR).

**Patients and Methods:** forty cases had previous mitral valve replacement were admitted for redo mitral valve replacement. They were divided into two groups:

Group (A): (Twenty cases) were admitted as emergency cases from the ER.

Group (B): (Twenty cases) were admitted from out patient clinic as elective cases.

**Results:**The hospital mortality was (20%). There was no effect regarding age, sex, cardiac rhythm, number of previous operations, type of the previous prosthesis, and interval from last implantation. Taking in consideration that mortality was higher with emergency group (15%).

**Conclusion:** pre operative parameters of morbidity and mortality that showed higher incidence in emergency group were: NYHA functional class, LVEDD, LVESD dimensions, Redo cardiac surgery, Infective endocarditis, left ventricular dysfunction EF less than 35.

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#### Introduction:-

Since the first valve replacements in the 1950s, major advances have been made in mitral valve (MV) surgical technique, prosthesis design and peri-operative care. Improved survival has inevitably meant that more patients require redo-MVR during follow-up. However, redo surgery may be associated with significant risk, which must be balanced against the benefits to the patient. Avoiding the complications of redo-sternotomy such as injury to prior grafts and haemorrhage must be taken in consideration. (Khan & Younan, 2009). Patients undergoing valve reoperations have a diverse and complex clinical profile. Thrombi may form on mechanical valves and cause orifice obstruction, leaflet malcoaptation, and acute valvular dysfunction (Tang, et al., 2007; Mahesh, et al., 2005). So, redo valve surgery is associated with a higher operative mortality rate than first time valve surgery and certain risk

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factors may be preventable (Tang, et al., 2007; Rankin, et al., 2006). With advances in medical therapy and life expectancy, reoperation to replace dysfunctional mechanical heart valve prosthesis is an increasingly common procedure and there have been gradual decreases in perioperative risk for redo valve surgery over the past 2 decades, likely due to increased surgical experience, better myocardial protection, and improved patient management. However, mortality rates remain higher than first-time valve replacement surgery (Rankin, et al., 2006; Borger, et al., 2002). Several studies have been studying the predictors of mortality during reoperative valve surgery (Rankin, et al., 2006; Borger, et al., 2002).

**Aim of work:-** The aim of this study was to investigate the overall outcome of adult patients undergoing redo-mitral valve replacement (redo-MVR).

### Patients and Methods:-

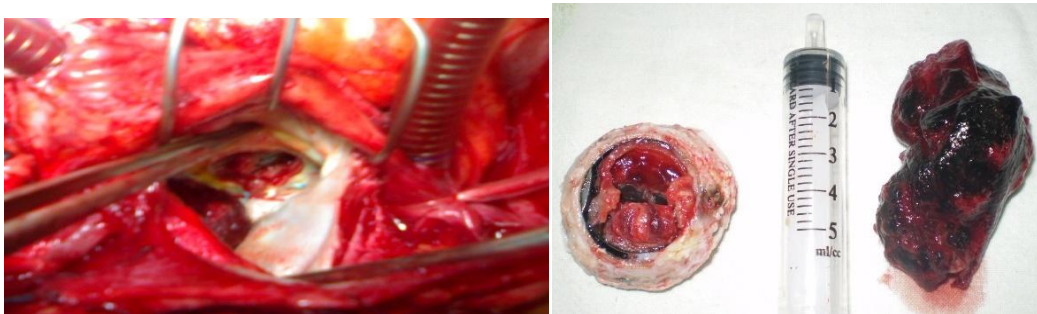
Forty cases had previous mitral valve replacement were admitted for redo mitral valve replacement. They were divided into two groups: Group (A): (Twenty cases) were admitted as emergency cases from the ER. Group (B): (Twenty cases) were admitted from out patient clinic as elective cases. All patients were opened through median sternotomy and cardiopulmonary bypass with aorto-bicaval cannulation. A mechanical valve is inserted with horizontal mattress pledgeted non absorbable sutures.

### Inclusion criteria:-

surgery for prosthetic endocarditis. Surgery for para-valvular leak. Surgery for structural valve degeneration. Surgery for prosthetic valve thrombosis .

### Exclusion criteria:-

Impaired renal or liver functions. previous cerebro-vascular disease. impaired respiratory functions( eg. Chronic obstructive pulmonary disease, emphysema, suppurative lung disease, etc..) concomitant coronary artery disease or aortic valve disease



**Figure 1:-** A showing intraoperative view of a stuck mitral valve prosthesis. & B showing a thrombus obstructing the mitral valve with a large left atrial thrombus .

### Statistical analysis:-

patients categorical predictor variables and outcomes were analyzed using Pearson Chi-Square ( $\chi^2$ ) test for Independence. Statistical analysis was performed using Microsoft® Office Excel 2010 and SPSS (Version 20, 2011).  $P$  value < 0.05 was considered statistically significant.

### Results:-

Forty cases underwent redo mitral valve replacement in department of cardiac surgery in National Heart Institute and Cairo University in the period between November 2012 and November 2014 after obtaining local ethical approval. There were 17 males (42.5%) and 23 females (57.5%), the age ranged between 22 and 58 years with a mean of 40 years. The predominant NYHA score classification was (II) =13 patient (32.5%), followed by (I)=11 patient (27.5%), then (III)=10 patients (20%), and finally (IV)= 6 patients (15%). Considering hemo-dynamics 5 patients were unstable (12.5%), 5 patients arrived operation room (OR) shocked with pale cold skin, low urine output, tachypnic, tachycardic and reduced conscious level, 30 patients were stable (75%), 5 patients were on inotropes (12.5%). Regarding number of previous mitral valve replacement 33 patients (82.5%) had previous mitral valve replacement once before, 6 patients (15%) had it twice, 1 patient (2.5%) had it thrice.

**Table 1:-** showing demographic data of the patients,

	Elective MVR	Emergency MVR
Age (span)	24-55	22-58
Gender	11 male/ 9 female	6 male/14 female
Body surface area( normal expressed by BMI less than 25 )	18 normal/ 2 over wt	19 normal /1 over wt
Euro score II	(2- 30%)	(15-60%)
NYHA score	I => 11 II=> 5 III=>4 IV=>0	I=>0 II=>8 III=>6 IV=>6
Previous MVR		
Once	18	15
Twice	2	4
Thrice	0	1
Bioprosthesis	1	0
Mechanical	19	20
Time to re-operation	(2 month- 19 .5 year)	(6 month- 15 year)
Indications for re-operation		
Thrombosis	14	12
Paravalvular leak	5	4
Endocarditis	0	4
Degenerative	1	0
Hemodynamic stability	20 stable	10 stable 5 on inotrope 4 shocked 1 shocked and arrested with induction

Indications for re-operation were thrombosis in 26 patient (65%) , paravalvular leak in 9 patients (22.5%), endocarditis in 4 patients (10%) and degenerative 1 patient (2.5%). Considering preoperative echo data : ejection fraction varies from (40-72%), and 2 cases were below than 50%.

**Table 2:-** pre-operative ejection fraction

Pre-op Ejection fraction	Elective	Emergency	Total
Good(> 50%)	18	8	26
Moderate(< 50% and >25%)	2	7	9
Poor (<25%)	0	0	0
<b>Total</b>	20	15	35

**Table 3:-** showing preoperative data.

	Elective MVR	Emergency MVR
Ejection fraction	( 42- 72%) 18 cases above 50% 2 cases below 50%	(40- 62 %) 5 cases were not assessed pre operative
LVESD	( 2.6 – 4.9)	( 2. 5 – 4.6)
LVEDD	(4.9 – 7.9)	(4.7 – 8.0)
Tricuspid regurge	17 severe TR 3 moderate TR	14 severe TR 1 moderate TR 5 cases were not asses
Atrial thrombus	14 cases	12 cases
Gradient (max)	( 11 -23) mmhg	(16- 26) mmhg
Gradient (mean)	(6- 14) mmhg	( 9 – 18)
Mitral valve area (cm2)	(0.3 -2.7) cm	(0.4 – 2.6) cm
Systolic pulmonary artery pressure	(20 – 74) mmhg	(25- 85) mmhg



Tricuspid regurge was found in all pre operative assessed cases, severe tricuspid regurge in 31 patients (77.5%) and moderate tricuspid regurge 4 cases (10%). Atrial thrombus was found in 26 patients (65%). Prosthetic valve gradient varied from (11-26 mmHg) as maximum gradient, and (6-18 mmHg) as mean gradient. Mitral valve area ranged from (0.3 -2.7%) cm<sup>2</sup>. systolic pulmonary artery pressure ranged from (20-85%) mmHg.

**Table 4:-** showing .Intra operative and immediate post operative events

	Elective MVR	Emergency MVR
Cross clamp time	(55 -145) min	(65- 185) min
Cardio pulmonary bypass time	(75- 240) min	(90 -260) min
Concomitant procedure	20 de vega	16 de vega
Type of prosthesis settled	Monleaflet 1 Bileaflet 18 Bioprothesis 1	Ball and cage 1 Bileaflet 19
Blood loss	2 cases Catastrophic blood loss	4 cases catastrophic blood loss
Pace maker device intra operative	3 cases	3 cases
Haemo filtration need	12 cases	15 cases
Intra operative mortality	1 case	4 cases
First two day ICU mortality	1 case (poor LV function)	2 cases (poor LV function)
Re opening (2 <sup>nd</sup> look)	1 case ( bleeding)	1 case ( open chest)
Prolonged ICU stay (> 7 days)	2 cases 1 (chest infection) 1 ( weaning inotrope)	3 cases 2 ( chest infection) 1 ( weaning inotrope)
Need for dialysis	0	1 case

**Considering intra operative and immediate post operative data:-**

Cross clamp time is a little bit shorter in elective cases (55-145) min compared to (65-185)min for emergency cases, and bypass time goes with the same sequence (75-240) min for elective cases and (90-260) min for emergency cases. Prosthetic valve types were as following; 1 patient (2.25%) with monoleaflet valve , 1 patient (2.25%) with ball and cage , 1 patient (2.25%) with bioprothesis , most of cases were bileaflet 37 patient (92.5%). Intra operative events included Catastrophic blood loss occurred in 6 patients (15%). Epicardial lead temporary pacemaker was needed in 6 patients (15%) also, most of cases needed hemofiltration 27 patients (67.5%). Intra operative mortality were 1 case (2.25%) for elective cases and 4 cases (10%). hospital mortality was 1 case (2.25%) for elective cases and 2 cases for emergency cases due to poor contractility. 2<sup>nd</sup> look was needed for 1 case in elective cases due to bleeding , and 1 case for emergency (open chest ).*Considering post operative data* :Permenant pacemaker was needed for 1 case. Residual infective endocarditis remained in 1 case (fungal type).1 case had cardiac tamponade (patient was discharged and came back 3 week later to emergency department with severe dyspnea , echo revealed massive effusion that was drained with subxiphoid incision )and 1 case left hospital with lt side hemiparesis.

(It is worth saying that these complications occurred in the emergency group.)*Considering post operative 6 month echo data* : Ejection fraction improved in most of cases , also left ventricle dimensions. Residual tricuspid regurge in 6 patients (15%) of each group a sum of 12 patients (30%). Gradients also decreased in all patients , maximum gradient ranged from (6-12) mmHg for elective group , and almost the same for emergency group (6-14) mmHg. Also mitral valve area ranged from (1.8- 3.1) cm<sup>2</sup> for both groups.Elective cases had a much better outcome considering mortality (2 cases for elective group compared for 6 cases for emergency group) and morbidities.

**Table 5:-** showing statistical analysis of data.

	Group	N	Mean	Std. Deviation
Age	Elective	20	37.55	10.445
	Emergency	20	37.65	9.986
BMI	Elective	20	22.100	4.0503
	Emergency	20	22.475	3.2024
Euro score II	Elective	20	18.400	9.4000
	Emergency	20	28.900	11.3000
EF-Pre	Elective	20	59.70	7.794
	Emergency	15	51.20	6.678
LVEDD-Pre	Elective	20	3.350	0.7688
	Emergency	15	3.620	0.6858
LVEDD-Pre	Elective	20	6.975	0.7552
	Emergency	15	7.060	0.7917
Max Grad-Pre	Elective	20	19.25	3.370
	Emergency	20	21.25	3.193
Mean Grad.-Pre	Elective	15	9.93	2.463
	Emergency	15	13.33	2.610
MVA-Pre	Elective	20	1.610	0.6112
	Emergency	15	1.540	0.5667
SPAP	Elective	20	52.70	15.644
	Emergency	15	58.53	17.952
CCT	Elective	20	105.75	24.777
	Emergency	16	122.19	31.831
CPB time	Elective	20	166.00	45.900
	Emergency	16	174.06	46.304
EF-Post	Elective	18	63.89	6.623
	Emergency	14	56.14	6.815
LVESD-Post	Elective	18	3.250	0.6819
	Emergency	14	3.393	0.5797
LVEDD-Post	Elective	18	6.294	0.8599
	Emergency	14	6.271	0.6999
Max Grad-Post	Elective	18	7.83	1.917
	Emergency	14	10.50	2.139
Mean Grad-Post	Elective	18	5.28	1.018
	Emergency	14	5.64	1.393
MVA-Post	Elective	18	2.517	0.3312
	Emergency	14	2.593	0.3407

**Table 6:-** Procedure delayed (6 m) Echographic characteristics.

	Elective MVR	Emergency MVR
Ejection fraction	( 50- 76%) 20 cases above 50%	(46- 70 %) 12 cases above 50%
LVESD	( 2.5 – 4.9)	( 2. 5 – 4.5)
LVEDD	(4.6 – 7.4)	(4.7 – 7.1)
Tricuspid regurge	6 cases ( mild to moderate)	6 cases ( mild to moderate)
Gradient (max)	( 6-12) mmhg	(6- 14) mmhg
Gradient (mean)	(3-7) mmhg	( 4-8)
Mitral valve area (cm <sup>2</sup> )	(1.8 – 3.0) cm	(1.8 – 3.1) cm
Systolic pulmonary artery pressure	(20 – 60) mmhg	(25-73) mmhg

**Table 7:-** Procedure related mortality

	Elective MVR	Emergency MVR
Intra operative mortality	1 case	4 cases
ICU mortality	1 case	2 case
Delayed (6 m) mortality	0	0
Over all mortality	2 cases	6 cases

**Discussion:-**

The reported mortality risk of elective re-operation may be as low as 5.4% to 11%, while, for emergency procedures, it could be as high as 38 to 61.5%. Replacement operations in emergency cases are generally performed in a functionally compromised group of patients, so these patients tolerate complications poorly in comparison to elective cases. *{FormattingCitation}(Sampath Kumar et al., 2002; Wauthy, Goldstein, Demanet, & Deuvaert, 2003)*. Nevertheless, there is evidence that clinical outcomes following redo-valve surgery have improved especially in emergency cases owing to advancement in cardiac critical care units (*Vohra et al., 2012*). In particular, it is necessary to identify the perioperative variables (including technical complications and the patients' preoperative condition in both emergency and elective cases) in order to offer patients the most appropriate interventions. (*Vohra et al., 2012*). In this study, the overall hospital mortality was 8 patients (20%), (2 cases for elective group (5%) one intra operative mortality and one ICU mortality compared to 6 cases for emergency group (15%) with four cases intra operative mortality and two cases ICU mortality). Brandao et al reported a hospital mortality of 10.9% for emergency redo cases. (*de Almeida Brandão et al., 2002*). In another study done in 2002, Kumar and associates reported mortality of 11% in emergency redo mitral valve operation (*Sampath Kumar et al., 2002*). Overall operative mortality was 8.4% in elective redo mitral operations (*Beghi et al., 2002*). Wauthy et al. observed in elective redo valve surgery a mortality rate of 8% (*Wauthy et al., 2003*). Such difference in mortality may be; as mentioned by Wauthy, related to technological evolutions of cardiac critical care units (e.g. defibrillation patches, improved ECC technology, the use of ECMO, the Cell Saver, etc.) and increased surgical experience. In this study, mortality in relation to NYHA classification were 2 cases (5%) from the elective group NYHA III, while it was 6 cases (15%) for emergency group (5 cases (12.5%) NYHA IV) and (1 case (2.5%) NYHA III). NYHA functional class IV was also a risk factor in short term survival as mentioned by Akay and associates and others in many studies (*Akay et al., 2008*). Our conclusion regarding NYHA classification as a statistically significant factors for mortality in both groups. Vohra et al also confirmed that New York Heart Association functional class was highly significant for operative mortality; as operative mortality in their study was 4% for functional classes (I through III), and 19% for functional class (IV), they reported NYHA functional class as an important risk factor for hospital mortality. NYHA FC is considered as the most frequently quoted risk factor associated with death in redo valve surgery. This was due to that mortality in their study reached up to 30% with stage IV (half cases were emergency) compared to less than 10% in stage II and III (all cases were elective). (*Vohra et al., 2012*). Considering morbidities, reopening was done in 1 case (2.5%) for elective group and 1 case (2.5%) that was left open chest for emergency group. This morbidity was not statistically significant between the two groups. Akay and associates reported bleeding in 5.6% of his patients with equal incidence for both emergency and elective cases (*Akay et al., 2008*). Pother et al had excessive postoperative bleeding (more than 1,000 mL in the first 24 postoperative hours) occurred in 14.5% (9% were for emergency group) of patients while re-exploration was done in only 8% of them (*Potter et al., 2004*). In this study, need for dialysis 1 case (2.5%) due to constant rising creatinine and potassium levels in emergency group. 6 cases (15%) had renal dysfunction 4 cases in emergency group (10%) and 2 cases in elective group (5%) in form of rising creatinine level that responded to diuretics and drug dose adjustment. Akay and associates reported 14.2% with postoperative renal dysfunction 10% for emergency group (*Akay et al., 2008*). Preoperative renal impairment, CVS, prolonged bypass time and cross clamp time are risk factors for postoperative renal dysfunction. In this study, permanent pacemaker was installed in 1 case (2.5%) in emergency group due to complete heart block that did not recover after 14 days. This morbidity was not statistically significant between the two groups. Pother et al had complete heart block and brady arrhythmia in 3% of cases of redo mitral valve surgery only 0.3% of cases needed permanent pacemaker (one case after redo aorta and mitral). (*Potter et al., 2004*). In this study, cerebrovascular accident (inform of left hemiparesis) was noticed in 1 case (2.5%) in emergency group. Hemodynamic instability and disturbed conscious level in absence of evidence of stroke were noticed in 5 patients (12.5%) in emergency group with 1 case (2.5%) that arrested with induction. This makes this parameter of statistically significance between the two groups. Potter in his study in 2004 documented 2.8% stroke in patients with repeated mitral valve replacement (75% of cases occurred in emergency cases. (*Potter et al., 2004*). Residual infective endocarditis evidenced by blood culture was

noticed in 1 case (2.5) in the emergency group. This morbidity was not statistically significant between the two groups. In our study the cause of this prolonged time for bypass was in most cases due to extra time needed for circulatory support due to associated left ventricular dysfunction. Mean cross clamp time for elective cases were 100 min and for emergency cases 125 min, as for bypass time were 157.5 min and 175 min respectively. This was not statistically significant for both groups. McGrath et al stated that long bypass time and long cross clamp time are predictors of mortality (*Wauthy et al., 2003*). Brandão mentioned that among the intraoperative variables associated with higher hospital mortality was Cross clamp time longer than 120 min (*de Almeida Brandão et al., 2002*). Global myocardial ischemic time alone was a strong predictor of hospital mortality in many studies. In contrary others had denied both factors as significant predictors for the hospital mortality (*Potter et al., 2004*). In our study, the sex (11 male, 9 female ) for elective group and (6 male, 14 female) for emergency group and age of patients mean for elective group (39.5 years) and mean for emergency group (40 years) were not statistically significant in both groups. Vohra et al showed that sex and age did not affect the outcome in both elective and emergency groups (*Vohra et al., 2012*). Another study done by Akay and co-workers shows that re-do cardiac surgery in patients over the age of 70 can be undertaken with acceptable operative morbidity and mortality. Advanced age is associated with decreased physiologic reserve and increased comorbid factors. Their functional reserve capacity is diminished compared with younger patients. They confirmed that females are significantly labile to mortality than males (*Akay et al., 2008*). In our study thrombosis was found in 26 patient (65%) with 14 (35%) elective cases and 12 (30%) emergency cases. paravalvular leak in 9 patients (22.5%) including 5 (12.5%) elective cases and 4 (10%) emergency cases, endocarditis in 4 patients (10%) all were emergency cases and 1 elective degenerative valve case (2.5%) . Indication of reoperation had no statistically significance regarding outcome for both groups. Brandao and Vohra mentioned that the indication for surgery had no impact on in-hospital mortality (*de Almeida Brandão et al., 2002; Vohra et al., 2012*). According to Maciejewski et al ; operative mortality was significantly higher in those patients who reoperated because of prosthetic endocarditis (*Maciejewski et al., 2011*). Presence of valve infection is also a predictor (*Potter et al., 2004*). Other observations suggest that the factors responsible for higher mortality are active infective endocarditis and valve thrombosis (*Sampath Kumar et al., 2002*). In our study Atrial fibrillation was observed in all patients (100%), this may be attributed to the fact that the main cause of the primary surgery for valve replacement was due to rheumatic affection but its effect on hospital mortality was not significant. Atrial fibrillation has been identified as a risk factor for mortality and morbidity associated with valve surgery (*Maciejewski et al., 2011*), as it may cause low cardiac output during the postoperative period or predispose to thromboembolic events. In our series, atrial fibrillation was not identified as a risk factor for hospital mortality. In our study, 33 patient (82.5%) had the operation once before (18 cases (45%) from elective group and 15 cases (37.5%) from emergency group). And 6 cases (15%) had it twice before (2 cases (5%) for elective group and 4 cases (10%) for emergency group. 1 case (2.5%) from elective group had it three times before. Number of prior operations did not show a significant effect on outcome on both groups. Although there was a trend to higher operative mortality with increasing number of prior cardiac operations, this factor was not significant in multivariable analysis.. Some reported that second reoperations were not more risky than first reoperations, but by the third reoperation, risks were high for all subgroups. This was confirmed by Beghi et al where the number of previous reoperations was independent determinant for reoperation (*Beghi et al., 2002*). Our study suggests that left ventricular dysfunction was associated with higher hospital mortality in both groups (1 case (2.5%) for elective group and 2 cases (5%) for emergency group). This was statistically significant. Low left ventricular ejection fraction (less than 35%) and increased LVEDD more than 50 mm have been reported of significance in mortality by Akay and associates (*Akay et al., 2008*). According to Maciejewski et al operative mortality was significantly higher in those patients who were had impaired left ventricular function (*Maciejewski et al., 2011*).

### Conclusion:-

Redo valve surgery is an increasingly common problem. Recent decades have seen a steady increase in the number of cases referred for redo cardiac surgery, which are associated with increased risk of morbidity and mortality compared to the first-time operations. Many studies were done to address the outcome ( mortality and morbidities) following redo mitral valve replacement. forty cases had previous mitral valve replacement were admitted for redo mitral valve replacement. They were divided into two groups: Group (A): (Twenty cases) were admitted as emergency cases from the ER. Group (B): (Twenty cases) were admitted from out patient clinic as elective cases. The hospital mortality was (20%). There was no effect regarding age, sex, cardiac rhythm, number of previous operations, type of the previous prosthesis, and interval from last implantation. Taking in consideration that mortality was higher with emergency group (15%). In conclusion, pre operative parameters of morbidity and mortality that showed higher incidence in emergency group were: NYHA functional class , LVEDD , LVESD

dimensions, Redo cardiac surgery sternotomy and adhesio-lysis carries a significant risk of catastrophic bleeding especially with the rush accompanying hemodynamic instability, Infective endocarditis, left ventricular dysfunction EF less than 35. Post operative morbidities noticed in emergency group were : (cardiac tamponade, permanent pacemaker, residual infective endocarditis , need for dialysis and cerebro vascular accidents ) were not statistically significant.

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### RESEARCH ARTICLE

#### PRIMARY CUTANEOUS T-CELL LYMPHOMA (CTCL); CASE REPORT & REVIEW OF LITERATURE

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#### Abstract

Primary Cutaneous T-Cell Lymphoma (CTCL) poses a diagnostic challenge. The diagnosis can be delayed for years due to the similarities to common skin diseases such as psoriasis. The discrimination between clinical and histopathological is crucial for optimal diagnosis and treatment. The treatment of CTCL requires multidisciplinary approach and combinations therapy such as chemotherapy, biological therapy, & Extra-Corporal Phototherapy (ECP). Stem Cell Transplantation (SCT) plays a role in treatment of CTCL. Autologous Stem Cell Transplantation (ASCT) is associated with lower toxicities, but higher relapse rate, whereas Allogeneic Stem Cell Transplantation (Allo-SCT) is associated with lower relapse rate, but is associated with higher morbidity and mortality. Here we present a case of CTCL that was misdiagnosed as psoriasis and finally the correct diagnosis was reached and appropriate treatment was initiated. We here explore the diagnostic challenges and the therapeutic options.

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#### Introduction:-

Primary cutaneous T-cell lymphomas (CTCL) are heterogeneous group of extra-nodal non-Hodgkin lymphoma, which is confined to the skin. The most common type of cell is T-cell derived which represents approximately 75% of the cases. It is classified into two main categories there are Mycosis Fungoid (MF), which has generally indolent behavior and Sezary Syndrome (SS), which is an aggressive and leukemic variant. MF and SS present with numerous variants that mimic benign skin conditions such as eczema, folliculitis, pigmented purpuric dermatoses, psoriasis, and vitiligo. Even after histological examination MF can resemble inflammatory dermatoses. MF can pose diagnostic challenges for dermatologist, but not for pathologist.<sup>[1]</sup>

#### Epidemiology:-

Surveillance, Epidemiology, and End Results (SEER) registry data, show the incidence of CTCL is the highest between male and African Americans. CTCL is not common in pediatric and young adult populations, often associated with histopathological variants of MF. The median age of diagnosis is mid-50s and increase 4-fold in patient over 70. Patient with MF and SS are significantly at increased risk of developing second lymphoma, Hodgkin lymphoma and CTCL subtype lymphomatoid papulosis as well as non-hematological malignancy.<sup>[1]</sup>

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**Table I:-** shows the new World Health Organization/European Origination for Research and Treatment of Cancer (WHO/EORTC) consensus classification for primary cutaneous lymphomas with relative frequency and 5-year Survival.<sup>[2]</sup>

WHO/EORTC Classification	Frequency (%)	5-year Survival (%)
Cutaneous T-cell and NK cell lymphoma		
<u>A-</u> Indolent		
Mycosis fungoides	<b>44%</b>	<b>88%</b>
• Follicular mycosis fungoides	<b>4%</b>	<b>80%</b>
• Pagetoidreticulosis	<b>&lt; 1%</b>	<b>100%</b>
• Granulomatous slack skin	<b>&lt; 1%</b>	<b>100%</b>
CD30+ lymphoproliferative disorders		
• Anaplastic large cell lymphoma	<b>8%</b>	<b>95%</b>
• Lymphomatoidpapulosis	<b>12%</b>	<b>100%</b>
• Subcutaneous panniculitis like T-cell lymphoma	<b>1%</b>	<b>82%</b>
• CD4+ small/medium pleomorphic T-cell lymphoma	<b>2%</b>	<b>72%</b>
<u>B-</u> Aggressive		
Sezary syndrome	<b>3%</b>	<b>24%</b>
Cutaneous peripheral T-cell lymphoma, unspecified	<b>2%</b>	<b>16%</b>
• Cutaneous aggressive CD8+ T-cell lymphoma	<b>&lt; 1%</b>	<b>&lt; 18%</b>
• Cutaneous $\gamma/\delta$ T-cell lymphoma	<b>&lt; 1%</b>	-
Cutaneous NK/T-cell lymphoma, nasal type	<b>&lt; 1%</b>	-

#### **Etiology:-**

MF is believed to develop as a result of chronic antigenic stimulation that leads to uncontrollable clonal expansion and the accumulation of T helper and memory T cells in the skin. Infections have been suggested have a role in development of MF particularly staphylococcus aureus (*S. aureus*). One study found high rates of *S. aureus* colonization's in patient with erythrodermic MF (EMF) and SS with clinical improvement of both conditions after antimicrobial treatment of the infection. Most CTCL serologically are associated with human T-Lymphotropic virus type 1 (HTLV-1). Other viruses have been identified in patients with CTCL like Epstein-Barr virus (EBV) and Cytomegalovirus (CMV) but the evidence that support virus as the etiology of disease is minimal. Immunosuppression medication is considered an risk factors for development of the disease. Certain occupations can put the patient at risk to develop the disease such as working in the glass, pottery and ceramic industry, but still the evidence is controversial. Also, military exposure, herbicide exposure has been linked to non-Hodgkin lymphoma, but still non-specific to CTCL.<sup>[2]</sup>

#### **Clinical presentation:-**

1. Classic patients with mycosis fungoides (MF) present with slowly progressive disease over years. Patients can present with a patch plaque on the skin of non-exposed areas such as breast, buttocks, lower trunk and groin. These patch plaques progress to tumor at the end.
2. Sezery Syndrome (SS) and Erythrodermic Mycosis Fungoides (EMF) are aggressive and leukemic CTCL variants characterized by atypical T- cell (sezery cell), diffuse (erythroderma) and severely disabling pruritus with or without lymphadenopathy. Some may have non-specific dermatitis. SS usually arises de novo in short time or takes indolent course arising from Classic MF.
3. Erythrodermic MF presents with erythroderma and together with SS formerly erythrodermic CTCL. EMF is generally considered a progression of MF and distinguished from SS by absent or minimal blood involvement. A low burden tumor of circulating sezery cells is seen in the circulation without meeting the criteria of SS. The skin appearances in EMF range from mild erythema to generalized exfoliative with keratoderma and fissures on the palm and soles. These finding may be associated with hair loss, electrolytes imbalance, hypothermia and eyelid change/ ectropion. Also, these can be missed in elderly people and attributed to advanced age, drug reaction, or infection. Generalized Seborrheic Dermatitis, Psoriasis and Chronic Photosensitive reaction can resemble Erythrodermic CTCL. Table II below shows the classification of international society of cutaneous lymphoma.<sup>[2]</sup>

**Table II:-**Proposed classification for erythrodermic cutaneous T-cell lymphoma and relative hematologic criteria developed by the international Society for Cutaneous Lymphoma in their consensus conference on erythrodermic cutaneous T-cell lymphoma<sup>[2]</sup>

<b>Erythrodermic CTCL</b>	<b>Pre-Existing MF</b>	<b>Blood finding</b>	<b>Tumor, node metastasis, blood staging</b>
Sezary Syndrome (SS)	Rarely	Leukemic	T4, No-3, M0-1 B2
Erythrodermic MF	Always	Always	T4, No-3, M0-1 B-1
Erythrodermic CTCL not otherwise specified	Absent	Absent	T4, No-3, M0-1 B-1

CTCL, Cutaneous T-cell lymphoma; MF, mycosis fungoides.

B> 5% circulating Sezary cells;

B1, Sezary cell count of B> 1000 cell/m<sup>3</sup> or >20% atypical T cell on peripheral smear, B2, Sezary cell count of < 1000 cells/m<sup>3</sup> or <20% typical T cells on peripheral smear.

### Case Report:-

32 years old male patient admitted with history of persistent skin lesion for eight years. The patient was diagnosed initially at the age of 24 as a case of psoriasis. He was managed as case of psoriasis for period with clear slow progression of the disease until it reached the stage of Erythrodermic state with multiple nodules all over the body, with the largest under the right armpit reaching the size of basketball. The skin lesions were scaly erythematous plaque involving the whole body. Then, the patient was seen by a senior dermatologist at King Abdulaziz University (KAU) and skin biopsy was done which showed the diagnosis to be a CTCL rather than psoriasis. Because the patient was beyond the topical therapy for CTCL he was referred immediately to hematology department at KAU for consideration of systemic rather than topical therapy. The patient was very sick with fever and multiple skin discharges he was admitted to complete diagnostic evaluation and treatment plan discussion in the lymphoma tumor board. Peripheral blood film showed 3% of Sezary cells and pan CT scan of the whole body showed generalized lymphadenopathy without visceral involvement. Bone marrow aspiration and biopsy confirmed the presence of sezary cells in the bone marrow also confirming the state of sezary syndrome based on peripheral blood sezary cells rather than the bone marrow ones. Molecular cytogenetic studies did not reveal any abnormalities. The treatment options that were considered during the weekly hematology grand round are; systemic chemotherapy, local radiotherapy for large areas as a palliative intent, or surgical excision of the large tumor mass under the left armpit. The case was discussed in the lymphoma tumor board and in the city-wide lymphoma club and recommendation was made to commence chemotherapy of CHOP chemotherapy (Cyclophosphamide, Hydroxydaunorubicin, Vincristine (Oncovin), and Prednisolone) to be followed by allogeneic bone marrow transplantation (BMT) if feasible or autologous stem cell transplantation (ASCT) if possible. HDAC Inhibitors of Vorinostat can be considered after debulking with chemotherapy as maintenance therapy or after transplantation for minimal residual disease (MRD) eradication. The patient received eight cycles of CHOP with dramatic response and excellent mid treatment response upon evaluation clinically and radiologically. Three months later the disease came back again by reappearing of the skin lesions. Reevaluation of the disease activity by clinical and radiological evaluation and re-biopsy to confirm the pathology was carried out. The patient was salvaged with **ESHAP** chemotherapy protocol (Etoposide, Solumedrol (methylprednisolone), High dose cytarabine (Ara C) and Platinum (cisplatin)), for two cycles and he achieved very good partial remission and then he received two cycles of oral HDAC Inhibitor of Vorinostat. The plan was to perform ASCT after the biological therapy, at the same time we tried to arrange for Extra-Corporal Phototherapy (ECP) but both procedures were not feasible due to lack of ECP and lack of logistics to carry on ASCT. Patient expectedly progressed and developed new generalized plaque skin lesion and he was readmitted two months after the completion of the Vorinostat cycles. He was readmitted with multiple sites of infection and pus discharge and bacterial swabs showed strep. Alagctiae and S. aureus. He was started on Co-Amoxiclav 625 mg tablet TID. Patient was evaluated again by the dermatology service and they recommended continuing fuisdic acid & Vaseline and no need for repeating the biopsy. Pan CT scan was done again and showed no visceral organ involvement and bone marrow aspiration and biopsy was done and did not show any involvement of the bone marrow. Patient was salvaged again with a third type of chemotherapy that is Gemcitabine based therapy of **GDP** (Gemcitabine, Dexamethasone, & Platinum (Cisplatin)). He received the first cycle and in process to receive the second cycle to be followed by ASCT since he has a chemo sensitive disease and this time the biological therapy will be used after ASCT for MRD rather than before as it was done before.



**Discussion:-****Table III:-**illustrates the main differences between the two entities

CTCL	Plaque Psoriasis
Mid-50s.	Between 15-30.
Male and African Americans commonly affected.	White commonly affected.
Medication to treat HTN.	Medication to prevent malaria and lithium
No definitive risk factor except HTLV-1.	Common risk factor: stressful event, strep throat, cold or dry weather and cut, or scratch or bad sunburn.
1- Reddish patch plaque cover the whole of the body (no specific place). 2- Patch can be itchy. 3- Lymphadenopathy. 4- Patch prone to be ulceration. 5- Nail dystrophy. 6- Alopecia. 7- Edematous skin. 8- Hepatosplenomegaly.	1- Raised, reddish patch on the skin called plaque. 2- patches cover with silvery-white coat called scale 3- Most of the patch appears on the knee, elbows, lower back and scalp. 4- Patch can be itchy Scratching the itchy patch causing thickening of the patch. 5- Nail involvement.

This 32-year-old male who presented with large mass in right armpit and of the chest wall and scaly erythematous plaques that cover his whole body represented a therapeutic dilemma after confirming his original diagnosis. The option for treatment of this large mass was surgery, radiation therapy, or chemotherapy. After multidisciplinary and multiple presentations in tumor board and city wide lymphoma club a decision was taken to give this patient chemotherapy of CHOP. Patient received eight cycles with excellent response to treatment. Surgery for the large mass was not recommended by the surgeon because patient will need a large flap and his skin is already affected by the disease and the rate of complication after the surgery will be high, so surgery was not an option. Radiation therapy can be used only for palliation and intent in this patient was a curative treatment, so radiation will not be used here. The complications of radiation include alopecia, atrophy of sweat glands and of the skin, radiation induced dermatitis, skin edema, and skin squamous cell carcinoma is associated with high dose radiation. It is very important for the radiation dose to be given in fractions to prevent other complications. The total dose of radiation if exceeded 36 Gy the rate of the complication will be high also. The patient relapsed three months later after a complete response with chemotherapy. He was salvaged with ESHAP chemotherapy for two cycles with good response. Then, he was given HDAC inhibitor of Vorinostat for two cycles for eradication of MRD and in preparation for ASCT. However, patient presented with his third relapse. He was readmitted to KAUH with multiple skin infections. His skin condition improved after starting antibiotics which suggested that skin infection may play a role in development of this disease especially infection with *S.aures*. Patient was given a third line of chemotherapy of GDP to be followed by ASCT for disease eradication and this time Vorinostat will be used post ASCT as a maintenance therapy for MRD and prevention of relapse. At the same time we are still trying to arrange for ECP as a tool for disease control and eradication.

**Risk-Stratification (Staging):-**

In SS and MF TMNB (tumor, node, metastasis, and blood) play an important role for the prognosis and help to form a risk-adapted approach for the treatment. In 2007 TMNB have been reviewed by EORTC and ISCL for staging of MF and SS. If the patient has only one patch/plaque, then he has stage I, but stage I is divided into two stages which are: stage AI (<10 % of the body surface is involved or T1) and stage IB (> 10% of the body surface is involved or T2) based on the extent of the skin disease. The Palm and the digits represent 1% of the body surface and this is very helpful for clinical practice. The current recommendation of staging and diagnosis does not recommend biopsy of clinical normal lymph node, but it recommends when the size of the lymph node is more than 1.5cm. Dutch system, grade the lymph node staging system to be based on the presence of large cerebriform nuclei (7.5 um) and the degree of architecture effacement. In another staging system classification is based on the number of atypical lymphocyte (not the size) and the architecture of the node on the specimen to determine nodal involvement. In a patient with a patch/plaque stage T1/T2 and architecture preservation of any abnormal clinical lymph node classified as limited-stage disease. The median age of these patients is measured in decades along with the survival of patient with stage AI. At the time of the diagnosis majority of the patients with MF have limited-stage disease. On the other hand, patients with tumor stage (T3), erythroderma (T4), nodal involvement characterized by partial or

complete architecture effacement (N3), visceral metastasis (M1) or significant leukemic involvement (B2) have advance-stage disease. The median survivals 1-5 years are observed in patient with extensive disease.<sup>[1]</sup>

#### The modalities of the treatment of MF/SS:-

##### HDAC inhibitors (Histone deacetylase):-

HDAC Inhibitors are a new group of biological therapy that works on epigenetics. HDAC is catalyzing the removal of acetyl group from both Histone and non-Histone proteins. HDAC inhibitors affect Histone proteins which are responsible for gene expression in cell-cycle and apoptotic regulator protein while non-Histone proteins are involved with regulation of cell growth and survival, angiogenesis, aggresomal formations and DNA repair. Also, it affects the micro-environment of the tumor via reactive oxygen species. It enhances antigens presentation and down-regulation of immunodulatory cytokines, like IL-10. Vorinostat (suberoylanilind hydroxamic acid, SAHA) and romidepsin (depsipeptide) inhibit class I and II HADCs and both drugs are being used in lymphoproliferative disorder due to high effectiveness of these novel therapy. The overall response rate is 30% in of advanced stage disease and the median duration of response to the drug is estimated to exceed 185 days but most responses were rapid <two month in patient with SS. Side effect of the these new medications include GI (nausea, vomiting, diarrhea) and hematological (anemia and thrombocytopenia). Vorinostate may cause prolong QT interval. The table shows the side-effects of the medication.<sup>[1]</sup>

**Table IV:-**Zolinza™ (vorinostat) clinical or laboratory adverse events occurring in CTCL patients (incidence  $\geq$  10% of patients).<sup>[3]</sup>

Adverse events	Zolinza 400-mg once daily (n = 86)			
	All grades		Grades 3-5*	
	n	%	n	%
Fatigue	45	52.3	3	3.5
Diarrhea	45	52.3	0	0.0
Nausea	35	40.7	3	3.5
Dysgeusia	24	27.9	0	0.0
Thrombocytopenia	22	25.6	5	5.8
Anorexia	21	24.4	2	2.3
Weight decreased	18	20.9	1	1.2
Muscle spasms	17	19.8	2	2.3
Alopecia	16	18.6	0	0.0
Dry mouth	14	16.3	0	0.0
Blood creatinine increased	14	16.3	0	0.0
Chills	14	16.3	1	1.2
Vomiting	13	15.1	1	1.2
Constipation	13	15.1	0	0.0
Dizziness	13	15.1	1	1.2
Anemia	12	14.0	2	2.3
Decreased appetite	12	14.0	1	1.2
Peripheral edema	11	12.8	0	0.0
Headache	10	11.6	0	0.0
Pruritus	10	11.6	1	1.2
Cough	9	10.5	0	0.0
Upper respiratory infection	9	10.5	0	0.0
Pyrexia	9	10.5	1	1.2

Table IV summarizes the frequency of specific adverse events, regardless of causality, in CTCL patients using the National Cancer Institute-Common Terminology Criteria for Adverse Events, version 3.0 (Olsen et al 2001; Foss et al 2005).

##### Extracorporeal photopheresis (ECP):-

In extracorporeal photopheresis, the product of leukapheresis and plasmapheresis are exposed to 8-mthoxyypsoralen (8-MOP) before extracorporeal circulation through 1-mm thick disposable cassette exposed to UVA radiation. The

irradiations of leukocytes represent about 5% of the peripheral blood leukocytes in circulation and are given back to the patient. Psoralens covalently bind and crosslink DNA after UVA exposure and this leads to cellular death by several mechanisms. On the other hand, ECP leads to monocytes activation which stimulate antigens presenting cell and gene expression change leading to enhancement of the immune response. To use this finding there is a new protocol “trans immunization “where the blood products incubated overnight before following UVA radiation. This protocol not commonly used due to the risk of the infection and lack proven efficacy. Following the landmark study by Edson et al. describing response in 27 out 37 patients with erythrodermic CTCL treated by ECP, ECP was approved by Food and Drug administration (FDA) of USA for treatment CTCL and now is considered the first line of management of patients with SS in many centers. The response to the treatment varies between different case series, and the overall response rate is 60% and complete response rate is around 20%. In current protocols of treatment with ECP, oral administration 8- MOP is no longer required. ECP is generally well tolerated by the patients with schedule of two consecutive days every two to four weeks. The mechanism of action of ECP is not completely understood. ECP has immunomodulatory effect which augments the immune response (host anti-tumor immunity). So, the median time to response is approximately six month. Median survival time after the treatment exceeds eight years as it has been observed in these patients. A lot of patients experience a durable response which may permit for some weaning from CTCL directed therapies. Some factors may affect the response to the treatment especially if there is significant nodal or visceral involvement. Also, ECP can be combined with other therapy such as interferon, or bexarotene.<sup>[1]</sup>

#### **High-dose chemotherapy and hematopoietic stem cell transplantation:-**

In CTCL the use of autologous stem cell transplantation is derived from case series study, but the durable response for treatment is observed after allogenic stem cell transplantation. This finding may be explained by the graft versus lymphoma immune response. A retrospective analysis of 60 patients with advanced-stage who underwent allogenic stem cell transplantation was recently reported. In this study, the patients had received a median of four prior therapies before the allogenic stem cell transplantation using a conditioning of either reduced-conditioning (73%) or myeloablative (27%) conditioning before related (75%) or matched-unrelated donor (25%) transplantation. Mortality rate for non-relapse at one year was only 14% for patients who received reduced intensity conditioning or HLA identical/related donor stem cell and 38 to 40% for those who received myeloablative conditioning or match-unrelated donor graft. Transplantation during early phase of treatment was associated with relapse rate (25 vs. 44%) and a statistically insignificant increase 3-years overall survival (68 vs.46%). The use of match-related donor was associated with superior overall survival (63% at 3 years). 17 out of 26 patients who relapsed received donor lymphocyte infusion. 47% achieved complete remission and this provides evidence for graft-verse-lymphoma effect in MF/SS. On the other hand, the experience with B-cell non-Hodgkin lymphoma, chemotherapy sensitivity before the transplantation or the extent of the burden of the disease did not influence overall survival. The conjunction of total skin electron beam therapy with allogenic stem cell transplantation may consider in selected cases.<sup>[1]</sup>

#### **Conclusion:-**

Cutaneous T-cell Lymphoma (CTCL) can be difficult to diagnose. In our case report the patient received four lines of systemic therapy that included three lines of chemotherapy (CHOP, ESHAP, & GDP) and one line of biological therapy (HDAC Inhibitor; Vorinostat) that halted the disease progression, but due to recurrent skin infections disease reactivation and progression occurred. A plan of high dose chemotherapy followed by stem cell rescue is planned to eradicate the disease and to be followed by biological therapy of Vorinostat for Minimal Residual Disease (MRD) eradication.

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### RESEARCH ARTICLE

#### SOME PROBLEMS AND ESPECIALLY IDENTIFICATION OF FOSSIL CORALS.

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#### Abstract

Provides a conceptual theory of identification fossil rugosa. Discusses the possibility define the boundaries of the variability of their featured. With specific examples showing ways distinguishing consimilar and different phenones. It is shown that based on the facts already discrete phenotypes identified between the two sets of signs, one could argue about the reproductive isolation of each single species

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#### Introduction:-

We do not work with fossil corals idea of the species as such, in the usual sense of the term; we will explore the remains of the stone specimens, samples and sample series. The first thing we do - combine them into groups of similar instances phenotypic - phenone (group of organisms isolated by analyzing the morphological anatomical characteristics). Phenone, collected in one locality (geological horizon) may represent different species or intraspecific differentiates. To be able to select the identification of alternatives, it is necessary to thoroughly examine individual variability, having fully its qualitative and quantitative analysis. Only if there is a sufficiently large number of carefully labeled specimens is possible a comprehensive analysis of the variability (Mayer, 1969; Latypov, 1984; Latypov et al, 1998).

At particularly high variability of corals and diverse, "if we know its limits, we will be able to know the boundaries of dissimilar types" (Vaughan, 1907, p. 4). The values of the individual features of corals may change 10-15 times even in the same population (Latypov, 1980; Latypov, 1984, Latypov et al. 1998). D. Hill studied the variability of coal rugosa Scotland united under one specific name 77 species and 7 genera established by previous researchers. Study in detail the variability of modern scleractinian species *Stylophora*, Ch. Veron and M. Pichon clearly showed a complete series of transitions from thin-branchy to massive colonies of the species *S. pistillata* and brought 12 different species of five genera in the synonymy of this species (Hill. 1938; Veron & Pichon, 1976). Yu. Latypov showed that in different sections of the microstructure of the coral septa could be holacant and rabdacant, bottoms plate could be cystiphyllid and full sub horizontal in close proximity to each other. Inside one sample (population) we can successfully trace all types of variability, including polymorphism (Latypov, 1976, 1977, 1982).

The author at rugosa has been shown that the more a series of samples, the more fully represented in them signs of variability and accurately define the boundaries of the morphological characteristics of the species. It was found that the degree of variability of traits directly increases with the number of copies in a population. With a large increase in the number of copies and variations of border populations signs are aligned, revealing the degree of volatility that characterized the specific features of each species (Fig. 1). Persistent symptoms showed no more than a 1.5-fold,

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and variable - 12-15-fold variability (Latypov, 1982, 2014). However, the identification of known or establishment of new types of a lower taxonomic categories are extremely important for both practical and theoretical biology problems, ecology and biogeography, paleontology, paleoecology and stratigraphy - science and the industries in which no univocal determine the type of impossible any successful research .

## Results:-

### *Conceptual Introduction*

Now, on several series of samples of fossil corals look at examples of different phenone recognition and influence the result of a comprehensive analysis of the variability in the separation of taxa previously made two methodological reservations. Firstly, in all its taxonomic constructs we will be guided hypodigm. Hypodigm of taxonomists at this time and for this taxon includes all instances, personally known to him at this time, considered it as an unmistakable member of the taxon. They are used collectively as a model, which concludes as the population (Simpson. 1961). Secondly, most corals grow during the whole life cycle, and, for example, fossil and modern single scleractinian may be 1000septum. During the evolution from the single rugosa also showed an increase in number of septum up to 6 to 150. In this regard, assume that quantitative traits (such as the number septum, the cross-sectional dimensions of the bottoms of plates, their numbers at unit height, and so corallites) by themselves do not mean anything, but different meaning only relative and correlative connection or relationship with each other. They identified, usually only if a statistically significant number of treated material.

### *Phenones morphologically distinguishable*

There is a sample Silurian rugosa (about 200 copies) from one biostrom capacity of slightly more than 1 m and a length of 30 m. On the external shape all instances, except for two, completely indistinguishable. According to morphological characters, easily distinguishable from the first observation, the entire sample of the coral breaks down into 10-13 phenones, many of which are recognized by a well-defined and easily. But some of phenone in their characteristics do not allow firm conclusions about their affiliation to any known taxa, as well as to classify them to new taxa.

According to a well defined set of morphological traits identified three fairly distinct phenones cystiphyllid rugosa.

- First - Cystiphyllidae with septa arranged just rare, not radials oriented, short spikes on the surface of the septa. Deferred sclerenchyme on the horizontal skeletal elements of the minor.

- Second - cystiphyllid with radial beaded septa. Deferred sclerenchyme abundant, sometimes in the form of broad basal rings.

- And finally, a clear cystiphyllid radials arranged rows rabadant septa resembling normal lamellar septum. Deferred basal sclerenchyme moderate (Fig. 2).

Corals of phenones are significant differences in the structure of the septa, but do not have those in the structure of the bottoms and septa. Knowing that the horizontal skeletal elements have rugosa very changeable sign (Wedekind, 1927; Latypov, 1977, 1982), and, as a rule, reflects the intraspecific variation, we do not attach much importance to it.

Comparing each of the phenone a number of features set them apart from all known species characteristics cystiphyllid coral. On the other hand, a clear gap symptoms as poor development of septum in the same group of corals and clearly ranks radial rabadant numerous septa the other allows the researcher to highlight the extreme phenones into separate taxa in the hope that it does not clog the biological literature has a pair of synonyms.

But do not jump to conclusions. It is necessary to examine the age and the individual variability of coral at least one phenone. The first ten copies show that in the course of ontogenesis there are significant changes in the structure of these rugosa. All holders of clear radial partitions do not have them in the initial stages of growth, sometimes up to his middle. They are randomly scattered short septal spines, sometimes grouped only on one side of the cup. Subsequently, these groups begin to form spikes and radials arranged rows of septum. Thus, the seemingly distinct morphological gap between individual phenones in the analysis of age variation was eliminated by itself.

Analysis of these corals age variability revealed that septal apparatus during ontogeny can vary from individual spikes, length 0.15 mm without any orientation, up to 27 rows of radials arranged spikes clearly 3.5 mm (Fig. 3).

Also changeable structure themselves thorns, it varies from holacant to rabdacant. But for all its volatile nature of the septum, forming in the course of ontogeny, they have a surprising unity of development. The initial group of spikes begin to form first on one side of the cup, and then during the growth of the same side of the first radial spikes are laid. In this radial arrangement of septa is not identified at diameter of corallites less than 12 mm. Horizontal skeletal elements change in ontogeny of coral from fine swollen vesicular plates to flat variously angled up to sub horizontal.

Identification of individual variability across the sample series shows that these signs are extremely variable and not fractures. They should be considered only as intra-taxa. So, it was high variability in the number of septa, their morphology and size. When corallites diameters from 13 mm to 22 mm radial orientation of sept can be clearly consistent or completely absent, and the number of rows of spines varies from 6 to 61, and not very dependent on corallites diameter. Wherein spikes themselves may be long or short, thick and thin, as a series of dots or dashes (see Fig. 2 and 3). All signs have shown a very high degree of variability. septum length varied by 23.3 times; sixes plates bottoms - 22; fat thickness basal sclerenchyme - 24 times. The diameter of the cup corallites changed only by 1.7 times. *It is a permanent was only coloration of corallites!*

This wide range of phenotypic differences corals both phenones is a product of the same gene pool, because they do not detect ruptures on any basis, thus reveals the taxonomic integrity of phenones and reflects the intraspecific variation of many members of the same population. Indeed, they have exactly the same course of ontogeny the ever persistent attitude of the two polymorphic forms: single septal spines on septum at coral wall at the earliest stages; then forming on one side of the cup coral groups spikes, their radial orientation; and, finally, the appearance clearly radials oriented spikes (see Fig. 2-1 and 3-4). In principle, the same structure of horizontal skeletal elements, consisting of inflated vesicular plates, differentiated on the axial and peripheral areas. They develop the same type of deposits sclerenchyme lifelong coral, and there is a painting of the same skeletal elements. In all instances corallites painted in yellow-brown color.

No other specimen of thousands rugosa of the study area were found a painting corallites that would differ from the color of the host rock. By the way, when was detected this peculiarity of this species, it was suggested that copies of the form *Cysticonophyllum dentatum* (Ivanovsky 1963), similar to our species, but not having a radials oriented septum, should be painted in brown. Asked whether corallites originals *S. dentatum* yellowish-brown color, the Central Siberian Geological Museum has sent an affirmative answer.

Compare inter-population variation between set limits morphological variability characters species as a whole, showed flexibility and stability of its phenotypic traits as an indicator of the stability of the population system and the integrity of a single taxon, existed on a large space for a long time the Silurian period.

*Phenone morphologically consimilar*

Because the same biostrome there are two other phenones which slightly differ morphologically. With essentially the same structure of the skeletal elements, these coral samples at first denied signs to classify them to different taxa. At the same time almost every feature they have slight variations, yet not allow uniquely combine them into one taxon (see table).

**Table:-** Comparison of signs of morphologically similar phenones

Phenone 1	Phenone 2
Septum are banded, reach or do not reach the axis, sometimes in a weak convoluted Vortex	Septum are banded, reach or do not reach the axis, often convoluted in moderate Vortex
The location of the septum is clearly symmetric	Location of septum pinnately-subradials
Home protosepta short, the opposite-a long, comes to axis	Home protosepta stands out no longer systematically, can reach up to axis
Small septum can reach in length half radius corallite	Small septum can reach more than half the radius of the corallite
Number of septum by when diameter 9-20 mm is equal to 32 x 2-39x2	Number of septum by diameter 6-22 mm equal to 31x2-39x2
Bottoms close to cystiform	Bottoms close to cystiform
Dissepiments numerous small	Dissepiments numerous small

As the table shows, a noticeable difference corals of phenones is reduced mainly to the symmetrical arrangement of septal apparatus in one case and the absence of, at least, apparently - in another (Fig. 4.). Analysis of age variability shows that changes in the ontogeny of both phenones corals are about the same. First formed a large septum, i.e., sporadic, discontinuous septum, small partitions. With increasing diameter corallites is a further increase in the number septum both cycles. During growth of the axial ends of the spirally septum tend to curl to a greater or lesser extent. Number of septum corals both phenones fluctuates around the same range. Roughly the same behavior in all other features of both phenones, as already mentioned, in addition to the orientation and topography septum cardinal and the other septum.

When plotting the amount of septum corallites diameter (Fig. 5A) revealed a clear pattern, which imparts additional specific and, in our opinion, an essential feature that allows to distinguish the studied phenones. In corals 1st phenone new septum stopped inserted in the range of diameter sizes from 10 to 15 mm, while the rugosa 2nd phenone they continued to be inserted at corallites diameters of 18-20 mm. Both of these are characteristic for each phenone is not the modification, and the hereditary nature. It determines a different development of septal walls in ontogeny. Morphologically it is expressed in a clear bilaterally oriented arrangement of septa in one case and pinnately subradials - in another. Is not the same topography and the opposing major protoseptum in both cases. In this regard, numerous become clear phenotypic difference almost every feature. Live corals were different in structure and individual development gastrovascular cavity. The number, orientation septum time of termination of their insertion in the course determined by the number of life-cycle orientation, termination of education radial chambers, as well as mesenteric filaments and in the intestinal cavity of the polyp. In other words, these corals phenones different device throughout the organ systems, representing at *Anthozoa* physiologically isolated intestine (Villee, 1959; Beklemishev 1964; Goreau et al, 1979.; Latypov, 2016). In this case, there can be traced variously organized digestive system that was most likely due to differences in food consumption (structure, size and so forth.). Such differently arranged groups of corals is likely to be genetically determined and had concise essentice distance.

### Discussion:-

Dismantling and phenones analysis lead to the need to make decisions about their attribution to certain taxa. And in the case of differing phenones were installed transitions between the most extreme forms, and these transitions are controlled in the ontogeny of a single instance. Therefore, the assignment of phenones to the same species is not in doubt. In case of similar phenones full transitions were found, on the contrary, a sign was found that distinguishes one from the other phenone. Having one sign by which two different phenones. it is useful to obtain a conclusive determination of correlations on other, less obvious signs.

Having identified the difference between the two phenones one basis, a detailed analysis can be found a lot less visible signs, which differ in these taxa. This will more likely include such taxa to different species - known *Neocystiphyllum lateseptatum* Ivanovsky and new *N. lateseptatum* (Latypov, 1979). Building a scatter plot ratio to the number of cup diameter septum showed a clear gap between the two is also on these grounds (Fig. 5B).

Getting a complete picture of the variability of other cystiphyllid phenones all samples to determine the differences as intraspecific, take all of the samples belonging to the same species and, moreover, a subspecies *Holmophvllum holmi* antis, described Latypov (1977) considered synonym of *N. dentatum* (Ivanovsky). There is likely an example of how the members of a population (polymorphic variants) have been described by various investigators as representatives of different genera. Iwanowsky (1963) has 12 copies rugosa these different safety with septal spines without radial orientation, in any case, is clearly visible. Author (Latypov 1977) had more than 70 copies. of the same population, the vast majority of which have been well expressed by the radial orientation of the septal apparatus at a late stage of growth. After studying all the samples of the seven local populations (stratigraphically consecutive populations or populations of the system) have been discovered corals with septa, varying from single spikes to very clearly radials oriented rows rabadacant septum. It traced in the course of ontogeny the same copies of corals with multiple septal spines, not orientated radials. In each population there are two well-identified forms cysisphyllid, the frequency of occurrence of one of them (more rare) was quite high (1:15), to re-consider its rate of mutation. And roughly the ratio of occurrence of different phenotypes maintained in all populations throughout the Wenlock. Thus, it reveals not only a high degree of continuous variation of characters, but also intermittent volatility, and hence two classes of ordered groups of corals at a very prominent classification criteria, representing actually polymorphs - members of the same taxon (Fig. 3), i.e., one species (Mayr, 1969; Latypov, 1984)

Here we have an example of what species of a biological phenomenon has existed at all times that this is not an invention of taxonomists and not special "paleontological" species (Simpson, 1961; Mayr, 1969; Latypov et al., 1998). All the revealed facts - the same course ontogeny, development sclerenchyme similar formations, coloring elements of the skeleton, polymorphism frequency stability of all the members of this population system - indirectly point to the existence of this situation, the system homeostasis (Bernard, 1879). It was she who supported physiological stable conditions in many individuals all seven populations that existed during the Wenlock, in a clearly changeable environment. This is known to be quite complex regulatory system aimed at support constant internal environment, in terms of principle is the same not only for the members of the local population, but also for all members of the species. In this case we had more time to make sure.

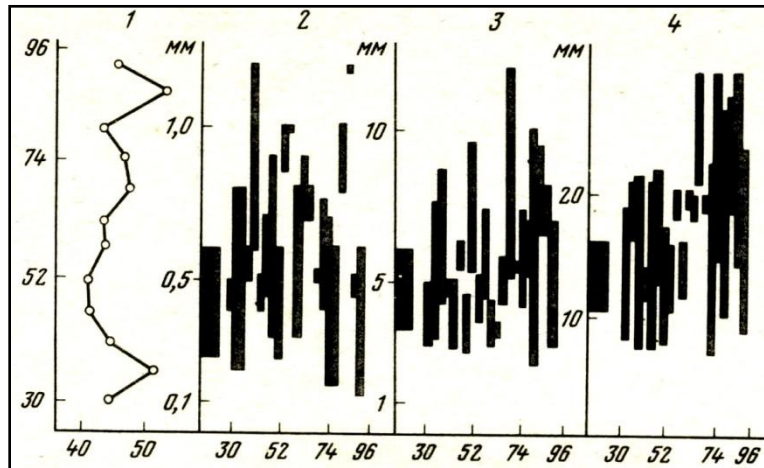


FIG. 1. Chart limits variations signs one type of coral. 1- number of septae at the same diameter, 2- width, 3- length of main protoseptum, 4- diameter corallite. Ordinate dimensions. Abscissa layers cut. 2-4 - Ordinate axis line of magnitude indications one specimen.

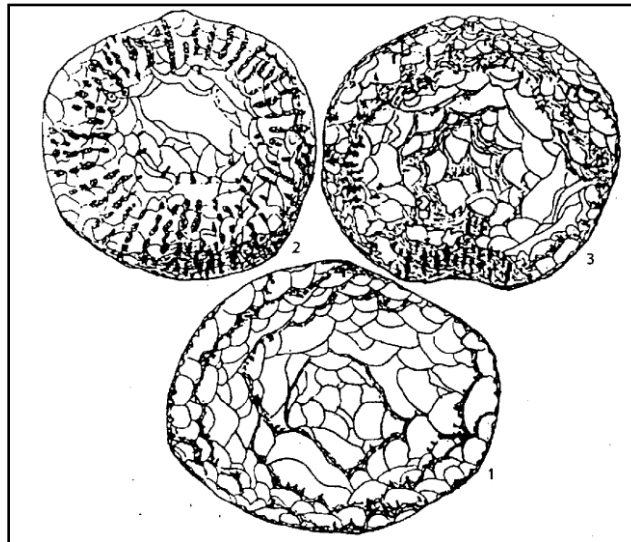
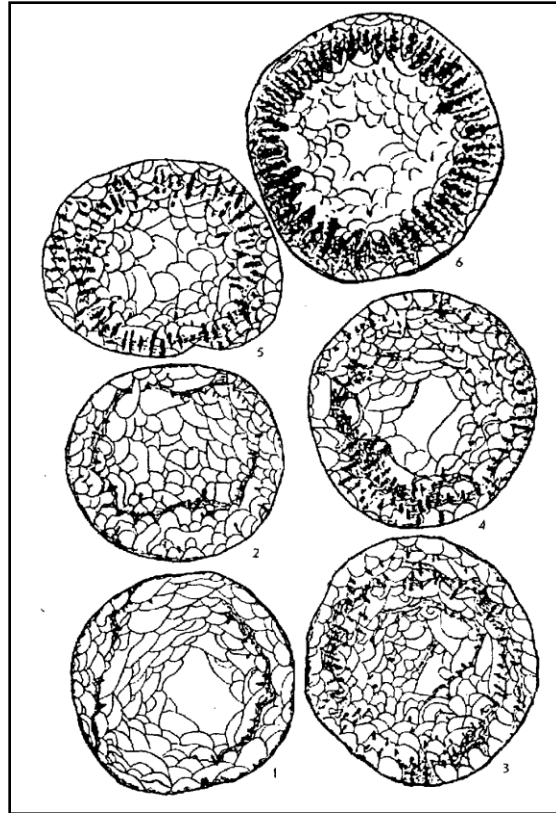
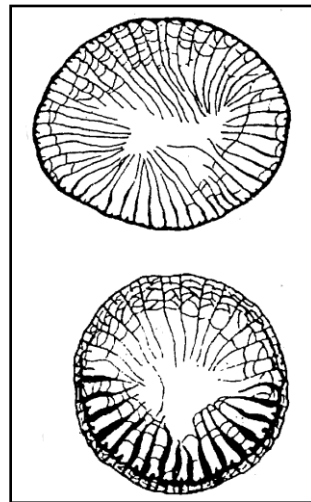


FIG. 2:- Cross-sections cystiflyllid three morphologically different phenons. 1-developed individual septal spines. 2-radial ranks of septal spines, 3-rows of thorns, blending in septum.

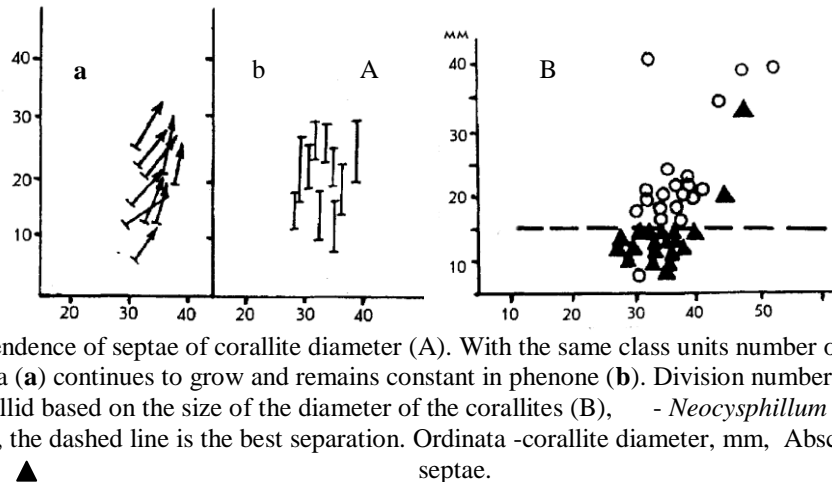




**FIG. 3:-** Individual variability in populations of *Holophyllum dentatum* from the foundation strip-pit 64 outcrops Mojero River (Siberian). 1-6-cross sections of various corallites near the bottom of the cup. Good traces transition between extreme, individuals with poorly developed septal apparatus and specimen with numerous radial rows of thorns.



**FIG. 4:-** Cross-section of corals far in the sibling relation. *Pseudophaulactis* – late Llandovery, *Caninia*- early Carboniferous.



**FIG. 5:-** Dependence of septae of corallite diameter (A). With the same class units number of corallites diameters septae phenona (a) continues to grow and remains constant in phenone (b). Division number of septae two species of cistyllid based on the size of the diameter of the corallites (B), - *Neocysphyllum simmetricum*, ○ - *N.lateseptatum*, the dashed line is the best separation. Ordinata -corallite diameter, mm, Abscissa - is the number of septae.

### Conclusion:-

By comparing samples from different populations, spatial or temporal, taxonomist looking for information that would help to decide where to put these populations - to the same or different taxa. The issue of full identity population in this never arises, for population genetics for a long time to convince us that there is a world of two completely identical individuals, even among identical twins, not to mention the identical populations (Mayr, 1969; Dobzhansky et al., 1977; Thorpe & Sole-Cava, 1994; Fukami, 2008). Therefore, the detection of statistically significant differences for any researcher certain groups of organisms - a self-evident matter.

When working with corals with extreme variability of almost all signs and. As a rule, polytypic species often gets question - if large enough differences between the samples (populations), allowing them to consider different types? In most cases we have isolated geographic or stratigraphically allopathic populations (Latypov et al., 1998; Manchenko et al., 2000; Baker, 2006). The criterion of reproductive isolation in pure form unfortunately, we can not use. And besides, to cross two or experimental specimens of suspected species we first must establish that this particular one or two related species, and this is our main problem. It remains to rely on probable evidence that reproductive isolation is correlated with the a certain degree of phenotypic outwardly visible difference and fairly constant within a given taxonomic group, i.e., to act on the reverse. If detected within a given taxon group is quite clear morphological differences, with good signs of a break, then we can assume that these groups - good views.

Thus, the problems encountered in the establishment of intra-and intraspecific differences identified morphophysiological, ecological and Ethological means, can be solved by using biochemical, cytogenetic, electrophoresis studies. But in any case, the original conclusion about the similarities or the differences between taxa is done based on the absence or presence of the unfilled gap in those or other signs, identification and comparison of the specific characteristics of each taxon. Then it turns out what biological reasons cause the differences and similarities of traits. And based on the facts already discrete phenotypes identified between the two sets of signs, one could argue about the reproductive isolation of each single species (Mayr, 1969; Latypov, 1984; Latypov et al., 1998; Manchenko et al., 2000, Latypov 2014, 2015).

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### RESEARCH ARTICLE

## IMPROPER SEMANTIC INTERPRETATIONS OF FOOD IDIOMATIC EXPRESSIONS BY IRAQI EFL LEARNERS.

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#### Abstract

The current paper is concerned with elaborating the improper semantic interpretations by Iraqi EFL learners concerning the performance of the idiomatic expressions. In particular, the paper shows the semantic failures of Iraqi EFL learners concerning the use of food idioms. The most important thing which it attempts to encompass is to show whether a food item in certain contexts is understood as a kind of food or as an idiomatic expression. This is mainly done through analyzing the responses of the learners when doing a test containing this type of idiomatic expressions. The study reveals that EFL learners fail when they attempt at explaining such food idioms due to various levels of semantic inefficient knowledge.

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#### Introduction:-

This type of idioms is a very interesting field of investigation as it provides insights on how people utilize language figuratively to be more effective and as it is part of the cultural aspect of the users of that language. A pure idiom, as defined by Fernando and Flavell (1981:48), is a 'non-literal set expression whose meaning is not a compositional function of its syntactic constituents but which always has a homonymous literal counterpart.' Fernando (1996:35-36) gives a more working definition of it as 'a type of non-literal, multiword expression.' The current paper attempts at showing the various levels of semantic failures of the use of such idioms when by Iraqi EFL learners. An empirical test is administered to show the attributes of semantic failures when learners explain food idiomatic expressions in specific contexts.

#### Definition and Main Properties of Idioms:-

There have been many attempts to define the word 'idiom'. An 'idiom' is usually understood to be as "a unit of two or more words whose meaning is not the combination of its syntactic elements" (Pinnavaia 2010: 25). Since, as this definition suggests, the whole meaning of an idiom is not inferred from the meanings of its constituents, idioms can be described as being semantically opaque expressions (Svensson 2008: 84). In fact the assumption that all idioms are opaque to the same extent is not altogether correct. It is argued that an expression can be defined as transparent when "a language user understands it without any problems, without any other previous knowledge than understanding the separate words that make up the expression". Expressions which are usually characterized by a high degree of transparency are similes such as easy as pie, as good as gold and white as snow (ibid).

In other cases, an expression such as kick the bucket can be labeled as opaque, since its idiomatic meaning bears no relationship to the meanings of its constituents (Tabossi and Zardon 1993: 145). Similarly; idioms have been shown

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to range from fully frozen to fully flexible. In other words, although “[c]ertain morphological and syntactic operations are allowed for virtually all idioms (e.g., insertion of an auxiliary in the phrase)”, idioms vary in the extent to which they can undergo morpho-syntactic transformations without losing their idiomatic meaning. Thus, in the case of a frozen idiom like kick the bucket (i.e. to die); it is not possible, for example, to passivize the idiom (e.g. the bucket was kicked by John) and still retain the idiomatic meaning. On the other hand, in the case of a more flexible idiom like lay down the law (i.e. to give strict orders), the passivization of the idiom (e.g. The law was laid down by her father) is possible in that it does not appear to change the figurative meaning of the idiom (Peterson and Burgess 1993: 208).

The other important intrinsic property concerning idioms is that they have some apparent communicative or discourse purpose. In other words, the acceptability of an idiom’s variant is dependent on the extent to which a listener/reader can infer communicative intent from the use of the idiom’s variant. For example, in the decomposable idiom spill the beans, the lexical substitution of pour for spill might be considered acceptable or not. If a listener/reader is not able to infer a communicative purpose from the replacement of spill with pour, then the variant pour the beans will be viewed as a mistake Glucksberg (1993: 19).

The latter function implies that speakers/writers can express positive or negative opinions about a particular fact or event by means of idioms, or, more precisely, by exploiting the positive or negative evaluations conveyed by idioms. The reason for the use of idioms as tools to express personal opinions lies in the communicative effects that can be obtained on listeners/readers (ibid: 302).

### **Analysis of Food Idiomatic Expressions:-**

This section is entirely devoted to analyse the food idiomatic expressions as they are used in various contexts focusing mainly on their non-literal meanings so as to have a better understanding of how they function in a given language. This means that the analysis will comprise the semantic level of language since such idioms fall within the study of the meanings they intend to convey and also other levels such as the culture and society in which such idioms are used.

### **Semantic Analysis of Food Idiomatic Expressions:-**

There is no doubt that food idiomatic expressions fall within the non-literal (or figurative) study of semantics since they convey meanings which are not related to their literal interpretations at all. Many food idiomatic expressions originated from colloquial speech and slang, the others can be presented as the result of specific historical circumstances. For example: "to be worth one's salt" –is idiomatic expression meaning "someone getting a salary not for nothing," but when translated literally it means "to be worthy of salt." Although today salt is one of the cheapest products in the history of man-kind, there have been periods when the salt was equal to gold. Thus, "to be worthy of salt" reflects human rights importance. As food is a prerequisite condition of human being almost every culture it finds important ceremonial, ritual and symbolic meanings connected with lexical level of language. In general, the semantic features of the majority of food idioms can be seen as types of connotations which can be defined as "additional semantic markers which are associated with the value judgments of a speech community or of an individual speaker or writer" (Gläser 1998: 127). They are usually used to cause an emotional reaction or to emphasize something that has been written or said by the user of language. Concerning food idiomatic expressions, three major types of connotations can be recognized: expressive, stylistic and register connotations. Expressive connotations can be of various types including humorous (e.g. "to have a bun in the oven"). Stylistic connotations are usually used in conversations and can be informal (e.g. "bad egg"). Finally, register markers, as a final type of connotations, usually appear in dictionaries as references to a specific field and can be related to astronomy, economics, medicinal etc. (ibid: 128).

### **Cultural Analysis of Food Idiomatic Expressions:-**

Since the paper focuses on the use of food idiomatic expressions in contexts and why learners may fail to interpret them efficiently, it is very significant to shed light on the use of such idioms as far as their use and meanings in culture and society are concerned. This is basically due to the fact that foods have a range of cultural meanings; they communicate information in terms not only of occasion but also social status, ethnicity and wealth. These meanings, however, are not intrinsic in foodstuffs. The meanings of such idioms rely heavily on the social context in which the items are found (Murcott, 1982: 203). The preparation and consumption of food provides, moreover, a material means for expressing the more abstract significance of social systems and cultural values. It may be argued that what people are prepared to take inside their bodies reflects their social identities, and their membership of social groups.

To view eating habits as a matter of culture is to understand that they are a product of codes of conduct and the structure of social relationships of the society in which they occur. Food, then, has both a material and a symbolic significance (ibid: 204).

### **Methodology of the Test:-**

Brown (1989: 129) defines a test as “a method of measuring a person’s ability or knowledge in a given area”. A reliable test should include testees, relevant data to achieve the aims of the test, scoring of the subjects’ answers to the test items and the interpretation of the response (ibid). The test is based on “A Lesson on Food Idioms” by Yen-Ling Teresa Ting (appendix1). The test includes food idiomatic expressions used in specific context to be interpreted by those learners with answers as typical interpretations so as to compare them later on to the responses of the learners. The test is given to each learner on a sheet of paper and each one is given a proper time to read and then answer. The sample includes ten students from the fourth grade are chosen from the Department of English/ Cihan University/ Sulymania/ for the academic year 2016-2017. The responses are then analysed for the purpose of showing the kinds of the semantic failures the learners may commit while trying to explain such idioms. As far as the scoring is concerned, Harrocks and Schannover (1969:76) believe that for the purpose of objectivity of the test, a scoring scheme must be objective and accurate. In scoring the subjects’ responses to the test items, the researcher depends on a ‘write-wrong basis’ or the ‘1-0’ principle by giving ‘1 mark for the correct answer and ‘0’ for the incorrect one.

### **Results and Analysis:-**

Within this vital section, the responses of the learners are analysed and discussed in detail so as to determine the semantic inefficient knowledge while trying to interpret the given idioms. Each failure is grouped according to the type of the semantic inefficiency or lack of knowledge.

#### **Failure due to Literal Interpretations:-**

This is the most frequent kind of the semantic failure which the responses of the learners showed. Mainly, this failure can be clearly attributed to the fact that learners did not recognize that a given food idiomatic expression is used in a non-literal sense instead of a literal one. In other words, the learners explained the idioms with regard to its literal interpretation; food stuff (as found in the test) is deemed purely food by the learners since they have a severe lack of knowledge about the non-literal use of food idiomatic expressions. The result of such explanations was entirely improper and not related at all to the intended meaning of the idiom as in the following examples:

Ex (1) “bring home the bacon means that Bob is eating a kind of meat.”

Ex (2) “well I think that this guy is interested in delicious food.”

Ex (3) “Mark doesn’t know to choose good egg.”

Ex (4) “He may not prefer tea but other kind of drinks, I think.”

Ex (5) “He needs a piece of cake in his job so as not to feel hungry.”

Ex (6) “ we need butter for health and other things.”

So the learners, as the responses clearly reveal, do not match the intended meaning; they totally interpret them as food stuff because they only took literally the meaning of the food (as for example the word ‘bad’ with ‘egg’ referring to a bad person) ignoring the other words which appear with the food expression or, in some cases, they ignored the entire idiomatic expression (as for example half-baked referring to an issue under discussion). In doing so, the entire context is ignored by the learners and this means that not recognizing that such expressions are used non-literally is a clear evidence of the fact that the learners have inefficient knowledge of the idiomaticity of food expressions and, thus, they are unaware of the communicative function of the use of such idioms. The total percentage of failure due to this factor is 25%.\*

\* The statistical procedures are recommended and supervised by the statistical expert Assist. Prof Dr. Atheer Anwar / College of Business Administration/ University of Anbar.

#### **Failure due to Improper Non- Literal Interpretations:-**

Although some responses showed that the learners are aware that the food idioms are used non-literally, they were unable to identify the exact or intended meaning of the given food idiom. So, they had knowledge of the fact that food is used as idioms but they did not have knowledge of what they exactly mean, again the result was improper

interpretations due to the fact that they are unfamiliar with the intended meaning as used in the given context as in the following examples:

Ex (7) "hot potatoes refer to an idea which they try to have."

Ex (8) "spill the beans is something unusual which may be difficult."

Ex (9) "one smart cookie means to get a new thing in life."

Ex (10) "it is the big thing that is not really important."

Ex (11) "we must say the truth when we talk about spill the beans."

The total percentage of failure due to this factor is 18%.

#### **Failure due to Total Lack of Semantic Knowledge:-**

In some cases, learners showed total awkwardness and severe shortage of semantic knowledge. This can be seen clearly when the responses were left unanswered or they included weak performance of language as in the following examples:

Ex(12) "his noodles are .....not clear.. noodles."

Ex (13) "chew is something that is.....not sure

The total percentage of failure due to this factor is 18%.

#### **Conclusion:-**

Food idiomatic expressions are one of the important idioms used in English language in various spoken and written contexts. The main feature of such idioms is the fact that they are used non-literally to make the use of language more effective and more colorful. In most cases, they have important communicative functions and various purposes. In general, Iraqi EFL learners lack knowledge of the intended meanings and communicative functions of food idiomatic expressions due to semantic attributes. They are unaware of the non-literal aspect that such idioms have when they are used in various contexts either because they are not familiar with them or they were not exposed to such idiomatic expressions in their academic studies. In some cases, the responses of the learners show that they lack total knowledge of semantics particularly the lexical meanings of certain words. In fact, Iraqi EFL learners should be exposed to such kind of knowledge so as to have a better performance and so as to improve their skills of communications when using various kinds of idiomatic expressions.

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**Appendix 1:-**

Read the following passage carefully then explain the underlined idioms according to the way they are used in the passage:

**Bringing Home the Bacon on the Gravy Train:-**

Bob works hard to **bring home the bacon**<sup>1</sup>, and put **bread and butter**<sup>2</sup> on his family's table. Every morning, he drags himself to his desk at the bank and faces his tedious 10-hour-a-day job. His boss, Mark, is a **bad egg**<sup>3</sup> but has somehow taken a liking to Bob so he always speaks well of Bob in front of Mr. Davies, the owner and **big cheese**<sup>4</sup> of the company. Mark tells Mr. Davies that Bob's **the cream of the crop**<sup>5</sup> and is **one smart cookie**<sup>6</sup> who **uses his noodles**<sup>7</sup>. Mark likes to **chew the fat**<sup>8</sup> with Bob during coffee break and discusses **half-baked**<sup>9</sup> company plans with him because he trusts Bob and knows that Bob won't **spill the beans**<sup>10</sup> behind his back. On these occasions, Bob tries to avoid any **hot potatoes**<sup>11</sup> and, even if Mark isn't **his cup of tea**<sup>12</sup>, Bob makes an effort to **butter him up**<sup>13</sup> by leading Mark into discussions about electronic gadgets which Mark **is nuts about**<sup>14</sup>. Bob really thinks that Mark is **out to lunch**<sup>15</sup> and **nutty as a fruitcake**<sup>16</sup>, but **in a nutshell**<sup>17</sup>, if he **polishes the apple**<sup>18</sup>, his job could become a **piece of cake**<sup>19</sup> and maybe one day he will find his **gravy train**<sup>20</sup>.

**Typical Interpretations:-**

Idiom	Meaning	Idiom	Meaning	Idiom	Meaning	Idiom	Meaning
1	Make a living	6	An intelligent person	11	Problematic issues	16	A little crazy
2	Food	7	Thinks	12	The type of person he likes	17	Basically
3	Scoundrel	8	Share confidential information	13	Chat	18	continues to be servile and brown-nose his boss
4	Boss	9	On the table but still not official	14	Really likes	19	Very easy
5	The best	10	Show admiration	15	A little out of touch with reality	20	Big income with little effort





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### RESEARCH ARTICLE

#### SPIRITUAL MARKETING: A STRATEGY TO INCREASED NUMBER OF ISLAMIC BANKING CUSTOMER IN CIANJUR, WEST JAVA, INDONESIA.

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Customers, Islamic Banking, Religiosity, Scholars, Sharia and Spiritual Marketing.

#### Abstract

The districts of Cianjur known as the city of students (*santri*), with 98% of the total population are Muslim. So that makes the Islamic scholar (*ulama*) as a central figure in deciding an issue or phenomenon that occurs in the community. Islamic banking have grown in Cianjur district, but the community's decision to choose Islamic banking in Cianjur very low. Cianjur community decision should choose Islamic banking is very high because it is motivated by the religiosity of the scholars. It's a big question for researchers, actually how much influence religiosity and scholars in an increasing number of Muslim Islamic banking customers in Cianjur. This study proves that the factor of religiosity (piety) of the Islamic scholars (*ulama*) has a significant effect on the increased number of customers of Islamic banking in Cianjur. However, the scholars also insist that the procedures need to be improved, since there are still some problems in the contract that violates the principles of Sharia. One of them is the practice of *mudaraba*, where the Islamic banking should emphasize more in the aspect of trust instead in the aspect of insurance owned by clients or potential clients. While from the aspect of profit sharing, the Islamic banking still based its profit from the expected return rather than on the actual return. Similarly in the practice of *murabahah bil wakalah*, which is considered to be inconsistent in practice (*akad*). All this, eventually affect the public doubt in the aspects of Sharia compliant on Islamic banking itself. For the rational, this condition has become the reason to re-switch into conventional bank; but for the emotional, it has no effect whatsoever. Because, the condition of conventional bank used interest system (*riba/usury*) in practice (contradictory with principles of sharia). This study also offers solution in the form of Islamic banking marketing model accompanied with spiritual approaches. This particular approach of spiritual values is one of the most effective ways in order to increase the participation and awareness in Cianjur district to use Islamic banking in its economic activities. This research strengthen the theory of Philip Gerrard, J. Banton Cunnghen, S.A Metawa, and Almosawwi, which proves that the customers are motivated by religious factors (customers emphasized to principles of sharia loyalty) in choosing Islamic bank. The study also, at the same time, denied the theory by Norafifah Ahmad and Sudin Haron, Baeck Ulrich, and T.

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Coyle, which concluded that the motivation of customers is not influenced by religion instead on the profit calculation.

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### **Introduction:-**

Islamic economic developments in the world starting with the establishment of Islamic banking and then followed by the establishment of Islamic financial institutions. Rapid growth encourage academics in various universities conduct more in-depth studies in various forms of research, discussion, and even develop it into a course either undergraduate to doctoral. Along with the Islamic economic development that have surfaced various research results which stated that the increase in the number of customers of Islamic banking and Islamic financial institutions are motivated by factors of religiosity and material benefits (rationality), where the public insists on adherence to the principles of Islam and the benefits to be obtained.

Various studies, which states that the decision of the people choose Islamic banking and Islamic financial institutions are motivated by factors such religiosity conducted by Philip J. Gerrard and Banton Cunngghen<sup>[4]</sup> which concluded that 22.6% of respondents from among the Muslim states that religiosity of religious reasons is the main motivation for saving money Islamic banking and Islamic financial institutions. The conclusion drawn in Muslim circles in Singapore as its object. S.A Metawa and Almosawwi<sup>[5]</sup>, this study proves that in choosing Islamic banking customers are motivated by a factor of religiosity, in which the customer stressed to compliance with the principles of Islam. Later, this conclusion is also expressed by Sehrish Rustam, Saiqa Bibi, Khalid Zaman, Adeela Rustam and Zahidul-Haq in the Perceptions of Corporate Customer toward Islamic banking Products and Services in Pakistan<sup>[6]</sup>. The conclusion of this study, stated that religiosity factors and factors of economic rationality a big influence on the selection of corporate customers in Pakistan. However, they still have less knowledge of the Islamic banks.

Meanwhile, the results of research which states that public perception to the Islamic banking and Islamic financial institutions are motivated by a gain factor of material (rationality) were performed by Norafifah Ahmad and Sudin Haron<sup>[2]</sup>, the study concluded that the decision of the people (customers) in choosing Islamic banking not influenced religiosity or faith in religion, but more influenced by the gains in the use of bank services. Next, research conducted Ulrich Baeck<sup>[1]</sup>. The results of this research are knowledge and education more factors influence their attitudes and behavior in choosing Islamic banking, the higher the education, the knowledge and awareness of the Islamic financial system will be better. Then, the research conducted T. Coyle<sup>[10]</sup>, the results of his research concluded that the motivation of customers choose the services of Islamic banking is not influenced by religiosity but tend to be based on the profit motive.

The society decision to choose Islamic banking in Cianjur very low. Currently, customers of Islamic banking in Cianjur only about 5-8% of the total population of 2.335 million. In fact, 98 % of the population in Cianjur is Muslim. Also known as the city of students, which makes scholars as the central figure in deciding an issue or phenomenon that occurs in the community. Supposedly, the decision of the people choose Islamic banking in Cianjur will be high because motivated by factors religiosity scholars. This, the big question for researchers, actually how much influence the religiosity of scholars to the increasing number of customers of Islamic banking in Cianjur.

### **Materials and Methods:-**

The research seeks to investigate the effect of Islamic scholar religiosity and the increased number of Islamic banking customers by using questionnaires sent to participants. The data used in this study are primary data in the form of results of a questionnaire distributed to the peoples in the district of Cianjur. The number of respondents was 100. According to Elis RatnaWulan and Uus Ahmad Husaeni<sup>[11]</sup>, that the nonprobability sampling technique was applied, in particular accidental sampling, which means sampling by coincidence, i.e., anyone who by chance met and elected to be the respondent. Data analysis techniques used in this study is as follows:

#### **Likert Scale:-**

According to Sudarmanto<sup>[7]</sup>, RS Likert developed a grading system that represents a bipolar continuum. At the left end are lower grades indicating a negative answer, while at the right end are greater numbers that indicate a positive answer. The Likert format is designed to allow customers responded in varying degrees on each item that describes services or products. The benefit of using the Likert-type format over a check list format that only provides "yes" or "no" responses is that the former accounts for the diversity of the responses for an item, ranging from 1 to 5. This

allows the consideration of various dimensions of perception and attitude regarding a given issue, allowing respondents to express their opinion about it.

#### Validity Analysis:-

According to Sudjana<sup>[8]</sup>, validity indicates the level or degree of data being used as evidence to support the conclusions drawn from the value derived from the size or scale used to measure the degree to which something is supposed to be measured. The data is said to be valid when the value corrected Item greater than the value of r table with  $df = n - 2$ .

#### Reliability Analysis:-

According to Sugiono<sup>[9]</sup>, reliability is defined as the extent of measurement that is free of variance error. To estimate the reliability of the variables studied, we used Cronbach's alpha. The coefficient is generally determined with SPSS software, which is designed to be able to calculate the estimate of reliability. A variable is said to be reliable if the value of Cronbach's Alpha is  $> 0.6$ .

#### Correlation Analysis:-

According to Sudjana<sup>[7]</sup>, correlation analysis is useful to assess the strength, significance, and direction of the relationship between the two variables. The direction of the relationship tested in the correlation analysis can indicate three patterns of relationships. The first pattern is a positive relationship or relationship in a unidirectional pattern; the second pattern is a negative correlation or relationship patterned in the opposite direction; and the last is where there is no pattern in the relationship. In measuring the degree of correlation, Pearson's correlation method was used and the analysis was completed through the SPSS software.

#### Regression Analysis:-

According to Sudarmanto<sup>[7]</sup>, regression analysis is a type of parametric analysis that can serve as a basis for predicting and analyzing the variants. Some of the objectives of regression analysis, among others, are to determine the regression line equation based on the value of the constants and the resulting regression coefficients, which indicate correlations between independent variables with the dependent variable, and to test the significance of independent variables on the dependent variable through F. Regression analysis is used to test for correlations partially between independent variables with the dependent variable and examine the significance of independent variables on the dependent variable through the *t*-test.

### Results and Discussions:-

#### Validity and Reliability Test:-

The validity and reliability tests were conducted to determine how many questions are valid and reliable, on the basis of a survey of 100 respondents. The results of tests on the validity and reliability of the questionnaire items are presented in table 1.

**Table 1:-** Operationalization Islamic Scholar Religiosity, and Increased Number of Islamic Banking Customers

Variable	Item	Correlated Items	Cronbach's Alfa
Islamic Scholar Religiosity	R1	0.484	0.626
	R2	0.376	
	R3	0.434	
	R4	0.383	
	R5	0.373	
	R6	0.464	
	R7	0.321	
	R8	0.258	
	R9	0.425	
	R10	0.373	
Increased Number of Islamic Banking Customers	I1	0.633	0.641
	I2	0.331	
	I3	0.651	
	I4	0.354	
	I5	0.533	
	I6	0.580	
	I7	0.558	
	I8	0.201	
	I9	0.576	
	I10	0.533	

As shown in Table 1, all items pertaining to the variables considered were valid because the value of Cronbach's alpha was positive (+) and greater than 0.1966 (r table) with  $df = n - 2$  or  $df = 98$ . The value of Cronbach's alpha for each variable was greater than 0.6, ranging from 0.628 to 0.641, which shows that the four variables were reliable.

#### **Correlation Analysis:-**

A close relationship was noted between Islamic scholar religiosity and increased number of Islamic banking, and the value of R was 0.756. This indicated a strong correlation between the variables of Islamic scholar religiosity and increased number of Islamic banking. The positive (+) sign of the value indicates that Islamic scholar religiosity and increased number of Islamic banking have a unidirectional relationship, indicating that the higher the value of Islamic scholar religiosity, the higher the value of increased number of Islamic banking.

#### **Regression Analysis:-**

Correlation analysis of independent variable on the dependent variable was followed by regression analysis to determine the influence of independent variable on the dependent variable. The results of the regression analysis are expressed as the following regression equation:

$$Y = 1,001 + 0,571 X$$

In regression analysis, a significant influence simultaneously or together was noted between the dependent variable and independent variable. This is evidenced by the results of the F test, which had a significance level of 0.000, a value that was lower than  $\alpha = 0.05$ . This is also supported by the results of the analysis of determination coefficient, which indicated that the independent variable in this study are related to increased number of Islamic banking customers in 57.1% of the cases, while variables other than those included in this study accounted for the remaining 42.9%.

#### **Spiritual Marketing (the New Marketing of Islamic Bank):-**

Based on the results of research on the Effect of Religiosity and the Islamic Scholar Increased Number of Islamic Banking Customers in Cianjur. It can be concluded that the variables Islamic Scholar Religiosity significant effect of 57.1% on the variable Increased Number of Islamic Banking Customers. It is very interesting if the Islamic factor Scholar Religiosity was developed to increase the number of customers of Islamic banking into a new approach to the science of modern marketing. Nowadays, almost all research on Islamic banking to conclude that Islamic banking still need to be developed from various aspects and dimensions so that truly meet the expectations of not only Muslim societies but also the world community. Problems often arise about the public perception of Islamic banking are public assumes that the Islamic banking and conventional banking alike, Islamic banking do not professional services, until the assumption that the brand image of "sharia" is used by the banking industry is only a symbol and identity. A very interesting fact is people who have mistaken views and skeptical of the Islamic banking are Muslims themselves.

Therefore, the results of this study provide a basic concept of spiritual marketing for Islamic banking, the authors focus on the concept of Islamic Scholar Religiosity. Based on interviews and research directly to the public as a key informant in the study (*majelis ta'lim*) in parts of the district of Cianjur. The results showed that the public strongly believes the adage or advice issued by local clerics while running recitation. And the role of the clergy as a resource not only spiritual, but also serve as the policy makers in deciding a problem of individuals or groups. The scholars view that that principle of Islamic banking operations need to be improved. Because, there are still some problems in the contract that are contrary to the principles of sharia economy. One of them is the practice of *mudaraba* should emphasize the aspect of trust, but in reality the Islamic banking more emphasis on aspects of collateral owned by clients or potential clients. Then, from the aspect of the determination of profit sharing, Islamic banking based on the expected return and not on the actual return. Similarly, the practice of *murabahah bil wakalah*, which is considered to be inconsistent in the application of it contract. This, impact on the public to doubt the aspects of sharia compliant Islamic banking itself. To the rational, these conditions have an impact on the selection of another bank switching (conventional banking). However, for groups of religious emotional this condition has no effect. Because the condition of conventional banks which use the system of interest (riba/usury) in practice, so contrary to Islamic principles. They cling to one of the rules of *ushul fiqh* which is "*ma la yudraku la yutrakukulluh*" meaning that cannot be left entirely do everything.

It is, to be one way Islamic banking to pursue cooperation with the Islamic scholars in Cianjur district to promote Islamic banking in order to increase the number of customers of Islamic banking increased. By way of approach of the scholars through Islamic factor Scholar Religiosity is recommending congregation or his students to become customers of Islamic banking. The scholars can be used as an alternative by Islamic banking to be the reference group in increasing the number of customers. The reference group is the group that is the size of a person's behavior shaping personality and attitude of a person to make his choice. According to Paul Peter and Jarry Olsen, there are three reference group influence, namely: information influence occurs when an individual uses the behavior and opinion of the group members as a contribution very useful information. Normative influence, sometimes referring to the utilitarian influence, occurs when the individual meets the expectations of the group to get a direct reward to avoid sanctions. Identification influence, also called value-expressive influence, occurs when an individual has experienced internalization of values and norms of the group<sup>[3]</sup>. According to investigators, spiritual approach to marketing done by the scholars to recommend congregation or its students to become customers of Islamic banks will succeed because the people in the district of Cianjur when obedient and submissive to the advice and recommendations given by the scholars.

### Conclusions:-

1. Based on the research that has been discussed, it can be concluded that: Testing is done on the hypothesis (Ha) Effect of Increased religiosity are the scholars of the Islamic Banking Customers in Cianjur. Can be seen from the t test resulted in the regression test  $t_{count} > t_{table}$  (11.416 > 3.94) thus proving the hypothesis (Ha) is accepted and the coefficient of determination (R<sup>2</sup>) of 0.571 or 57.1%
2. Based on interviews and research directly to the public as a key informant in the study (*majelis ta'lim*) in parts of the district of Cianjur. The results showed that the public strongly believes the adage or advice issued by local clerics while running recitation. The role of the clergy as a resource not only spiritual, but also serve as the policy makers in deciding a problem of individuals or groups. By way of approach of the scholars through Islamic Scholar Religiosity factor is recommending congregation or his students to become customers of Islamic banking. The scholars can be used as an alternative by Islamic banking to be the reference group in increasing the number of customers using the spiritual marketing concept.

### Acknowledgment:-

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### RESEARCH ARTICLE

## CORRELATION BETWEEN CLINICAL MANIFESTATIONS AND CD4 COUNT LEVEL IN SERO-POSITIVE HIV PATIENTS WITH TUBERCULOSIS.

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#### Manuscript Info

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#### Abstract

##### Aims & Objectives:

- 1.To study the various clinical manifestations of both pulmonary and extrapulmonary tuberculosis in HIV positive patients.
- 2.To observe the impact of CD4 count on the severity of manifestations of TB in HIV positive patients.
- 3.To determine the correlation between clinical manifestations and CD4 count level in seropositive HIV patients with tuberculosis.

##### Materials And Methods:

Study was conducted on 100 HIV sero-positive patients with TB ( Pulmonary and Extra pulmonary)

##### Inclusion Criteria:

- Patients who were HIV sero-positive according to NACO guidelines.
- Patients diagnosed as new TB (Pulmonary and Extrapulmonary as per WHO criteria)

##### Exclusion Criteria:

- Patients with past H/O TB or diagnosed TB before being detected as HIV positive.
- Patients on long term immunosuppressive therapy or having co-existing immune-suppressive conditions.

##### Results:

- Mean CD4 count in the study was relatively higher at  $289.96 \pm 177.49$ .
- Extra pulmonary TB was the most common type. Amongst the extrapulmonary TB, TB lymphadenitis was the most common in 40% followed by Pleural effusion in 20%.
- Amongst X-ray findings, Pleural effusion was most common followed by infiltrative lesions, mediastinal and hilar lymphadenopathy.
- Sputum positivity was relatively low.

##### Conclusions:

- Correlating CD4 levels with the various forms of TB and radiological manifestations of PTB, proves beyond doubt that sputum+ve PTB occurs at a much higher CD4 count followed by sputum-vePTB, EPTB, disseminated TB with gradually diminishing CD4 count.

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- Thus overall the significant correlation of CD4 count with clinical and radiological manifestations revealed in this study re-establishes CD4 count assay as a useful diagnostic tool, prognostic indicator and a guide to assessment of response to therapy.

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### **Introduction:-**

Association between tuberculosis and HIV –HIV TB coinfection is an immediate, grave public health & socioeconomic problem in the developing countries.

Impact of HIV on TB –It worsens the tuberculosis situation by increased reactivation of latent tuberculosis infection in dually infected persons, favouring rapid progression of new infection.

### **CD-4 Cell:-**

CD4 cells or the T-helper cells, are a type of WBC'S that fight infections.

HIV has a special predilection for CD4 cells.

Effect of HIV on CD4 cells is that it can destroy entire “families” of CD4 cells following which opportunistic infections take over.

Typical characteristic of tuberculosis is that it occurs throughout the course of HIV at all levels of CD4 counts.

### **Clinical Manifestations Of HIV-TB:-**

Pulmonary involvement occurs in 75% of all HIV – TB coinfection.

Clinical manifestations depend on the level of immunosuppression . Typical manifestations occur when CD4 + T cell count > 200 cells/cumm. Atypical manifestations and extrapulmonary manifestations ( ranging 46% to 79% ) occur at CD4 cells + T cell count < 200 cells/ cumm.

### **Aims And Objectives:-**

To study the various clinical manifestations of both pulmonary & extrapulmonary tuberculosis in HIV positive patients.

To observe the impact of CD4 count on the severity of manifestations of TB in HIV positive patients.

To determine the correlation between clinical manifestations & CD4 count level in seropositive HIV patients with tuberculosis ( both pulmonary & extrapulmonary )

### **Methods:-**

The study was conducted on 100 HIV sero-positive adult patients with tuberculosis ( both pulmonary & extrapulmonary) who visited the department of Pulmonary Medicine ( OPD & indoor)

### **Inclusion criteria –**

Patients who were HIV seropositive as per NACO guidelines.

Patients who were diagnosed as new tuberculosis cases ( both pulmonary & extrapulmonary ) as per WHO criteria .

### **Exclusion criteria :**

Patients with past history of tuberculosis or diagnosed tuberculosis before being detected as HIV positive.

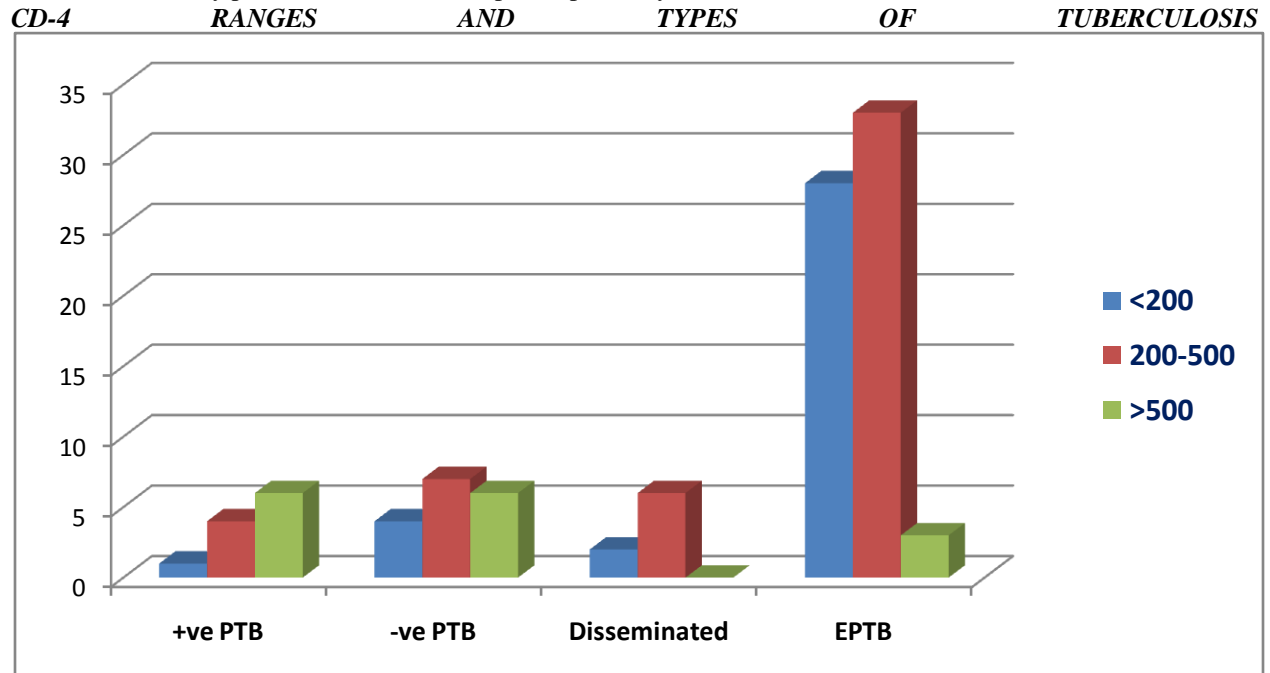
Patients on long term immunosuppression therapy or co-existing immunosuppressive conditions .

**Results:-**

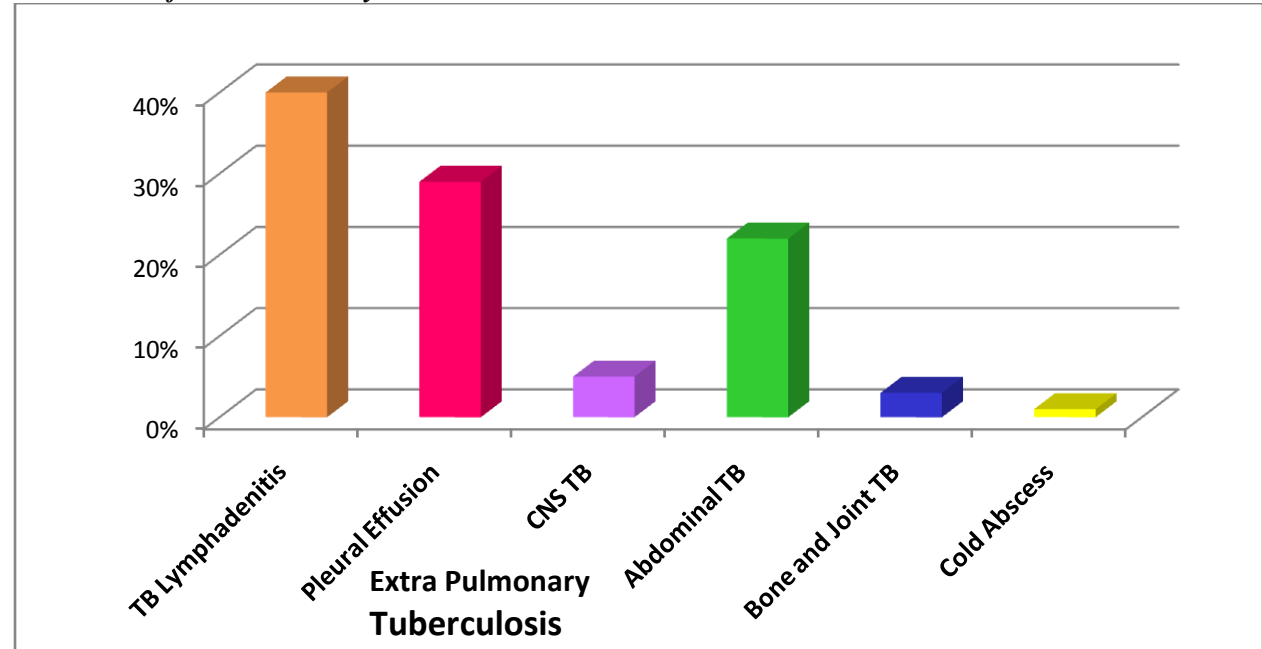
Mean CD4 count was high at  $289.96 \pm 177.49$ .

Extrapulmonary tuberculosis was the most common type of TB.

Amongst the extrapulmonary tuberculosis , tuberculosis lymphadenitis was the most common (40%), followed by pleural effusion(29%) .Sputum positivity was low.

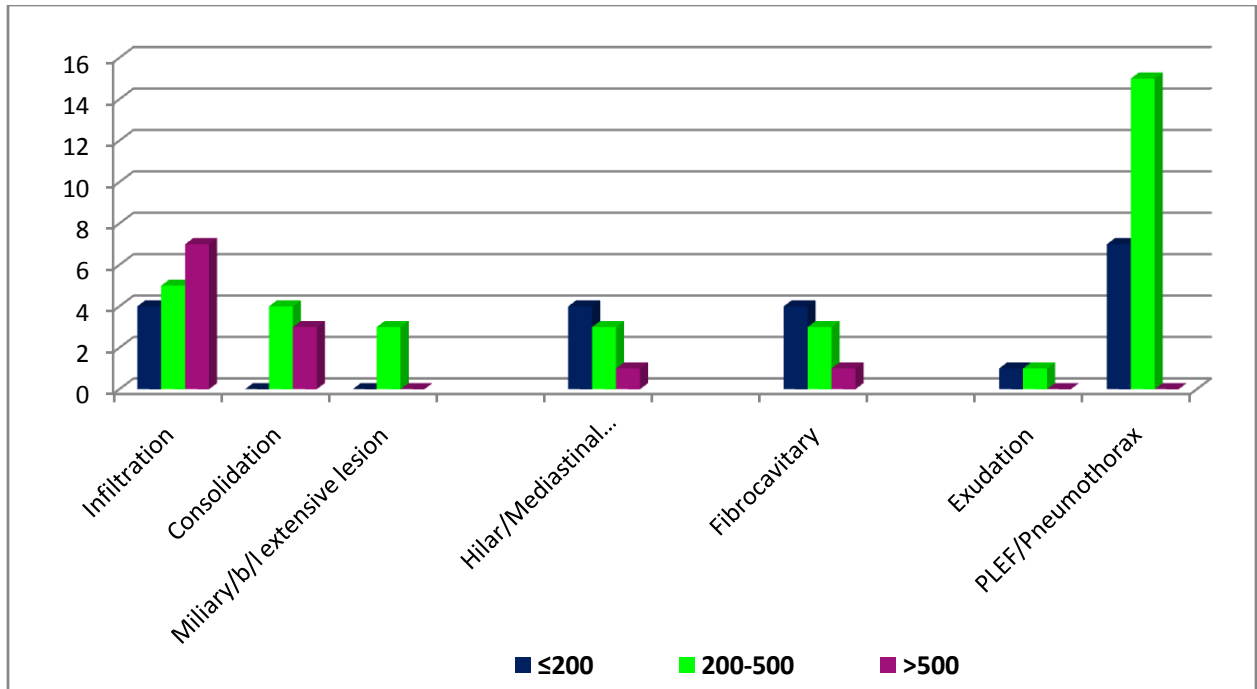


**Distribution Of Extra Pulmonary Tuberculosis**

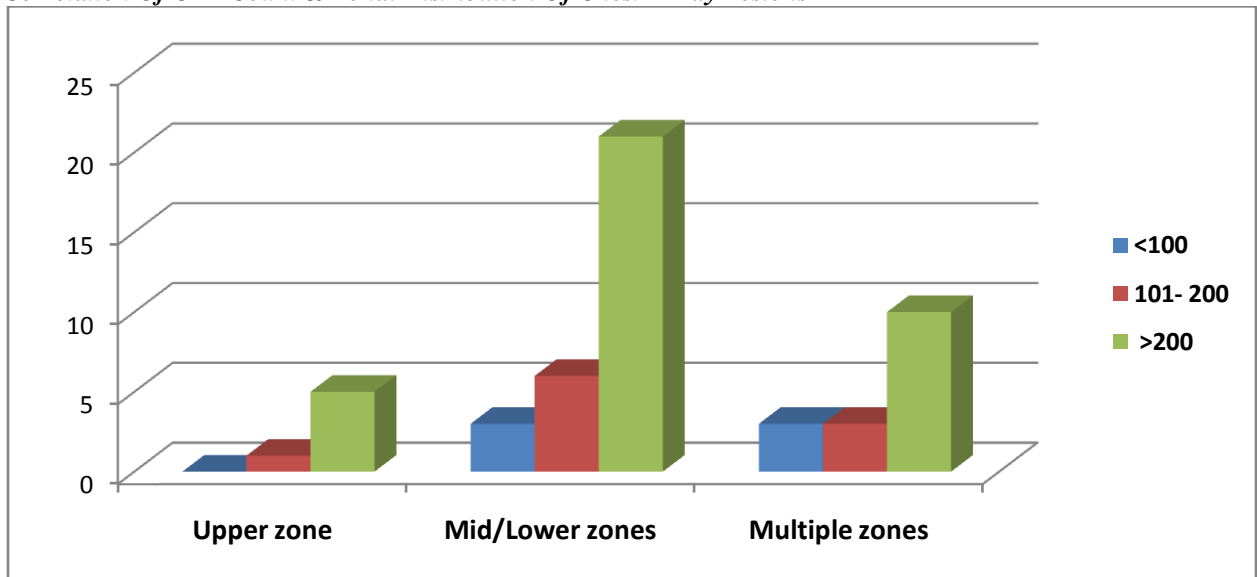


CD-4 Count And Chest X-Ray Distribution Of Lesions

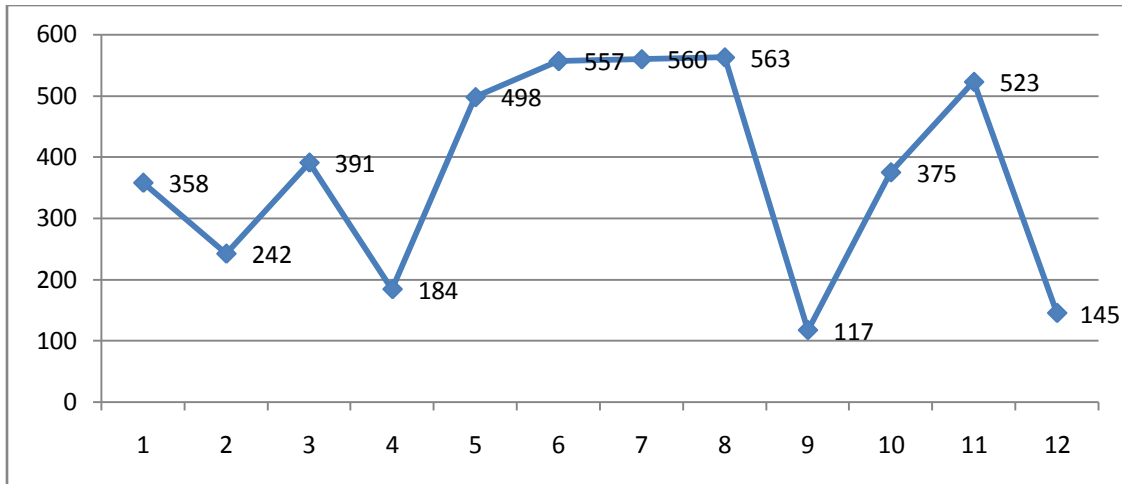




Correlation Of CD4 Count & Zonal Distribution Of Chest X-Ray Lesions



Correlation Between Sputum Positivity With CD-4 Count



**Salient Features On Discussion:-**

Maximum number of patients were in the productive age bracket of 20 to 50 years.

The study marked an extremely skewed sex ratio. The percentage of female seropositivity was much less (18%) as compared to males (82%).

As regards occupation, the maximum number of patients were drivers. No occupation or class is absolutely immune.

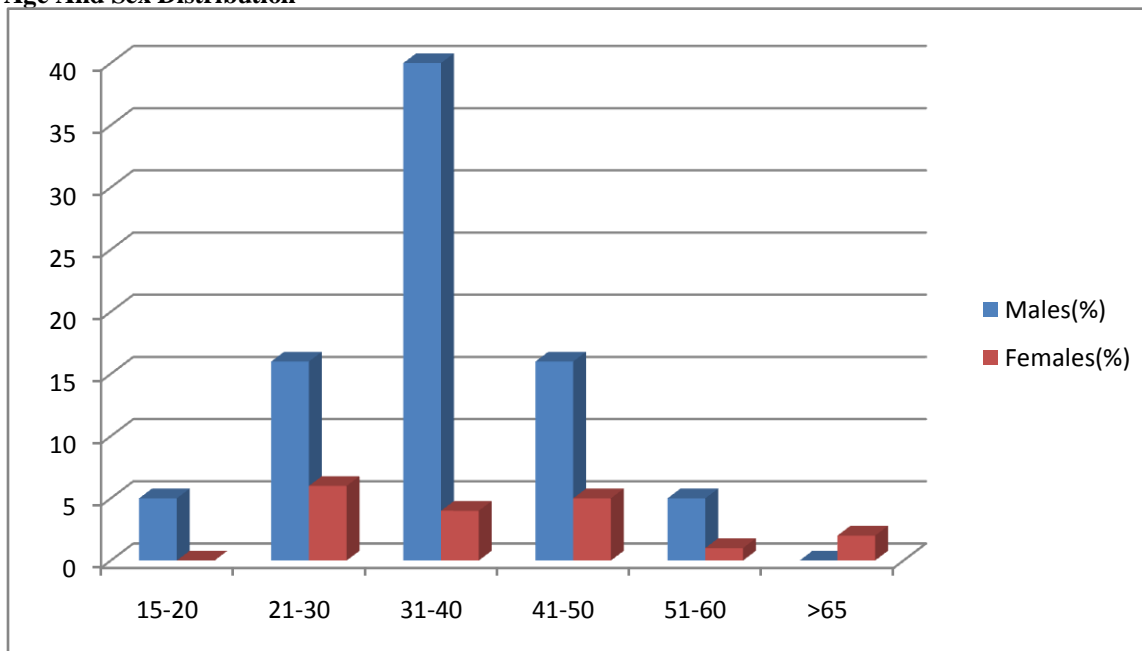
**Symptoms:** weight loss & fever were the most common symptoms.

**Signs :** anemia was the most common sign .

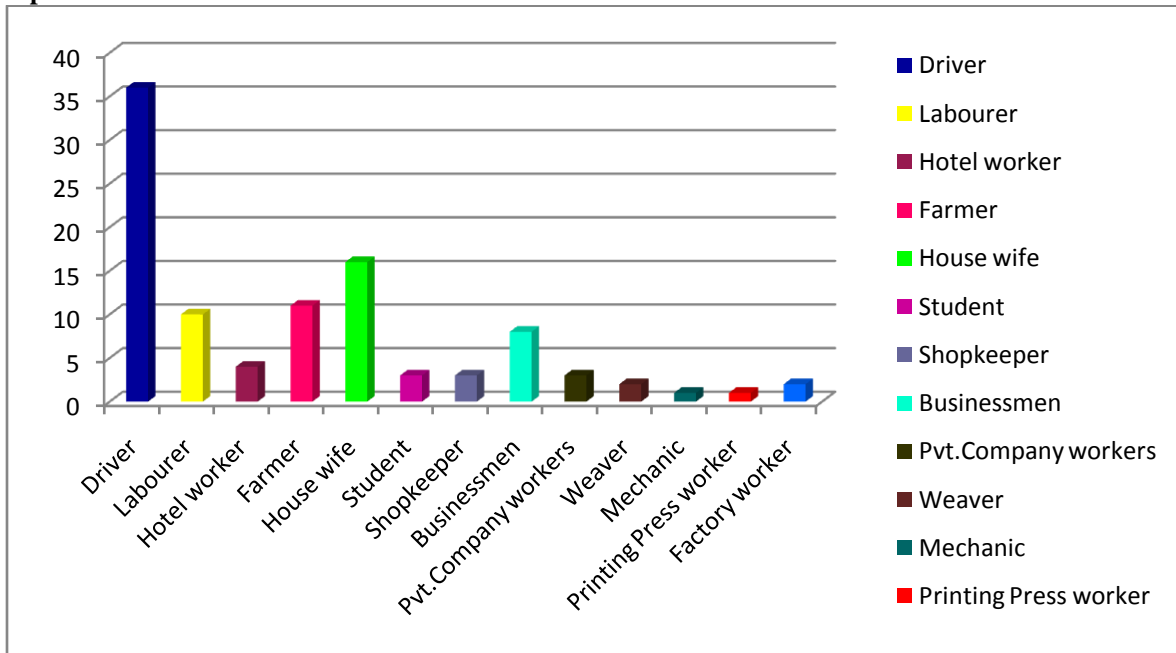
**Radioimaging :** normal chest X-ray was seen in majority of patients which made it imperative for a culmination of clinical experience, knowledge, bacteriologic & other relevant tests for prompt diagnosis .

Tuberculin sensitivity was high due to greater number of patients, higher mean CD4 count, early diagnosis & prompt initiation of treatment .

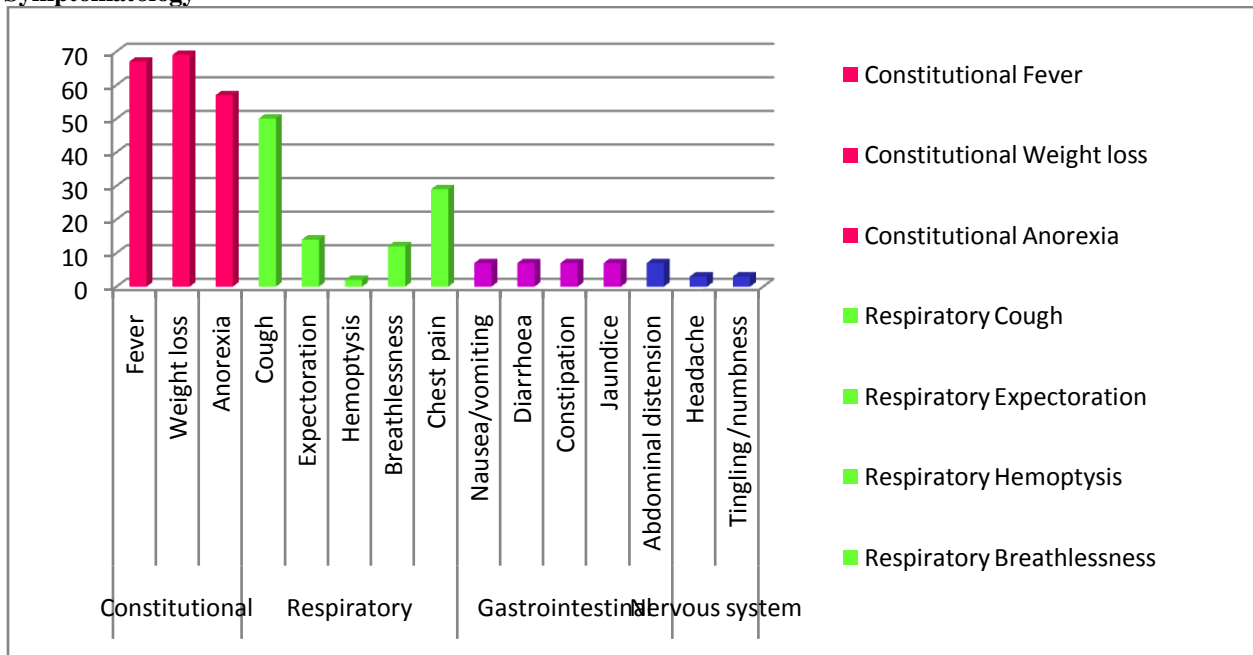
**Age And Sex Distribution**



**Occupation**

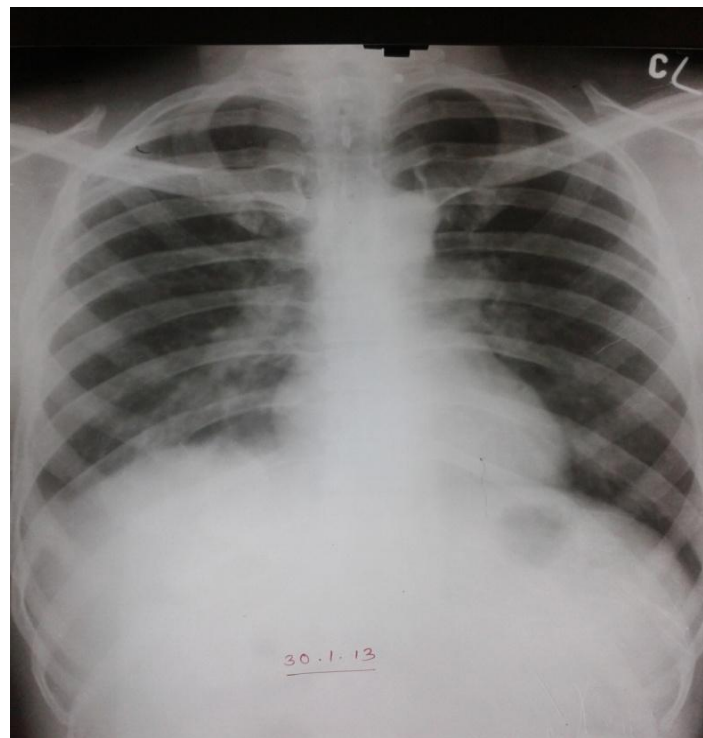


**Symptomatology**

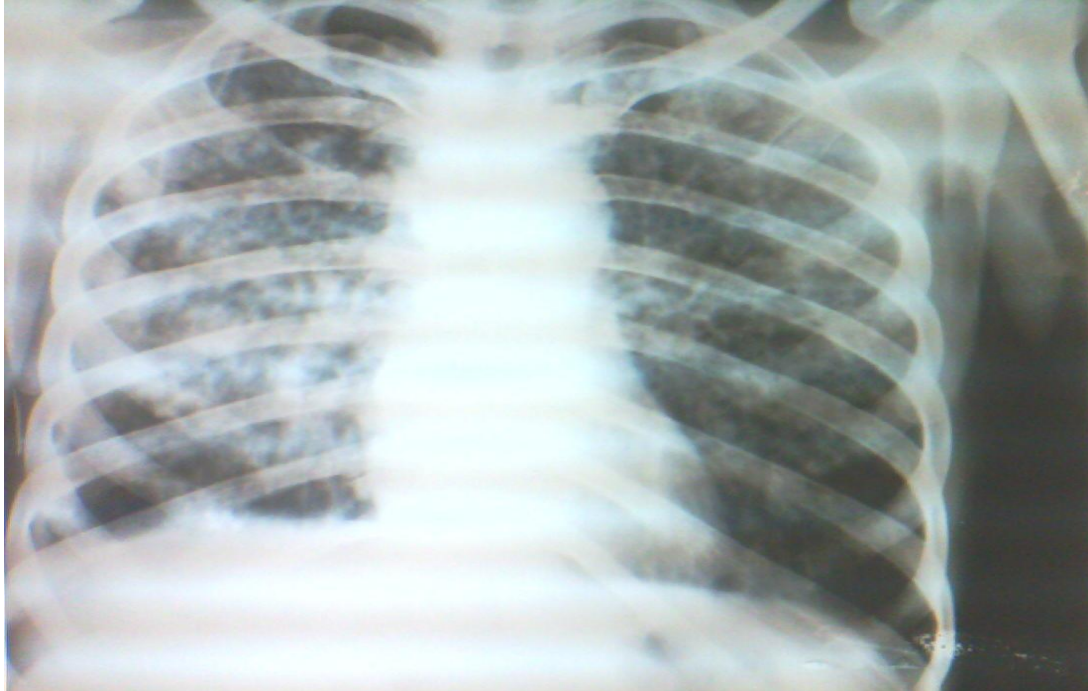




**CECT Thorax Of A Patient Showing Right Hilar Lymphadenopathy with Right Pleural Effusion.**



**Chest X-Ray PA View Of A HIV Seropositive Patient Showing Bilateral Hilar Lymphadenopathy With Right Sided Minimal Pleural Effusion.**



**Chest X-Ray PA View Of A HIV Seropositive Patient Showing Bilateral Infiltrative And Fibrocavitary Lesions.**

### **Conclusion:-**

Correlating CD4 count level with the various forms of tuberculosis and radiological manifestations of pulmonary tuberculosis, proves beyond doubt that sputum +ve pulmonary tuberculosis occurs at a much higher mean CD4 count ( $444.09 \pm 144.57$ ) followed by sputum -ve pulmonary tuberculosis ( $399.44 \pm 234.07$ ), extrapulmonary tuberculosis ( $245.56 \pm 149.41$ ) & disseminated tuberculosis ( $240.0 \pm 79.24$ ) with gradually diminishing mean CD4 count level.

Typical radiological manifestations of upper zone affection, fibrocavitary lesions & single hemithorax affection occur at a relatively greater percentage at a higher value of CD4 count.

Atypical manifestations of middle/lower/multiple zone affection, miliary lesions & hilar lymphadenopathy occur at a lower CD4 count level.

Thus overall a significant correlation of CD4 count was established with the severity of clinical and radiological manifestations in HIV- TB coinfection.

CD4 count assay is an important diagnostic tool, prognostic indicator & assessment of response to therapy of unequivocal importance.

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3. Clinical manifestations of pulmonary & extra-pulmonary tuberculosis: Robert L. Serafino Wani MBBS, MRCP, MSc (Trop Med) [[www.southsudanmedicaljournal.com/assets/files/journals/....](http://www.southsudanmedicaljournal.com/assets/files/journals/....)]



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### RESEARCH ARTICLE

#### PROTECTION OF KEY IN PRIVATE KEY CRYPTOGRAPHY.

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Cryptography, Key, Private Key, Public key, Asymmetric cryptography, Symmetric Cryptography

#### Abstract

The ever increasing technologies with parallel advancements in the development of notorious attempts, to play with the integrity of the information, in the field of communication over the internet present the need for the equally enhancing security measures. We here, try to analyze the security steps and related phenomena which have been developed specific to the symmetric cryptosystems. With the application of different protocols and their related drawbacks, we try to introduce a few changes, if possible, without diminishing the essence of such protocols. Our attempt is to look for the possibility of introducing asymmetric cryptosystem security measures to meet our purpose. The works already being done are a source of reference to invoke something inquisitive towards our topic. Such works include techniques such as key management, magic rectangle, hash functions, encrypted key exchange, etc.

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#### Introduction:-

Over the years, the topic of cryptosystems and their associated safety has been gathering the attention of the security related departments to safeguard such systems against the attacks; they undergo or may counter in future references. Before we move towards exploring the potential security protocols, we must remember that any cryptosystem primarily is composed of two main processes namely, encryption and decryption respectively. The main idea behind the application of encryption technique is to strengthen any communication system with the security feature of confidentiality and not integrity. The sole idea of confidentiality is to provide the information exchange between authorized parties and restrict the reach of unauthenticated party (ies) to the information.

The various issues concerned regarding the algorithms and protocols for implementing the same are as follows:-

- The process of authorization should be kept intact.
- The private key used by the sender to encrypt data should not be susceptible to a usual guess by the attacker.
- The communication channel being used to transfer the data from sender's end to the receiver's end should be made protected against any suspected cryptanalytic activity.
- There should be a mechanism to monitor the information flow.
- Not just passwords or any usual practice of securing data should be used but some mathematical application should also be looked into.
- The algorithm being used to carry out associated steps must be compatible to the system's configuration.

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- The techniques of making confidential communication should not be mistaken with the methodologies of keeping integrity of the information.
- Also, our protocols should not violate the rules and regulations as laid by standard organizations.
- The semantics should take care of proper speed and sequencing of data.
- The message should reach the intended receiver located at any part of the world.

There may be some other issues beside the above listed. In order to have glimpse at the utmost need to the safety in terms of security of the information of user, we can take aid of several statistical data being published by respective organizations timely. This will let us understand the need to upgrade the various available security measures with some new updates or design absolutely new methodology to meet the need. The WhatsApp vulnerability to spying of the messages even after the application of end to end encryption using signal protocol, points to the need of continuous and comprehensive enhancements in the technologies that are in use at present. That is the reason for increased interest in pursuing research in the field of network security.

Therefore, it is needed that the techniques available should be able to shield our data with optimum security features without allowing the attackers to play with the connection between sender and receiver. We can use a predictive analysis i.e. a form of advanced analysis that uses both new and historical data to forecast future activity, behavior and trends.

### **Cryptography:-**

It is a technique, using suitable algorithm(s), which deals with the encryption and decryption of the secret information. The method of applying cryptographic techniques classifies it into two categories namely symmetric key cryptography and asymmetric key cryptography.

*Symmetric key cryptography*, as the name suggests, the key used to shield the information is same and shared between sender and the receiver. We can apply several asymmetric measures or algorithm(s) to enhance the security of this shared key. A key which is used to encrypt & decrypt the information is called *private key* or *secret key* or *shared key* as it is known only to the parties involved in direct communication using the communication channel. The main issue in secret key cryptography is the protection of this shared key. As available algorithm such as *Diffie-Hellman Key Exchange* is used to share a secret key but suffers a drawback as a result of man-in-the-middle attack. RSA algorithm is used to again encrypt this shared key so that it is delivered free of threat, but is still vulnerable to attacks. The main class of attacks being invoked by notorious people to steal away information includes brute force attack. In order to counter such threats, one can definitely look for applying logarithmic complex calculations to generate a factor that would be able to lock our keys. It can be represented as follows:-

#### **Let us suppose shared key:- S**

Encryption key by RSA: E

- E → S i.e. E encrypts S

Now, in order to transmit the information packed in double shield, we may try to apply the binary logic in accordance with mathematical principles in order to guarantee its safe disposal at receiver's end.

The key in symmetric key cryptography can be protected by either of the two stated methods-

- Protecting the channel by applying public key encryption algorithm such as RSA algorithm.
- Applying modified version of RSA algorithm on key before transmission of key in channel.

*Asymmetric key cryptography*, as the name suggests, two keys are used namely *private key* and *public key*. The message may be encrypted using the public key of receiver and to be decrypted by his/her private key. The most popular asymmetric algorithm in use is RSA algorithm. Its importance can be understood from the fact that it is used even in symmetric key cryptographic systems to render the security to the secret or shared key. It can be represented simply as:-

- Message say, M
- Sender say, S
- Receiver say, R
- Encryption using public key of R say, R''

- Decryption using private key of R say, R' respectively.

Again, we may try to apply different protocols to give this communication a level of security such as image encrypted using PGP i.e. Pretty Good Privacy in somewhat modified manner.

Recently US based security agency i.e. NSA, USA (National Security Agency, United States of America) has identified a problem named 'Going Dark Problem', which they have suggested, could be controlled using split key encryption in which the service provider retains half of the master key and law enforcement would retain other half so that decryption process requires the participation of both the parties. To such problems, we may think to apply protocols already available such as Kerberos but for the receiver's end i.e. whenever information is read, a ticket confirming the retrieval and consisting of the shared piece of identity, is sent to sender.

#### **Future Scope:-**

As it can be predicted that the area of information transfer is the one that covers many possibilities to unfold the new methods and protocols for safe communication, meanwhile preserving the confidentiality. Many new techniques have so far been suggested based on research but their implementation relies on the possibilities to counter changing trends. Furthermore we can think to introduce some changes in the functioning of RSA algorithm in order to safeguard against threats in form of attacks. It is not just the protection of information which is necessary but it is equally necessary to identify the attacker. Though, there may be drawbacks to the protocols already in use, we should try out different possibilities in terms of network methodologies.

#### **Conclusion:-**

The research area in the field of cryptography and associated security is ever widening, so is equally important to look for modified algorithms and rules governing them. Protecting the information as well as communication channel are the major ways to make any cryptosystem secure and safe in terms of its application to information exchange. The concepts of double encryption or half encryption being talked about and former used also, suggests same that information may be secured at the cost of increasing complexities to the process of communication. Thus it is a challenge to establish a balance between the security measures and the overall cost of the system in terms of time, computation, space, etc.

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### RESEARCH ARTICLE

#### STUDY OF SERUM CALCIUM AND CREATININE LEVELS IN PREECLAMPTIC WOMEN BELOW 35 YEARS IN A TERTIARY CARE CENTRE IN SOUTHERN ASSAM, INDIA.

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Calcium, creatinine, pre-eclampsia, pregnancy, supplementation.

#### Abstract

Pre-eclampsia, a hypertensive multisystem disorder is one of the major causes of maternal morbidity and mortality. The exact aetiology is still unknown, though numerous hypotheses have been put forward. Studies have found that low serum calcium level may be associated with development of pre-eclampsia.

The aim of this study was to find the association between serum calcium level and pre-eclampsia by comparing the serum calcium levels in pre-eclamptic women with that of normal pregnant ladies. Our findings in this study indicate that pre-eclamptic women had a significantly lower serum calcium level than normal pregnant women ( $p < 0.01$ ) and creatinine level was found to be higher in preeclamptics. ( $p < 0.01$ ) This study concludes that low serum calcium level may be a causal factor for the development of pre-eclampsia. So, intake of mineral supplements like calcium may reduce the incidence of pre-eclampsia.

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#### Introduction:-

Preeclampsia syndrome, a hypertensive multi-system disorder either alone or superimposed on chronic hypertension forms the deadly triad, with hemorrhage and infection. It has often been labeled the "disease of theories" due to the numerous hypotheses that drive research into this complex disease (Solomon CG and Seely EW, 2004). This complication of pregnancy is one of the most common causes of maternal morbidity (Sukonpan K and Phupong V, 2005).

Preeclampsia is characterized by high blood pressure  $\geq 140/90$ , oedema and proteinuria. It typically occurs sometime in the second or third trimesters — after 14 weeks of pregnancy — with symptoms like swelling of the hands and face, and sudden weight gain. In severe cases, symptoms include nausea, vomiting, vision changes, headache, belly pain, haemolysis, elevated liver enzymes, thrombocytopenia, pulmonary oedema and foetal growth restriction [Chesley LC (1978)]. It is a pregnancy-specific syndrome characterized by variable degrees of placental dysfunction and a maternal response featuring systemic inflammation (Evans KN, *et al.* 2006). Studies suggest a failure of the trophoblastic invasion of the spiral arteries, leading to maladaptation of maternal spiral arterioles. This is associated

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with an increased vascular resistance of the uterine artery and a decreased perfusion of the placenta [Walker JJ(2000)].

The exact cause of preeclampsia is still unknown, despite considerable research.( Bringman J, *et al.*2006). The relationship between the aggravation of hypertension and the change in maternal serum level of various minerals during pregnancy have been shown in many clinical studies. (Kisters K, *et al.*2000). Modification of plasma calcium concentration leads to the alteration of blood pressure. The lowering of serum calcium and the increase of intracellular calcium can cause an elevation of blood pressure in pre-eclamptic mothers (Ray J, *et al.* 1999).

Also, various studies have reported elevated levels of serum creatinine in hypertensive disorders of pregnancy and also its effects on maternal and fetal outcomes. (Manjareeka M and Sitikantha N. ,2013).Serum creatinine levels are a part of work up for the hypertensive pregnant women .The elevated level of this parameter is due to decreased urinary clearance secondary to reduced GFR and increased reabsorption ( Jeyabalan A and Conrad KP,2007).

Research suggests intake of supplements, mainly calcium may help in the reduction of incidence of pre-eclampsia especially in a population of a developing country like India where the nutrition is poor.Hence, focus should be given more on prevention measures to manage preeclampsia. The present study aimed at measuring the serum calcium and creatinine levels in pre-eclamptic women and comparing the same with that of normal pregnant women.

### **Materials and Methods:-**

This hospital based case-control study was conducted on 200 pregnant women admitted in the indoor ward in the Department of Obstetrics and Gynaecology, SMCH, a tertiary care hospital, in southern Assam, India during July,2015-July,2016. They were divided into 2 groups comprising 100 normal pregnant women taken as controls and 100 pre-eclamptic women taken as study group. The pre-eclamptic patients were chosen in accordance with the American College of Obstetrics and Gynaecology guidelines. The normal pregnant women had normal blood pressure with no proteinuria. All subjects were primi below 35 years of age and >20 weeks of gestation. All maternal / foetal abnormal pregnancies (except pre-eclampsia), patients with essential hypertension, systemic or endocrine disorders and patients on calcium supplementation were excluded from the study. Written informed consent was taken from each subject and the study was approved by the Institutional Ethics Committee. Detailed family and medical history was taken from each patient. A thorough clinical examination was done on each subject and systolic and diastolic blood pressures were carefully recorded. Under aseptic precautions, 5 ml of venous blood was collected from each subject. The collected blood was allowed to clot spontaneously in a container, and then centrifuged at 3000 rpm for 10 minutes. Whenever possible, the analysis was done immediately. When there was a delay, the samples were stored at -20 degree till further analysis. After centrifugation, serum calcium and creatinine levels were estimated using standard procedures in AU-480 analyser in the laboratory of Biochemistry. The data obtained were tabulated and entered in MS Excel Worksheet. Data were expressed as mean  $\pm$  SD. Independent student t-test was applied for parametric variability considering  $p < 0.05$  to be statistically significant. Data analysis was done by Graph Pad InStat (Version 3.10).

### **Results:-**

The study was an observational hospital-based case control study of 100 preeclamptic (cases) and 100 normotensive pregnant (controls) of < 35 years of age conducted during July 2015 – July 2016. The study subjects were investigated for and results were analysed by using unpaired student's test which was two tailed.

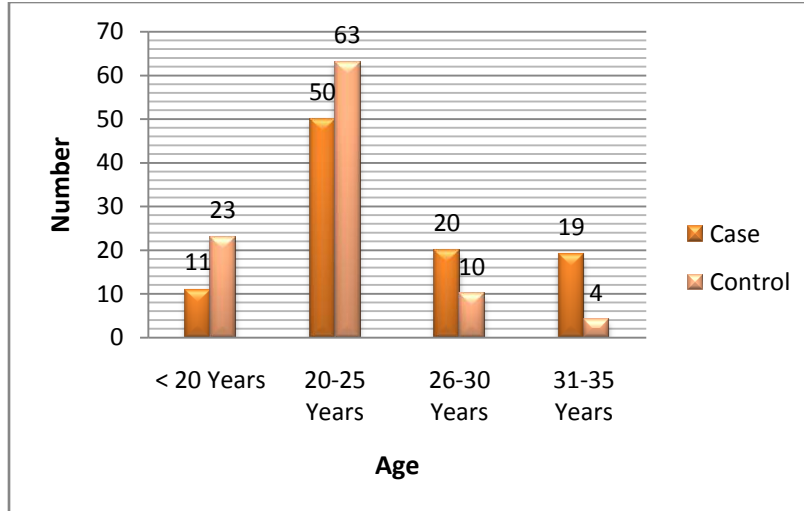


Figure 1:- Age distribution in case and control groups

The maximum number of subjects in each of the two groups was in the age group of 20-25 years. The maximum number of preeclamptics 63% belonged to the age interval of 20-25 years. Second largest group of preeclamptics (23%) were distributed in the age interval of <20 years. The other two age interval 26-30 years and 31-35 years contributed 10% and 4% respectively.

**Serum Creatinine:-**

Mean serum creatinine of cases and controls along with SD, SEM and p value given in following tables and figures.

Table 1:- Comparison of serum Creatinine in cases and controls.

	Mean	SD	SEM	95% CI for Mean	p-value
Cases	1.27	0.53	0.05	[1.16, 1.37]	<0.01
Controls	0.77	0.18	0.02	[0.73, 0.80]	

In the present study the mean serum creatinine level in cases was  $1.27 \pm 0.53$  and in controls  $0.77 \pm 0.17$ . In the Unpaired t test between case and control groups, the two-tailed P value < 0.01 which is considered significant.

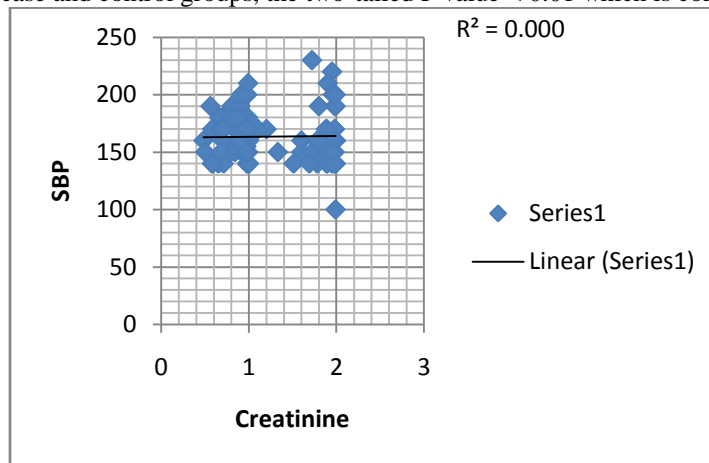
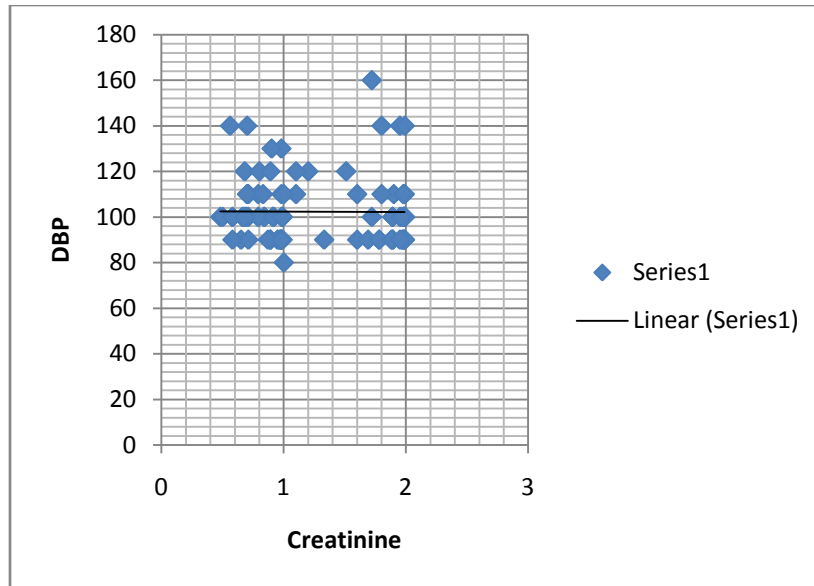


Figure 2:- Graph showing correlation between S.B.P. (Systolic blood pressure) and creatinine levels

R=0.02

Pearson’s correlation coefficient between systolic B.P. and creatinine is 0.02.  $R^2=0.000$

P value=.847, which indicates positive correlation, but it is not significant since p value>0.05.



**Figure 3:-** Graph showing correlation between D.B.P. (Diastolic blood pressure) and creatinine levels  
 $R = -0.007$ ,  $R^2 = 0.000049$   
 Pearson’s correlation coefficient between D. B.P. and creatinine is  $-0.007$ .  
**P value= .944**, which indicates insignificant correlation, since  $p \text{ value} > 0.05$ .

**Serum Calcium:-**

Mean serum calcium level of cases and controls along with SD,SEM and p value given in following tables and figures.

**Table 2:-** Comparison of serum Calcium in cases and controls.

	Mean	SD	SEM	95% CI for Mean	p-value
Cases	7.98	0.47	0.05	[7.89, 8.08]	<0.01
Controls	8.78	0.81	0.08	[8.62, 8.94]	

We found mean blood level of serum calcium in preeclamptic cases was  $7.9 \pm 0.47$  and in controls was  $8.7 \pm 0.81$ . In the Unpaired t test between case and control groups, the two-tailed P value  $< 0.01$  which is significant.

**Discussion:-**

Pre-eclampsia is associated with increased morbidity and mortality in developing countries but the exact cause of pre-eclampsia is still unknown. Several inferences can be drawn on the basis of the available results of this and other previous studies.

Our study assessing the serum calcium levels in pregnant women with and without pre-eclampsia showed serum calcium level to be significantly reduced in women with pre-eclampsia compared to normal pregnancy. This correlates well with the other studies ( Malas NO and Sheridan ZM, 2001).

Studies investigating calcium supplementation of pregnant women at risk of developing pre-eclampsia have shown that this intervention reduces the incidence and severity of the disease. An inverse relationship between calcium intake and hypertensive disorders of pregnancy was first described in 1980 and led to the hypothesis that an increase in calcium intake during pregnancy might reduce the incidence of high blood pressure and pre-eclampsia among women with low calcium intake (Belizan JM and Villar J, 1980).

Low serum calcium may predispose women to pre-eclampsia for the following reasons: (1) by increasing parathyroid hormone release and thus increasing vascular smooth muscle intracellular calcium, which promotes vasodilatation; (2) by stimulating renin release, which increases angiotensin II levels; (3) by decreasing serum magnesium levels, inducing vasoconstriction in vascular smooth muscle; (4) by diminishing the effect of endothelial

nitric oxide synthase, a calcium-dependent enzyme with vasodilatory action; and, finally (5) by reducing circulating prostacyclin, a calcium-dependent enzyme and a potent vasodilator. (Hofmeyr GJ, *et al.* 2010).

Recent evidence indicates that calcium supplementation affects uteroplacental blood flow (it lowers the resistance index in uterine and umbilical arteries). Supplementation in the second half of pregnancy appears to reduce blood pressure directly, rather than preventing the endothelial damage associated with pre-eclampsia (Hofmeyr GJ, *et al.*, 2010).

Calcium supplementation may play a beneficial role in the prevention of PIH by maintaining plasma ionized calcium levels within the narrow physiological range. Studies have shown that maintaining this range is crucial for the ongoing synthesis of vasoactive substances such as prostacyclin and nitric oxide in the endothelium and consequently for a normal endothelial function and thus lowering the blood pressure.

In one study by Deepa Kanagal *et al.*, the serum calcium concentration was significantly lower in the pre-eclamptic group compared to normotensives ( $7.84 \pm 0.87$  mg/dl Vs  $8.97 \pm 0.69$  mg/dl,  $p < 0.001$ ) (Deepa Kanagal, *et al.* 2014). Akhtar S *et al.*, in a study from Bangladesh showed significantly lower levels of calcium in pre-eclamptic women (Akhtar S, *et al.* 2011).

Jain *et al.*, Sukonpan and Phupong found a decrease in both serum calcium and magnesium in pre-eclamptic pregnant women as compared to normal pregnant women in their study thus supporting the hypothesis that hypocalcemia and hypomagnesemia are possible aetiologies of pre-eclampsia (Sukonpan K and Phupong V, 2005). A study from Northern part of India by Chaurasia *et al.*, found significantly lower levels of serum calcium and magnesium in pre-eclamptic women compared to normal pregnant women (Chaurasia PP, *et al.* 2012).

In the present study the mean serum creatinine level in cases was  $1.26 \pm 0.53$  and in controls  $0.76 \pm 0.17$ . In the Unpaired t test between case and control groups, the two-tailed P value  $< 0.001$  which is considered significant. Serum creatinine is a marker of GFR and renal dysfunction. Thus, in our study, we observed elevated levels of serum creatinine in preeclampsia when compared with normal pregnant women. This is in accordance with previous studies (Padma Y, *et al.* 2013).

The kidney is the organ most likely to manifest endothelial injury related to preeclampsia. Although the plasma creatinine concentration is generally normal or only slightly elevated (1.0 to 1.5 mg/dL (88 to 133 mmol/L), this could represent a decrease by 30–40% of glomerular filtration rate (GFR) for the values experienced in pregnant normotensive controls. Renal failure is an unusual complication that most often occurs in patients who develop severe preeclampsia. Progressive renal insufficiency i.e. serum creatinine concentration  $> 1.1$  mg/dL or a doubling of the serum creatinine concentration in the absence of other renal disease along with preeclampsia is a feature of severe preeclampsia (K. P. Conrad, *et al.* 2009).

Manjareeka *et al.* 2013, also found serum creatinine, expressed in mg/ dL to be significantly elevated in preeclamptics ( $0.72 \pm 0.387$ ) when compared to normotensives ( $0.58 \pm 0.283$ ) (Manjareeka M and Nanda S., 2016).

One study by Salako BL, found there was no significant difference in the mean values of uric acid and creatinine in the two groups. This was contrary to the findings of other workers that serum uric acid and creatinine levels are usually raised in patients destined to develop pre-eclampsia (Salako BL, *et al.* 2003). However, the inclusion criteria used in some of these studies were slightly different from those of the present study. Hayashi *et al.* demonstrated that abnormally high blood creatinine levels are seldom observed and those of uric acid often are normal even though the clearance was reduced in patient with preeclampsia (Hayashi T. and Philadelphia P., 1956).

### Conclusions:-

Our study shows a significant reduction of serum calcium level in pre-eclamptics compared to normotensives. This supports the hypothesis that hypocalcaemia may have a role in the aetiology of pre-eclampsia. It also emphasizes the need for monitoring the serum calcium level during the antenatal period so that appropriate measures may be instituted to reduce the incidence of pre-eclampsia.

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### RESEARCH ARTICLE

#### A RARE BRAIN TUMOUR- HYPOTHALAMIC PLEOMORPHIC XANTHOASTROCYTOMA IN A 11 YEAR OLD CHILD.

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pleomorphicxanthoastrocytoma,  
 supratentorial,  
 infratentorial,astrocytomas.

#### Abstract

**Background:** Astrocytomas are the most common glial tumors of the central nervous system among the pediatric age group. Most of the childhood tumors occur infratentorially (medulloblastoma, astrocytoma and ependymomas ). Supratentorialastrocytomas are more likely to be low grade compared with their infratentorial counterpart. Pleomorphic xanthoastrocytomas are rare tumors accounting for only 1% of all astrocytomas. Despite its highly pleomorphic and bizarre looking cytology, it appeared to have a favorable prognosis and a relatively benign course. Its correct diagnosis is crucial.

**Conclusion:** Pleomorphic Xanthoastrocytoma is a rare slowly growing tumour of childhood and young adults. Hypothalamus is a very rare site for pleomorphic xanthoastrocytoma. It can present with unusual sensory manifestations. Classical neuroimaging and histopathological characteristic are useful aids in diagnosis. Complete excision is the treatment of choice and gives very good results. A close follow up is always needed, as both recurrence and anaplastic transformation has been reported. Role of radiotherapy and chemotherapy is controversial except in malignant growth.

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#### Introduction:-

Astrocytomas are the most common glial tumors of the central nervous system among the pediatric age group. Most of the childhood tumors occur infratentorially (medulloblastoma,astrocytoma and ependymomas). Supratentorialastrocytomas are more likely to be low grade compared with their infratentorial counterpart<sup>1</sup>.Pleomorphic xanthoastrocytomas are extremely rare tumours accounting for only <1% of all astrocytomas. It was described for the first time by Kepes et al in 1979<sup>2</sup> . Among all sites, occurrence of the tumour in hypothalamus is extremely rare. The peculiarity of this tumor is despite its highly pleomorphic and bizarre looking cytology, it appeared to have a favorable prognosis and a relatively benign course. Its correct histological diagnosis is crucial and outcome is good when managed appropriately by surgery. Here we describe one such rare case in a rare location i.e hypothalamus which was managed successfully by surgery without any adjuvant therapy.

#### Case Report:-

A 11 year old female child patient presented in our outpatient department with chief complaints of decreased vision in both eyes and deviation of eyes since 10 days . No history of convulsions, loss of consciousness, vomiting and limb weakness.

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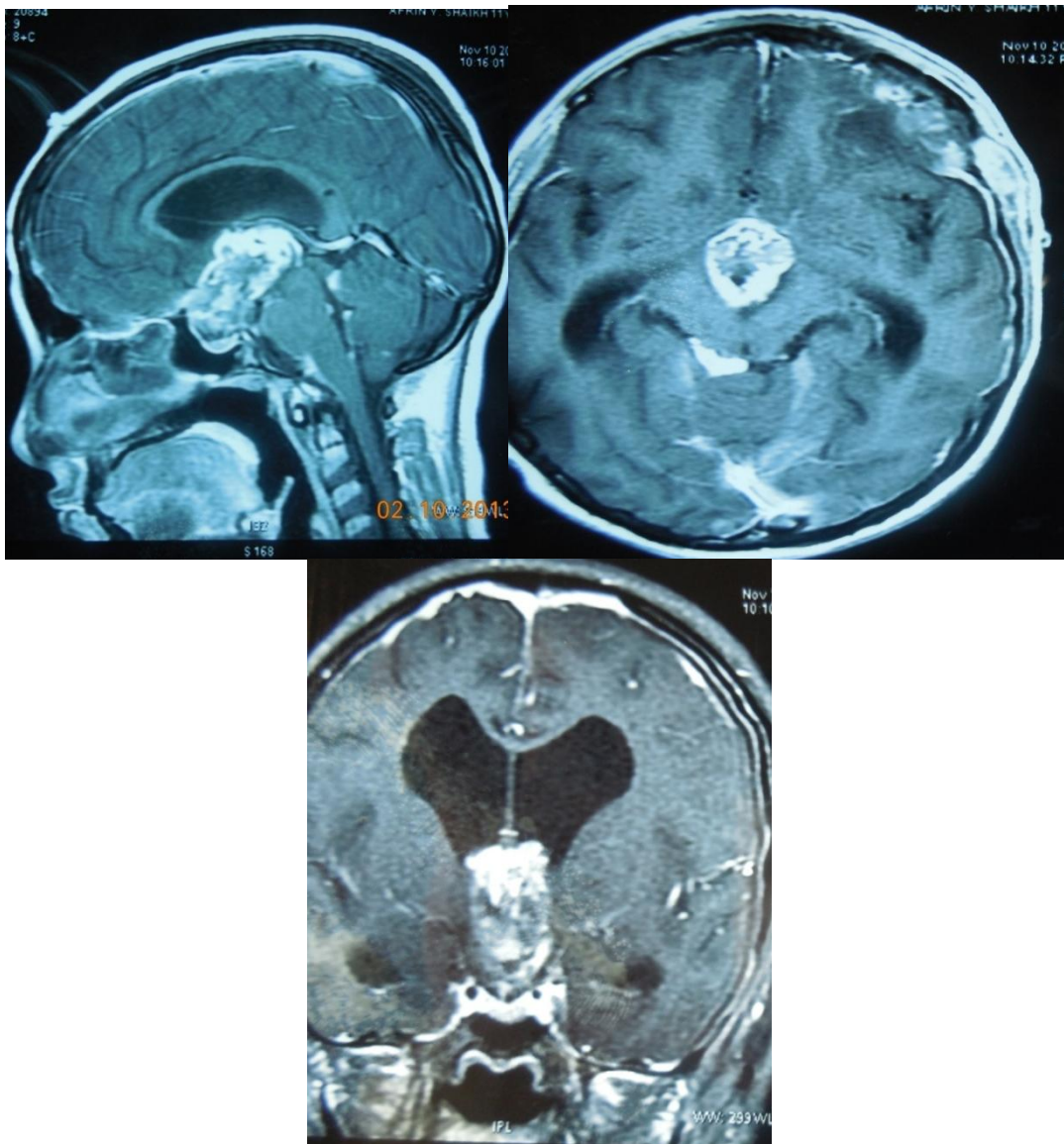


She had normal cognition and behavior. Her school performance was also good. Past and family history was not significant.

**On examination:-**She had normal higher functions, normal speech, decreased vision in both eyes . Patient had Right eye- Finger Counting +ve and Left eye- Perception of light +ve and bilateral 6<sup>th</sup> nerve paresis. Rest of neurological examination was essentially normal. Hormonal profile was normal.

**MRI BRAIN:-** Large suprasellar lesion, which is iso-intense on T1 weighted sequence, iso-intense to hypointense on T2 weighted sequence and heterogeneously enhancing on post contrast images extending upto floor of 3<sup>rd</sup> ventricle.

FIG:1

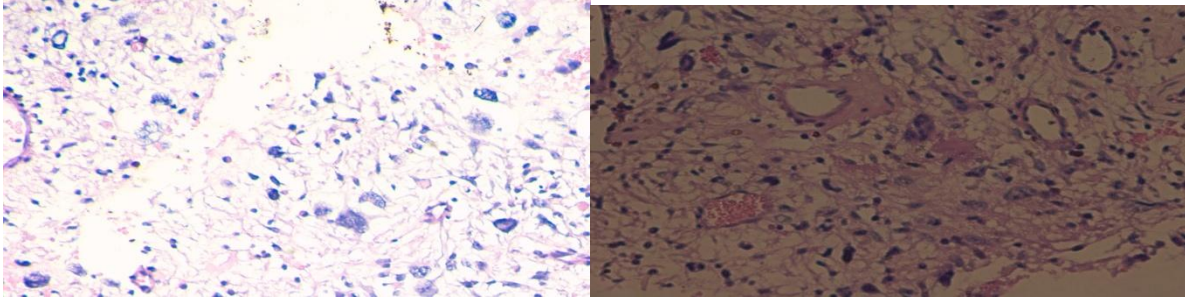


**Surgery:-** Right side Ventriculoperitoneal shunt was done followed by left frontal craniotomy with sub-frontal approach with near total excision of tumor under GA. Patient had post operative diabetes insipidus which was managed conservatively. Patient had significant improvement in vision after surgery :- RT eye:- >6/60 and left eye 6/60. Extra-ocular movements improved significantly and diplopia subsided.

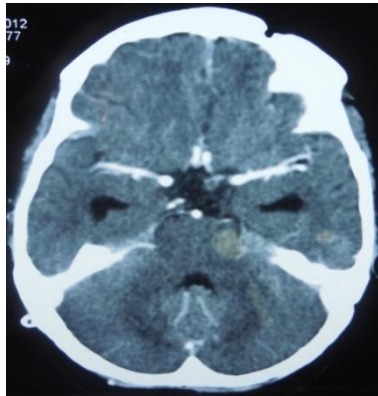


**Histopathology:-S/O Pleomorphic xanthoastrocytoma**

FIG:2



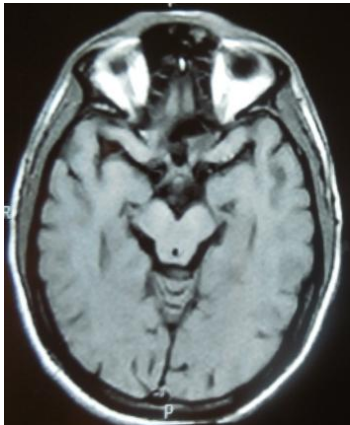
Astrocytic cells having large irregular hyperchromatic nuclei and small lymphocytic like cells. Uni-nucleated and multinucleated tumor giant cells and scattered lymphocytes in a glial background. No significant vascular endothelial proliferation seen. Large pleomorphic cells, prominent eosinophilic granular bodies, lipidized astrocytes, focal perivascular lymphocytes, abundant reticulin network, absent or scant mitoses.

**FIG 3: Immediate post op CT:- Complete tumor excision.**

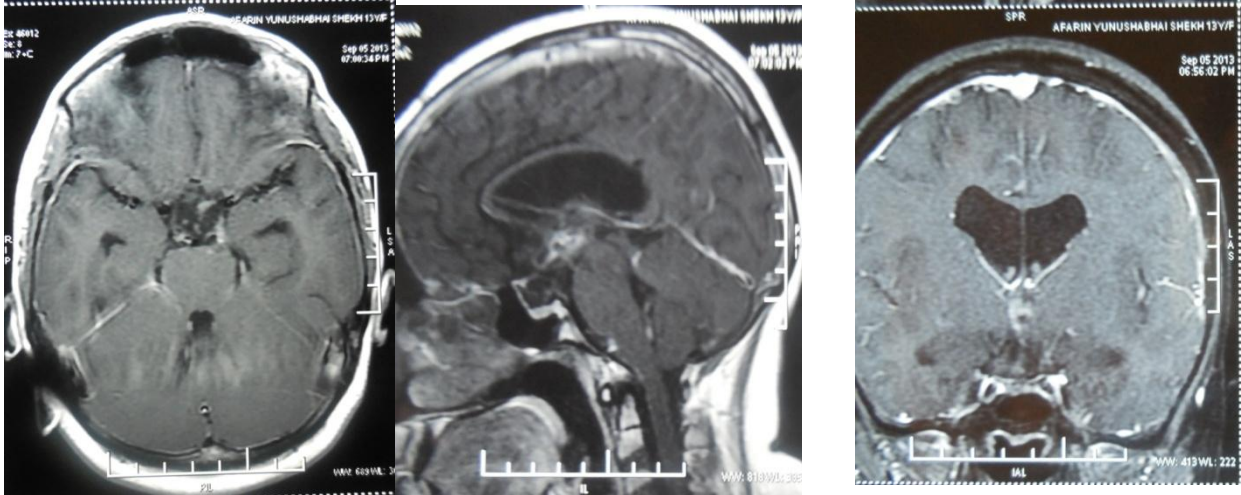
**No adjuvant therapy was given. Patient was followed up regularly at 6 months , 1<sup>st</sup> year and 2<sup>nd</sup> year.**

MRI Brain showed no evidence of tumour at 6 months follow-up. No neurological deficits. Vision improved significantly and diplopia completely subsided. Patient had normal cognitive development.

FIG 4: MRI image at 6 month follow-up.



**MRI brain after 2 year:-** No evidence of tumor recurrence seen after 2 years of follow-up. Patient is attending school regularly with normal intellectual capacity.

FIG 5: MRI images at 2<sup>nd</sup> year follow-up:

### Discussion:-

In 1993, the World Health Organization recognized Pleomorphic xanthoastrocytoma as a distinct tumor in the classification of grade II tumors. It represents less than 1% of all the astrocytomas. It can occur throughout the supratentorial compartment, mostly commonly in the temporal lobe, next in frequency are the parietal, occipital and frontal lobes<sup>3</sup>.

To the best of our knowledge, only one case of pleomorphic xanthoastrocytoma involving hypothalamus has been reported in the literature<sup>4</sup>. Location outside the supratentorial compartment has been reported in cerebellum and spinal cord.<sup>5</sup>

Patients typically present in the second or third decades of life, with the median age of 14 years. Both sexes are affected equally. Most patients have seizures and headache and focal location related deficits<sup>2</sup>. Patient may present with decreased vision if tumor located in sellar and suprasellar region, as in our case. Rarely, patients present with symptomatic hemorrhage from the tumour<sup>7</sup>.

Supratentorial tumours are most often cortically based, adjacent to the meninges but not involving the dura-mater. On CT and MRI as a cystic structure with an enhancing mural nodule. Both CT and T1 weighted imaging reveal a focal, ill defined mass with mixed intensity, isointensity or hypointensity to the gray matter. Well defined contrast enhancement of nodule is often seen on CECT and contrast MRI. On T2 weighted imaging, tumor is hyperintense and cyst also hyperintense. Typically, cyst wall is non enhancing and mild to moderate amount of edema may be present and calcification is very rare<sup>2</sup>.

Grossly, tumors are usually firm, variable in color, and relatively avascular. A yellowish cyst with a mural nodule is common, with the solid portion contacting the lepto-meninges. The characteristic histopathological features of PXA include:- large pleomorphic cells, prominent eosinophilic granular bodies, lipidized astrocytes, focal perivascular lymphocytes, abundant reticulin network, absent or scant mitoses, and absence of necrosis<sup>2</sup>.

PXAs demonstrated immunoreactivity for glial fibrillary acidic protein (100%), S-100 (100%), class III [beta] tubulin (73%), synaptophysin (38%), NF (nuclear factor) proteins (18 and 8%) and MAP2 (microtubular associated protein 2) (8%)<sup>7</sup>. These tumors are relatively slow clinical course, a favorable prognosis and does not require an aggressive postoperatively therapy. The overall prognosis is good with only 30% tumors recurring and undergoing anaplastic transformation.

Increased mitotic activity, high MIB-1 and proliferating cell nuclear antigen labeling indices and necrosis are poor prognostic factors, whereas abundant lymphocytic infiltration is associated with more benign biological behavior. Other factors influencing clinical outcome include extent of resection, old age, peri-tumor edema, and increased FDG uptake on PET. A close follow up is needed in order to detect any recurrence with malignant transformation.

Craniotomy and gross total resection is the treatment of choice. Patients with subtotal resection or high mitotic index or necrosis on pathologic examination should at least undergo vigilant, routine gadolinium-enhanced MRI as surveillance for progression. Patients with favorable anatomy, repeat resection may be attempted. Malignant transformation may necessitate adjuvant treatment with chemotherapy and radiation.

**Conclusion:-**

Pleomorphic Xanthoastrocytoma is a very rare slowly growing tumor of childhood and young adults. Hypothalamus is a very rare site for PXA. It can present with unusual sensory manifestations. Classical neuroimaging and histopathological characteristics are useful aids in diagnosis. Complete excision is the treatment of choice, gives very good results. A close follow up is always needed, as both recurrence and anaplastic transformation has been reported. Role of radiotherapy and chemotherapy is controversial except in malignant growth.

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### RESEARCH ARTICLE

#### VISCOUS DISSIPATION AND HEAT TRANSFER EFFECTS IN MHD RAYLEIGH PROBLEM.

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Hall Effect, Rotation, Heat transfer,  
Viscous Dissipation, Uniformly  
accelerated.

#### Abstract

In this paper an attempt has been made to study explicitly the effect of viscous dissipation in the MHD Rayleigh problem with inclined magnetic field is investigated in this paper. Numerical results and graphs are presented to study the combined effect of Hartmann number, Hall Parameter, Rotation parameter, Eckert number, angle of inclination and Prandtl number.

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#### Introduction:-

The study of Magnetohydrodynamics of a conducting fluid has applications in a variety of geophysical and astrophysical problems. The unsteady free- convection flow of a electrically conducting, viscous incompressible fluid have gained considerable attention in the presence of applied magnetic field in connection with the theories of fluid motion in the liquid core of the earth, oceanographic and metrological applications.

The *viscosity* of the fluid in a viscous fluid flow will take energy from the motion of the fluid and transform it into internal energy of the fluid. That means heating up the fluid. This partially irreversible process is referred as *dissipation* or *viscous dissipation*. Viscous dissipation is defined as the irreversible process by means of which the work done by a fluid on adjacent layers due to the action of shear forces is transformed into heat.

The effect of viscous dissipation in natural convection was analyzed by Gebhart [1]. Iqbal et.al [2] studied the viscous dissipation effects on combined free and forced convection through vertical circular tubes. Hossian [3] studies the effect of viscous and Joules heating on the flow of an electrically conducting fluid past a semiinfinite plate when temperature varies linearly with the distance from the moving edge and it in the presence of a uniform transverse magnetic field. Vajravelu and Hadjiniwlaou [4] analyzed heat transfer in a viscous fluid over a stretching sheet with viscous dissipation and internal heat generation. The problem of heat transfer on a moving plate with a uniform magnetic field has attracted the attention of many researchers such as Ali [5], Takharet. al. [6] and Zakaria [7].

The simultaneous effects of the heat transfer and Hall current on a MHD flow with a porous medium in a rotating system was investigated by Dileepsing [8]. Loganathan [9] analyzed the viscous dissipation effects on unsteady natural convective flow past an infinite vertical plate with uniform heat and mass flux. In all the above cases either normal or horizontal magnetic field is considered, but this cannot support the entire physical scenario. In Science

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and Engineering problems oblique magnetic field also play a vital role. Hence this paper mainly deals with the problem involving viscous dissipation and oblique magnetic field.

**Author’s Contribution:-**

The effect of inclined magnetic field with viscous dissipation may become very important in several flow configurations occurring in the Engineering problems. In view of the importance of an inclined magnetic field and dissipation effects, the effect of viscous dissipation in the MHD Rayleigh problem with inclined magnetic field is investigated in this chapter.

**Formulation of the Problem:-**

An unsteady free convection flow of an electrically conducting viscous incompressible fluid with heat transfer along an infinite flat plate occupying the plane  $y = 0$  has been considered. The  $x$ -axis is taken in the direction of the motion of the plate.  $z$  – axis lying on the plane normal to both  $x$  and  $y$  – axis. Initially it is assumed that the plate and the fluid rotate in unison with a uniform angular velocity  $\bar{\Omega}$  about the  $y$  - axis normal to the plate are at the same temperature  $T$  everywhere in the fluid. At time  $t > 0$ , the plate starts moving impulsively with the uniform velocity in its own plane along the  $x$ -axis. Also the temperature of the plate is raised/lowered to  $T_\infty$  and there after maintained uniform. A uniform magnetic field  $H_0$  is applied in a direction which makes an angle  $\theta$  with the positive direction of  $y$  - axis in the  $xy$  – plane. The magnetic Reynolds number of the flow is taken to be small enough so that the induced magnetic field can be neglected.

Here  $\bar{q}=(u,0,w)$  represents the velocity vector,  $\bar{H}=(H_0 \sin\theta, H_0 \cos\theta, 0)$  is the magnetic induction,  $\bar{E}=(E_x, 0, E_z)$  is the electrostatic field and  $\bar{\Omega}=(0,\Omega_y,0)$  denotes uniform angular velocity. Under these conditions, the governing boundary layer equations are

Equation of continuity  $\nabla \cdot \bar{q}=0$  (1)

Equation of motion  $\frac{\partial \bar{q}}{\partial t} + (\bar{q} \cdot \nabla)\bar{q} + 2\bar{\Omega} \times \bar{q} = -\frac{1}{\rho} \nabla P + \nu \nabla^2 \bar{q} + \frac{1}{\rho} (\bar{J} \times \bar{B})$  (2)

Here  $P$  is the pressure,  $\rho$  is the density,  $\nu$  is kinematic viscosity and  $\bar{J} \times \bar{B}$  is the Lorentz force.

The Energy equation  $\rho C_p \left[ \frac{\partial T}{\partial t} + (\bar{q} \cdot \nabla)T \right] = K \nabla^2 T + \mu \Phi$  (3)

where  $C_p$  is the specific heat at constant pressure,  $K$  is the thermal conductivity and  $\Phi$  is the dissipation function due to viscosity.

The generalized Ohm’s law is,  $\frac{\bar{J}}{\sigma} = (\bar{E} + \bar{q} \times \bar{B}) - \frac{\bar{J} \times \bar{B}}{n.e}$  (4)

where  $\sigma = \frac{e^2 n}{m_e \tau}$  (is the electrical conductivity). Here  $\bar{J}$  is the current density,  $e$  is the electric charge,  $\tau$  is the mean collision time,  $n$  is the electron number density and  $m_e$  is mass of an electron. As the plate is infinite, all variables in the problem are functions of  $y$  and  $t$  only. So the term  $(\bar{q} \cdot \nabla)\bar{q}$  reduces to zero and  $\nabla P$  vanishes as  $P$  is constant in equation (2).  $T(y, t)$  is the temperature of the fluid in the boundary layer and  $T_\infty$  is the fluid temperature far away from the plate and let  $T(y, t) - T_\infty = \theta_T(y, t)$ . Subject to the boundary conditions,

$u = 0, w = 0, \theta_T = 0$  for all  $t \leq 0$  and for all  $y$   
 $u = U_0, w = 0, \theta_T(0, t) = ae^{i\omega t}$  for all  $t > 0$  and  $y = 0$   
 $u \rightarrow 0, w \rightarrow 0, \theta_T \rightarrow 0$  for all  $t > 0$  and  $y \rightarrow \infty$  (5)

Let us introduce the following non-dimensional quantities:

$y^* = \frac{U_0 \cdot y}{\nu}, u^* = \frac{u}{U_0}, w^* = \frac{w}{U_0}, t^* = \frac{U_0^2 t}{\nu}, \theta_T^* = \frac{\theta_T}{a}, m = \omega \tau, M^2 = \frac{\sigma H_0^2 \nu}{\rho U_0^2},$   
 $Pr = \frac{\nu \rho C_p}{K}, K^2 = \frac{\nu \Omega_y}{U_0^2}, \xi = \frac{\nu \omega}{U_0^2}, Ec = \frac{U_0^2}{a C_p}$  (6)

Equations (1), (2) and (3) transform to the following non-dimensional forms (dropping the stars)

$\frac{\partial u}{\partial t} = \frac{\partial^2 u}{\partial y^2} - \frac{M^2 \cos^2 \theta}{(1+m^2 \cos^2 \theta)} (u + mw \cos \theta) - 2wK^2$  (7)

$\frac{\partial w}{\partial t} = \frac{\partial^2 w}{\partial y^2} + \frac{M^2 \cos^2 \theta}{(1+m^2 \cos^2 \theta)} (mu \cos \theta - w) + 2uK^2$  (8)

$\frac{\partial \theta_T}{\partial t} = \frac{1}{Pr} \frac{\partial^2 \theta_T}{\partial y^2} + Ec \left[ \left( \frac{\partial u}{\partial y} \right)^2 + \left( \frac{\partial w}{\partial y} \right)^2 \right]$  (9)

with the corresponding boundary conditions,

$t \leq 0: u(y, t) = w(y, t) = 0, \theta_T(y, 0) = 0$  for all  $y$

$$\begin{aligned}
 t > 0: u(0, t) = 1, w(0, t) = 0, \theta_T(0, t) = e^{i\xi t} \\
 t > 0: u(y, t) \rightarrow 0, w(y, t) \rightarrow 0, \theta_T(y, t) \rightarrow 0 \text{ as } y \rightarrow \infty
 \end{aligned}
 \tag{10}$$

**Solution of the Problem**

By using (7) and (8), we get

$$\frac{\partial q}{\partial t} = \frac{\partial^2 q}{\partial y^2} - \left[ \left( \frac{M^2 \cos^2 \theta}{1+m^2 \cos^2 \theta} \right) (1 - im \cos \theta) - 2iK^2 \right] q
 \tag{11}$$

with the boundary conditions,

$$\begin{aligned}
 q(y, 0) = 0, \quad q(0, t) = 1, \quad q(\infty, t) = 0 \\
 \theta_T(y, 0) = 0, \quad \theta_T(0, t) = e^{i\xi t}, \quad \theta_T(\infty, t) = 0
 \end{aligned}
 \tag{12}$$

Equation (11) reduces to the form,

$$\frac{\partial q}{\partial t} = \frac{\partial^2 q}{\partial y^2} - \alpha q
 \tag{13}$$

$$\text{where } \alpha = \left( \frac{M^2 \cos^2 \theta}{1+m^2 \cos^2 \theta} \right) (1 - im \cos \theta) - 2iK^2$$

$q(y, t) = e^{i\xi t} g(y)$  in (13) gives

$$g''(y) - (i\xi + \alpha)g(y) = 0
 \tag{14}$$

Equation (14) can be solved under the boundary conditions,

$$g(0) = e^{-i\xi t}, g(\infty) = 0
 \tag{15}$$

The solution is

$$g(y) = e^{-i\xi t} e^{-y\sqrt{i\xi + \alpha}}
 \tag{16}$$

$$\text{Hence } q(y, t) = e^{i\xi t} \left[ e^{-i\xi t} e^{-y\sqrt{i\xi + \alpha}} \right]
 \tag{17}$$

Real and imaginary parts of equation (17) are

$$u(y, t) = e^{-yS_1} \cos yS_2
 \tag{18}$$

$$w(y, t) = -e^{-yS_1} \sin yS_2
 \tag{19}$$

$$\text{where } S_1 = \sqrt{\frac{a + \sqrt{a^2 + (\xi + b)^2}}{2}} \text{ and } S_2 = \sqrt{\frac{-a + \sqrt{a^2 + (\xi + b)^2}}{2}}$$

$$\text{Equation (9) reduces to } f''(y) - i\xi \text{Pr} f(y) = \text{Pr} Ec e^{-i\xi t} \left[ \left( \frac{\partial u}{\partial y} \right)^2 + \left( \frac{\partial w}{\partial y} \right)^2 \right]
 \tag{20}$$

where  $\theta_T(y, t) = e^{i\xi t} f(y)$  with the boundary conditions,

$$f(0) = 1, f(\infty) = 0
 \tag{21}$$

Hence the solution is

$$\begin{aligned}
 f(y) = & (\text{Cos}yS_3 e^{-yS_3} - L_7 \text{Cos}yS_3 e^{-yS_3} - L_8 \text{Sin}yS_3 e^{-yS_3} + L_7 e^{-yS_1}) \\
 & - i(\text{Sin}yS_3 e^{-yS_3} - L_8 \text{Cos}yS_3 e^{-yS_3} - L_7 \text{Sin}yS_3 e^{-yS_3} - L_8 e^{-yS_1})
 \end{aligned}
 \tag{22}$$

$$\text{where } L_1 = \frac{4S_1^2}{16S_1^4 + \xi^2 Pr^2}, L_2 = \frac{\xi Pr}{16S_1^4 + \xi^2 Pr^2}, L_3 = \frac{16(S_1^2 - S_2^2)^2 - \xi^2 Pr^2 + 64S_1^2 S_2^2}{(16(S_1^2 - S_2^2)^2 - \xi^2 Pr^2 + 64S_1^2 S_2^2)^2 + 64(S_1^2 - S_2^2)\xi^2 Pr^2},$$

$$L_4 = \frac{8(S_1^2 - S_2^2)\xi Pr}{(16(S_1^2 - S_2^2)^2 - \xi^2 Pr^2 + 64S_1^2 S_2^2)^2 + 64(S_1^2 - S_2^2)\xi^2 Pr^2},$$

$$L_5 =$$

$$L_1 PrEc(S_1^2 + S_2^2) + 8L_3 PrEcS_1 S_2 \text{Sin}2yS_2 (S_1^2 - S_2^2) + 2L_4 PrEcS_1 S_2 \text{Sin}2yS_2 \xi Pr - 16L_3 PrEc(S_1^2 S_2^2) \text{Cos}2yS_2,$$

$$L_6 =$$

$$L_2 PrEc(S_1^2 + S_2^2) + 8L_4 PrEcS_1 S_2 \text{Sin}2yS_2 (S_1^2 - S_2^2) - 2L_3 PrEcS_1 S_2 \text{Sin}2yS_2 \xi Pr - 16L_4 PrEc(S_1^2 S_2^2) \text{Cos}2yS_2, L_7 = L_5 \text{Cos}\xi t + L_6 \text{Sin}\xi t, L_8 = L_6 \text{Cos}\xi t - L_5 \text{Sin}\xi t$$

Hence

$$\begin{aligned}
 \theta_T(y, t) = & e^{i\xi t} ((\text{Cos}yS_3 e^{-yS_3} - L_7 \text{Cos}yS_3 e^{-yS_3} - L_8 \text{Sin}yS_3 e^{-yS_3} + L_7 e^{-yS_1}) \\
 & - i(\text{Sin}yS_3 e^{-yS_3} - L_8 \text{Cos}yS_3 e^{-yS_3} - L_7 \text{Sin}yS_3 e^{-yS_3} - L_8 e^{-yS_1}))
 \end{aligned}$$

**Shearing Stress and Nusselt number**

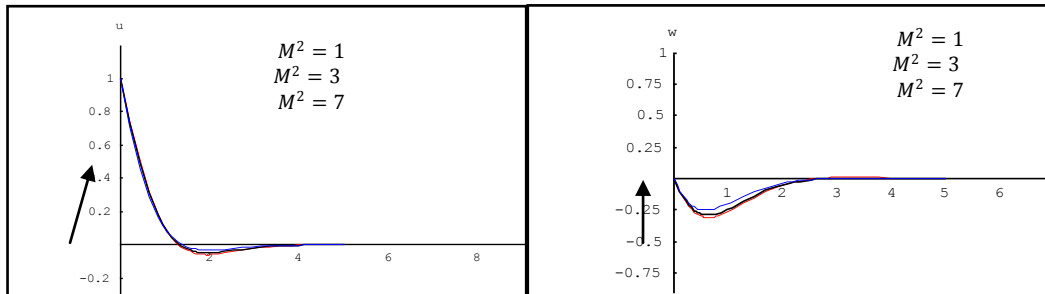
The shearing stress at the wall along  $x$  - axis and  $z$  - axis are given by  $\tau_x = \left( \frac{\partial u}{\partial y} \right)_{y=0}$  and  $\tau_z = \left( \frac{\partial w}{\partial y} \right)_{y=0}$

From equation (18) and (19),  $\tau_x = -S_1$  and  $\tau_z = -S_2$

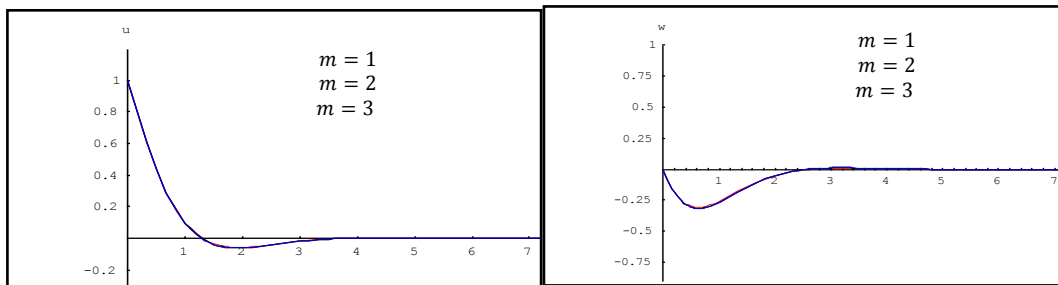
The rate of heat transfer at the plate in terms of the Nusselt number is given by  $Nu = -\left(\frac{\partial T}{\partial y}\right)_{y=0}$

**Results and Discussion:-**

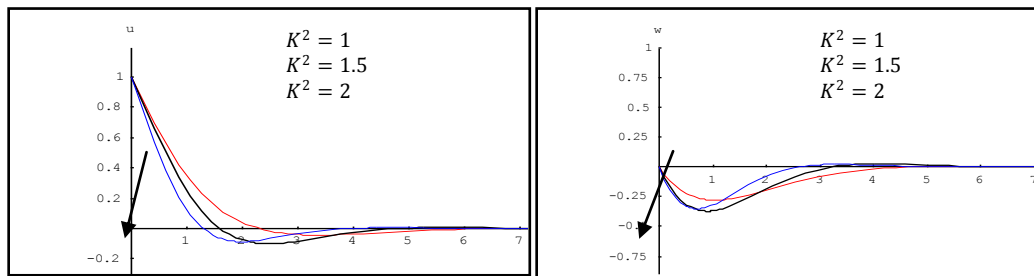
To get a physical insight to the problem graphs are drawn by varying the physical parameters such as Hartmann number, Hall Parameter, Rotation parameter, Eckert number, angle of inclination, Prandtl number and time. Following results are obtained from the graphs.



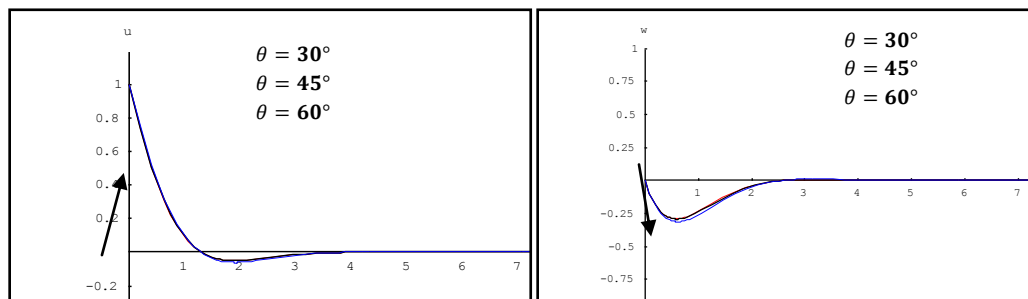
**Figure 1:- Effect of Hartmann number ( $M^2$ ) on primary and secondary velocity profile when  $m = 1; K^2 = 2; \theta = 30^\circ; \xi = 1$**



**Figure 2:- Effect of Hall parameter ( $m$ ) on primary and secondary velocity profile when  $M^2 = 1; K^2 = 2; \theta = 30^\circ; \xi = 1$**



**Figure 3:- Effect of Rotation parameter ( $K^2$ ) on primary and secondary velocity profile when  $M^2 = 1; m = 1; \theta = 30^\circ; \xi = 1$**



**Figure 4:- Effect of angle of inclination ( $\theta$ ) on primary and secondary velocity profile when  $M^2 = 1; m = 1; K^2 = 2; \xi = 1$**



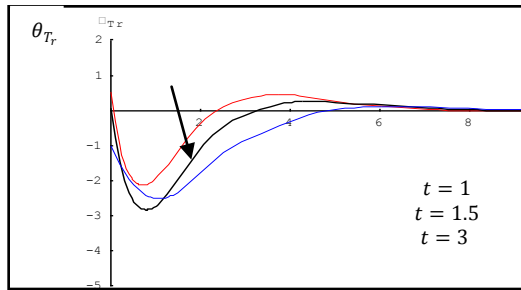


Figure 5:- Temperature profile for various values of time ( $t$ ) when  $Pr = 0.71$ ;  $M^2 = 1$ ;  $m = 1$ ;  $K^2 = 2$ ;  $\theta = 30^\circ$ ;  $\xi = 1$ ;  $Ec = 1$

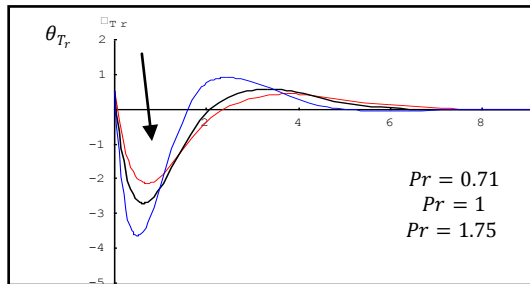


Figure 6:- Temperature profile for various values of Prandtl number ( $Pr$ ) when  $t = 1$ ;  $M^2 = 1$ ;  $m = 1$ ;  $K^2 = 2$ ;  $\theta = 30^\circ$ ;  $\xi = 1$ ;  $Ec = 1$

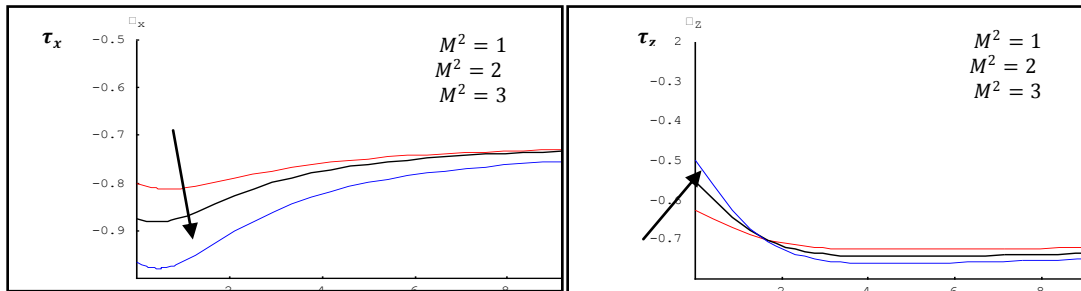


Figure 7:- Shear stress  $\tau_x$  and  $\tau_z$  for different  $M^2$  when  $K^2 = 2$ ;  $\theta = 30^\circ$ ;  $\xi = 1$

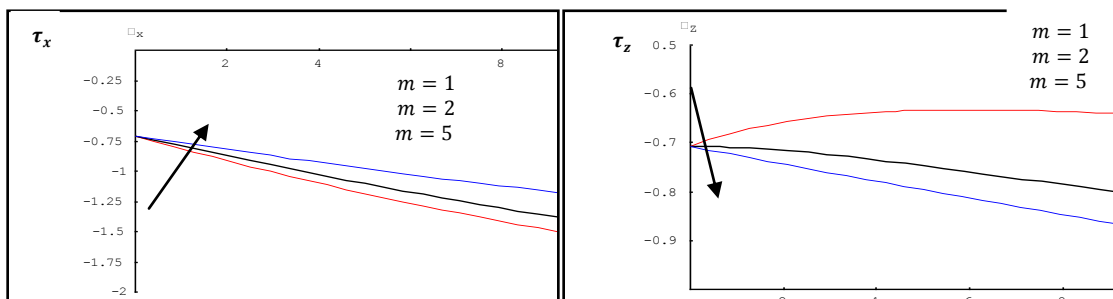
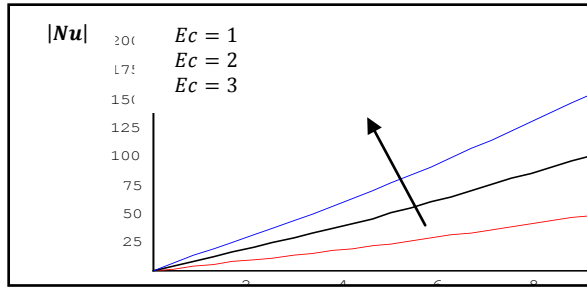
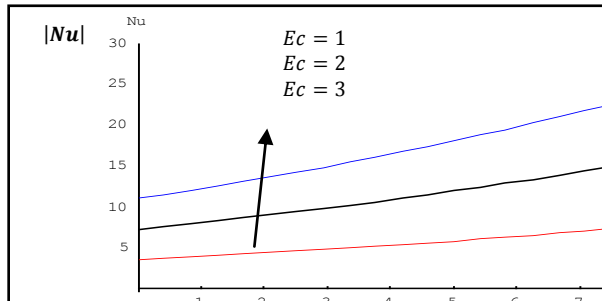


Figure 8 : Shear stress  $\tau_x$  and  $\tau_z$  for different  $m$  when  $K^2 = 2$ ;  $\theta = 30^\circ$ ;  $\xi = 1$

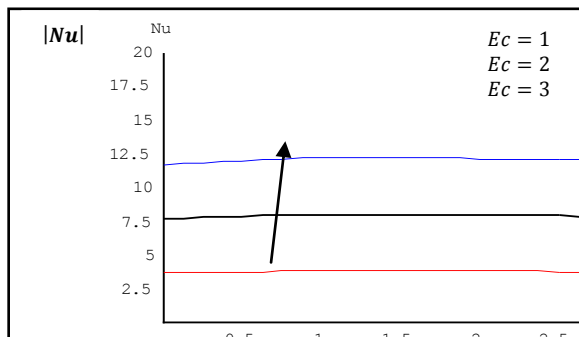




**Figure 9:- The amplitude  $|Nu|$  when  $M^2 = 1$ ;  $m = 1$ ;  $K^2 = 2$ ;  $\theta = 30^\circ$ ;  $\xi = 1$ ;  $t = 1$**



**Figure 10:- The amplitude  $|Nu|$  when  $Pr = 0.71$ ;  $m = 1$ ;  $K^2 = 2$ ;  $\theta = 30^\circ$ ;  $\xi = 1$ ;  $t = 1$**



**Figure 11:- The amplitude  $|Nu|$  when  $Pr = 0.71$ ;  $M^2 = 1$ ;  $K^2 = 2$ ;  $\theta = 30^\circ$ ;  $\xi = 1$ ;  $t = 1$**

Figures 1 illustrate the velocity profiles of both primary and secondary for various values of Hartmann number. It is clearly seen from the figure that the profiles increase near the plate and attains a free stream away from the plate. Figure 2 represents the variation of the primary and secondary velocities under the influence of the Hall parameter. It is evident from the figures that when the Hall parameter is increased, both the velocity profiles almost remain as constant. The effect of Rotation parameter retards both the velocity profiles are shown in figures 3. Figure 4 reveals the primary velocity component increase while the secondary velocity component decreases with an increase in the angle of inclination of the magnetic field. This implies that the angle of inclination of the magnetic field accelerates the primary velocity whereas it has a retarding influence in the secondary velocity. In figure 5 and 6, the temperature profile for different values of time and Prandtl number are presented. Here temperature profiles are gradually decreases near the plate and reach the free stream temperature.

The shear stress along the  $x$  - axis and  $z$  - axis with increase of Hartmann number with respect to the Hall parameter are shown clearly in the figure 7. When the strength of the applied magnetic field is increased, the primary skin friction  $\tau_x$  decreases due to the Hall effect. The secondary skin friction  $\tau_z$  increases near the plate. Figure 8 clearly depicts that the shear stress along the  $x$  - axis, the primary skin friction has a higher influence and it accelerates whereas the shear stress along the  $z$  - axis, the secondary skin friction retards with increase of Hall parameter with

respect to Hartmann number. Figures 9 – 11 depicts the profiles of amplitude  $|Nu|$  when Eckert number is increased with respect to Prandtl number, Hartmann number and Hall parameter. Eckert number expresses the relation between kinetic energy and the enthalpy. Figures clearly show that the amplitude  $|Nu|$  increase considerably when Eckert number increases with the increase of Prandtl number, Hartmann number and Hall parameter.

### Conclusion:-

When the magnetic field is increased the velocity profiles also increase but the Hall parameter is not having a notable influence in velocity components. When the rotation parameter is increased the velocity profiles decrease. The primary velocity increase and secondary velocity decrease when the angle of inclination is increased. The temperature profile decreases when time and Prandtl number are increased. The shear stress  $\tau_x$  at the plate decrease and  $\tau_z$  at the plate increase with increase of Hartmann number and with increase of Hall parameter  $\tau_x$  increase and  $\tau_z$  decrease. With increase of Prandtl number, Hartmann number and Hall parameter, the profile of amplitude  $|Nu|$  accelerates.

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### RESEARCH ARTICLE

#### ASSIGNING RANK AND WEIGHTAGES TO LANDSCAPE PARAMETERS TO WORK GROUNDWATER POTENTIAL - CASE OF MIDC, BUTIBORI, NAGPUR.

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##### Key words:-

Natural Landscape Parameters, Satellite Imagery, G.I.S., Overlays and weight percentages.

#### Abstract

In Nagpur region, Central Ground Water Board (CGWB) is monitoring the ground water quality of the district since the last four decades through its established monitoring wells. Ground water trace and exploration has become a cumbersome task in central India in due to irregularities in annual rainfall. The objectives behind the monitoring are to develop an overall picture of the ground water quality of the district. Hydrological traces and possibilities is sought with the help of natural landscape elements like topographical landforms, drainage patterns and watersheds, vegetative land use, soils patterns etc. by image interpretation techniques. The present study was carried out in an area covering around 520.86 sq.km. to deduce the groundwater potential zones in urban industrial fringe area of Nagpur (Maharashtra Industrial Development Corporation - MIDC, Butibori), based on the remote sensing techniques and interpreting and overlaying basic natural landscape parameters.

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#### Assigning Rank and Weightages:-

The weights and rank have been taken considering the earlier works carried out. The maximum value is given to the feature with highest groundwater potentiality and the minimum given to the lowest potential feature. The higher rank factors are assigned to low drainage density because the low drainage density factor favors more infiltration than surface runoff. Lower value followed by higher drainage density. The primary study of slope gradients was carried using top sheet of Survey of India, Nagpur region, while soils data was taken from National Bureau of soil survey and land use planning and remote sensing data was referred from Maharashtra Remote Sensing Applications Centre, Nagpur. The overall analysis is tabulated in following table no.1as:

**Table. No. 1:-** Showing various parameters with ranking and weightages.

Parameter	Classes	Rank	Groundwater prospect	Weightages (%)
<b>Slope Gradients</b>	Almost Flat (1-3%)	5	Very good	40
	Gently sloping (3-5%)	4	Good	
	Sloping (5-10%)	3	Moderate	
	Steep Sloping (10-15%)	2	Poor	
	Very Steep Sloping (15-35%)	1	Very poor	
<b>Soil Types</b> (based on sand, silt and clay contents)	Tamboli	5	Very good	30
	Paunar	4	Good	
	J Yenwa	4	Moderate	
	Pangagoan	3	Moderate	
	Jawal	2	Poor	
<b>Geology</b>	Basalt	5	Very good	15
<b>Drainage density</b> (Km/Km2)	0 – 1.2	5	Very good	15
	1.2 – 2.4	4	Good	
	2.4 – 3.6	3	Moderate	
	3.6 – 4.8	2	Poor	
	4.8 – 6	1	Very poor	

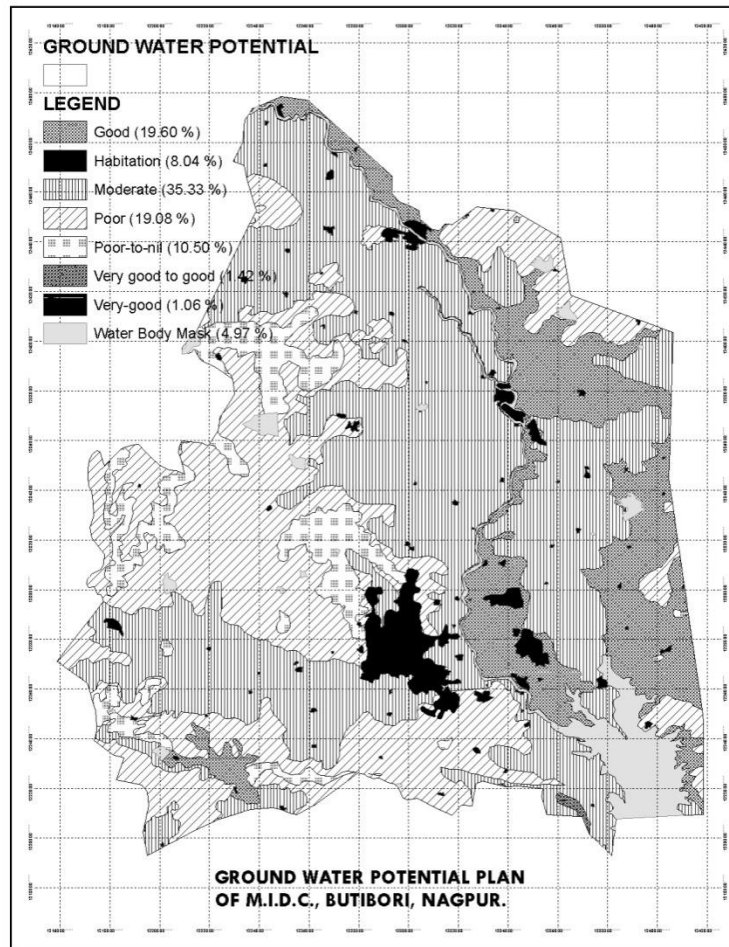


Figure showing Derived Ground Water Potential Plan of Butibori, Nagpur.

**Table 2: Area and Percentage wise Ground Water Potential of Various Zones:**

Sr. No	Potential zones	Area (Km <sup>2</sup> )	Area (%)
1	Very Good	5.52	1.06
2	Very Good to Good	7.39	1.42
3	Good	102.09	19.60
4	Moderate	184.03	35.33
5	Poor	99.38	19.08
6	Poor to Nil	54.69	10.50
7	Habitat Mask	41.88	8.04
8	Water Body	25.88	4.97

**Conclusions:**

1. Different thematic layers such as geology, slope gradients, soil types drainage density and the other relevant associated detail give a broad idea about the groundwater prospect of the area. Remote sensing proves to a very effective tool for delineation of groundwater.
2. Geographical information system and remote sensing has proved to be powerful and less time consuming method for determining groundwater potential in parts of MIDC, Butibori, Nagpur.
3. The study reveals that integration of basic natural landscape parameters such as drainage density (with 15 as weight percentage), slope gradients (40%), geology (15%) and soil types (30%) as combination gives first hand information to local authorities and planners about the areas suitable for groundwater exploration.
4. Moderate ground water potential is been observed in one third of the study area while one sixth share is been taken by both good and poor categories. Very Good and Good categories received a negligible share of around 1 -2 %. The major factor being the dominance of clayey soils with less sand contents having average to flat slope conditions.
5. This groundwater potential information will be useful for effective identification of suitable locations for utilization of water for biomass and other environment friendly development. Further, it is felt that the present methodology can be used as a guideline for further research to determine further combinations using other landscape parameters.

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### RESEARCH ARTICLE

#### HIGH VELOCITY PENETRATING FOREIGN BODY SUSTAINED IN PTERYGOPALATINE FOSSA, CASE REPORT.

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#### Abstract

Craniofacial penetrating foreign body involving the pterygopalatine fossa is a rare condition, it present 2.17% of all head and neck trauma. It could be life-threatening due to injury of vital surrounding structure such as eyes, carotid arteries and cranial nerves.<sup>35</sup>We present a case of a sustained foreign body in the pterygopalatine fossa in a 3-year-old boy sparing the eyes and vasculature. The object was a gun shoot.it was removed successfully using endoscopic approach with no complication.

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#### Introduction:-

Skull base penetrating foreign body is a rare condition.<sup>3 5</sup> In our case, the foreign body was found as sustained foreign body in pterygopalatine sparing the eyes and vasculature, it was removed successfully using endoscopic approach with no complication.

Here we are presenting a case of accidental gun shoot victim who presented to our university hospital in Saudi Arabia.

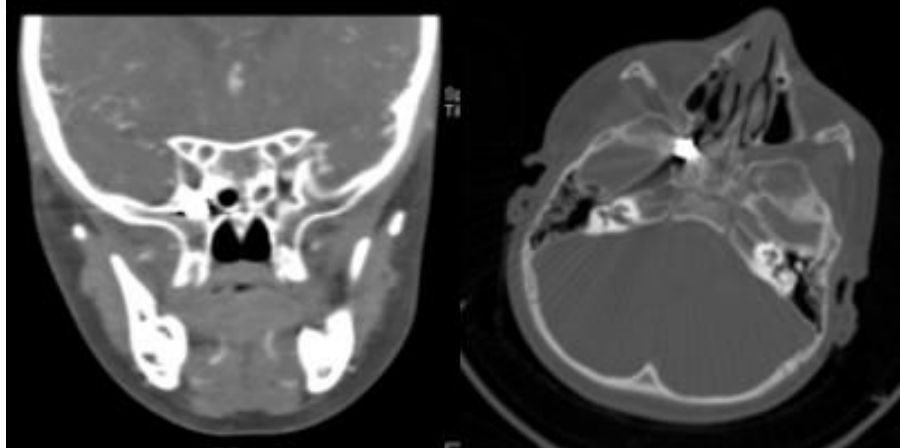
#### Case:-

3 years old Saudi boy was a victim of accidental gun shoot in the right dorsum of his nose. They presented to a local hospital in Saudi Arabia with excessive bleeding at the site of bullet not associated with any neurological symptoms nether irritability or vomiting. 15 days later, they were referred to our university institute because they do not have the facilities of skull base surgery. The patient's status upon referral was stable the bleeding was stopped and the wound wasn't showing any discharge, sparing the eyes and craniofacial vasculature,

Patient's hemoglobin and blood indices all were in the normal ranges. CTscan of head and neck showedforeign body located in right pterygopalatine fossa situated in the right sphenoid bone within right foramen of rotundum area(**figure 1**), CT angiogram showed no vascular insult with normal course of internal and external carotid arteries. Even though the patient was asymptomatic, a decision of surgical removal was done and accordingly Trans-nasal endoscopic removal was done successfully under general anesthesia with no complication. Post-operative, the patient was vitally stable doing well with no neurological deficit.

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**Figure 1:-**

### **Discussion:-**

Skull base penetrating foreign body is a rare condition, it present 2.17% of all head and neck trauma. It could be life threatening due to injury of vital surrounding structure such as eyes, carotid arteries and cranial nerves.<sup>35</sup> Compared to our case, the carotid arteries & cranial nerves were spared. CT scan is the method of choice to diagnose and localize the foreign body, however wood particles can be missed, in this case MRI can be used, CT angiogram should be performed to rule out vasculature injury.<sup>5,6</sup>

The metallic foreign body has to be removed even in asymptomatic patient because it can lead to infection & is believed to be a cause of chronic irritation and could be cancerous due to epithelial alteration.<sup>3</sup> Endoscopic and open surgeries both are the available approaches of removal, however endoscopic approach was described to be associated with less complications.<sup>4</sup> Prognosis and timing of removal is contingent on the patient's overall status.<sup>15</sup> Compared to our case, trans-nasal endoscopic approach was done & the foreign body was removed with no complications.

### **Conclusion:-**

Penetrating metallic foreign body has to be removed to prevent infection & chronic irritation. The endoscopic approach of removal is preferred due to less complication compared to open surgery.

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### RESEARCH ARTICLE

## WATER POLLUTION SITUATION AND APPLIED WASTEWATER TREATMENT STRATEGIES IN BANGLADESH.

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Water pollution, Wastewater, Salinity, Arsenic Contamination, and Treatment.

#### Abstract

Bangladesh, a developing country, located in South Asia along with large population size but with limited land. Due to rapid industrialization and urbanization, scarcity of clean water is rising up day-to-day. Contrary, contamination or pollution of water is still increasing for which many factors are playing roles. The prime source of drinking water in Bangladesh is groundwater and the wide causes for the water pollution is arsenic contamination. Then other major sources of water pollution included industrial wastewater, municipal wastewater, pesticides and chemicals usage in agriculture, road construction, oil spills, salinity intrusion, heavy metals, sedimentation deposit during the flood, and illegal disposal of suspended matters into water bodies. Currently, water pollution is a principal environmental issue in Bangladesh. With-a-view to solving this paramount problem, a lot of water treatment technologies have already been introduced in Bangladesh paradigm – physical, chemical, and biological process (shafi filter, tin kolsi method, oxidation, coagulation, precipitation, adsorption, reverse osmosis, solar desalinization, and new technology for oil removal. But in a case of industrial effluent and municipal wastewater treatment is still limited within primary treatment process. Salinity intrusion is a big problem in the whole southern part of the country but it still unresolved. Further, agricultural pesticide runoff is causing depletion of fishes but there is no step for controlling it. For removing sedimentation deposit in a river, a degrading program has already commenced but not sufficient. But still, there is not found any resource recovery process from wastewater in Bangladesh.

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#### Introduction: -

Bangladesh is a densely-populated country and being developing country, rapid and haphazard urbanization and industrialization is frequently expanding, which is responsible for significant environmental damage suchlike water pollution (Mahmud, 2003). Consequently, the water pollution in Bangladesh has become the worst problem comparing with the other pollutions based on historical data and this situation is triggering by the result of human induced activities among the poor nations of the world. A British study shows that, about 80 million people from Bangladesh (South Asia) were exposed to a high level of toxicity from the water contaminated with arsenic. Besides, an international team of researchers has detected water intake from arsenic contaminated wells and the impact of

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12,000 people in the last decade. Further, it was identified that the death of five people was directly linked to the elevated levels of arsenic in the bodies of the victims of the Bangladesh water. The problem is known for some years now and, hence local residents were advised to dig deeper wells to avoid the potentially contaminated surface water consumption (Smith et al., 2000; Mukherjee, 1999). Dhaka is the capital and the densely-populated city in Bangladesh while the biggest problem of the city is the arsenic in the water. Unfortunately, there is a plenty of dust and soil; hence the main pollution of Bangladesh is on the water. Some studies indicate that 20 years are needed for the morbid effects of arsenic poisoning to disappear. About 59 districts out of 64 are affected by arsenic contamination. Arsenic contamination level varies from 0–20,000 ppm while WHO permit level in drinking water is 10 ppm but 50 ppm in Bangladesh standard while some experts have recommended 20 ppm (Safiuddin & Karim, 2001).

Rivers and canals in Bangladesh are becoming increasingly polluted from industrial wastewater dumping by factories, especially textile industry. Leather tanneries are also a significant source of toxic pollutants to the air and water. The important river of Dhaka city is mainly polluted due to tanneries effluent discharges. The water pollution threatens food production as well as raising both environmental and human health hazards. According to Human Rights Watch report, toxic from tanneries are seriously affecting workers like skin diseases, and respiratory illnesses caused by exposure to tanning chemicals, and limb amputations caused by accidents in dangerous tannery machinery (Miti et al., 2009). Runoff agricultural pesticides mixed water; oil spills from tankers, household wastewater discharge, and thermal water pollution from hydroelectric project are also contributing river water pollution in Bangladesh major or minor scale.

Bangladesh is a deltaic country with total area of 147,570 km<sup>2</sup> where the major part consists of alluvial sediments deposited by the rivers of Ganges, Brahmaputra, Tista, Jamuna, Meghna and their tributaries. The coastal region covers about 20% of the country but in case of the cultivable lands cover more than 30%. About 53% of the coastal areas are affected by salinity. Agricultural land use in these areas is very poor for salinity intrusion, which is much lower than country's average cropping intensity. The factors which contribute significantly to the development of saline soil area, tidal flooding during wet season (direct inundation), and upward movement of saline ground water during dry season. The severity of salinity problem in Bangladesh increases with the dehydration of the soil. The dominant crop grown in the saline areas is local transplanted Aman rice crop with low yields (Haque, 2006).

Pesticide use in Bangladesh is often excessive and unregulated. Despite of their worldwide ban, Persistent Organic Pollutants (POPs) and other harmful organ-chlorine pesticides are widely being used yet. The presence of POPs such as DDT in agricultural wastewater which is carried into rivers flows or nearby water bodies during rainfall causes serious water pollution. This is responsible for dying of fishes and extinction of abundance fishes from rural water bodies (Hasan et al., 2012). Consequently, the abundance fishes in water bodies of Bangladesh have already declined remarkably. A study shows pesticide sprayed in farm lands is higher dust than non-spraying. The distributions of the pesticides throughout the various rooms sampled suggest that the strictly agricultural herbicides are potentially being brought into the home on the farmer's shoes and clothing. These herbicides are not applied in or around the home but they appear to be getting into the home para-occupationally. For agricultural pesticides, take-home exposure may be an important source of home contamination (Curwin et al., 2005).

Storm water and flood water runoff carry silts and waste material into river or channel flows and thus pollute water bodies as well as fill up. This water also carries construction debris and oils from road or park lots. Moreover, deforestation, soil erosions and land use change are resulting into sedimentation deposit in water flows and finally, these water bodies are becoming dry up depleting fish resources. Therefore, pollution in Bangladesh has brought enormous problems throughout the country suchlike drinking water source destroy, irrigation water supply problems, household, and industrial water supply troubles. Defective implementation of laws and lack of awareness among mass people is retarding water pollution control efforts.

#### **Investigation Of Water Pollution Situation In Bangladesh: -**

Day-to-day water pollution situation in Bangladesh is becoming worsened. The factors which are responsible for water pollution and increasing severity are diversifying frequently as well as new sources are adding everyday due to rapid population growth, economic growth, improvement of living standard, and more chemicals, pesticides, and heavy metal usages for different purposes. But they are still under control range. The major types and sources of water pollution in Bangladesh are described as follows.

### Municipal Wastewater: -

Bangladesh is an over populated country and urbanization process is continuously expanding frequently but indiscriminately. There are 11 city corporations, 119 municipalities and 310 urban centres while urban population rate is 28.4% now. Besides, about 3-4 % people are migrating to the urban areas every year for searching of livelihood or better living standard (BBS, 2011). Hence, high rate of rural people migration to urban areas is worsening the environmental situation. Consequently, more population is producing large volume of wastewater and directly discharging into water bodies. Hence water pollution from municipal household sources is a big problem in Bangladesh now. Further, per capita polluted water discharge and per capita pollutant load in water bodies is rising up. For detecting the pollutant load in the river, river flow fluctuation derived from the tidal level fluctuation was important to be considered in regards to both water quantity and quality (Parvez et al., 2007). Enough knowledge about the nature of wastewater is essential to design and operate collection, treatment, and disposal process to manage quality of environment. As example: Municipal wastewater of Sylhet city originates from different types of sources and then falls into the Surma River through different channels without any treatment. The discharged wastewater quality of Sylhet city is medium for suspended solids, BOD and chlorides, and strong for alkalinity (Alam et al., 2006).

Similarly, in other cities like Khulna Municipal area wastewater is discharged to the nearby rivers, canals, etc. without treatment. The observed values of different parameters lie within the range to permit reuse in agriculture. The values of DO are found to be below the permissible level recommended for irrigation while some values of EC and TDS exceed the irrigation water quality standards. Chloride was the dominant anion following bicarbonate, sulfate, phosphate and nitrate whereas calcium is the dominant cation following magnesium, sodium and potassium in wastewater generated in Khulna city. This domestic effluent dominated wastewater flow through the numerous concrete and earthen drains which finally dispose of to the nearby water bodies without treatment. As the quality of wastewater is not fully satisfactory, there are valid probabilities for occurring pollution problems in river waters (Mridha, 2011). In the same way, others cities of Bangladesh paradigm Dhaka, Chittagong, Rajshahi, Barisal, Gazipur, Narayanganj, Comilla, and Rangpur discharge their daily generated municipal wastewater into nearby water bodies (especially river) without making any pre-treatment which is responsible for polluting the concerning water bodies. Thus the water pollution situation in Bangladesh is enhancing rapidly which has become a tough task to control if it is delayed.



Figure 1: - Bangladesh political map indicating major cities

**Industrial Wastewater: -**

There are total 30 industrial estates in Bangladesh currently according to Bangladesh Small and Cottage Industries Corporation (BSCIC). BSCIC was created through an Act of Parliament in 1957 which was later amended in 1992. Likewise, the Bangladesh Export Processing Zones Authority (BEPZA) was established to setup and operate export processing zones in Bangladesh under the Bangladesh Export Processing Zones Authority Act, 1980. According to Act the Chittagong Export Processing Zone (CEPZ) was established in 1983 and later, the Dhaka Export Processing Zone (DEPZ) created in June 1993. The rest industrial parks are dispersedly located in different parts of Bangladesh mainly in Chittagong, Dhaka, Khulna and some others placed in distinct place of the country (Yunus and Yamagata, 2012).



**Figure 2:-** Industrial effluent discharge and river water pollution in Dhaka

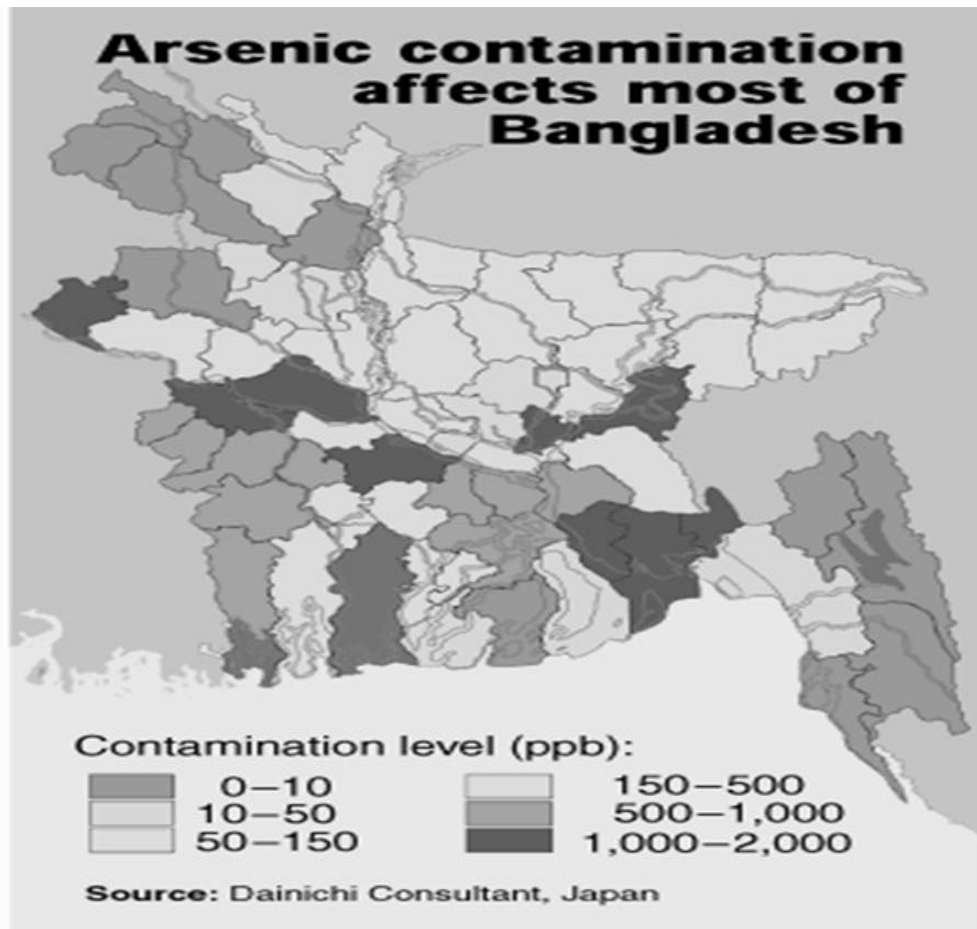
The most polluting industries are tanneries, textiles, chemicals, dyeing and pharmaceuticals factories. All the industries produce gigantic volume of effluent every day during their normal operations as by-products. This wastewater contains TDS, TSS, heavy metals, nutrients, and toxic chemicals which are responsible for destroying water quality and making unsuitable water bodies for survival of organisms as well as for other purposes of use like household, irrigation, industrial, and drinking. Almost all the factories discharge their daily generated wastewater directly into nearby water bodies without any pre-treatment. Majority number of industrial units has their own effluent treatment plants (ETP) but they don't use regularly to save cost. Only a few industries partially operate their installed ETP regularly. All the ETP use mainly biological process to remove BOD, TSS, and others. But they don't collect nutrients and heavy metals from wastewater. Therefore, their treated wastewater is also unsafe for further usage (Yardley, 2013).

**Groundwater Pollution: -**

The groundwater has been used for agricultural and drinking purpose since 1960's in Bangladesh. With a view to bringing change in conventional groundwater extraction system, another initiative based on previous agencies on principal began to supply of safe drinking water for rural people by installing tube wells headed by UNICEF in 1970s. Unfortunately, this project was the cause of one of the worst environmental calamities in the delta's history. Arsenic is a naturally occurring element that exists in the earth. Besides, most of the tube wells weren't penetrated into deep rather extracts subsurface water. But there is more potentiality of arsenic availability in sub surface water source. Consequently, later for the past two decades the water from over a million tube-wells has been slowly poisoning with naturally occurring arsenic predominantly in the village areas. According to WHO, up to half the country's tube wells, estimated to number 10 million, are poisoned by arsenic contamination (2001). Hence, it is estimated that about 35 to 100 million people are at risk of drinking arsenic-contaminated and large scale groundwater extraction is the root cause of arsenic contamination in the ground water.

Purification of drinking water using various methods was practiced in ancient India and it is a shame to find the very source of potable water contaminated in the Bengal Basin. The region has constantly struggled in its attempt to administer safe and adequate water resources, making it easier for people in the Bengal Basin to access safe drinking water. By the late 1980s, surface water was the main source of drinking water in the region which was severely polluted. As a result, the population largely suffered from diarrhea and various water-borne diseases. Then Bangladesh government, UNICEF and various other aid groups suggested using groundwater as an alternative source for drinking water. This idea seemed logical because of the ample number of aquifers in the Bengal Basin and the deltaic alluvium which was easy to dig (Telfeyan, 2009).

In 1993, studies detected the first patient suffering from arsenic-contaminated groundwater. The Bangladesh government began to face a very difficult and serious water problem. Arsenic is a known carcinogen and highly toxic substance. It has gradually affected people in the Bengal Basin. But it is difficult to realize that drinking water is affected by arsenic because it is colourless, tasteless and odourless. Now, this disaster is widespread in the Bengal Basin and about one-third of the population of the Bengal Basin suffers from various diseases such as warts, skin lesions, and cancers. This serious water problem can be attributed to the combination of ineffective water resource management, industrialization and the rapid increase of population. Anyhow, the arsenic-contaminated groundwater problem is mainly caused by the lack of knowledge of water resources (Mukherjee, 1999).

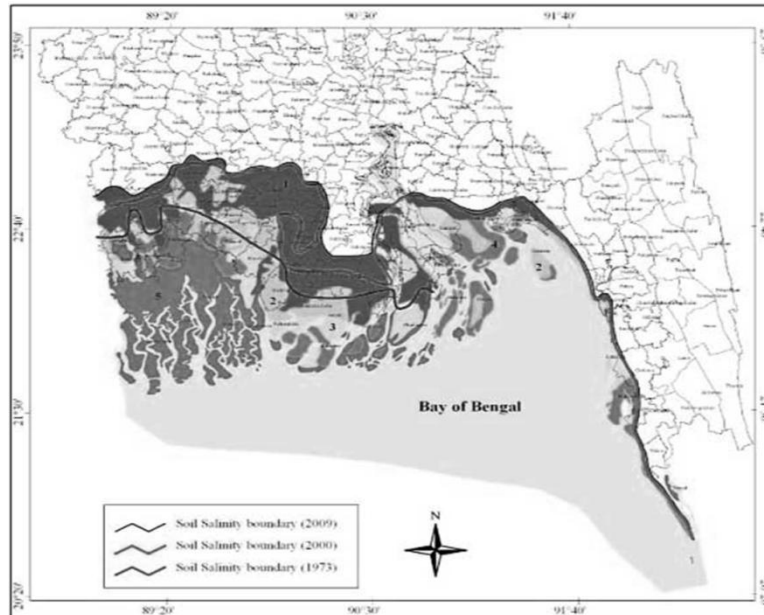


**Figure 3:-** Arsenic contamination showing map of Bangladesh

#### **Salinity Intrusion in Fresh Water Sources: -**

Bangladesh is a riverine country and the whole southern part of the country is covered by the Bay of Bengal. But the water of the Bay of Bengal is saline and so the southern part of the country is affected by salinity intrusion through ground water infiltration or inundation by flood water. Moreover, salinity intrusion is an impact of climate change and it has become a common phenomenon in the country's coastal belt. The intrusion of salt water into arable land is now severely affecting boro rice cultivation in the dry season. But about 2.85 million hectares of land is available in the coastal belt where only 0.83 million hectares of land is cultivable amidst 0.44 million is now salt-affected (Haque, 2006). As a result, they can't grow rice in their belonging lands due to salinity effects. Contrary, a large number of farmers are cultivating boro rice in salt-affected areas, while most of them are using hybrid rice and local rice variety which require 145 to 160 days to harvest. Farmers need to prepare seedbeds in November, followed by main land preparation and transplanting of rice seedlings in the main field in December-January. Similarly, the farmers are facing serious problem in cultivating boro rice due to increasing salinity intrusion in these areas. So, they get low yields and sometimes no yield at all (Hassan, 2009; Haque, 2006).

For overcoming rice production problem, Bangladesh Institute of Nuclear Agriculture (BINA) in collaboration with International Rice Research Institute (IRRI) has developed salt-tolerant rice variety named Binadhan-8 which can survive up to 10 ds/metre. The National Seed Board of Bangladesh officially released Binadhan-8 in 2010 to enable farmers to cultivate this variety a larger scale in the salt-affected areas. With this variety, it is possible to yield six tons per hectare in salt-free land. So Binadhan-8 can be cultivated in both salt-affected and salt-free lands (BINA, 2014).



**Figure 4:** Salinity intrusion extent in different time in the southern part of Bangladesh map.

Anyhow, farmers in the southern region of the country got desired results from this salt-tolerant rice variety under close technical follow-up and supervision by IRRI and DAE field staff and its partner NGOs as well as private seed companies. It was found that without any salinity, farmers received around 5.5 tons of rice per hectare, which required 135-145 days to harvest. But when the variety was planted in salt-affected lands (8-12 dsm/metre), farmers received around three to four tons of rice per hectare, depending on the degree of salinity. Both farmers and farm labourers of the coastal areas are getting benefits from the cultivation of Binadhan-8, which is salt-tolerant and high-yielding (Haque, 2006).

#### **Agricultural Pesticides: -**

Bangladesh is an agricultural country. Most of the part of the country is fertile but total land area is limited. Besides, rice and fish are our staple food. Moreover, our population volume is large along with high growth rate. For meeting the high demand of food, farmers are using more pesticides and chemical fertilizers for getting highest production within limited land. But these pesticides are very harmful for environment and fishes though they can destroy insects. During heavy rainfall and flood this agricultural wastewater runoff into nearby water bodies or rivers and get mixed with river water and occur water pollution. For this reason, our historical abundances of fish is declining rapidly and appearing scarcity of fishes. Pesticides and chemical fertilizers use in agricultural crops or farm is the main cause of fish reduction in Bangladesh (Kabir and Rainis, 2012). In many developed countries, this harmful and toxic pesticides use has already banned for saving environment. But in developing countries like Bangladesh, these pesticides are still widely used in agriculture and farms.





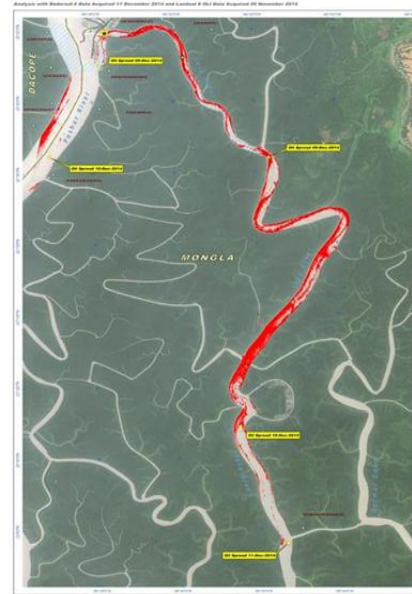
**Figure 5: - Agricultural pesticides use and nearby water bodies' pollution**

#### **Oil Spills and Road Construction Materials: -**

Bangladesh imports all the consuming oil from middle estate countries. Therefore, oil pollution is not a familiar and serious pollution in Bangladesh. But when some ships discharge their oily wastewater directly into the Bay of Bengal or wash up their ship then water pollution occurs. The Bay of Bengal is vast, so it is not a big problem. On the other hands, road construction and park lots oil mixed materials get mixed with rain water runoff during heavy rainfall and flood which is finally carried into Inland River or channel waters and happen water pollution. Very recently, (9<sup>th</sup> December, 2014) a large-scale oil spills took place in Sela River of Sundarbans. Consequently, the fragile Sundarbans region stared at an ecological nightmare after a vessel carrying 350 tonnes of oil crashed, spilling the toxic liquid over an 80-sq-km area along the Sela River in Bangladesh and threatening a sanctuary of rare Irrawaddy and Ganges dolphins. Sundarbans, a UNESCO world heritage site, has a unique land-marine eco-system which includes the Bengal tiger. The tanker, Southern Star VII, sank after colliding with another vessel early Tuesday while trying to steer through dense fog. Now it is considered as an ecological catastrophe (Mukherjee and Chakrabarty, 2014).



#### **OIL SPILL IN SUNDARBANS MANGROVES, KHULNA, BANGLADESH**



**Figure 6: - Oil spills from tanker (left) and oil spread through river map (right)**

#### **Thermal Water Pollution: -**

Thermal pollution is not a big factor in Bangladesh now. But it is increasing gradually due to rapid industrial growth. Majority of the industries in Bangladesh directly discharge their used water into nearby water bodies making hot. This hot water reduces oxygen availability of the water and make unsuitable for fish survival. Besides, in Chittagong there is one hydro-electric project which use river water and discharge the used hot water into Kaptai

Lake. Consequently, it is decreasing oxygen availability from the lake which is resulting into fish production or survival problem.

#### Natural Disasters (Flood and Storm): -

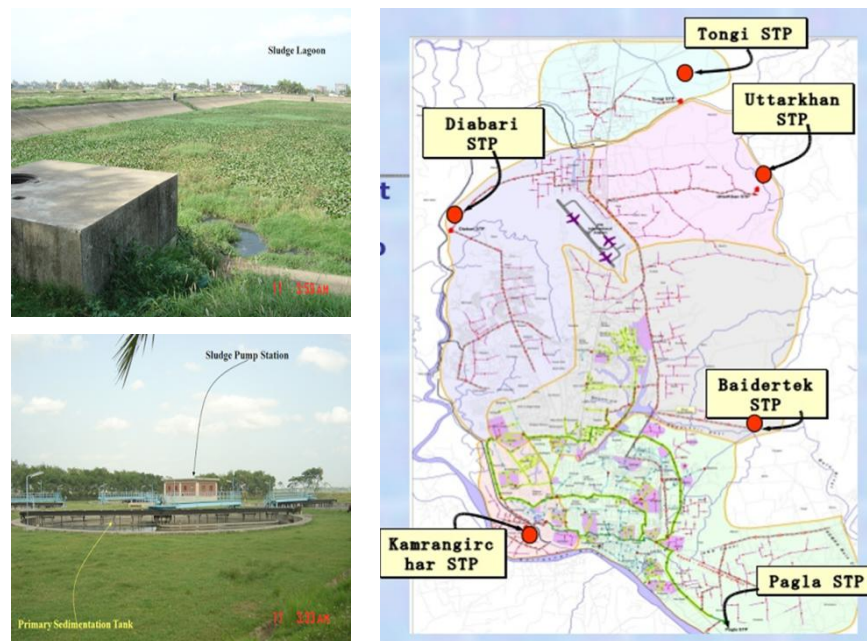
Bangladesh is a disaster-prone zone and many natural disasters visit this country every year suchlike flood, cyclone and storm. These disasters sweep away waste, silt and clay from land during disasters and deposit in river, channel, lake or wetland water and cause water pollution. It is also responsible for occurring eutrophication process in lake or lagoon because this water runoff carries nutrients along with wastes.

#### Some Applied Strategies for Wastewater Treatment In Bangladesh: A Few Case Studies:

Currently, Bangladesh is giving priority on arsenic removal from ground water, municipal sewage treatment, industrial effluent treatment, and salinity removal from coastal inland water sources and they are major concerning issues too. All the major water pollution control process and technology are described below –

#### Municipal Wastewater Treatment: -

Municipal sewage treatment is one of the biggest problems in Bangladesh but still neither central government nor local government has taken proper steps to resolve this trouble rather they are planning to do something for treatment of sewage. Anyway, Dhaka City Corporation had established one sewage treatment plant namely Pagla Sewage Treatment Plant in 2003 which can treat only 10% comparing to the total daily sewage generation. The current area and population of Dhaka city is 348.57 sq. km. and about 15 million. Consequently, this large population generate huge volume of sewage which demands more sewage treatment plants. Hence, one study suggests that Dhaka city need five new sewage treatment plants immediately to increase efficiency. In case of sewage treatment, they use conventional treatment process and limited within primary treatment (figure 7). But in case of other cities there is no sewage treatment plant yet. So, major fraction of sewage is remained untreated and causes water pollution (Amin, 1998; Arafin, 2011).



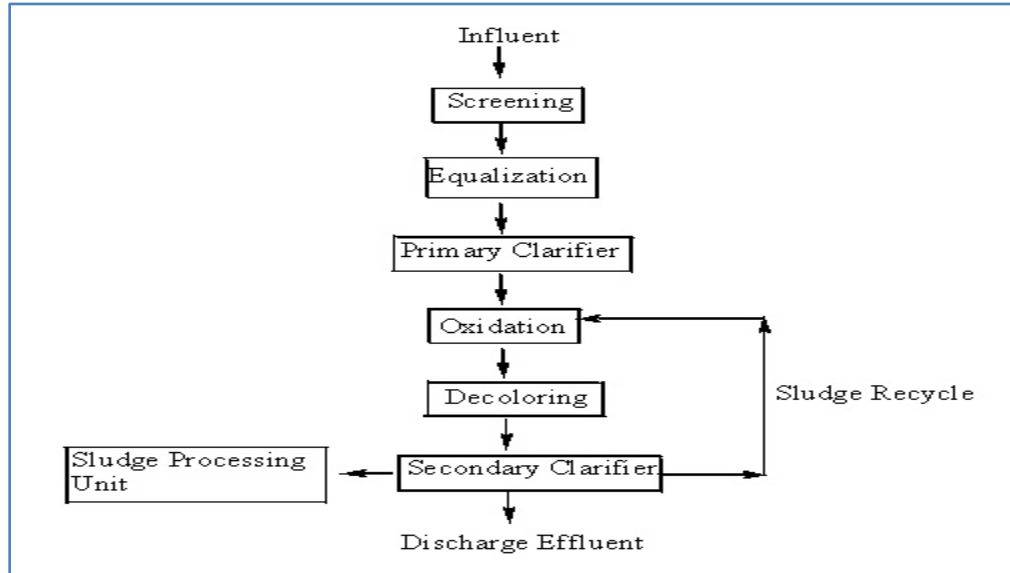
**Figure 7:** - Pagla Sewage Treatment Plant, Dhaka (left) and proposed map for new plants.

While for sewage and drinking treatment, there are six plants in Dhaka city and they can supply only about 35% and the rest comes from ground water. Then in other large cities suchlike Chittagong, Khulna, Rajshahi, Sylhet, Barisal, and Narayanganj they have only drinking water treatment plant but no sewage treatment plants still.



**Industrial Wastewater (effluent) Treatment: -**

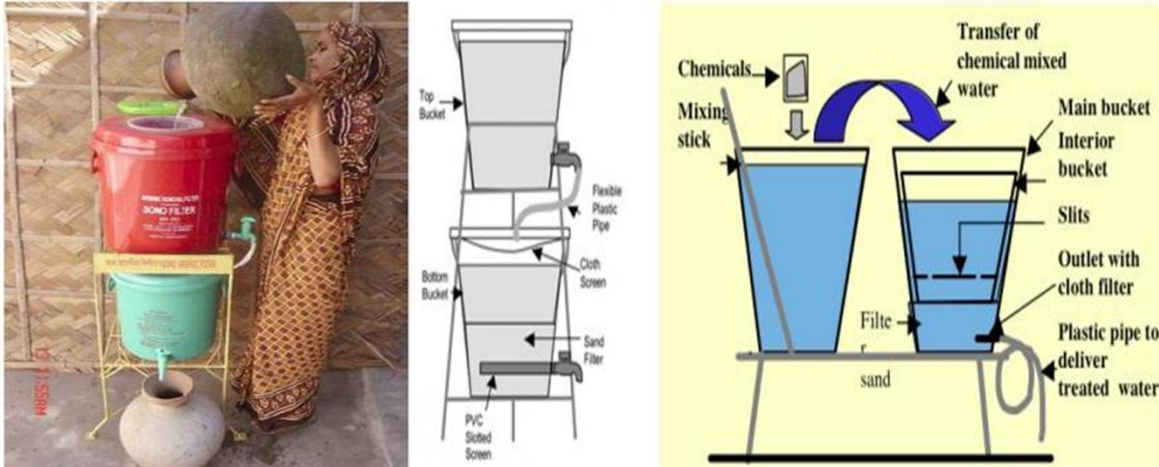
In Bangladesh industrial growth is rapidly occurring but in haphazard and unplanned way. Most of the small-scale industry has no effluent treatment plants. Contrary, medium and large scale industries have their own effluent treatment plants but don't operate regularly with a view to saving cost. But the large-scale industries that operate their sewage treatment regularly are not sufficient because they do partially not fully. Most of them use physical, chemical and biological process mixing up as well as conventional technology. But they give priority mainly on biological process rather than chemical ones. Very few small industrial parks in Dhaka has their common effluent treatment plants while large scale common effluent treatment plants are only in Chittagong and Dhaka located at Chittagong Export Processing Zone and Dhaka Export Processing Zone. There is given one process flow chart of effluent treatment in Bangladesh (figure 8) (Alam&Guha, 2012).



**Figure 8: - Industrial effluent treatment process flow chart.**

**Arsenic and Iron Removal from Ground Water: -**

The presence of elevated levels of arsenic in groundwater has become a major concern around the world, especially in South Asia. Up to date, there is no effective treatment for curing health impacts due to the intake of high levels of arsenic. A wide range of technologies has been developed for the removal of high concentrations of arsenic from drinking water. The most common arsenic removal technologies use oxidation, coagulation, precipitation adsorption, ion-exchange and membrane techniques while local technologies are Shafi filter and Tin-Kolsi Method. All the arsenic treatment technologies ultimately concentrate arsenic in the sorption media, the residual sludge or in a liquid media. To avoid indiscriminate disposal and environmental pollution, these wastes need to be treated or disposed of properly. In the areas where the drinking water contains unsafe levels of arsenic, the immediate concern is finding a safe source of drinking water. There are two main options: Finding a new safe source or removing arsenic from the contaminated source. If an arsenic safe water source cannot be established, the short-term goal is to reduce arsenic levels. There are several methods available for removal of arsenic from water. Both local and import technologies can remove arsenic 3-20 ppm while the highest level of arsenic contamination in Bangladesh is about 20,000 ppm. Besides, the government has taken one step to keep away people from collecting drinking water from arsenic contaminated sources by painting red colour in affected one and green colour in arsenic free one. Thus, people are being aware about arsenic. Now people are using many methods for arsenic removal at household level and three from them are shown in (figure 9) (Ahmed, 2001).

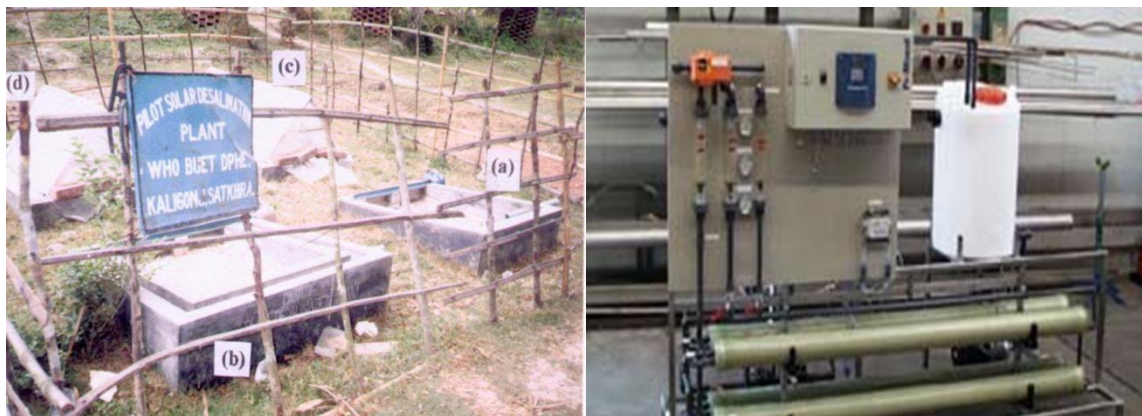


**Figure 9:** Sono filter (left) and bucket treatment Unit (middle), and Stevens Institute Technology (right) household-level filters for arsenic removal from drinking water.

#### Desalination of Drinking Water: -

Salinity intrusion into drinking water source and agricultural land is a big problem in the southern part of Bangladesh. Hence, they suffer from different water-borne diseases and can't grow crops. For resolving this problem many technologies have been imported from other countries but costly and not sufficient according to social and community demand (Sobuz et al., 2010). Meanwhile, some local technologies are also developed for removing salt from water suchlike –

- ❖ Reverse Osmosis (RO) Method,
- ❖ Solar Desalination,
- ❖ Multi-Stage-Flash (MSF),
- ❖ Multieffect-Distillation (ME) with Thermal Vapour Compression (ME-TVC), and
- ❖ Thermal Solar Desalination.



**Figure 10:** - Solar desalination plants at Kaligoanj, Khulna (left) and RO Plant (right)

Anyhow, the situation is gradually changing and many national and international NGOs are working together with Bangladesh government to resolve this problem. But still the problem is unresolved though many technologies have been imported and developed due to lack of sufficient fund and awareness among mass people. Contrary, some saline tolerant varieties of crops have also been invented by Bangladesh Rice Research Institute.

#### Agricultural and Oil Contaminated Water Treatment: -

Agricultural pesticides and chemical fertilizers mixed wastewater from agricultural field and farms are runoff into surrounding water bodies and pollute water. The whole country is suffering from this problem but no initiative has been adopted still to remove it though it the root cause of fish reduction from our natural water bodies. Once, natural sources of fish were abundance with varieties of fishes but now it is just like a dream.

Then oil pollution is also getting remarkable due to uncontrolled trend of it. Bangladesh is much undeveloped in case of oil pollution treatment of water. Oil is used as fuel both in land and water transport along with some oil mixed materials in construction works but they are not conscious about its misuse and getting polluted water bodies. Chemical spray, neutralization process, and hand collection are the available technologies for oil removal from water but last year a new technology was developed based on local ones.

### Concluding Remarks: -

Comparing with the population growth, the industrial development and urbanization process is also expanding. Consequently, water scarcity is intensifying as well as water pollution is triggering day-to-day. Arsenic contamination, salinity intrusion, industrial effluent discharge, and municipal wastewater discharge are the major water pollution in Bangladesh now. Large scale industrial wastewater treatment plants are in Chittagong and Dhaka. Then in case of municipal wastewater treatment, there is only one Sewage Treatment Plant in Dhaka. For desalination sea water, in the Khulna there are a few small or medium scale treatment plants but not sufficient. Almost the whole country is affected by arsenic contamination as well as Dhaka and Chittagong is more polluted cities in Bangladesh. The rest cities and places are not so seriously polluted. Therefore, that still it is possible to protect the whole country being polluted because the extent of present water pollution situation is under control. But appropriate policy, plan, and public awareness are required to resolve the problem first.

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### RESEARCH ARTICLE

#### PREVALENCE OF VITAMIN D DEFICIENCY IN TYPE 1 DM A CONTROL CROSS SECTIONAL STUDY HELD IN MIDDLE AND WEST REGIONS OF SAUDI ARABIA.

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#### Abstract

This study compares the prevalence of Vitamin D deficiency in pediatric patients of type 1 diabetes mellitus in the central and western regions of Saudi Arabia with children having no type 1 diabetes mellitus.

Research Methods: A control cross sectional study conducted in Al-Yamamah Hospital (Central Saudi region) and Hera General Hospital (Western region). New cases or known cases of type 1 diabetes were recruited in the outpatient clinic and measurement of blood Vitamin D level, PTH, Ca, Phosphorous and Alkaline phosphatase were done.

Result: The study showed that among type 1 diabetic patients, 71.1% were severely Vitamin D deficient, 20.6% were moderately Vitamin D deficient, 8.1% were mildly Vitamin D deficient and 0.2% had normal Vitamin D levels. In the control group 42% were severely Vitamin D deficient, 18.8% were moderately Vitamin D deficient, 8.7% were mildly Vitamin D deficient and 30.4% had normal Vitamin D levels. So overall nearly 100% of the children with Type 1 Diabetes Mellitus were deficient for Vitamin D as compared to 69.5% of the control children.

Conclusion: - Vitamin D levels must be done for every child that has proven Type 1 diabetes mellitus (T1DM). This will ensure early detection of Vitamin D deficiency and proper management. This will ultimately yield a better outcome and prognosis.

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#### Introduction:-

Diabetes mellitus is a common disease and is especially prevalent (almost as an epidemic) in the Middle Eastern countries. Many researchers have been highlighting the association of Type 1 diabetes and Vitamin D deficiency. Vitamin D is known to regulate the functions of over 200 genes in our body and is essential for growth and development. (1).

Type 1 diabetes mellitus (T1DM) is the most commonly diagnosed type of DM in children and adolescents. It usually presents with symptomatic hyperglycemia and implies the immediate need for exogenous insulin replacement. (2).

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Vitamin D3 is a fat soluble vitamin required for normal growth of all tissues originating from the ectoderm (e.g. bone, teeth, hair and skin). This is especially evident in children. Vitamin D deficiency can result in manifestations of rickets in children and osteomalacia in adults.

The main source of Vitamin D is sun exposure through skin synthesis under the action of ultraviolet irradiation of ergosterol (D1) transferred to a crystalline compound called ergocalciferol (D2) and cholecalciferol (D3) which is formed in our body. Vitamin D is described as "the Sun Vitamin". It is a steroid with hormone like activity. Minor sources of Vitamin D come from dietary sources such as oily fish, meat and egg. Until 1980, the role of Vitamin D in the functioning of the immune system was unknown.

In recent years an effort has been made to understand possible non-calcemic roles of Vitamin D, including its role in the immune system, particularly on T cell-mediated immunity. Vitamin D receptors are present in significant concentrations in the T lymphocyte and macrophage populations. However, their highest concentration were found in the immature immune cells of the thymus and the mature CD-8 T lymphocytes. The significant role of Vitamin D compounds as selective immune suppressants is illustrated by their ability to either prevent or markedly suppress animal models of autoimmune disease. Results show that 1,25 dihydroxyvitamin D3 can either prevent or markedly suppress experimental autoimmune encephalomyelitis (3, 4).

The incidence of diabetes is increasingly approaching an epidemic population in many countries including Saudi Arabia. There was a study done in 2010 in the Saudi province of Dhahran among a population of children younger than 15 years from the period of 1990-2007. Results showed an increase in the rate of diabetic patient from 18.05 per 100,000/year in the first 9 years to 36.99 per 100,000/year in the next 9 years. (5)

#### **Research Methodology:-**

From a control cross-sectional study of all samples collected from Al Yamamah Hospital OPD as well as Hera General Hospital OPD, we selected a sample of Saudi patient type 1 diabetes to measure their total Vitamin D3 level in the blood. This laboratory investigation was done in two hospitals of different regions in Saudi Arabia, the first one was in Al Yamamah Hospital in Al-Riyadh which is the capital of Saudi Arabia and marked by high temperatures during the day and low temperatures at night. Most of the country follows the pattern of the desert climate with very hot weather especially in Jun, July and Aug reaching temperatures up to 55 degrees Celsius. The second analysis was done in Hera General Hospital in Makkah which is the Islamic capital for Muslims that has a similar climate as Riyadh.

The patients referred to both centers either as newly diagnosed type 1 diabetes based on clinical presentation for the disease, mostly DKA on admission, or rarely presented by hyperglycemia without DKA. Also known cases of T1DM being managed in the two hospitals were included in the study. Diagnosis of T1DM was confirmed by measuring C-peptide.

The data was collected in a period between Jan 2008 to Jun 2015. The sample consisted of 135 patients aged between 1 to 16 years. All patients were Saudi. Family history regarding T1DM or any risk factors for Vitamin D Deficiency (e.g. Sun exposure, nutritional history) were obtained from the parents. Vitamin D3 levels were measured by (Roche diagnostic GmbH German) 411 Immunoassay analyzer (after the patients recovered from DKA episode). PTH, Ca, Phosphorous and Alkaline Phosphatase were measured as well. Patients then were followed monthly or every 3 months in OPD. Patients started on a conventional treatment in the form of NPH and Regular insulin. Patients presented from Al-Riyadh city didn't like multiple daily injections (50%) but remaining patients (50%) started on multiple daily injections in the form of long acting insulin (Lantus) and rapid acting insulin (Novorapid). The results of vitamin D3 levels were categorized according to Vitamin D Council (15).

We divided the levels into severe type, which is less than 30 nmol/l, moderate type between 30-50 nmol/l, and mild type between 50-70 nmol/l and normal more than 70 nmol/l which is defined as an adequate vitamin level where there are no symptoms or signs of vitamin D deficiency and the same was used in control group. We selected the control patient referred to OPD with complaint of non-thriving. The control group consisted of 83 patients.

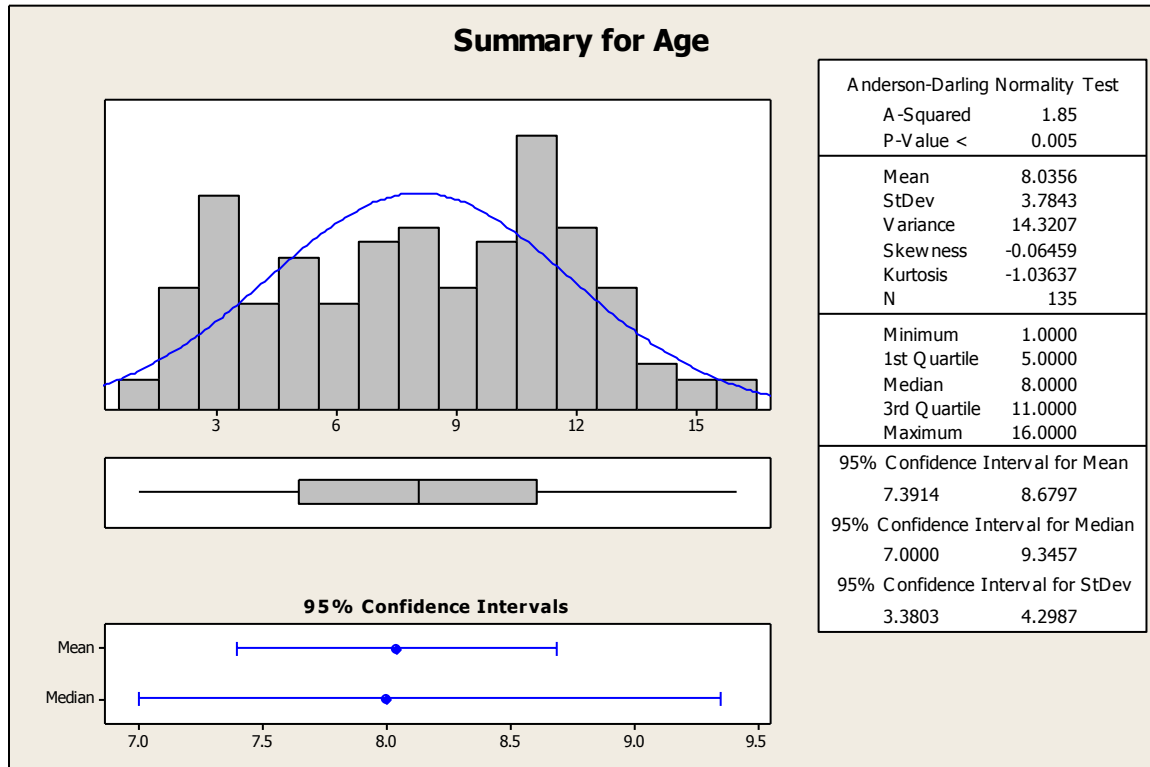
There were certain Exclusion criteria:

- Children Younger than 1 year who have signs of rickets
- Other endocrinal gland disease like (Hypo or Hyperaldosteronism)
- Chronic disease (lungs, gastrointestinal disease)



**Research sample:-**

There were a total of a 135 patients included in the study having type 1 DM. The mean age was 8.0356 years old (range from 1 to 16 years old) with BMI mean 15.832 (11-25) P-value <0.005. There were 62 (45.9%) males and 73 (54.07%) females. The mean vitamin D3 level for all patients was 22.993 nmol/l (4-89nmol/l) P-value<0.005. Mean HbA1c for all patients was 10.887 (1-17.5) P-value <0.005.



**Figure 1:-**Summary of Age of type one diabetes.

This diagrams shows the age vs. the number of type 1 diabetes patients. There are two clear peaks visible, one before the age of 5 and another between the ages of 9 and 15. Children are prone to infections around the age of the first peak (3 years) and around the second peak (11 years) they can suffer from pre pubertal hormonal secretion.

**Discussion:-**

There have been a lot of studies carried out showing the prevalence of vitamin D deficiency in type 1 diabetes compared with a control group. One of these studies is the north Indian study (6) which showed a Vitamin D deficiency in 91.1% of the subjects with diabetes, and in 58.5% of the healthy controls, (60%) of the cases had severe Vitamin D deficiency compared to 8.3% in the control group. Another study done in Qatar revealed that Vitamin D deficiency was considerably higher in T1DM children (90.6%) compared to non-diabetic children (85.3%). (7)

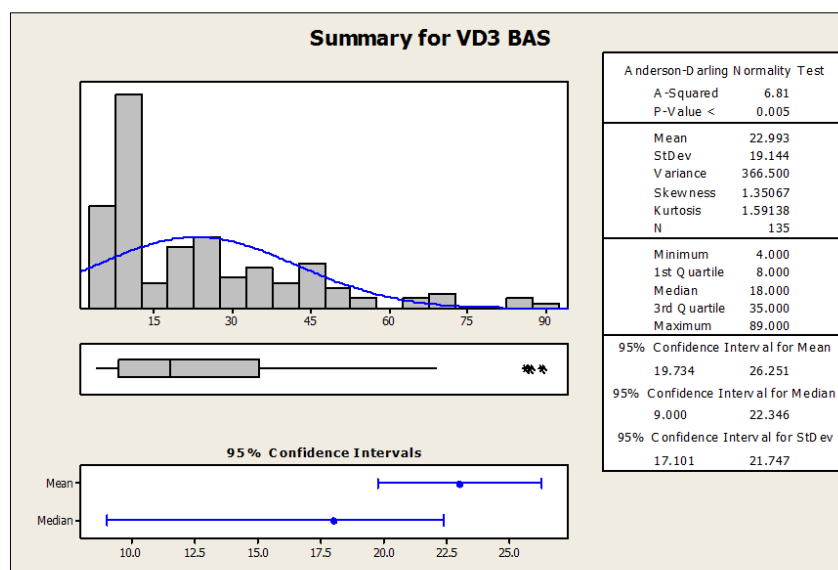
There was a significant difference found in the mean value of Vitamin D between T1DM and non-diabetic children in Egypt, among diabetic cases, 55% were Vitamin D deficient; meanwhile 45% of cases had normal Vitamin D levels ( $P < 0.01$ ). (8)

In the T1DM children of Bin Abbas group, 64% were mildly Vitamin D deficient, 16% were moderately Vitamin D deficient, and 4% were severely Vitamin D deficient as compared with 52% (mildly), 6% (moderately), and 1% (severely) in the control group. Overall, 84% of the T1DM children, and 59% of the healthy children were Vitamin D deficient (9).

Also in another study of 129 Swiss children and adolescents with type 1 diabetes, 78 (60.5%) were Vitamin D deficient. In this study, Vitamin D deficiency was defined as a 25-hydroxy-Vitamin-D level below 50 nmol/L. During the winter this number rose to 84.1%. 25-hydroxy-Vitamin-D levels showed marked seasonal fluctuations. There was no correlation with diabetes control, despite the high prevalence of Vitamin D deficiency (10).

Prevalence of Vitamin D deficiency was 60.5% in a Swiss study (11), 43% in an Australian study (12), approximately 25% in an Italian study (13). In a cross-sectional study performed in Jeddah on 510 children aged between 4-15 years, 13.7% had a normal Vitamin D level, 58.8% had relative deficiency, 27.4% had severe deficiency. Saudi and Yemeni patients were more affected than Egyptian and other nationalities but all children which were included in the sample were not diabetic (14).

In our study, almost 100% of the children of type 1 diabetes had insufficient level of Vitamin D in comparison with (69.5%) in control group. Severe deficiency was 71.1% in T1DM group and 42% in control group. Moderate deficiency 20.6% vs 18.8%, mild deficiency 8.1% vs 8.7% and only 0.2% had sufficient Vitamin D levels vs 30.5%.



**Figure 2:-** Summary for VD3 in type one diabetes.

This diagram shows the level of Vitamin D in nmol/l vs. the number of T1DM patients. It is obvious that most of the patients lay in the insufficient area and they are mostly present with severe deficiency.

### Conclusion:-

Vitamin D level should be a routine test for pediatric patients with Type 1 DM during diagnosis and follow up. Early detection of Vitamin D deficiency and appropriate management will lead to better prognosis and better quality of life, especially the effect on improving glycosylated hemoglobin (H<sub>A1c</sub>). This area is an evolving field of research and our knowledge regarding Vitamin D role in T1DM outcomes is not yet complete.

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### RESEARCH ARTICLE

#### THE STATUS OF THE GENUS *ROOTALA* L. (LYTHRACEAE) AND DESCRIPTION OF A NEW SPECIES FROM KERALA, INDIA.

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#### Abstract

The genus *Rotala* L., is represented by about 44 species and primarily distributed in tropical and subtropical regions. In India, the genus has represented by 66% of the globally known species and among that 83% are remarkably endemics which show its evolutionary significance. The study on this genus led to discuss a novelty to science, which has been collected from the lateritic plateau of northern Kerala, India. The species is similar to *R. densiflora* (Roth ex Roemer & Schultes) and *R. malampuzhensis* R.V. Nair ex C.D.K.Cook, but differs from the former by having smaller habit (size), aristate bracteoles, clawed petals, and presence of nectar glands etc., and from the latter by its habit, trimerous flowers, shorter or absence of calyx appendage.

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#### Introduction:-

The Genus *Rotala* L. (Lythraceae), has tropical and subtropical distribution and is represented globally by 44 species (Mabberley, 2005), with highest distribution in tropical Asia (Cook, 1979). After Cook's revision, it is represented, as per the revised estimate, in India by 29 species, of which 24 are from the Peninsular India (Joseph & Sivar., 1988, 1989; Pradeep *et al.*, 1990; Mathew & Lekshminarasimhan, 1990; Yadav *et al.* 2010; Prasad *et al.*, 2012; Gaikwad *et al.*, 2013; Prasad & Raveendran 2013 a, b; Sunil *et al.*, 2013; Anto *et al.*, 2014; Ratheesh Narayanan *et al.*, 2014; Lemiya & Pradeep 2015). The authors collected an interesting specimen belonging to the genus *Rotala* L. from the muddy substratum of drying depressions on the lateritic rocky areas of Kanayi village in Kannur District of Kerala, India. Detailed studies of these specimens revealed that it is distinct from all the known species of the genus and hence being described and illustrated as new species.

*Rotala kanayensis* Rijuraj, Rajendraprasad, Shaju & Pandurangan *sp. nov.* (Figs. 1 & 2).

Type: INDIA, Kerala, Kannur District, Kanayi village, ± 60 m, 9<sup>th</sup> January 2017, Rijuraj, Rajendraprasad & Shaju (Holotype, TBGT; Isotype, MH).

The new species *R. kanayensis* resembles *Rotala densiflora* in having erect habit, decussate leaves and calyx appendages, and *R. malampuzhensis* by decussate leaves, campanulate calyx tube and presence of nectar glands. It differs from the former by having smaller habit (size), aristate bracteoles, clawed petals, and presence of nectar glands and from the latter by its habit, trimerous flowers, shorter or absence of calyx appendage (Table-1).

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Erect, marshy-terrestrial annuals. Stem single, to 15 cm tall, much branched at the tip, rooting from the nodes below, inconspicuously 4-angled below, strictly angled and narrowly winged on young branches, reddish when mature. Leaves simple, decussate, sessile, linear lanceolate to oblong, greenish, 1.5- 2.0 x 0.3-0.5 cm, base slightly cordate to amplexicaul, margin entire, reddish-tinged, apex obtused, midrib prominent below, canaliculated above, reddish when mature. Flowers solitary in axils, sessile, strictly 5-merous, 2-2.5 x 1.5 mm; bracts similar to foliage leaves; bracteoles linear lanceolate, slightly cordate at base and aristate at tip, 3 mm including 1 mm long arista, exceeding calyx tube. Calyx appendages narrowly triangular, tip acuminate, 1-1.5 mm long, longer than calyx lobes; calyx tube campanulate, 1.5 – 2 mm long, lobes broadly triangular, ca. 0.5 mm long. Petals 5, obovate, rounded at tip, 1-1.5 x 0.7-1 mm long, distinctly clawed, alternating with calyx lobes, bright pink. Stamens 5, inserted at the base of the calyx tube with a pair of nectar glands, equalling to the level of calyx lobes, filaments 0.75-1mm long, anthers 2, globose, dorsifixed, nectar glands triangular, fleshy; ovary sub globose, sessile, 3-locular, trilobed, 1 mm; style short; stigma capitate. Capsule sub globose, 3 valved, equal or slightly exceeding calyx tube, 1.5 mm long and 1mm diam. Seeds numerous, semi ovoid, 0.3 mm long, bright yellow.

Flowering & Fruiting: December-January.

**Table 1:-** Comparison of morphological characters of *Rotala densiflora*, *R. malampuzhensis* and *R. kanayensis*

Characters	<i>R. densiflora</i>	<i>R. malampuzhensis</i>	<i>R. kanayensis</i>
Habit	Erect, amphibious or terrestrial annuals, simple or branched, 50 cm tall	Tufted creeping annuals, to 30 cm tall	Erect, branched, terrestrial annuals, to 15 cm tall
Stem	4-angled, often winged	Terete, not winged	Inconspicuously 4-angled, narrowly winged on tender branches
Leaves	Sessile, ovate or elliptic-oblong, apex acute to acuminate, to 2-2.5 cm long	Sessile, linear to lanceolate, greenish, apex acute to shortly truncate, to 1.5 cm long	Sessile, linear-lanceolate to oblong, base cordate to amplexicaule, apex obtuse, 1.5-2.0 cm long
Bracts	Ovate or elliptic, much shorter than foliage leaves	Linear-lanceolate, as long as foliage leaves	Elliptic, leaf like, as long as foliage leaves.
Bractioles	Lanceolate-acuminate, exceeding calyx	Capillary, equalling calyx lobe, 1mm long	Linear lanceolate lanceolate, 3 x 0.5 mm long, exceeding the calyx, arista 1 mm long
Flowers	Usually 5 merous, occasionally 4 merous	Strictly 3 merous	Strictly 5 merous
Calyx appendage	Longer than calyx lobe	Shorter than calyx lobe, sometime absent	Twice as long as calyx lobe
Petals	5, 0.5-1 mm long, obovate, 2-lobed at apex, pink	3, elliptic to oblong, acute at apex, bright red	5, obovate, rounded at apex, distinctly clawed at base, 1-1.5 mm long, bright pink
Stamens	5, rarely fewer, attached below the middle of the calyx tube	3, inserted above the base of the calyx tube	5, inserted at the base of the calyx tube
Nectar glands	Nectar glands absent	Nectar glands 3, prominent alternating with stamens	Nectar glands 5 pairs at base of each stamen
Style	Style as long as ovary	Sub sessile	Shorter than half the ovary or sub sessile
Capsule	Globose, 2-3 mm long, 3-4 valved,	Globose, longer than the floral tube 3-valved	Subglobose, 1.5 mm long, 3 valved
Seeds	Semi ovoid, yellow	Semi ovoid, bright red or yellow	Semi ovoid, smooth, bright yellow

#### Distribution and Ecology:-

*Rotala kanayensis* is so far known only from the type locality, Kanayi, a laterite area in Kannur District. Significantly a small population occurs in the marshy substratum of a drying depression on the lateritic rock surface. Our observations confirmed that there are less than 50 individuals growing in the site of collection in association

with *Pogostemon deccanensis* (Panigrahi) Press, *Lindernia antipoda* (L.) Alston, *Lindernia tenuifolia* (Colsm.) Alston var. *tenuifolia*, *Drosera burmannii* Vahl etc. It is therefore necessary to identify more areas of its occurrence towards planning further conservation measures as per IUCN guidelines and criteria (IUCN 2010, 2012); since it has been discovered now, *Rotala kanayensis*, could be categorized as 'Data Deficient (DD)'.

**Eponymy:-**

*Rotala kanayensis* is named after its type locality Kanayi in Kannur District, Kerala.

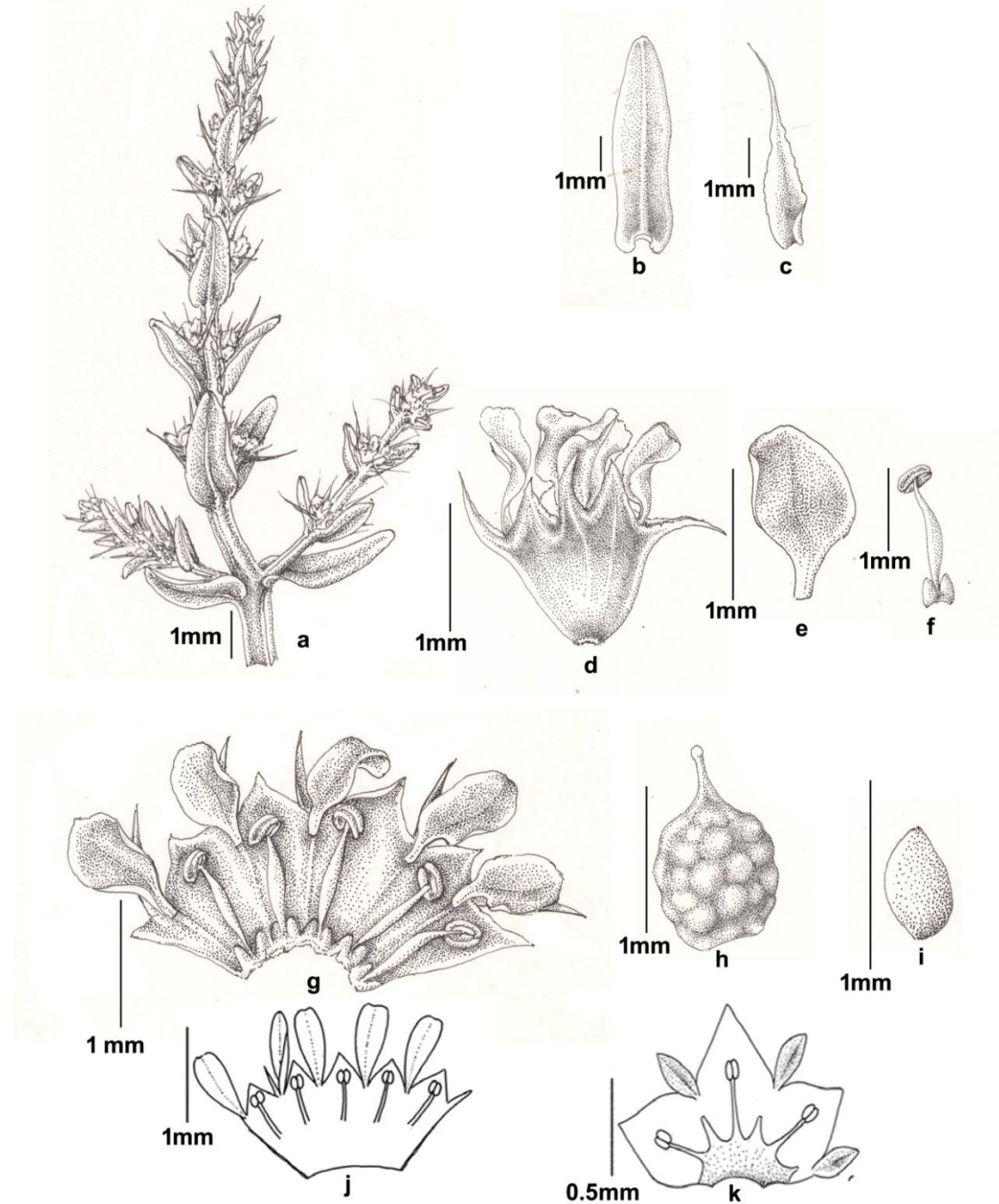


Figure 1. *Rotala kanayensis*. a. A portion of flowering twig; b. Leaf abaxial surface; c. Bractiole; d. Single flower; e. Petal; f. Stamen with a pair of nectar glands; g. Flower split open; h. Capsule; i. Seed; j & k. Flower split open (Reproduced from Joseph & Sivar., 1989): j. *R. densiflora* (Roth ex Roemer & Schultes); *R. malampuzhensis* R.V. Nair ex C.D.K.Cook



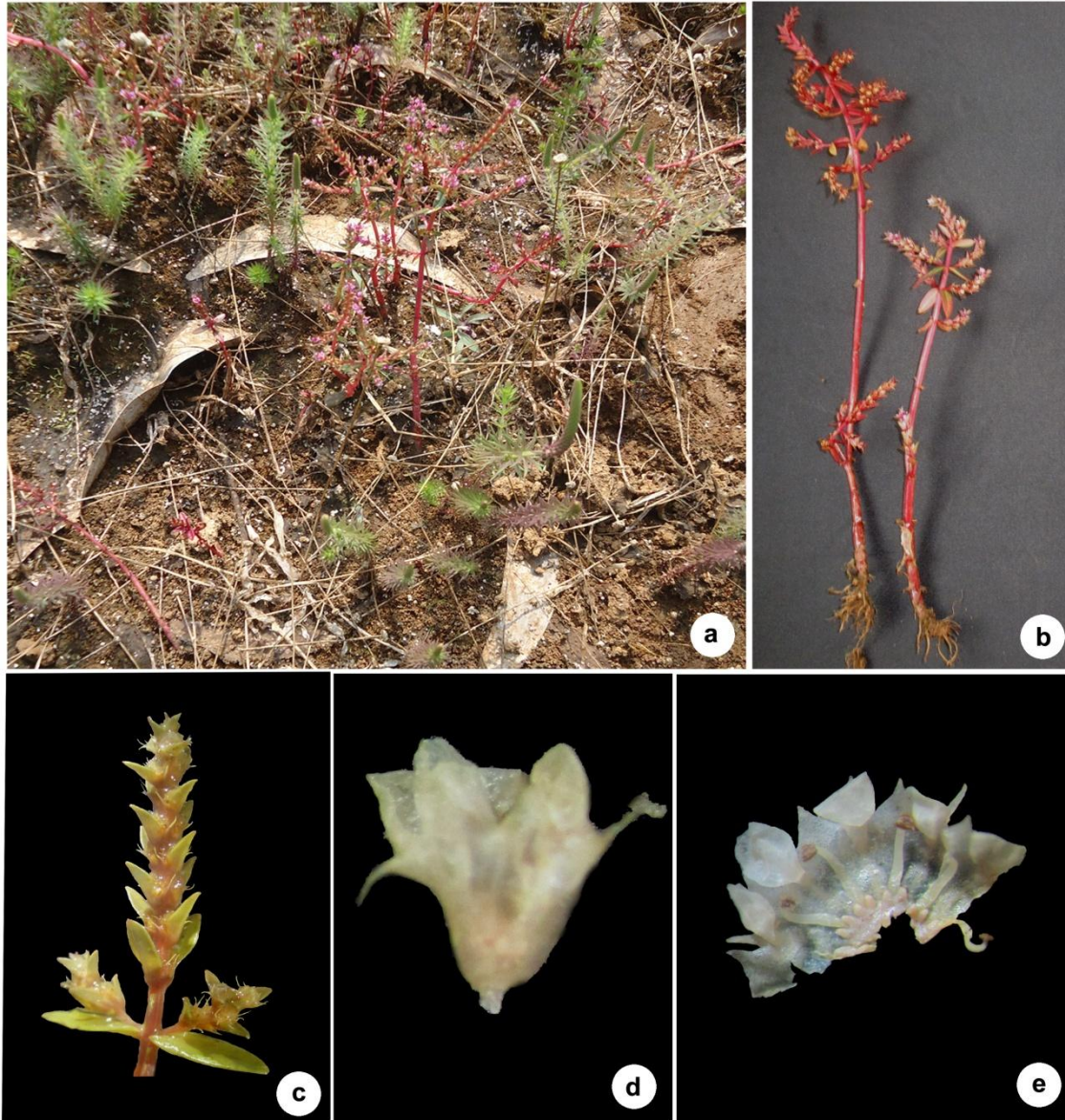


Figure 2: a. Habitat; b. Habit; c. Flowering twig; d. Single flower; e. Flower split open

#### **Endemism and habitat preferences of *Rotala* in Peninsular India**

The study on endemism provides an insight into the centres of diversity and clues to the pattern of distribution and process of speciation. The evolutionary history of all endemics starts as neoendemics and end up as palaeoendemics (Richardson, 1978). Neoendemic species are newly evolved endemic species of relatively recent origin from an actively evolving genetic stock in a particular ecotone. They develop in different ecological niches or habitats through speciation and will have closely related taxa occurring in the same area. Neoendemics generally have herbaceous and shrubby forms and they occur in the areas that are prone to climatic and environmental stresses. All these factors substantiate the view that narrow endemism exhibited by the species of *Rotala* on the Peninsular India may indicate that they are neoendemics and the region can be considered as one of the centres of active speciation of the genus. The Peninsular Indian region has always been considered as an oceanic island in having conditions favourable for high degree of endemism (Turrill, 1964).

*Rotala* is an aquatic or amphibious, tropical and subtropical genus with a considerable number of phenotypic plasticity (Joseph & Sivar., 1988). Based on the nature of habitats, species of the genus *Rotala* falls under two groups, namely obligate aquatics which grow in shallow waters and semi-aquatic or terrestrials which thrive in marshy lands. Most of the species in Peninsular Indian regions are mainly distributed in amphibious ecosystems of lateritic plateau, especially in northern Kerala. Edaphic matrix of lateritic plateaus provides smaller scale habitats with hydro-geo-morphological anomalies that support significant plant taxa, especially endemics in restricted areas. The restriction of endemic plant species to nutritionally imbalanced substratum (laterite/serpentine) is a wide spread phenomenon in endemic rich areas. There is much evidence to suggest that this nutritionally imbalanced substrate provide a strong selective force for the evolution of endemic plants. In India, the genus *Rotala* is represented by 29 species, with their maximum morphological diversity in Peninsular India manifested by 26 species including 18 endemic taxa. Kerala is the major centre of distribution for the genus in Peninsular India with 21 species, in which 14 species are endemics, including 9 exclusive endemics. This highest degree of endemism of the genus is mostly represented from the lateritic zones of northern Kerala with very narrow distribution range. Endemics with extremely small range size, *i.e.* <5 km<sup>2</sup> are regarded as point endemics (Cowling, 2001), a category of narrow endemics. The analysis of distribution patterns of endemics gives a clear picture about the zones of their concentration and possible areas of active speciation. In this background an analysis of endemism in the genus *Rotala* L. in Peninsula Indian region with distribution status (IUCN, 2012) summarised in Table 02.

**Table 02:-** Distribution pattern of the genus *Rotala* L. in Peninsular India

Peninsular Indian Endemic species	Haibtat	Distribution
<i>Rotala anamika</i> Lemiya	Wet mashy area	Kerala *
<i>R. belgaumensis</i> Yadav <i>et al.</i>	Temporary pools in depressions on lateritic rocks	Karnataka*
<i>R. cookie</i> Joseph & Sivar. (IUCN: Endangered)	Paddy fields, lateritic annual pools	Kerala*
<i>R. cheruchakkiensis</i> Anto <i>et al.</i>	Laterite hilly area	Kerala*
<i>R. dhanesiana</i> Sunil <i>et al.</i>	Semi marshy areas in the moist deciduous forest	Kerala*
<i>R. fimbriata</i> Wight (IUCN: Least concern)	Shallow water or marshes in lateritic area	Maharashtra, Karnataka, Tamil Nadu & Kerala
<i>R. floribunda</i> (Wight) Koehne (IUCN: vulnerable)	Wet rocks	Maharashtra*
<i>R. illecebroides</i> (Arn. ex C.B. Clarke) Koch (IUCN: Least concern)	Wet places and on dripping rocks in hilly areas	Maharashtra, Karnataka, Tamil Nadu & Kerala
<i>R. kasargodensis</i> Prasad & Raveendran	Water logged soil on the lateritic plateau	Kerala & Karnataka
<i>R. khaleeliana</i> Sunil <i>et al.</i>	Temporary pools on the lateritic plateau	Kerala*
<i>R. malabarica</i> Pradeep, Joseph & Sivar. (IUCN: Critically Endangered)	Temporary pools in depressions on lateritic rocks,	Kerala*
<i>R. malampuzhensis</i> Nair ex Cook (IUCN: Least concern)	Temporary pools on the lateritic rock, paddy fields	Maharashtra, Goa, Karnataka & Kerala
<i>R. meenkulamensis</i> Prasad & Ravi	Temporary pools on the lateritic plateau	Kerala*
<i>R. ritchiei</i> (C.B. Clarke) Koehne (IUCN: Endangered)	Shallow margins of fresh water ponds.	Maharashtra, Karnataka, Tamil Nadu & Kerala
<i>R. sahyadrica</i> Gaikwad <i>et al.</i>	Fresh water pool on the lateritic plateau at high altitude	Maharashtra*
<i>R. tulunadensis</i> Pasad & Raveendran	Temporary pools on the lateritic plateau	Kerala*
<i>R. vasudevanii</i> Joseph & Sivar.	Fresh water pond	Kerala*

\*Exclusive endemics

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### RESEARCH ARTICLE

#### DENTAL MARKETING: YAY OR NAY? – A SURVEY.

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#### Manuscript Info

##### Manuscript History

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##### Key words:-

Dentists, marketing, opportunity.

#### Abstract

**Aim:** To investigate the effects of dental marketing on a dentist's career

**Objective:** To evaluate the importance of dental marketing done within the guideline

**Background:** Dental marketing is a way to attracting new patients but it needs to be done in an appropriate way by following the guidelines provided. Dentists have different opinions regarding this issue as some dentists think that they should hold themselves to a higher ethical code instead of acting like a salesperson while other dentists view it as a great opportunity to actively market their practices in order to maintain themselves in the business, especially with the growing interests towards dental health from the public.

**Materials and Method:** A questionnaire survey was conducted among 200 practicing dentists in Chennai. All participants were provided with a list of 12 questions related to dental marketing with answers given for each question. The participants were told to choose only one answer based on their personal opinion.

**Result:** The results from the study indicate the importance of dental marketing to a dentist's career provided that it is done within the guidelines given by the dental council.

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#### Introduction:-

In today's world, the competition between dental practitioners has increased tremendously, which causes them to seek marketing alternatives to survive and prosper in this challenging field.<sup>[1]</sup> Dentists all around the world have started showing their interests in dental marketing as their view and perception on the subject has changed throughout the years, leading to the great evolution in dental marketing.

Nowadays, dentists have begin to realize that they cannot depend solely on the quality and reputation of their practice to gain and maintain their patients' interest and trust, instead they should also focus on creating an image and brand for themselves. A good reputation is important for a dentist to be successful and it can be achieved by focusing on how to make their practice big enough to earn such reputation. In order to attain a good reputation, a dentist should be able to market themselves well in the community. Since dental care is considered as a part of business like any other sector, dentists should apply the same principal and strategies to achieve a profitable business.<sup>[1]</sup>

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It is very important for dentists to be well-prepared with the information about their practices in order to provide a clear and consistent communication that can make them stand out in the sea of sameness.<sup>[2]</sup> Planning of dental marketing normally involves market data, marketing budget, budget allocation, priority promotion medium, deployment strategies for each medium, line item costs and a period of when to implement each component within the plan.<sup>[3]</sup>

#### **Unique Value Proposition (UVP):-**

UVP refers to a clear statement that explains what a dentist has to offer, how they provide the patients' needs and what makes them different from the other dentists. It is also known as unique selling proposition (USP).<sup>[4]</sup> The UVP of a dentist should be easy to understand, concise and appealing, solving the patients' problems, communicate specific value that is unlike primary alternatives and better than alternatives to the patients.<sup>[2]</sup> UVP helps dentists to stand out by clarifying how they are different from their competitors in a way that matters to their target patients. By knowing their target patients, dentists can better understand their patients' needs and able to meet their expectations in a distinctive, relevant and remarkable way.

People normally perceive that all dentists offer the same thing, which makes them less interested in knowing more about the profession.<sup>[2]</sup> This is actually a great opportunity for dentists to introduce their practices to the people and convince them on why they are better than their dental competitors in solving their patients' problems. UVP is a form of dental marketing that enables dentists to attract possible patients especially those living in the market area surrounding the dental practice. Planning a UVP requires an effort, in which a dentist needs to know their business, target patients, competitors and strategy to fulfill the specific market need. In order to create an effective UVP, a dentist should be able to identify who, where, what, why and when as part of their dental marketing plan.

#### **Materials and Method:-**

A questionnaire-based study was done among dentists with various years of practice. A total of 200 practicing dentists in Chennai participated in the survey. All the participants were provided with a list of 12 questions related to dental marketing with answers given for each question. The participants were told to choose only one answer based on their personal opinion.

#### **Dental marketing, yay or nay?—a survey:-**

1. Do you have patients who visit you on a regular basis?
  - Yes
  - No
  
2. How often do your patients come for regular check-ups?
  - Every 6 months
  - Once a year
  - Every 2 years
  - Occasionally
  - Other: .....
  
3. How did your patients find out about you?
  - Referral by family member / friend / neighbor
  - Referral by another dentist
  - Referral by acquaintance
  - Phone book
  - Saw sign / location
  - Advertisement
  - Other: .....
  
4. Do you notify your patients when it is time for a check-up?
  - Yes
  - No

5. How do you notify your patients for a check-up?
- Phone call
  - Text message
  - Email
  - None of the above
  - Other: .....
6. Do you have any form of social media (ex: Facebook, Twitter, etc.) to promote your dental practices?
- Yes
  - No
7. Do you often communicate with your patients (ex: out-of-office referrals, events, email, etc.)?
- Yes
  - No
8. Do you provide special offers or discount coupons for your patients?
- Yes
  - No
9. Do you have a clear plan for your dental marketing activities?
- Yes
  - No
10. Do you spend a lot on dental marketing (ex: more than 10 lakhs)?
- Yes
  - No
11. Do you think dental marketing is important for your career as a dentist?
- Yes
  - No
  - Not sure
12. What type of dental marketing do you prefer?
- Advertisement
  - Social media
  - Special offers, discount coupons, etc.
  - Other: .....

### Results:-

**Table 1:-** "Do you have patients who visit you on a regular basis?"

Question 1	Number of Individuals	Percentage of Individuals (%)
Yes	168	84
No	32	16

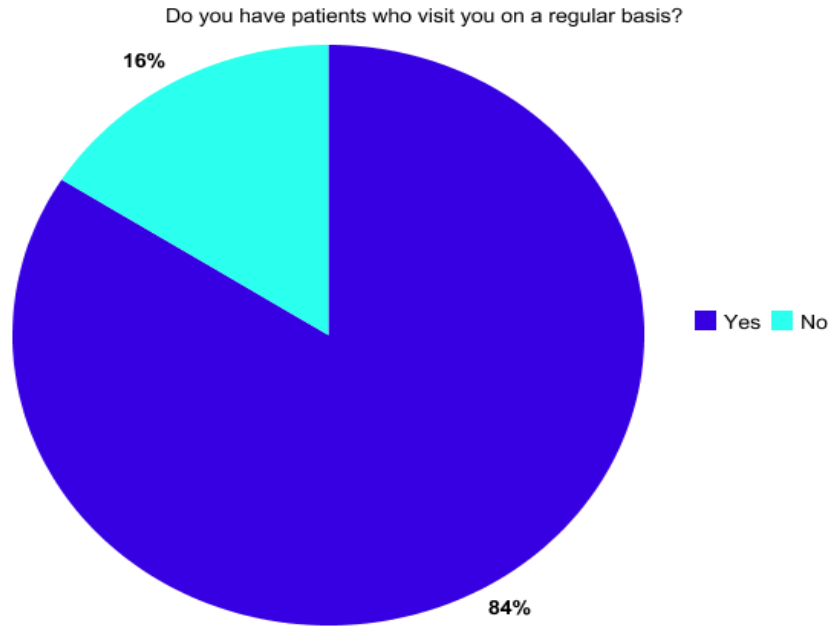


Figure 1:- “Do you have patients who visit you on a regular basis?”

Table 2:- “How often do your patients come for regular check-ups?”

Question 2	Number of Individuals	Percentage of Individuals (%)
Every 6 months	110	55
Once a year	50	25
Every 2 years	0	0
Occasionally	38	19
Other	2	1

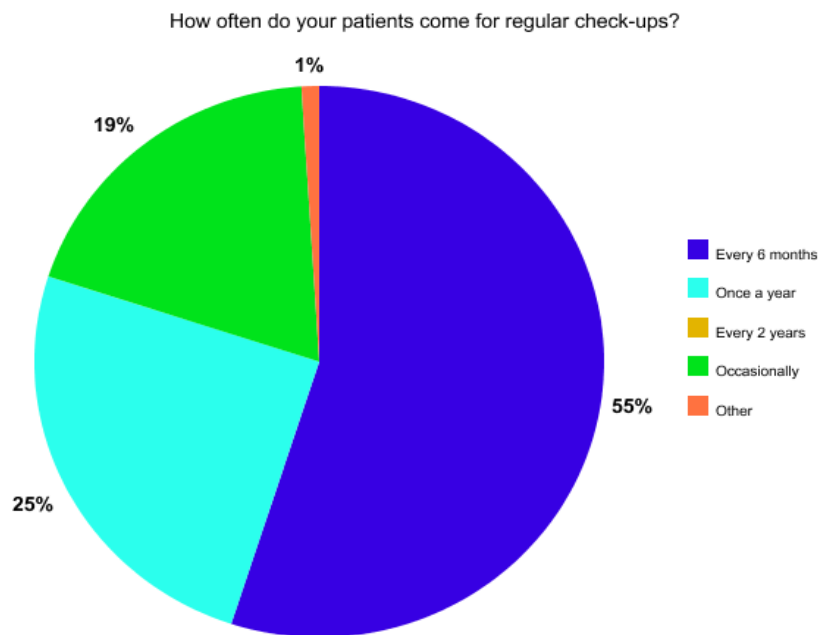
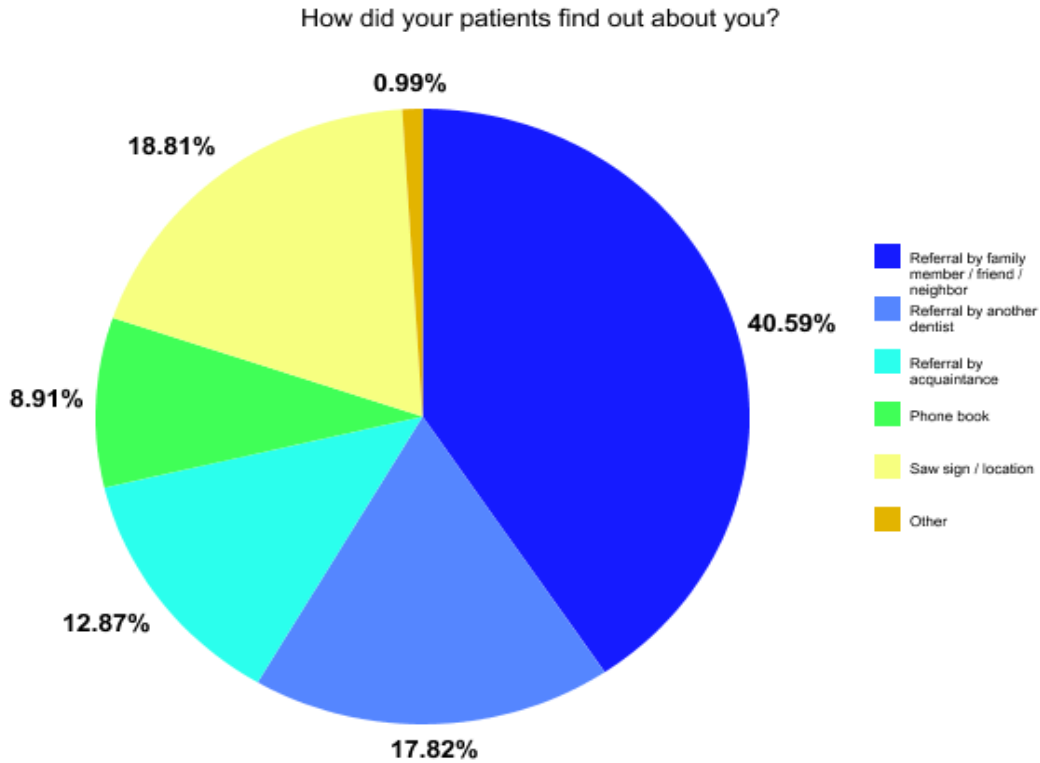


Figure 2:- “How often do your patients come for regular check-ups?”

**Table 3:-** “How did your patients find out about you?”

Question 3	Number of Individuals	Percentage of Individuals (%)
Referral by family member / friend / neighbor	81	40.59
Referral by another dentist	36	17.82
Referral by acquaintance	26	12.87
Phone book	18	8.91
Saw sign / location	37	18.81
Other	2	0.99



**Figure 3:-** “How did your patients find out about you?”

**Table 4:-** “Do you notify your patients when it is time for a check-up?”

Question 4	Number of Individuals	Percentage of Individuals (%)
Yes	168	84
No	32	16

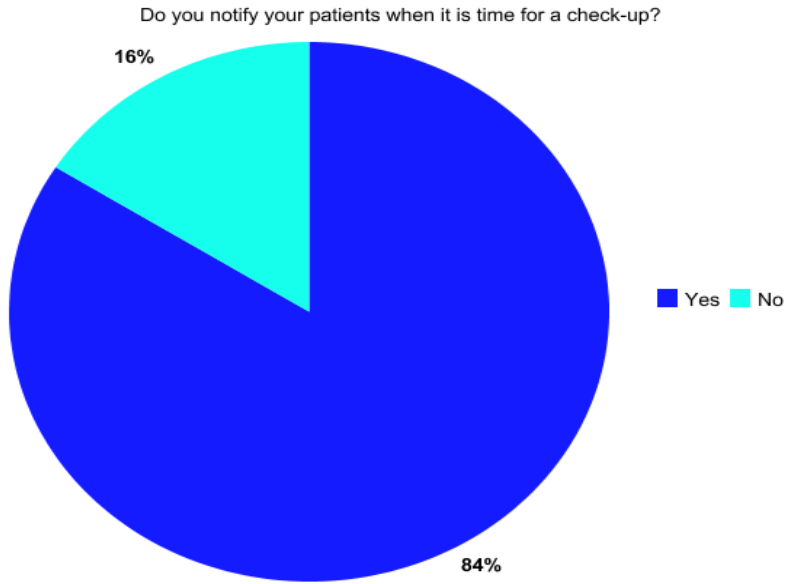


Figure 4:- “Do you notify your patients when it is time for a check-up?”

Table 5:- “How do you notify your patients for a check-up?”

Question 5	Number of Individuals	Percentage of Individuals (%)
Phone call	79	39.42
Text message	77	38.46
Email	13	6.73
None of the above	31	15.38
Other	0	0.00

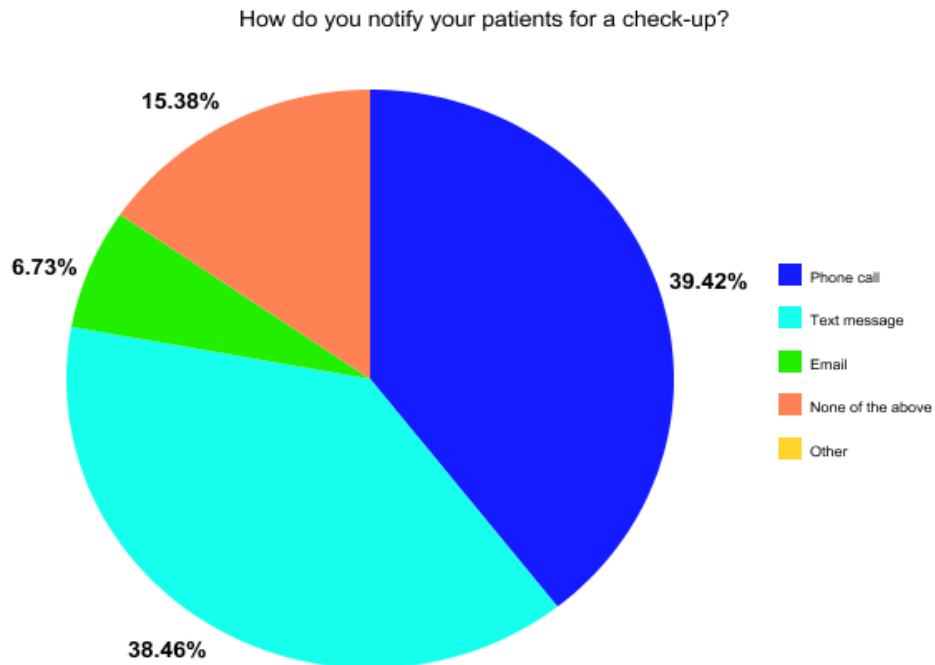
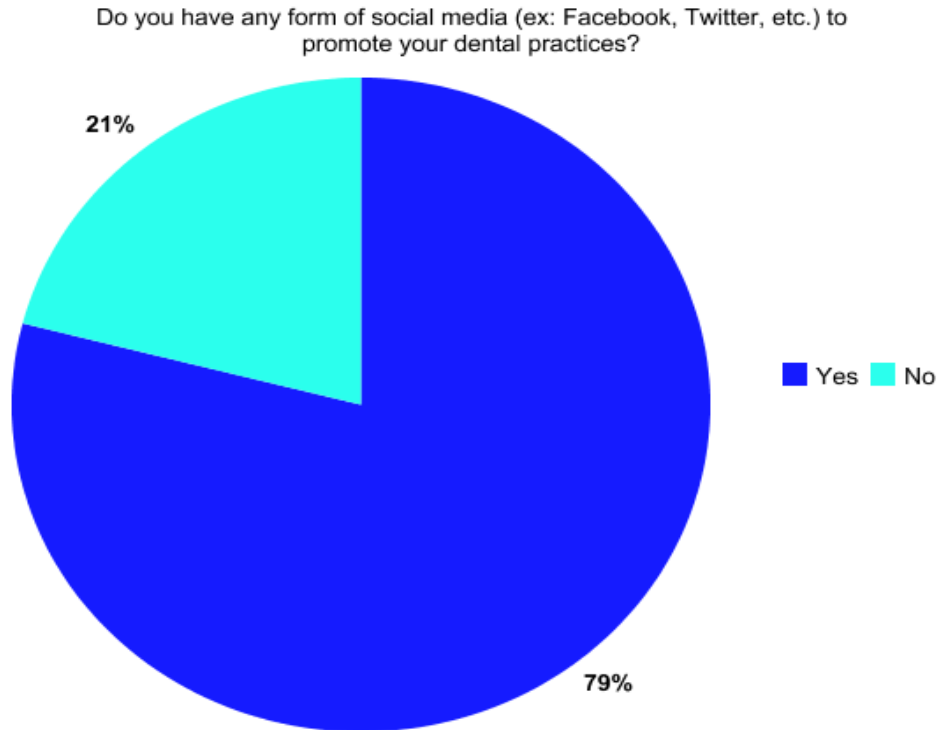


Figure 5:- “How do you notify your patients for a check-up?”

**Table 6:-** “Do you have any form of social media (ex: Facebook, Twitter, etc.) to promote your dental practices?”

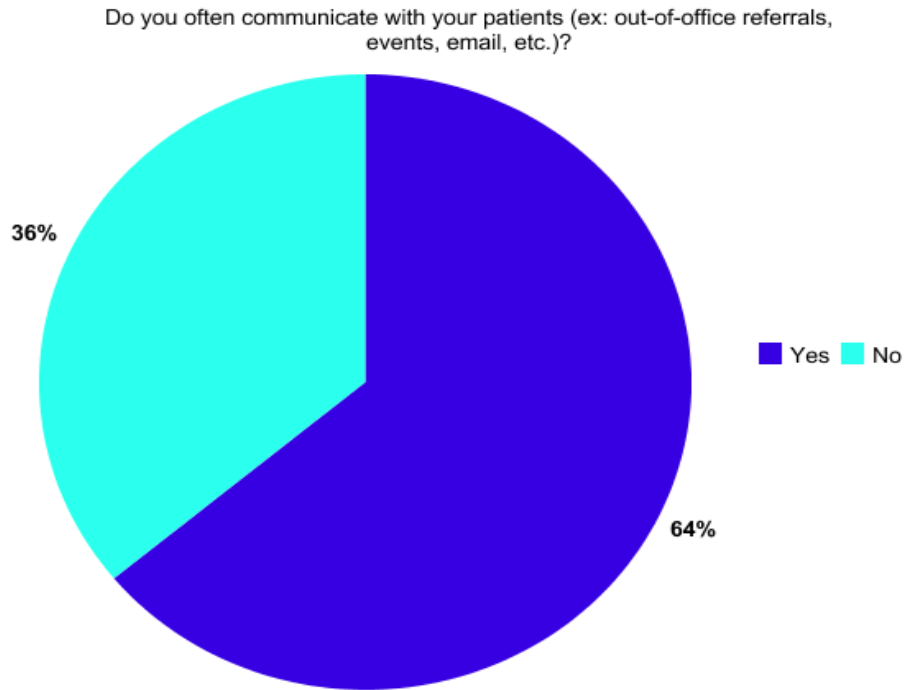
Question 6	Number of Individuals	Percentage of Individuals (%)
Yes	158	79
No	42	21



**Figure 6:-** “Do you have any form of social media (ex: Facebook, Twitter, etc.) to promote your dental practices?”

**Table 7:-** “Do you often communicate with your patients (ex: out-of-office referrals, events, email, etc.)?”

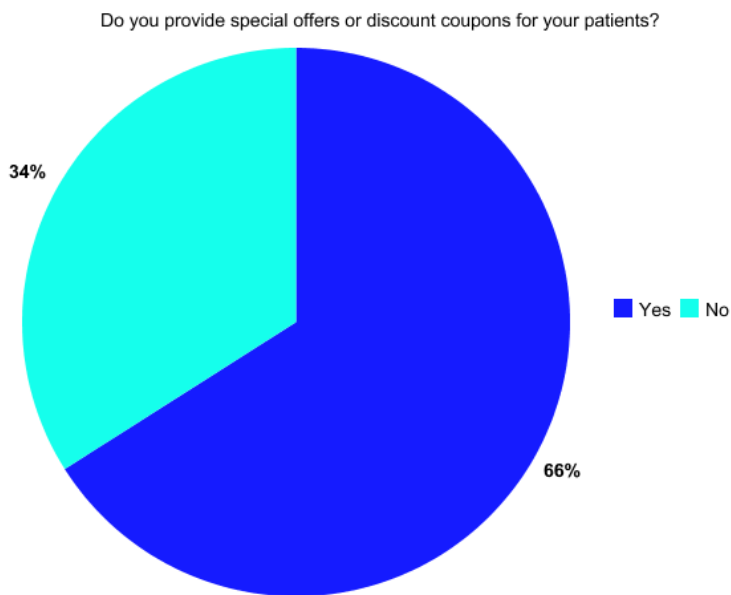
Question 7	Number of Individuals	Percentage of Individuals (%)
Yes	128	64
No	72	36



**Figure 7:-** “Do you often communicate with your patients (ex: out-of-office referrals, events, email, etc.)?”

**Table 8:-** “Do you provide special offers or discount coupons for your patients?”

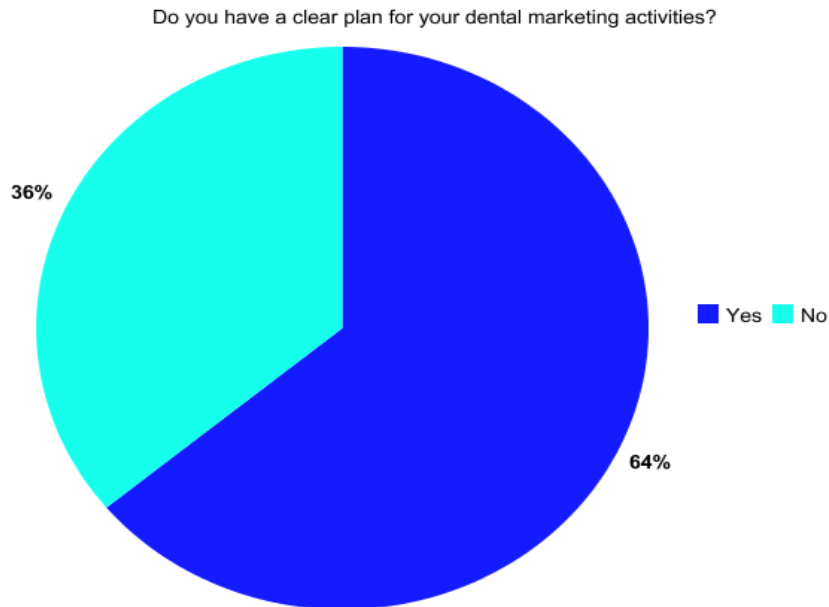
Question 8	Number of Individuals	Percentage of Individuals (%)
Yes	132	66
No	68	34



**Figure 8:-** “Do you provide special offers or discount coupons for your patients?”

**Table 9:-** “Do you have a clear plan for your dental marketing activities?”

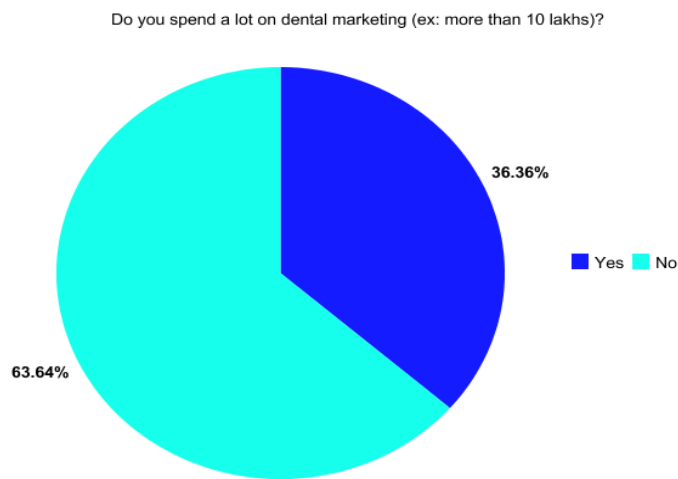
Question 9	Number of Individuals	Percentage of Individuals (%)
Yes	128	64
No	72	36



**Figure 9:-** “Do you have a clear plan for your dental marketing activities?”

**Table 10:-** “Do you spend a lot on dental marketing (ex: more than 10 lakhs)?”

Question 10	Number of Individuals	Percentage of Individuals (%)
Yes	73	36.36
No	127	63.64

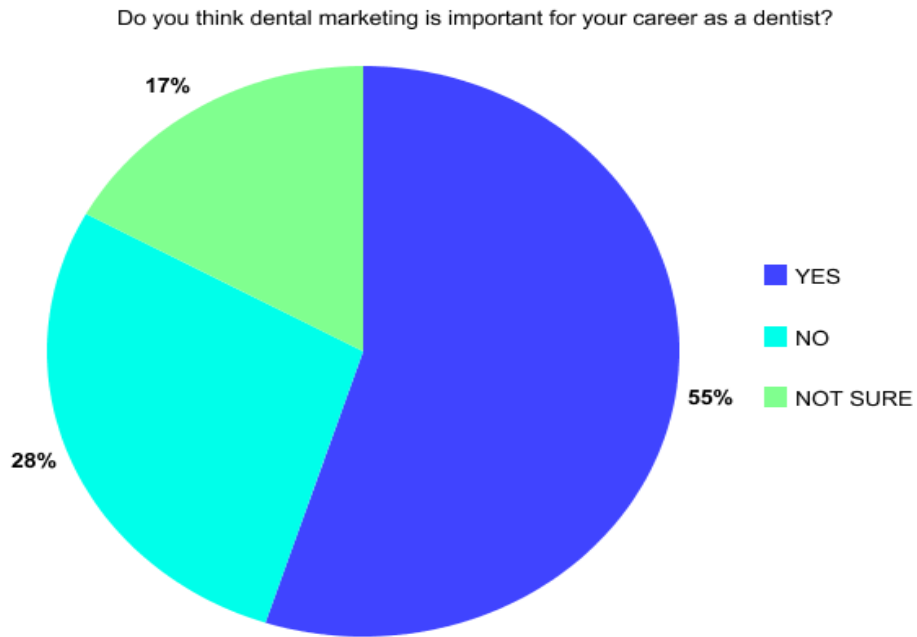


**Figure 10:-** “Do you spend a lot on dental marketing (ex: more than 10 lakhs)?”



**Table 11:-** “Do you think dental marketing is important for your career as a dentist?”

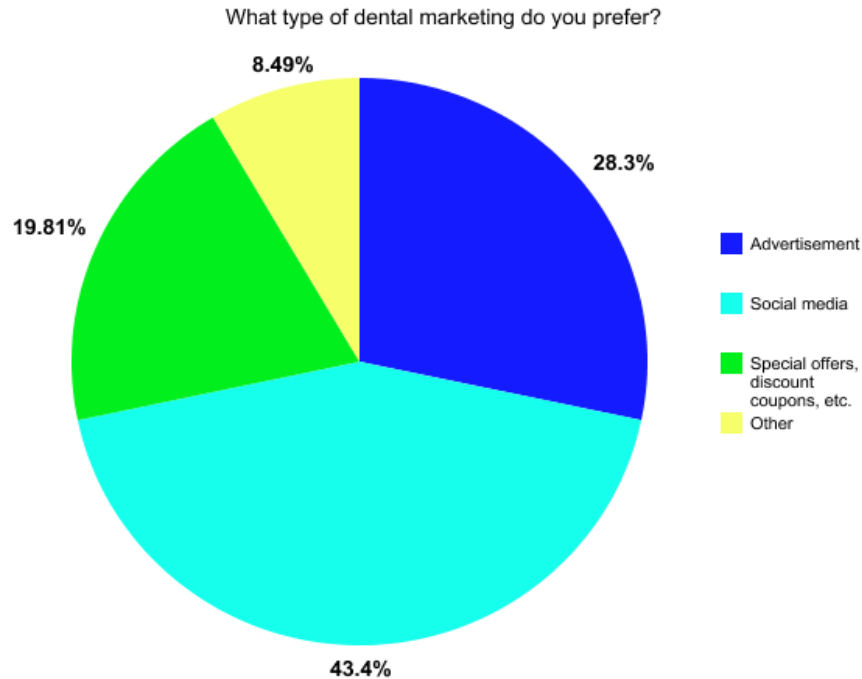
Question 11	Number of Individuals	Percentage of Individuals (%)
Yes	110	55
No	56	28
Not Sure	34	17



**Figure 11:-** “Do you think dental marketing is important for your career as a dentist?”

**Table 12:-** “What type of dental marketing do you prefer?”

Question 12	Number of Individuals	Percentage of Individuals (%)
Advertisement	57	28.30
Social media	87	43.40
Special offers, discount, coupons, etc.	39	19.81
Other	17	8.49



**Figure 12:-** “What type of dental marketing do you prefer?”

#### **Discussion:-**

According to Figure 1, a total of 168 participants in the survey have patients who visit them on a regular basis while the remaining 32 participants have patients visiting them once in a while. The larger number of participants is represented by 84% and the remaining 16% represents the smaller group of participants.

The result obtained from Figure 2 indicates about 55% of the participants have patients who visit them every 6 months for regular check-ups, which is equivalent to 110 of the total number of participants in the survey. 25% of them have patients coming for treatments once a year, 19% with occasional patients and the rest 1% had chosen “other” as the answer without specifically stating how often their patients visit them. None of the participants have patients who visit them every 2 years.

Based on Figure 3, 81 or 40.59% of the participants have patients who found out about them through a family member, friend or neighbor. 17.82% or 36 have patients coming to them by referral from another dentist and 12.87% or 26 of them were recommended by their patients’ acquaintance. The result also indicates that 8.91% and 18.81% of the participants were recognized by their patients through phone book and saw sign or location respectively. Only 0.99% of them showed different opinion from the given answers in the survey.

When asked if they notify their patients prior to a check-up, 84% of the participants answered “Yes”, which is equivalent to 168 dentists. The remaining 16% or 32 of them answered the opposite.

The participants were further asked on how they notify their patients for a check-up, in which 39.42% or 79 of them prefer phone call and 38.46% or 77 normally use text message as a method to notify their patients. Email notification was chosen by 6.73% or 13 participants and the rest 15.38% or 31 of them usually do not notify their patients prior to a check-up.

It can be seen that most of the participants have a basic knowledge on dental marketing with 158 or 79% of them having a form of social media to promote their dental practices while the remaining 21% represents the smaller group of participants who do not promote their practices through social media.

According to Figure 7, 64% of the participants often communicate with their patients in various occasions such as out-of-office referrals and events while 36% of them only communicate with the patients during their visits to the dental clinic.

It can be said that most of the participants have interests towards dental marketing as 66% of them provide special offers or discount coupons to their patients, which is similar to 132 of the total participants in the survey. 68 participants answered the opposite indicating that 34% of them do not provide any special offer or discount coupon to their patients.

Figure 9 shows that 64% of the participants have a clear plan for their dental marketing activities indicating their awareness and knowledge on the subject. However, planning of dental marketing still remains ambiguous for the remaining 36% of the participants.

Based on Figure 10, 73 or 36.36% of the participants are willing to spend a lot on marketing their dental practices, which is lesser than the remaining 127 or 63.64% of them who disagree with the idea of spending more than 10 lakhs for dental marketing.

The result obtained from Figure 11 indicates that 55% of the participants in the survey view dental marketing as a way to boost their career as a dentist, while 28% disagree with the idea and the remaining 17% are not sure whether dental marketing affects their career in any way.

Based on their basic knowledge on dental marketing, 43.40% of the participants had chosen social media as a great platform for them to promote their dental practices, followed by 28.30% for advertisement and 19.81% of them preferred special offers, discount, coupons, etc. as a medium for dental marketing. The remaining 8.49% or 17 of them had chosen other form of dental marketing without clearly stating them.

### **Conclusion:-**

Dental marketing has both its advantages and disadvantages on a dentist's career. Previously, dentists engaged in marketing and advertising their dental practices were constantly criticized for being unprofessional and dental marketing campaigns were often ridiculed and even taken to court. As time goes by, a lot of dentists have started to realize that a form of marketing plan is required in order for them to maintain themselves in this competitive field. Although dental marketing can be very helpful to a dentist, it must be done within specific guidelines to prevent them from false or misleading advertising. According to a guideline provided by the American Dental Association (ADA), "a dentist's marketing materials must not contain a material, objective representation, whether express or implied, that the advertised services are superior in quality to those of other dentists, if that representation is not subject to reasonable substantiation."<sup>[5]</sup>

Comparing the results obtained from this study to a similar survey done by Jim Du Molin in 2007, it can be seen that dentists have different opinions on dental marketing throughout the years. Based on his study, previous dentists had split opinions regarding the issue as 54% of the participants in the survey disliked the idea of marketing their dental practices claiming that dentists should always hold themselves to a higher ethical code instead of acting like a salesperson. The remaining 46% of them believed that dental marketing can actually help dentists to survive in this competitive world without being negatively judged by the public.<sup>[6]</sup>

In today's world, dental marketing has become an important role in the dental industry that dentists who do not take part in marketing their dental practices risk falling behind those who use dental marketing as a medium to reach out to their patients. A California dentist mentioned that, "It costs so much to market, it's hard to tell if it's working, and we all have to do it to keep up with the other dentists who have started advertising."<sup>[7]</sup> There are also some dentists who showed their concerns regarding this issue as seen from a statement by a North Carolina dentist, "Heavy advertising reduces dentistry to a commodity rather than a professional service," and "We are cheapening our profession," said a Washington general dentist. As opposed to that, more dentists have come together to show their support for dental marketing, "Today's consumers rely on advertising to make their choices. People used to rely on neighbors to recommend dentists. Now you are lucky if you meet your neighbor within five years. I have increased my advertising over the past 18 months, and it has been very rewarding financially," said a New Hampshire dentist.<sup>[7]</sup>

Despite the different opinions among dentists, dental marketing has continuously proven itself to be one of the effective ways for dentists to attract new patients provided that it is done within the guidelines given by the dental council. According to Jim Du Molin who is the founder of The Wealthy Dentist and the Internet Dental Alliance,

"Sooner or later, all dentists will realize that if they don't market their dental practices, they're going to go out of business."<sup>[7]</sup>

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### RESEARCH ARTICLE

#### EDUCATION –R.K.NARAYAN.

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#### Manuscript Info

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##### Key words:-

Education, System, Envisioned, Rote learning, Gurugula System.

#### Abstract

R.K.Narayan is the most famous Indian novelist, his reputation as one of the founding figures of Indian writing in English. This paper attempts to explain the Educational view of R.K.Narayan as envisioned in his novels. He carried an untiring crusade against the memory based Indian System of Education throughout his writing career. Narayan was of the opinion that he resented anything that cramped the soul and believed in return to an educational system based not on rote learning but on story- telling, games for the young and appreciation of the Indian Culture. He did not fail to indicate his new notions of education. He aimed at an ideal education and it was possible only in a free atmosphere. Narayan was not only criticised the education system but also had given solution for the problem. He favoured the Gurugula System of learning, the age old system which gave opportunity to the students and teachers lived together, learning without books. It was sort of natural learning.

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#### Introduction:-

The Educational set up in Indian society with reference to the novels of Narayan is discussed in this paper. The Indian school system does not produce conducive atmosphere to the learners; instead, it gives boredom to the students. It is reflected in the first page of his first novel *Swamy and Friends* itself. Swaminathan, an average school going boy in the novel does not like to think about the school which is opened on Monday after enjoying Saturday and Sunday holidays and even the very thinking of school gives him bitterness:

It was Monday morning Swaminathan was reluctant to open his eyes. He considered Monday especially unpleasant in the calendar. After the delicious freedom of Saturday and Sunday, it was difficult to get in to the Monday mood of work and discipline. He shuddered at the very thought of school:that the dismal yellow building; the fire eyed Vedanayagam, his class – teacher; and the Head Master with his thin long cane... (SF, p.3)

Narayan boldly criticised colonial educational system. He resented anything that cramped the soul and believed in areturn to an educational system based not on rote learning but on story–telling, games for the young and appreciation of the Indian culture.

Raju the hero of *The Guide* describes the bitter experience of his early education:

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When the sky lightened, my father was ready for me on the *pyol*. There he sat with a thin broken twig at his side. The modern notions of child psychology were unknown then; the stick was an educator's indispensable equipment. 'The unbeaten brat will remain unlearned', said my father, quoting an old proverb. He taught me the Tamil alphabet. He wrote the first two letters on each side of my slate at a time. I had to go over the contours of the letters with my pencil endlessly until they became bloated and distorted beyond recognition. From time to time my father snatched the slate from my hand, looked at it, glared at me, and said, 'What a mess! you will never prosper in life if you disfigure the sacred letters of the alphabet'. Then he cleaned the slate with his damp towel, wrote the letter again and gave it to me with the junction, 'If you spoil this, you will make me wild. Trace them exactly as I have written. Don't try any of your tricks on them', and he flourished his twigs menacingly.

Although the lessons had seemed interminable to me, my mother said the moment she saw me, 'so you have been let off! I wonder what you can learn in half an hour!'

I told her, 'I'll go out and play and won't trouble you. But no more lessons for the day, please.'

..... 'You will go to a school tomorrow and every day'  
'Father!' I cried. He was passing a harsh sentence on me.

It was what was called a *pyol* school, because the classes were held on the *pyol* of the gentleman's house.

For the first few days I enjoyed all this attention, but soon developed a normal aversion;  
..... His interest in us was one rupee a month and anything else in kind we cared to carry  
..... The dropping off my school unobtrusively.

Raju has become school dropout. School going and learning is boring for Raju and Swaminathan.

The writer criticises the existing educational system in his novel *The English Teacher*:

This education had reduced us to a nation of morons we were strangers to our own culture and camp followers of another culture, feeding on leaving and garbage. I am up against the system, the whole method and approach of a system of education which makes us morons, cultural morons, but efficient clerks for your entire business and administration of office source. (ET, p.203)

Narayan carried an untiring crusade against the memory based Indian system of education throughout his writing career, by series of ironic jibes at schools and teachers.

Krishnaswami (2006) quotes in his article in 'The Hindu,'

Narayan is also a great favourite syllabus planner at both the school and the college level. When he became Rajya Shaba M.P. (Member of Parliament) he wanted to reduce the burden of school children. As member of the Rajya Sabha, Narayan made children the subject of his inaugural speech, highlighting the issue of the "crushing burden of the heavy school bag". "I have investigated and found that an average child carries strapped to his back like a pack-mule, not less than six to seven kilograms of books, note-books and other paraphernalia of modern education in addition to lunch box and water bottle ..... it made many children hang their arms forward like chimpanzees..... I am now pleading for abolition of the school bag by an ordinance, if necessary – so that childhood has a chance to bloom".

In response, the Deputy Chairman said: "The entire House associates with Mr.R.K.Narayan and I feel that the whole country will notice it."

The examination system as it is practised in India is particularly primitive.

To quote Narayan (1974): "the whole aim of our education is to strain the faculty of Memory."

April is the cruelest month for Indian students. Two weeks before the examination, Swami and his friends were seized by a phobia of examination.

Instead of inculcating a natural interest in studies the system of education practised in India only creates disgust for books. Reading outside the school and examination preparation, is rarely thought of.

The conversation between Swaminathan and his father during the vacation is suffused with deep irony. Father asked Swaminathan:

‘How many days it is since you have touched your books?’  
 Swaminathan viewed this question as a gross breach of promise:  
 ‘Should I read even when I have no school?’  
 Father asked again ‘Do you think you have passed BA?’  
 ‘I mean Father, when the school is closed, when there is no examination, even then should I read?’  
 Father said vehemently:  
 ‘What a question! You must read.’  
 ‘But Father, you said before the examinations, that I need n’t read after they were over’.  
 He quoted the instance of Rajam as a norm:  
 Even Rajam does not read. (SF, p.64)

It is worth examining how Narayan’s criticism works. Rajam bitterly complained of a home tutor who came and pestered him for two hours a day thrice a week. Narayan drives home the point that reading is rendered unpleasant to Indian students. Narayan expands on the theme when he records Swaminathan’s protest, before a more sympathetic Granny. “If one has got to read even during holidays, I don’t see why holidays are given at all.” (SF, p.65)

He even showed a spirit of revenge to his mother’s joining hands with father in setting him to the torture of learning, by pulling the sheet under his young brother and made him roll on the ground. When Swaminathan sat in his father’s room to do a simple equation problem in arithmetic, Narayan represents artistically, his own disinclination towards figure work:

Father held the Arithmetic book open and dictated:  
 ‘Rama has ten mangoes with which he wants to earn fifteen annas. Krishna wants only four mangoes. How much will Krishna have to pay?’ (SF, p.66)

Narayan touches humourously on the inadequacy of formal education, when Swami, Mani and Rajam could not make head or tail of the letters they received from Messers Binns, Madras. The concern had asked to send twenty five per cent advance payments with their order. When Rajam expressed his inability to interpret it, Swami said: “I am surprised that, you cannot understand this letter” (SW, p.89)

In the opinion of Narayan the educational methods are defective; you got 80 percent in the last examination. The first part of the novel ‘*The Bachelor of Arts*’, Narayan expresses his views on education from the other student point of view. At the higher level, text books and examinations replace the appeal to the big stick of the lower one, as potential threat to students.

As a young man with a poetic turn of mind, Krishnan in *The English Teacher* subjects his own profession of teaching to serious assessment, though as a teacher he behaves as any other teacher in his circumstances would do. Narayan’s treatment of education is suggestive not cavilling and the eccentric Head Master of Leela’s School, introduced later in the novel, represents the positive aspects of Narayan’s own conception of the ‘Leave alone’ system of education.

Narayan’s opinion against the system of Western education speaks through the hero Krishnan of *The English Teacher* that he is both a product and an operator of that system by being a teacher of English:

In it I was going to attack a whole century of false education. I was going to explain why I could no longer.... feed them on the dead mutton of literary analysis and theories and histories, while what they needed was lessons in the fullest use of the mind. This education had reduced us to a nation of morons; we were strangers to our own culture and camp followers of another culture, feeding on leavings and garbage. (ET, p.205)

**R.K.Narayan (1974) in his article, “My Educational outlook.” He points out:**

My educational outlook had always been different from those of my elders and well wishers. And after five or more decades, my views on education remain unchanged... I am not averse to enlightenment, but I feel convinced that the entire organization, system, outlook and aims of education are hopelessly wrong from beginning to end; from primary first year to Ph.D.

The examination system as it is practiced in India is particularly primitive. To quote Narayan (1974) “the whole aim of our education is to strain-in the faculty of memory.”

Narayan (1974) warns the powers: “If our education system is not to continue as a well-endowed elaborately organized, deep-rooted farce, a remedy must be found immediately.”

Such is the outlook of Narayan on the western system of education which was implemented in India. He described the reality of the Examination Hall of today. Narayan criticised how examiners behaved and sometimes they fell asleep, one Examiner was sitting in drowsiness: “One supervisor was drowsing in his chair; another was pacing up and down, with an abstracted look in his eyes.” (SW, p.46)

Our weak Examination pattern gives too much importance and emphasis to write and not to develop other skills like listening, speaking and reading which are also very important for learning any language.

**Narayan (1974) criticises the evaluation system of our education:-**

Your examiner, he is also a human being subject to fluctuating Moods caused by unexpected domestic quarrels or a bad digestion just when he is sitting down to correct your papers; also, not being an adding machine, occasionally he may slip and arrive at 7 while totalling 8 and 3. Please forgive him.

**Narayan criticises the question paper, its secrecy and the paper evaluation in our examination system:-**

If I became Vice-Chancellor, my first act would be to abolish all secrecy that surrounds question papers. Instead of permitting wild speculations or as it happens nowadays, advance sale of questions in the block market, I would take advertisement space in newspapers and publish the questions in every subject, adding under each a credit line; ‘Set by Professor So-and-so’. I would not hesitate to announce with courage the names of those who are going to evaluate the answers and decree failures and successes. (1974)

**Narayan offers remedy for the present education system:-**

Memory is not so important today. Our need is for more libraries and multiple copies. The only condition I make for my boys is that they spend at least six hours a day in the library a month before the examinations and while writing the answer I permit them to refer to the books. (1974)

Narayan also highlights the corruption in the education system through his novel *The Financial Expert*, Margayya inducts himself into the Administrative Committee and manages a pass for his son, till the matriculation examination. There he goes paper tracing, but with no positive result.

Margayya (*The Financial Expert*) resorts to carefully considered bribery in order to secure his son’s future through the hallowed halls of learning. In the novel *The Vendor of Sweets*, Jagan cannot understand his son Mali’s sullen obstinancy where going to school is concerned.

R.K.Narayan does not fail to indicate his new notions of education. He aims at ideal education and it is possible only in a free atmosphere. His views on education of children find full expression in other novels *The English Teacher* and *The Bachelor of Arts*. *Swamy and Friends* with their class mates, their fear for masters and their frequent quarrels with their school mates brings into focus various aspects of student life – a life which a youth had to lead in the masters’ house staying with him doing all service to him and learning from him was an old education system called *Gurugula* system of education. He went on to recommend the ancient Sanskrit method of learning which took many years, and dispensing with books, relied on memory. “It’s a sort of natural training”. But modern circumstances are different and Swamy does not praise his masters but curses them; Narayan loves his masters, learns his subjects and all the more loves the college atmosphere. The only defect is that he takes the period of study as a casual and pleasurable period of his life.



Lord Macaulay proposed to produce cheap clerks through the medium of English education. Lord Macaulay in his famous Minute of 1835:

We must at present do our best to form a class who may be interpreters between us and the millions whom we govern; a class of persons, Indian in blood and colour, but English in taste, in opinions, in morals, and in intellect; to that class we may leave it to refine the vernacular dialects of the country, to enrich those dialects with terms of science borrowed from the Western nomenclature, and to render them by degrees fit vehicles for conveying knowledge to the great mass of the population (Krishnaswamy and Lalitha Krishnaswamy, 2009).

### Conclusion:-

Swami Vivekananda says that India wants man making education. Hence Narayan line of thinking is the same.. Narayan carried an untiring crusade against the memory based Indian system of Education throughout his writing career by series of ironic jibes at school and teacher. He resented anything that cramped the soul and believed in a return to an educational system based not on rote memory but on narration and games for the young and appreciation of Indian Culture. The main impulse behind his consistent rejection of colonial education has been his deep concern for his own culture. The writer advocates his educational philosophy in his novel *The English Teacher*. He criticises the Education System of Macaulay which produced mere clerks for the British Empire. Education as it is practised in modern India has caught the Western model in the wrong end. It is unfortunate over the years in spite of many education commission reports, nothing concrete has been achieved. It is worked out on the basis of memory with no effort to develop analytical reasoning. It does not allow the scholars to flower forth into intellectuals. Narayan feels that this education has reduced our nation to a nation of morons; we have become strangers to our own culture and camp followers of another culture. Such is the outlook of Narayan on the western system of education which was implemented in India. Education as practiced in India is legacy of Macaulay that was interested in churning out clerks for British administration. The Education System should undergo drastic revision if Indians are to be the Managers and intellectually superior in coming era. Indian should awake to the great opportunities and potentials of emerging world order and to take lead roles in it.

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### RESEARCH ARTICLE

## THE IMPACT OF AGE ON SOME PHYSIOLOGICAL, HEMATOLOGICAL AND BIOCHEMICAL PARAMETERS OF NEONATAL NATIVES CALVES IN QENA, EGYPT.

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#### Key words:-

Calf, neonatal period, physiological parameters, blood parameters, biochemical parameters.

#### Abstract

The study was carried out on twenty calves suspected while all animals were belonged to the villages scattered in the Qena Governorate Egypt. Blood samples were taken from the external jugular vein, and then centrifuged and stored until analyses.

Blood was taken aseptically from all the animals and transported to laboratory for hematological and biochemical analysis. The hematological parameters (Hemoglobin, total erythrocyte count, total leukocyte count, packed cell volume) and biochemical parameters (Total protein, creatinine, calcium, phosphorous, iron, copper, sodium, chloride, AST, ALT) values were statistically analyzed, mean and standard deviations were calculated and set as reference values. The results showed a significant effect of days of life ( $P < 0.05$ ) only on total Rbcs, Wbcs, Hb. Total protein, Calcium, Phosphorus, Chloride, a Copper and GOT during the first week of life and a significant effect of days of life. In conclusion, modifications of studied parameters could be attributed to functional development of calves in neonatal period and contribute to the knowledge of adaptation processes in calf during the first week and the first month of life resulting useful for the diagnosis and treatment of any neonatal diseases.

The aim of this work was to follow the changes, during the early growth of calves, of a wide range of blood variables commonly used by veterinarians to aid the diagnosis of disease.

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#### Introduction:-

Physiological, hematological and biochemical variables are most widely used medical decision making tool. Hematological and biochemical analyses of blood are very useful to get an insight in health status of animal. The neonatal period represents a critical time during which all organ functions must adapt to the extra-uterine life; it is a transition phase from the sheltered intra-uterine to the exposed extra-uterine environment (Piccione et al., 2008).

#### Material and Methods:-

This study was carried out in Qena Governorate, Egypt, on twenty clinically healthy and full-term-born native calves (eight males: mean body weight  $26.23 \pm 2.29$  kg; twelve females: mean body weight  $25.21 \pm 2.1$  kg) which were monitored for 30 days. Calves were kept with their mothers and were fed only with maternal milk. For each calf, physiological parameters were measured and blood samples were collected at the same hour (10am). The studied

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parameters were assessed on all animals in the following experimental conditions: from the day after the birth, daily for one week and every seven days for 30 days. Rectal temperature was recorded using a digital thermometer and respiratory rate was visually recorded using a stopwatch over a 5min period.

From all animals, blood samples were collected from the external jugular vein into 10mL in Vacutainer tubes with no addition of anticoagulants after collection all blood samples were centrifuged at 3000rpm for 10 minutes; serum were separated and stored at -20°C until analyses. Serum were analyzed with commercially available kits by means of a UV spectrophotometer. Serum concentrations of the following blood parameters were measured: total protein, calcium, iron, phosphorus, chloride, and sodium for each parameter. All results were expressed as mean±standard error of the means (SEM). On all data, normally distributed ( $P < 0.05$ , one way analysis of variance (ANOVA) was used to evaluate the effect of days of life during the first, second, third, and fourth week of life. If ANOVA showed an acceptable level of significance ( $P < 0.05$ ).

## Results:-

The obtained results represented in tables 1,2,3,4.

**Table1:-** Average values ( $\pm$  standard errors) of physiological parameters, with the statistical significances observed in twenty calves during the first month of life.

	Day 1	Day7	Day14	Day22	Day30
Temperature	39.1±2.2	39.3±1.9	39.2±0.5	39.1±3.1	39.3±3.1
Breath/minute	56.2±2.1	57.1±2.3	57.1±2.1	56.3±2.2	57.2±2.2
Heart beat/minute	156.1±1.3	156.2±2.4	157.3±2.1	157.5±2.3	157.3±2.3

**Table2:-** Average values ( $\pm$  standard errors) of hematological parameters, with the statistical significances observed in twenty calves during the first month of life

	Day 1	Day7	Day14	Day22	Day30
RBCs $10^{12}/L$ )	7.75 $\pm$ 1.42	7.7±1.8	8.2±1.2	8.1±0.5	8.1±0.5*
WBCs $10^9/L$ )	9.1 $\pm$ 2.7	9.6 $\pm$ 2.7	9.3 $\pm$ 2.7	10.1 $\pm$ 2.7	10.1 $\pm$ 2.7*
Hb (g/L)	104.1 $\pm$ 13.7	107.1 $\pm$ 10.2	107.1 $\pm$ 11.3	110.1 $\pm$ 16.5	110.1 $\pm$ 15.7*
PCV (L/L))	0.32 $\pm$ 0.07	0.33 $\pm$ 0.05	0.31 $\pm$ 0.07	0.34 $\pm$ 0.02	0.34 $\pm$ 0.06

\*significant at ( $P < 0.05$ )

**Table 3:-** Average values ( $\pm$  standard errors) of blood parameters studied, expressed with the statistical significances observed in twenty calves during the first month of life

	Day 1	Day7	Day14	Day22	Day30
Total protein(g/dL)	5.75±0.88	5.94±1.1	5.82±1.6	5.65±0.95	6.92±0.9*
Glucose (mmol/L)	4.7±0.8	4.8±0.6	5.5±0.1	4.6±0.1	4.4±0.2
Urea (mg/dL)	54.25±5.2	55.25±6.7	55.25±5.3	54.25±4.6	55.25±6.1
Creatinine (mg/dL)	1.5±0.5	1.3±0.2	1.8±0.2	1.22±0.1	1.6±0.2
GPT/ALT (u/l)	6.75±1.1	6.65±0.3	6.55±1.2	6.8±0.6	6.66±0.2
GOT/AST (u/l)	46.5±2.4	46.2±3.3	48.3±2.6	46.3±1.9	48.2±2.3*

\*significant at ( $P < 0.05$ )

GPT:glutamate pyruvate transaminases.

GOT: glutamate oxalacetate transaminases.

**Table4:-** Average values ( $\pm$  standard errors) of electrolytes, expressed in their conventional units of measurement, in twenty calves during the first month of life

	Day 1	Day7	Day14	Day22	Day30
Calcium mg/dl	7.34 $\pm$ 0.5	7.35 $\pm$ 4.2	8.2 $\pm$ 3.1	8.1 $\pm$ 3.2	8.5 $\pm$ 2.1*
Phosphorus (mmol/L)	2.1 $\pm$ 0.2	2.3 $\pm$ 0.2	3.1 $\pm$ 0.1	2.5 $\pm$ 0.2	2.6 $\pm$ 0.3*
Chloride (mmol/L)	93.5 $\pm$ 2.6	93.1 $\pm$ 2.5	94.1 $\pm$ 3.1	94.1 $\pm$ 2.1	95.2 $\pm$ 2.5*
Sodium (mmol/L)	132.5 $\pm$ 2.2	133.1 $\pm$ 2.1	134.6 $\pm$ 3.1	133.1 $\pm$ 4.1	133.6 $\pm$ 3.4
Iron ( $\mu$ mol/L)	25.2 $\pm$ 1.6	25.1 $\pm$ 1.6	26 $\pm$ 2.1	25.4 $\pm$ 3.2	26.1 $\pm$ 3.1
Copper mg/dl	133.1 $\pm$ 3.6	134.2 $\pm$ 2.3	133.5 $\pm$ 3.1	134.6 $\pm$ 3.5	135.3 $\pm$ 6.1*

\*significant at ( $P < 0.05$ )**Physiological parameters:-**

Temperature, heart rate and breath/minute represented at **table 1**, the values were not increase with days.

**Hematological parameters:-**

Data in **table 2**, indicated that the values of Rbcs, Wbcs, Hb. And Pcv were increased by the day of life of calves .

**Blood biochemical parameters:-**

**Total protein** Results in table 3 indicated that, the concentrations of plasma total protein were increase from one day (5.75 $\pm$ 0.88 ) to (6.92 $\pm$ 0.9g/dl) at 30 days.

**Plasma glucose** Data in **table 3** indicated that, the concentrations of plasma glucose were decreased with time from one day(4.7.8 $\pm$ 5.2 ) to (4.4 $\pm$ .2mg/dl) at 30 days.

**Urea** values in **table 3** showed that, the concentration of urea values increased with time from one day(54.25 $\pm$ 5.2 ) to (55.25 $\pm$ 6.1mg/dl) at 30 days.

**Creatinine** Data in **table 3** indicated that, the concentrations of plasma creatinine were increase in dam from zero time (1.5 $\pm$ 0.5) to (1.6 $\pm$ 0.2 mg/dl) at 30 days.

**GPT: glutamate pyruvate transaminases** showing that in table 3 there are no variations of the values from one day to 30 day. (6.75 $\pm$ 1.1)to(6.66 $\pm$ 0.2(u/l)).

**GOT: glutamate oxalacetate transaminases** data indicated that there are an increase of the values from one day46.5 $\pm$ 2.4to48.2 $\pm$ 2.3(u/l)at 30 days in **table 3**.

**2-blood electrolytes**

**Calcium level** Results in **table 4** indicated that there was an increase in calcium level in calves at one day (7.34 $\pm$ 0.5) than at 30 day (8.5 $\pm$ 2.1mg/dl).

**Phosphorus level** results in **table 4** indicated that, the concentrations of plasma phosphorous were variations in the value of calves from one day 2.1  $\pm$ 0.2to2.6  $\pm$ 0.3 mmol/L) at 30 day.

**Sodium level** Data in **table 4** indicated that, the concentrations of plasma sodium were increased in calves from one day (132.5 $\pm$ 2.2) to133.6 $\pm$ 3.4(mmol/L).

**Chloride level** Results in **table4** indicated that, data indicated that there are an increase of the values from one day (93.5 $\pm$ 2.6) to94.1 $\pm$ 2.1(mmol/L) at 30 days .

**Iron values table 4** Results indicated that, the concentrations of plasma iron were slow increased in calves from one day (25.2 $\pm$ 1.6)to(26.1 $\pm$ 3.1) (mmol/L)at 30 day.

**Copper values table 4** Results indicated that, the concentrations of plasma copper were increases in the value of calves from one day (133.1  $\pm$ 3.6)to(135.3  $\pm$ 6.1 mg/dl) at 30 day.

**Discussion:-**

The obtained data did not show a significant effect of days of life on the studied physiological parameters (rectal temperature, heart rate, and respiratory rate) during the first month of life. Rectal temperature was between 39.1°C and 39.3°C for the first days of life, with no significant differences recorded (**Piccione et al., 2007b**). Also in the present study for respiratory rate during the first month of life there are no significant effect of days of life on the respiratory rate. Also there is no significant effect of days of life on the heart rate. Regarding to the age influence, the results indicate the influence of the age of cattle on the red blood cells, white blood cells, hemoglobin, and packed cell volumes which are significantly more in young cattle than in adult.(**Moosavian et al., 2010**),(**Mohriet al., 2010**),( **Nezar et al.2013**),(**Mohriet al. 2006**),(**Brun–Hansen et al. 2006**)and(**Hege C. et al. 2006**).

Immediately after parturition the values of (PCV), haemoglobin (Hb) and number of red blood cells are higher in newly calves (Harvey 1997), while (Mohri et al. 2007) observed a decrease of PCV and Hb from birth to the age. The obtained results showed a significant effect of days of life on total proteins, these agree with (Muri et al., 2005), Egli and Blum (1998), (Peterson et al., 1981). Total protein data increased with the increasing the age of calves and significant at ( $P < 0.05$ ) (Egli and Blum (1998), (Knowles et al. 2000), (Neama .A. Ashmawy 2015), (Csilla Tóthová et al. 2016).

Plasma glucose increase with the increasing day of life, these agree with (Knowles et al. 2000) and ECLI and BLUM 1998).

The concentration of urea in blood depends from nutrition, diagnostically is important also at diseases of kidneys (Kraft & Dürr, 1999b; Jazbec, 1990). Increased concentration of urea in calves' serum indicates increased catabolism of proteins and appears at long lasting diarrheas (Jazbec, 1990). Hanschke and Schulz (1982), (Maria et al, 2011, Campanile et al, 1997 and, Grasso et al, 2007). The obtained results are not increase with the age of calves, this are not agree with the results obtained by Hanschke and Schulz (1982), (Hugi et al. 1997), (Knowles et al. 2000).

GOT is present in different tissues and is a sensitive indicator of soft tissue damage. In heart and skeleton musculature as in liver there is high activity of GOT, (Kurz & Willet, 1991), Hammon and Blum (1998) glutamate oxalacetate transaminases have an increase change with day of life., this agree with (Egli & Blum, 1998). Mohri et al. (2007). while the (GPT) glutamate pyruvate transaminases; have no change with day of life.

Age-related changes have been detected for Calcium, and Phosphorus. Egli and Blum (1998). The obtained data showing an increase in the values of calcium (Bostedt and Schramel, 1982), While Egly and Blum 1998) said that it is decreased with the age.,

The values Sodium and chloride in the present study are increase with age, this agree with (Dubreuil and Lapierre 1997), (Reece, 1984), (Maach et al., 1991). (Jozcia and Martin 2006) they reported the increase of sodium and chloride levels with age. Other researches said that the values of Cl, Na and K were within the published reference values for adult cattle. (Dubreuil and Lapierre 1997). and copper with the days of life of the calves significant at ( $P < 0.05$ ) while the values, this agree with (Birgit Puschner et al. 2004). For diagnostic purposes, liver copper concentrations of newborn calves are often used to determine the copper status of dams (Gooneratne and Christensen 1989).

The values of phosphorus are increase with the age of calves, this agree with (Underwood & Suttle, 2001), (Kraft 1999b) (Rosol and Capen, 1997), (Steinhardt and Thielscher, 2000), (Mohri et al. 2007). The iron is very important for synthesis of haemoglobin. The level of iron have slow increase with the increasing day of life of calves, this agree with the result achieved by (Egli and Blum 1998), (Knowles et al. 2000). Creatinine is excreted with urine. It is important for the assessment of functioning of the glomerular system in the kidneys, but its concentration increase only at serious damage (Kraft & Dürr, 1999b). the values of creatinine obtained are not increase with the age of calves, and this are not agree with the results reported by (Maach et al. (1991), (Klee, 1985), they observed increase of creatinine concentration to the age of calves.

### Conclusion:-

The age of calves influence the hematological and biochemical variables what should be considered by interpretation of laboratory results.

The results of various studies on age dependent dynamics of hematological and biochemical variables in calves are different. The differences are influenced by the fact that blood samples were taken in different age periods, breeds, rearing systems, geographic regions, and were analyzed with different methods.

For proper interpretation of laboratory results it is the best to use the reference values from the laboratory which performed the analyses of blood.

The results of the present study showed that for some physiological, hematological and biochemical parameters. The results from this study provide data on 20 calves followed over time and may serve as preliminary reference intervals. However, because of differences between herds in relation to geographical regions, management and feeding strategies of dairy cows and calves cautions must be in mind to use appropriate reference range.

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### REVIEW ARTICLE

#### PHARMACOKINETICS OF BIO-THERAPEUTICS: Rituximab

Parbhat Saini.

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#### Manuscript Info

#### Abstract

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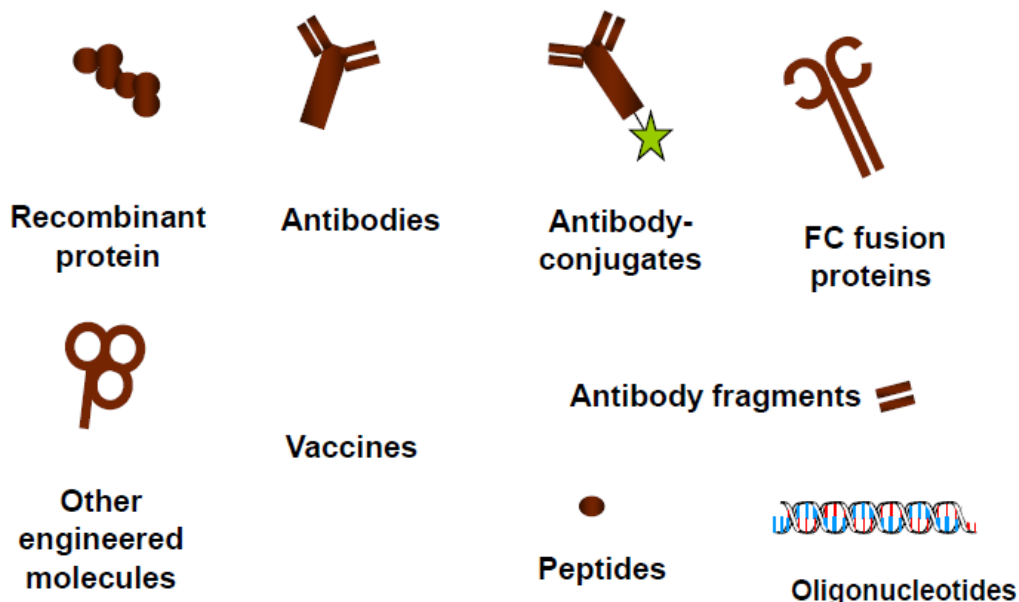
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#### Introduction:-

- The term Bio-therapeutics usually refers to therapeutic materials produced using biological means, including recombinant DNA technology.
- Therapeutic agents that are produced from living organisms or their products(including rDNA technology, biotechnological manufacturing & chemical synthesis using nucleotides or amino acid).
- Includes monoclonal antibodies antibody fragments, peptides, replacement factors, fusion proteins, oligonucleotides, and DNA preparation for gene therapy as well as vaccines.



**Types of Biopharmaceutical Modalities:-****How they are different from biopharmaceuticals:-****Biopharmaceuticals:-**

- Small molecule drugs are organic or metallic compounds which bind with proteins in the body, thereby altering their function and their role in disease.
- Size is <600 Da
- Typically made utilizing chemistry synthesis.
- Work intracellularly.
- Less specificity.
- Easier to deliver (often oral, e.g., aspirin, antibiotics).
- Generally cheap to manufacture and easy to replicate after patent expiration (the high cost is the initial development)

**Bio-therapeutics:-**

- Large molecule therapeutics treats diseases using biological matter, e.g., proteins monoclonal antibodies, peptides, RNA, cells, vaccines etc.
- Size is ~150,000 Da.
- Typically grown and extracted from living cells
- Work extracellularly.
- High specificity limits toxicities
- Difficult to deliver (usually must be injected)
- Generally expensive to manufacture.

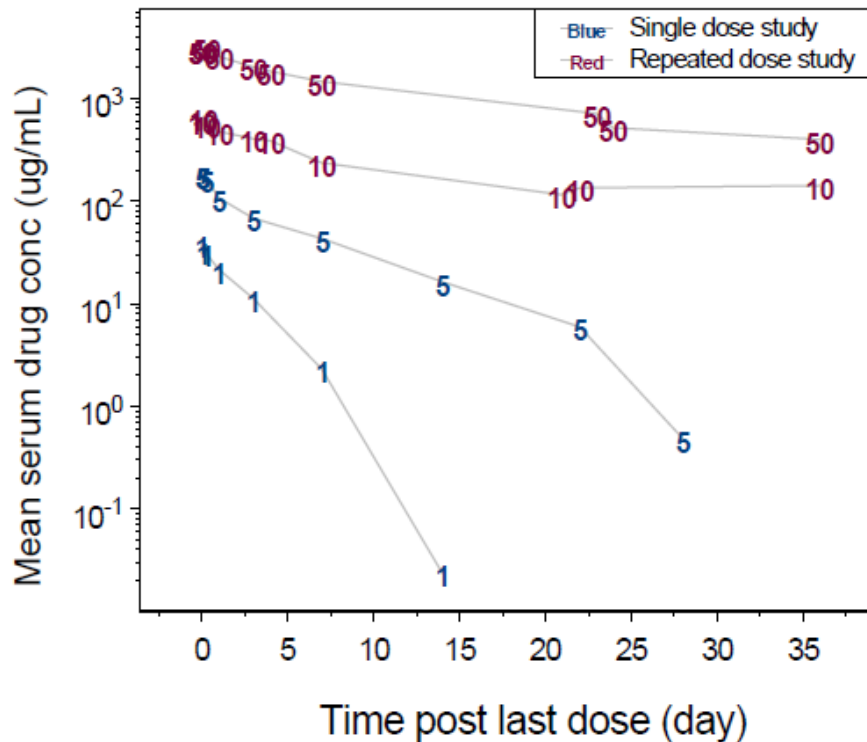
**Additional Challenges for Bio-therapeutics:-**

- Delivery options are currently limited (main routes are intravenous and subcutaneous).
- Target Mediated Disposition may lead to **Nonlinearity**.

- Manufacturing is significantly more complex and a critical factor in safety and efficacy thus manufacturing changes have to be carefully assessed (**Comparability**).
- Products can lead to **immunogenicity where the body mounts** an immune response to the product. This is especially true for products that contain other species components (i.e. giving human protein to animals for safety studies).
- Species specificity may limit standard preclinical models for safety testing.
- First pass metabolism i.e g.i.t degradation.

#### Examples of Special Bio-therapeutics Considerations:-

- **Nonlinearity**



#### Comparability:-

Understanding potential changes in a product due to manufacturing changes.

- Comparable means “highly similar” not identical”
- ICH Q5E

“The demonstration of comparability does not necessarily mean that the quality attributes of the pre-changed post-change products are identical; but that they are highly similar and that the existing knowledge is sufficiently predictive to ensure that any differences in quality attributes have no adverse impact upon safety and efficacy of the drug product”.

#### Potential changes to manufacturing process:-

##### Expression system:-

Master cell bank  
Working cell bank

##### Fermentation

Raw materials, cell culture conditions, scale, equipment, site change

**Purification process:-**

Column/resin, reagents, scale, site, equipment.

**Formulation and filling:-**

Excipient, liquid tolyophilized or *vice versa*, equipment, change in manufacturing protocol.

**Drug product:-**

– Batch definition, shelf-life, container/closure, shipping, storage.

**Immunogenicity in Bio-therapeutic Development:-**

- Immunogenicity refers to the production of an unwanted immune response directed at a bio-therapeutic.
- These are typically called anti-therapeutic antibodies (ATA) or anti-drug antibodies (ADA).
- Any exogenous protein may be viewed by the body as foreign and trigger immune response that lead to generation of endogenous antibodies against that protein.
- **Immunogenicity of biological products is a high profile concern for industry and for regulatory authorities:**
  - Immunogenicity may impact safety and efficacy.
  - FDA & EMA require that immunogenicity of bio-therapeutics be evaluated.
- Development of bio-therapeutics for chronic use is increasing the need to understand potential implications of immunogenicity.
- Immunogenicity strategies and data are essential components of Target Product Profiles, INDs, and BLAs.
- **Immunogenicity of the administration route: intradermal > inhalation > subcutaneous > intraperitoneal > intramuscular > intravenous.**

Clinical Impact	Clinical Outcome
<b>Safety</b>	<ul style="list-style-type: none"> <li>➤ Hypersensitivity or anaphylactic reactions</li> <li>➤ Neutralize activity of endogenous counterpart with unique function causing deficiency syndrome</li> <li>➤ Immune complex formation</li> </ul>
<b>Efficacy</b>	<ul style="list-style-type: none"> <li>➤ Neutralize activity of therapeutic protein</li> <li>➤ Increase or decrease efficacy by extending or curtailing half life</li> <li>➤ Increase or decrease efficacy by changing bio-distribution</li> </ul>
<b>Pharmacokinetics</b>	<ul style="list-style-type: none"> <li>➤ Extend, or curtail half life</li> <li>➤ Alter biodistribution</li> <li>➤ PK changes may dictate changes in dosing</li> </ul>

#### Advantages To Bio-therapeutics:-

- ❖ Favorable attrition rate.
- ❖ Minimum risk for non-mechanism based toxicity and safety issues.
- ❖ Can augment bodies normal growth factors, hormones, and enzymes.
- ❖ Able to modulate protein/protein interactions intractable to small molecules.
- ❖ Applicable in multiple therapeutic areas and for a variety of targets.
- ❖ Inherently highly specific for the target.
- ❖ Maintain natural biological activity.
- ❖ Broad range of protein expression capabilities, including enzymes, cytokines, hormones and mAbs.
- ❖ Scalability.
- ❖ Safety, potency and consistency of the end product.

#### Pharmacokinetics Of Rituximab:-

- **Rituximab (RTX; Rituxan, MabThera)** is a **chimeric monoclonal antibody (mAb)** that binds the CD20 antigen, a transmembrane phosphoprotein specifically expressed by B-lymphocytes. RTX induces target cell death and is used in combination with polychemotherapy in the treatment of all histological types of B non-Hodgkin lymphoma (B-NHL) and in chronic lymphocytic leukemia (CLL), both as first-line and as rescue therapy. Furthermore, it is used for maintenance therapy of B-NHL and for treatment of several autoimmune diseases, in particular rheumatoid arthritis.

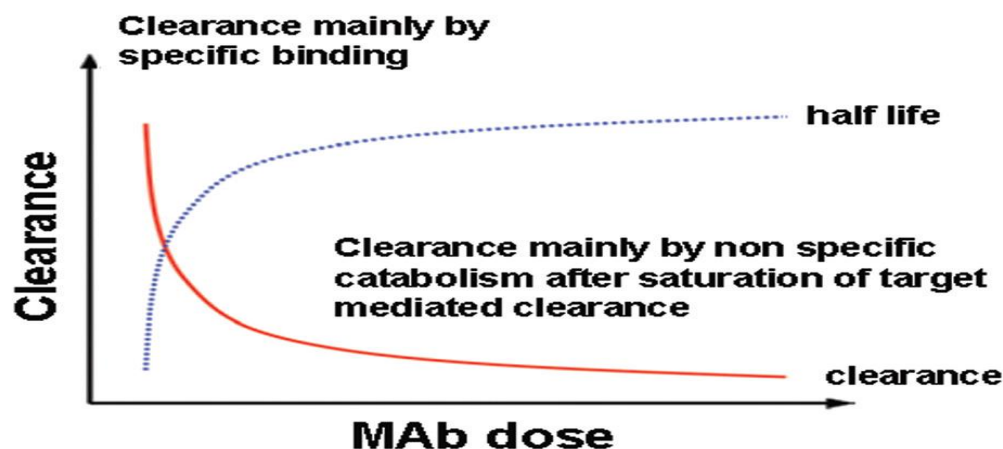
**Doses and routes of administration:-**

- RTX is usually administered by **intravenous (i.v.) injection**. The first approved schedule for induction therapy of B-NHL was 375 mg/m<sup>2</sup> i.v. given for 4 cycles, and this was based on the pivotal trial of the antibody.
- Limited to the treatment of central nervous system (CNS) lymphomas, an intrathecal or intraventricular route has also been attempted since maximal RTX levels in cerebrospinal fluid are generally not more than 1% of serum levels after i.v. administration. Doses administered by the intrathecal or intraventricular route are generally 10 or 25 mg antibody every few days.
- A more convenient administration would be the **oral route**, but this is limited by **pre-systemic degradation** in the gastrointestinal tract, and by inefficient diffusion or convection through the intestinal epithelium. To bypass the low oral bioavailability, and as an alternative to i.v. administration, a number of mAbs are delivered **subcutaneously (s.c.)**. The subcutaneous route has been employed for antibodies used in the treatment of allergy or autoimmune diseases, but more recently has been extended to trastuzumab, an anti-human epidermal growth factor receptor (HER)-2 antibody approved for treatment of breast cancer.

**The proposed s.c. dose for RTX is a fixed dose of 1400 mg.**

**General aspects of RTX PK:-**

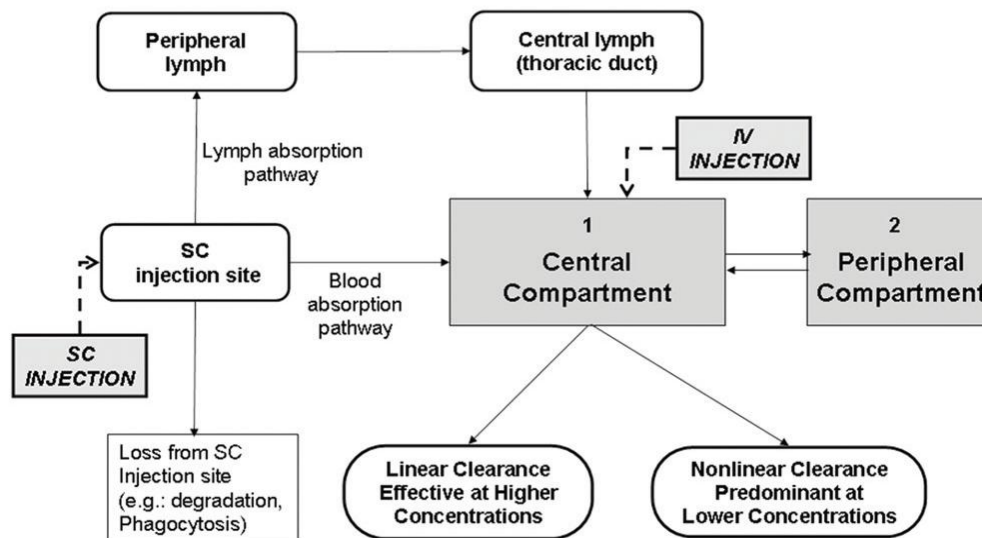
- PK of RTX has been mostly studied after i.v. administration. In this case, RTX disposition is characterized by a 2-exponential decay, with a long elimination half-life of about 3 weeks (Fig. 1). The 2-compartment open PK model with first-order elimination represents the best structural model and seems to provide the best fit of RTX disposition, both during and after treatment, even with different schedules of drug administration.



**Figure 1:-** Biphasic PKs of RTX. The model shows high clearance by specific binding to CD20) which, after saturation, leads to low clearance through non-specific binding via FcγR (RES).

**Absorption:-**

- After i.v. administration of RTX, all the drug administered reaches the systemic circulation (by definition the bioavailability (F) by this route is 100%), while after s.c. administration only a fraction of RTX dose ( $F \cong 60\%$ ) is absorbed because, during the absorption phase, a portion of the drug undergoes proteolytic degradation or phagocytosis.
- Primary pathways for systemic absorption include **convective transport** of antibody through lymphatic vessels and into the blood, and **diffusion** of antibody across blood vessels distributed near the site of injection; however, on the basis of its molecular size, it is considered more likely that the RTX administered via s.c. injection is absorbed mainly via convection through lymphatic vessels.
- Generally, after s.c. injection, absorption occurs slowly and the time to reach maximum plasma concentration varies from 2 to 8 d. The bioavailability is determined by the extent to which the drug after s.c. administration undergoes pre-systemic catabolism and systemic absorption. In general, the absolute bioavailability reported varies from 50 to 100%.<sup>59</sup> Clearly, RTX will also bind to CD20 on B cells after s.c. administration.
-



**Figure 2:-** Model of mAb absorption and clearance after i.v. or s.c. administration. Absorption and clearance pathways are shown.

#### Distribution:-

- Antibody distribution kinetics is influenced by rates of convective transport, binding to tissue sites, and rate of catabolism within tissue. After i.v. administration, RTX binds to the CD20 antigen present on the surface of normal or neoplastic B cells in the peripheral blood, bone marrow and lymph nodes.
- After distribution at the level of tissue blood vessels, there are different mechanisms of transport of the antibody from the systemic circulation through the capillary endothelial cells and into tissues. RTX diffusion across vascular endothelial cells is very slow and the movement of RTX through or between the cell membranes mainly occurs via transcellular (endocytosis) or paracellular mechanisms, i.e., convective transport of the antibody within the movement of the fluid flow
- For both i.v. and s.c. administration of antibodies, FcRn plays an important role by reducing mAb catabolism and mediating mAb transport across endothelial cells, thus promoting the distribution of the antibodies across tissues.
- The volume of distribution of RTX at steady-state is approximately 9.6 L. Since the plasma volume is only 3–3.5 L, this suggests that the mAb distributes into the extracellular spaces of tissues, except the CNS.

#### Elimination:-

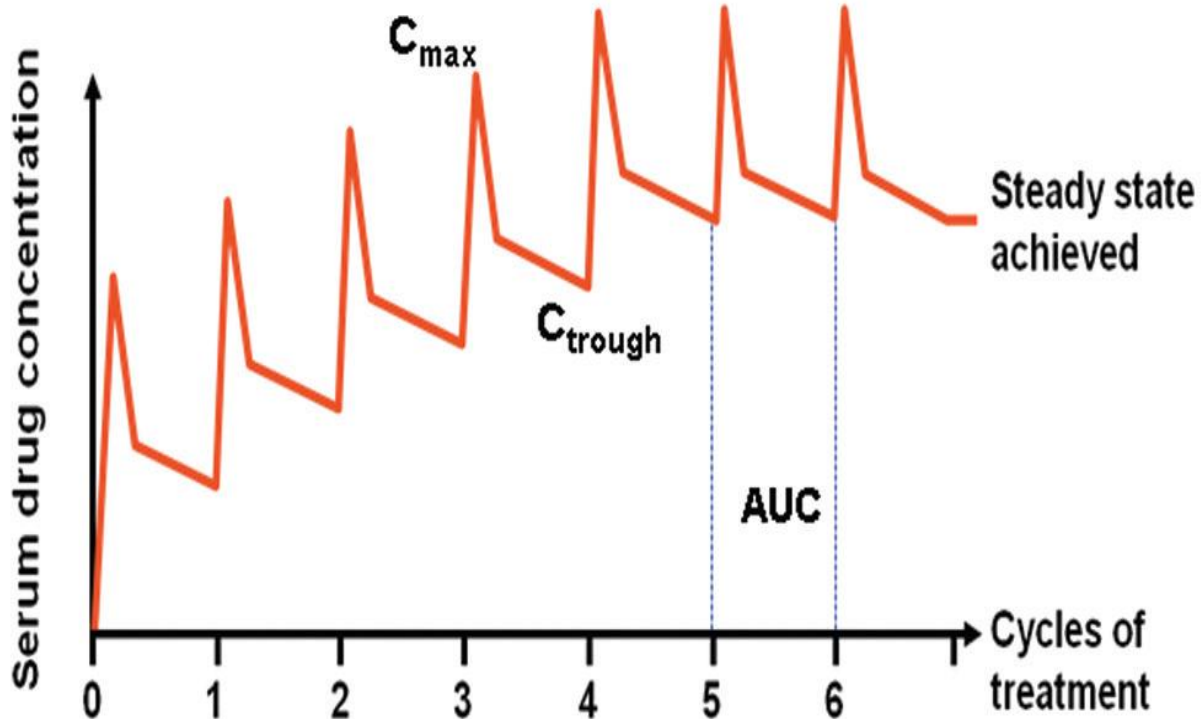
- The total clearance is the sum of specific target mediated internalization, which is not linear and saturable, and non-specific clearance, which is linear and mediated by both FcγR-dependent and independent mechanisms (Fig. 1).
- Binding to FcRn generally reduces clearance because the antibody is recycled through FcRn to the surface and released into the cell environment. Therefore, FcRn binding protects mAbs from intracellular degradation.

#### The mechanisms of antibody eliminations are three:-

1. target-mediated elimination
2. proteolysis by the liver Kupffer cells and by monocytes/macrophages of the reticuloendothelial system (RES).
3. non-specific, FcγR-independent, endocytosis.

#### Accumulation:-

- Because RTX distribution and elimination are very long and clearance rate can vary, the extent to which the drug could accumulate after multiple doses is difficult to estimate. A steady-state condition (i.e., the condition in which, during each dosing interval, the intake of a drug is equal to the amount eliminated from the body) is achieved after approximately 3–5 half-lives (Fig. 3).
- In fact, small molecules (e.g., chemotherapy) have an elimination half-life in the magnitude of hours and rapidly achieve steady-state following administration (hours-days), while large molecules (e.g., mAbs) have a very long elimination half-life (in the magnitude of weeks) and may take up to 12 weeks to achieve steady-state.
-



**Figure 3:-** Model of RTX PK after multiple dosing.  $C_{max}$ ,  $C_{trough}$ , AUC and steady-state, reached after about 5 cycles, are shown.

#### Factors Affecting RTX PK:-

The association between tumor burden and RTX levels. Circulating RTX levels have been shown to be affected by the “tumor burden” (tumor volume) in an inversely proportional way. Clinical studies have demonstrated that a high “tumor burden” is associated with low RTX serum levels. This is because the tumor cells act a sink for the antibody, adsorbing RTX through CD20 binding and inducing target-mediated elimination. A similar phenomenon is associated with the observation that a decrease in serum antibody levels during maintenance treatment can be predictive of relapse. Indeed, tumor growth adsorbs antibody, whose levels consequently fall in the circulation, in some cases anticipating clinical relapse.

#### Association between RTX levels and clinical response:-

Exposure to RTX (assessed by the area under the serum concentration-time curve [AUC]) and trough/pre-dose concentration of the drug are the PK parameters most frequently related to the patient’s response (Fig3).  $C_{max}$  represents a measure of drug concentration in the blood immediately following i.v. administration, but it should be noted that during the first hours after drug injection, the changes in serum concentration do not always reflect a proportional change in the concentration of RTX in all other tissues, and hence in the amount of drug in the body. The balance between plasma/serum and tissue concentrations is obtained only a few days after drug administration. This is probably the reason why AUC and  $C_{trough}$  are more directly related to clinical response compared to  $C_{max}$ . This has suggested that maintaining RTX above 25  $\mu\text{g/ml}$  would be beneficial.

#### Gender effects:-

An interesting aspect that has recently emerged is the effect of gender on RTX PK.  $C_{trough}$  and AUC were generally higher in females than males both in the induction phase and in the maintenance phase, resulting in a better quality of response.

**Comparison of Analytical Assays for Protein Quantitation:-**

Variable	Immunoassay	Direct LC-MS	Immuno-capture LC-MS
Limit of quantification	5-200ng/ml	500-1000ng/ml	20ng/ml
Target Concentration	Mixture of free and bound	Total	Mixture of free and bound
Precision	Medium, No internal standard possible	High, with internal standard	Same as Direct LC-MS
Time for development.	8 months	Less than 1 month.	4 months
Throughput	High	High	Low, automation (robot)
Cost	Low	High	High

**When to use LC/MS/MS****First Choice:-**

- Peptides.
- Oligonucleotides in tissues.
- Early discovery (when no reagents are available).
- Antibody drug conjugates.

**LC/MS/MS as a compliment to ligand binding assays (ex. ELISA)**

- When there are issues with unresolved interference.
- Characterization – to understand what the ligand binding assay is measuring.

**Conclusion:-**

- ✓ Bio-therapeutics are becoming an increasingly important part of drug development.
- ✓ There are multiple types of bio-therapeutics each with their own distinct characteristics and drug development challenges.
- ✓ Bio-therapeutics have unique challenges for drug development when compared to small molecules including (but not limited to) target mediated disposition, comparability, and immunogenicity.
- ✓ A key factor for Bio-therapeutics is the development of fit for purpose bio analytical assays with the appropriate validations.
- ✓ Over the past 15 years, however, many data have been obtained on PK and PD and different prognostic factors have been identified, allowing better prediction of what could be the best treatment regimens.
- ✓ At least in the context of B-cell malignancies, the maintenance of a minimum level of drug (currently defined as > 25 µg/ml) for a prolonged time (at least 200 days for induction therapy and up to 2 y for maintenance), seems to be more important rather than the rapid achievement of a very high dose (200–300 µg/ml) for a shorter time.
- ✓ Better timing, simplified administration (fixed doses, s.c.) and different schedules with respect to chemotherapy are being introduced, on the basis of the present knowledge and of the widely different characteristics of therapeutic mAbs compared with standard drugs in terms of both PK and PD.
- ✓ Several of the lessons learned from RTX studies should be valuable for other anti-cancer mAbs.

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### RESEARCH ARTICLE

## THEORETICAL ASPECT OF SOCIAL COMPETENCE FORMATION IN TEACHING FOREIGN LANGUAGES

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##### Key words:-

Teaching, linguistics, culture, values, foreign languages, intercultural relations, communicative competence, social-cultural competence.

#### Abstract

The article is devoted to theoretical aspect of formation of social-cultural competence which is necessary in teaching foreign languages. After getting independence the educational system in Uzbekistan was changed by making a number of reforms aimed at preparing further generation with high intellectual development, moral and spiritual upbringing. Since obtaining national sovereignty the system of education is improving by embedment of new methods and models of teaching. The content of teaching, of course, contains teaching culture and spiritual heritage. Essential in this aspect becomes formation of the social-cultural competence in the process of teaching foreign languages.

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#### Methods and Materials:-

The methodological ground of the present research includes theoretical issues of N. Muravyova, Z. Nikitenko, I. Bim, G. Ferapontov and others who devoted their investigation to the problems of integration of teaching culture into the process of teaching foreign languages. Methods used for the present research are: descriptive method – for description of the problem; method of observation – for revealing main aspects of forming of social-cultural competence and its integration into teaching process; componential analysis – for dividing the process of social-cultural competence formation into components; method of critical analysis of the researches done in the sphere of investigation.

#### Results and Discussion:-

The new model of education aims at effective teaching foreign languages and formation of educated personality. New approach in teaching foreign languages makes an accent at teachers training institutions. Teaching programmes should match new demands of theory and practice of teaching foreign languages.

Knowledge of a foreign language is based on not only language skills but on knowing cultural peculiarities and lingual behavior as well. As foreign languages serve as means of intercultural relations between countries, so they should maintain perfect dialogue of different cultures.

Integration of teaching culture in the process of foreign language teaching has become wide. Mastering a foreign language deals with mastering national culture of its native speakers, cultural background and ability to comprehend the mentality of its speakers in the process of communicative dialogue.

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The present manuscript explains the notion of social-cultural competence and its peculiarities of formation in the process of teaching foreign languages.

The aim of teaching a foreign language is formation of communicative competence, which includes lingual, social-cultural competence. The absence of social-cultural background knowledge will lead to incorrect communication and can't maintain communicative competence.

Social-cultural competence is an effective means of formation of a personality of a foreign language teacher. It brings to development of students' personal qualities such as creativity, new ideas, comprehension of communicant's psychological state, tolerance to diversity and another point of view, positive attitude to foreign culture and its bearers<sup>1</sup>.

Being the elements of culture, languages function in the frames of a definite culture. Students, who are taught these languages, should be aware of cultural peculiarities. National-cultural competence includes specifics of speech behavior of language native speakers and elements of social-cultural context: customs, traditions, norms, rules, social conditions, rituals, country study knowledge.

All these problems are attracting more attention of researchers who point the necessity of including teaching culture into the process of teaching foreign languages. N.G. Muravyova points: "Social-cultural competence is an integrative characteristics of a person, being aware of various social-cultural spheres and being able to communicate with different people basing on life experience"<sup>2</sup>.

Learning the culture of the country of a foreign language develops mutual understanding, tolerance to each other, respect to another culture, comprehension of its peculiarities in the process of communication with foreigners<sup>3</sup>.

The most effective way of learning foreign language culture is living in that country, being involved into the atmosphere of culture, traditions, customs and social norms of the country of foreign language. But not all the learners have chance for it. So we should offer the most effective ways of development of social-cultural competence outside of authentic language sphere.<sup>4</sup>

#### **The development of social-cultural competence includes 4 main steps:-**

1. Social-cultural knowledge – materials about the country of a foreign language, its spiritual values and cultural traditions, peculiarities of national mentality;
2. Experience of communication with foreigners – choice of the style of communication, correct expression of thoughts, and correct explanation of phenomena of foreign culture;
3. Personal attitude to the facts of foreign culture – tolerance and ability to avoid social-cultural conflicts in communication with foreigners;
4. Correct usage of socially marked language units in various spheres of cultural communication, comprehension of diversity and difference of foreign culture with native one.

We see that a language is a means of transformation of cultural experience of a country and reflection of historical changes.

Social-cultural competence suggests that knowing the norms of speech behavior gives opportunity to reveal nationally marked lexics in the texts of different styles.

Formation of social-cultural competence deals with practical, developing and upbringing functions of a language. The upbringing function is the most essential as it helps to increase the feeling of patriotism and feeling of internationalism in a young learner. Learning English, we form comprehension of world culture in a person's mentality. We compare lingual phenomena, customs, traditions, art, and way of life of people.

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<sup>1</sup> Ferapontov G.A. Laboratory of social-cultural and cross-cultural education. – Novosibirsk, 2001. – 273 p.

<sup>2</sup> Muravyova N.G. The notion of social-cultural competence in modern science and educational practice //The Journal of Tyumen State University. - 2011. - № 9. - PP. 141-148.

<sup>3</sup> Nikitenko Z.N. Specifics of teaching english in primary school. – Moscow: Pedagogical university, 2010. – PP. 115.

<sup>4</sup> Bim I.L. The content of teaching English in basic course. // Foreign languages at school.- 1996. - № 2. - PP.11.

A.B. Minenko identifies social-cultural content of communicative competence with a) country study, б) language study, в) culture study, г) culturology<sup>5</sup>.

Social-cultural component in teaching a foreign language creates the basis of background knowledge about realias, tastes, customs, and traditions of the country of the learned language. All these elements are necessary in the speech act, verbal and non-verbal behavior and are included into the content of national culture. This component has a vast potential in the dialogue of cultures and introduction with national cultures in the development of humanity culture.

### **Conclusion:-**

The analysis of different explanations of the notion “social-cultural competence” lets conclude that this competence is built on ability to reveal similar and different points between various countries and civilizations, ability to represent native country and its culture.

In this way, the context of professional training of teachers includes ability to interconnect with representatives of foreign culture, ability to interconnect with pupils as they are also representatives of different cultures though they speak the same language.

The result of social-cultural education is formation of social-cultural competence which leads to successful intercultural communication. Introduction with the culture of foreign language country takes place by comparing and evaluating of earlier obtained knowledge and new knowledge in this aspect. Comparison reveals specifics and similarities between different cultures and brings to kind relations and respect to different countries, people and their traditions.

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<sup>5</sup><http://nsportal.ru/shkola/inostrannye-yazyki/library/2013/05/13/sotsiokulturnaya-kompetentsiya-v-prepodavanii>



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### RESEARCH ARTICLE

#### THE LEVEL OF AWARENESS OF DIABETIC FOOT AMONG PATIENTS WITH TYPE 2 DIABETES MELLITUS (T2DM) IN ALAHSA, SAUDI ARABIA.

Mohamed Riched Nabouli Asst Prof, Ali Hussain Al Rasasi MBBS, Mohammed Saleh Al Saeed MBBS and Mohammed Fahd Al Momen MBBS and Asma Saleh Alsaheed MBBS.

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#### Abstract

**Introduction and background:** Diabetic foot disease is a major challenge for the healthcare system, with enormous economic consequences for people living with diabetes, their families, and society, affecting both quality of life as well as the quality of care. The burden of diabetes and its foot complications is increasing in Saudi Arabia. Prevention of these complications through foot care education should be explored. The objectives of this study is assessing the level of awareness of diabetic foot among patients with type 2 diabetes mellitus (T2DM) .In addition to finding the effectiveness of health education in improving foot care practice among diabetes patients in Al Ahsa .

**Methodology:** A cross-sectional study was conducted among patients with T2DM .The study involved 360 diabetic patients who attended diabetic clinics in Al Ahsa city , Saudi Arabia between January 2016 to November 2016. Structured questionnaire was used to assess their knowledge and practices regarding foot care. The questioners containing 9 parts involving age , sex , educational level , economic status , duration of DM , current complications , any surgical intervention for the foot and foot care practices . The data analyzed using SPSS 20 version software . Appropriate statistical tests used to analyzed the data .

**Result :** The study involved 360 patients with T2DM. Out of the total sample, 221 (61,4%) were male and 139 (38,6%) were female. There education levels were (24,4%) illiterate, (33,3%) elementary, (13,3%) secondary, (13,1%) higher, and (16,1%) academic. 70% of them had middle income. (16,7%) of the participants had previous foot injury due to diabetes. Less than half of the participants 147 (40,9) obtained an awareness about diabetic foot injury. 214 (59,6%) reported having basic knowledge about diabetic foot injuries were the rest did not have basic knowledge. Educational level ( $p= 0,001$ ) and household income ( $p= 0,001$ ) had a significant impact on knowledge about diabetic foot injuries.

**Conclusion:** The results from our study revealed that patients were unaware of diabetes foot risk factors and the importance of foot care practice to their health . Awareness programs should be implemented in all hospitals to help to overcome the paucity of knowledge among the

participants coupled with regular assessment of the patients foot at each visit to the diabetic clinic.

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## **Introduction and Background:-**

Diabetes mellitus is common chronic disease, affecting nearly all the population in the developing and developed countries .Worldwide, more 120 million people affected by diabetes mellitus. It is expected that this number will reach to 250 million by the year 2050 (1). In Saudi Arabia, more than 25 percent of adult population over 30 years of age is suffering from diabetes mellitus and by the year 2030 this number will be more than double. (2) Diabetes mellitus complications especially diabetic foot problems are a major cause of morbidity and premature mortality. Annually around 3.2 million deaths in the world occurs as result of Diabetes mellitus complications. (3-4) 20 percent of diabetic hospitalizations are attributed to diabetic foot problems. The risk of lower limb amputation is found to be 10 to 15 times higher among diabetic patients compared with non-diabetics. (5)

Diabetic foot disease considered as a major challenge for the healthcare system, with enormous economic consequences for people living with diabetes, their families, and society, affecting both quality of life and quality of care. (2) The burden of diabetes and its foot complications is increasing in Saudi Arabia which demanding for effective prevention strategies.

The studies have revealed that there is marked correlation between the level of awareness of diabetic foot lesions and reduction of its occurrence rate. proper education of patients regarding the foot care and awareness of diabetic foot disease have shown to achieve a marked reduction in the limb amputation rate. it reduced the amputation rate by half in addition to minimizing the rate diabetic foot hospitalization and its burden. (5-8) since education of patient about diabetic foot care is considered as a mainstay of prevention for the diabetic foot complications by many Literatures. This study aimed to assess the level of awareness of diabetic foot among patients with type 2 diabetes mellitus (T2DM). In addition to finding the effectiveness of health education in improving foot care practice among diabetes patients in Alhasa city.

## **Methodology:-**

### **Study design and setting:-**

A cross-sectional study was conducted among diabetic patients. The study involved 360 diabetic patients who attended diabetic clinics in Alhasa city, Saudi Arabia between January 2016 to November 2016. The sample size calculated by using Rosoft website, with a margin of error of 5%, and confidence interval of 95%.

### **Data collection:-**

Structured questionnaire was used to assess their knowledge and practices regarding foot care. The questioners containing 9 parts, (a) personal data ( age, gender, educational background, socioeconomic status and Province ), (b) duration of DM, (c) current complications ( retinopathy, nephropathy, Diabetic neuropathy, stroke, coronary artery disease (CAD) and peripheral artery disease (PAD)), (d) prior foot or leg problem, (e) surgical intervention for the foot, (f) current treatment for DM ,(g) Hb A1c level , (h) Self-assessment of the Feet, (i) duration of foot washing,

(j) Walking barefoot, (k) foot care practices (using nail clipper, warming feet in the winter ,checking water temperature before feet washing , using herbal medication ,wearing comfortable footwear), (l) patients knowledge about diabetic foot disease and its risk factors ( the patient should indicate the source of information), (m) number of feet examination by doctor. After obtaining a written consent, the patients were asked to check the appropriate boxes for the questions. the questionnaire translated to Arabic to ensure full understanding of questions by the patients.

### **Statistical analysis:-**

The data analyzed using Statistical Package for Social Sciences version 22 Descriptive analysis was carried out to analyze the date. In addition to chi-square test and t-test which done tounderstand the variables associated with awareness of Diabetic foot problems. The data checked at 95% confidence interval (CI) and significant level of p-value of <0.05.

**Result:-**

A total of 360 diabetic patients were involved in the study. The mean age of the respondents was 57,2 years .out of 360 respondents, 221(61,4%) were male and 139 (38,6%) were female. \Around one third (33.3%) of the sample was having elementary education and one quarter (24,4 %) of the sample was illiterate. Only 16,1 % completed university. The majority (76,45%) of them were living in city and 23,6 % was living in village. regarding the household income around 70 % were having middle income. ( Table 1)

**Table 1:-** Demographic characteristics of study population .

<b>Categorical Variables</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Gender</b>		
Male	221	61,4
female	139	38,6
<b>Education level</b>		
elementary education	120	33,3
secondary education	47	13,1
higher education	47	13,1
academic education	58	16,1
illiterate	88	24,4
<b>Province</b>		
City	275	76,4
Village	85	23,6
<b>Household income</b>		
Low	74	20,6
middle	241	66,9
High	45	12,5
<b>Current medication for DM</b>		
healthy diet only	20	5,6
Oral hypoglycemic agent (OHA)	208	57,8
OHA + Insulin	78	21,7
Insulin only	54	15,0
<b>Quantitative variables</b>		
	<b>Mean</b>	<b>Standard deviation</b>
Age	57,2	13,1
Duration of DM	11,6	8,3

The mean duration of diabetes was 11,6 years. More than half (57,8%) of responders were using oral hypoglycemic agent only, 21,7 % were using oral hypoglycemic agent in combination with insulin, 15,0 % were using insulin alone and only few (5,6 %)of them were following diabetic diet only. (table 1)

Regarding the diabetic complications, large number of patients were suffering from retinopathy 145(40,3%) and Peripheral Neuropathy 84(23,3%) . Other complications were reported with lower frequencies 52 (14,4%) Diabetic Peripheral Artery Disease of feet , 46 (12,8%) Nephropathy , 29 (8,1%)Brain stroke , 26 (7,2%) Coronary artery disease .141(39,2 %) were not suffering from any complications . (table 2)

The greatest number of respondents 300 (83,3%) had no any previous foot injury due to diabetes were 60 (16,7%) only had previews foot injury due to diabetes. Around half of the participants who suffered from diabetic feet injury undergo feet surgery . ( table 2 )

**Table 2:-** distribution of diabetic complications , diabetic feet injury and surgery among participants.

Variable(s)	Frequency	%
<b>Retinopathy</b>		
yes	145	40,3
no	215	59,7
<b>Peripheral Neuropathy</b>		
yes	84	23,3
no	276	76,7
<b>Diabetic Peripheral Artery Disease of feet</b>		
yes	52	14,4
no	308	85,6
<b>Nephropathy</b>		
yes	46	12,8
no	313	87,2
<b>Brain stroke</b>		
yes	29	8,1
no	331	91,9
<b>Coronary artery disease</b>		
yes	26	7,2
no	333	92,5
<b>Previous feet injury due to diabetes</b>		
yes	60	16,7
no	300	83,3
<b>Previous feet surgery due to diabetes</b>		
Yes	31	8,6
No	329	91,4

Regarding foot care, some practices were taken into consideration such as using nail clipper, monitoring water temperatures, drying the feet after each exposure to water, warming the feet during winter, using herbs to treat the feet, wearing cotton socks, wearing comfortable closed shoes , self-examination of the foot , duration of foot washing with water and walking barefooted . Of the total sample , Almost all the respondents 352 (98,1%) used nail clippers to cut their nails, 302 (48,1%) monitored water temperature before washing foot or shower ,167 (46,5%) dried their feet after water exposure , 314 (87,5%) kept their feet warm during winter, 258 (71,9%) of the respondents wore comfortable cotton socks , 242 (67,4%) wore closed comfortable shoes and 338 (94,2%) did not use herbs to treat their feet . Regarding self-examination of the foot, 81 (22,5%) of the participants perform it regularly, were 196 (54,4%) perform it in case of pain and 83 (23,1%) don not perform self-examination at all. (table 3).Considering duration of foot washing with water, three quarters of the participants 275 (67,4%) washed for less than 5 minutes. 67 (18,6%) of the participants wash from 5 to 10 minutes. The least number of participants 18 (5%) wash for longer than 10 minutes. The majority of the respondents 253 (70,3%) do not walk barefooted, were 106 (29,4%) of the do walk barefooted .(table 3)

**Table 3:** -diabetic foot care practices among the participants.

Variables	Frequency	%
<b>Self-examination of the foot</b>		
not at all.	83	23,1
in case of pain	196	54,4
regularly	81	22,5
<b>Duration of foot washing with water</b>		
less than 5 minutes	275	76,4
from 5 to 10 minutes	67	18,6
more than 10 minutes	18	5,0
<b>Walking barefoot</b>		
yes	106	29,5
no	253	70,5
<b>Using nail clipper to cut nails</b>		
yes	352	98,1
no	7	1,9
<b>Monitoring water temperature before washing foot or shower</b>		
yes	302	84,1
no	57	15,9
<b>Drying feet after each exposure to water</b>		
yes	167	46,5
no	192	53,5
<b>Warming feet in winter</b>		
yes	314	87,5
no	45	12,5
<b>Using herbs to treat the feet</b>		
yes	21	5,8
no	338	94,2
<b>Wearing comfortable cotton socks</b>		
yes	258	71,9
no	101	28,1
<b>Wearing comfortable and closed Shoes</b>		
yes	242	67,4
no	117	32,6



More than half the respondents 214 (59,6%) had knowledge about diabetic foot injuries, were the rest 146 (40,4%) did not have knowledge about diabetic foot injuries. 212 (59,1%) of the respondents reported obtaining proper awareness about diabetic foot injuries, 147 (40,9%) did not obtain any awareness. The majority of patients who reported obtaining proper awareness they obtain it from doctors 83 (56,5%) , while the rest of them obtain it from other sources ; nurse 11 (7,5%) , relatives 32 (21,8%), social media 27 (18,4%), or 19 (12,9%) health education campaign. (table 4)

**Table 4:-** source of awareness among the participants who obtained an awareness

Source of awareness	Frequency	%
<b>Doctor</b>		
yes	83	56,5
no	63	43,5
<b>Nurse</b>		
yes	11	7,5
no	135	92,5
<b>Relatives</b>		
yes	32	21,8
no	114	78,2
<b>Social Media</b>		
yes	27	18,4
no	119	81,6
<b>Health educational campaign</b>		
yes	19	12,9
no	127	87,1

Around one third of the respondents 125 (34,7%) have basic knowledge about the risk factors of diabetic foot injury, while the majority 235 (65,3%) of them were lacking of these basic knowledge. The knowledge of the patient who reported having basic knowledge about the risk factors of diabetic foot injury were furtherly assessed by asking them to select one or more of the following if they think that it could be a risk factor ; duration of foot washing, walking bare foot, and wearing inappropriate shoes Out of the 125 (34,7%), 79(63,2) of them thought that the duration of foot washing increases the risk of diabetic foot injury, as 62 (49,6) of them thought that walking bare foot do. While only 39 (31,2) of them thought that wearing inappropriate shoes is a risk factor. (table 5)

**Table 5:-** Assessment of the participants' knowledge about the risk factors of diabetic foot injuries

Variables	Frequency
<b>Do you think duration of foot washing is a risk factor for diabetic foot injuries?</b>	
yes	79
no	46
<b>Do you think Waking Bare Foot is a risk factor for diabetic foot injuries?</b>	
yes	62
no	63
<b>Do you think Wearing Inappropriate Shoe is a risk factor for diabetic foot injuries ?</b>	
yes	39
no	86

Most of the participants 236 (65,6%) indicated that they received foot examination by a doctor only if they have a complaint, were 63 (17,5%) will get their feet examined at each visit to the doctor, and 61 (17%) will not examine even in case of a complaint. (Table 6)

**Table 6:-** foot examination by doctor among the participants.

Variables	Frequency	%
<b>At Each Visit To The Doctor</b>	63	17,5
<b>If There Is A Complaint</b>	236	65,6
<b>Not Examine Even With Complaint</b>	61	16,9

Gender (p=0.07) and province (p=0.9) of the participants did not show a significant impact on patients’ knowledge about diabetic foot injuries .While the educational level of the participants (p=0,001) and household income (p=0,001) had shown a significant impact on patients’ knowledge about diabetic foot injury(table 7)

**Table 7:-** Relationship of knowledge with gender ,educational status, province and household income.

		Knowledge about diabetic foot injuries			
		Yes	No		
		N (%)	N (%)		
<b>Gender</b>	Male	123 (55,9)	97 (44,1)		0.07
	Female	91 (65,5)	48 (34,5)		
<b>Education level</b>	Elementary Education	74 (61,7)	46 (38,3)		0.00
	Secondary Education	31 (66,0)	16 (34,0)		
	Higher Education	27 (57,4)	20 (42,6)		
	Academic Education	44 (77,2)	13 (22,8)		
<b>province</b>	City	163 (59,5)	111 (40,5)		
	Village	51 (60,0)	34 (40,0)		
<b>household income</b>	Low	31 (41,9)	43 (58,1)		0.00
	Middle	149 (62,1)	91 (37,9)		
	High	34 (75,6)	11 (24,4)		

Previous feet injury (p=0,131), previous feet surgery (p=0,560) due to diabetes were not significantly associated with better knowledge or foot care practices (table 8) .

**Table 8:-** Relationship of knowledge with varies diabetic complications , Previous diabetic foot injury and Previous feet surgery due to diabetes

		Knowledge about diabetic foot injuries				p
		Yes	No			
		N (%)	N (%)			
<b>Retinopathy</b>	Yes	85 (59,0)	59 (41,0)		0.8	
	No	129 (60,0)	86 (40,0)			
<b>Nephropathy</b>	Yes	23 (50,0)	23 (50,0)		0.1	
	No	191(61,2)	121(38,8)			
<b>Peripheral Neuropathy</b>	Yes	36 (42,9)	48 (57,1)		<10 <sup>-4</sup>	
	No	178 (64,7)	97 (35,3)			
<b>Coronary artery disease</b>	Yes	10 (38,5)	16 (61,5)		0.02	

	No	203	(61,1)	129	(38,9)	
<b>Brain stroke</b>	Yes	14	(48,3)	15	(51,7)	0.1
	No	200	(60,6)	130	(39,4)	
<b>Peripheral Artery Disease of feet</b>	Yes	28	(53,8)	24	(46,2)	0.3
	No	186	(60,6)	121	(39,4)	
<b>Previous diabetic foot injury</b>	Yes	41	(68,3)	19	(31,7)	0.1
	No	173	(57,9)	126	(42,1)	
<b>Previous feet surgery due to diabetes</b>	Yes	20	(64,5)	11	(35,5)	0.5
	No	194	(59,1)	134	(40,9)	

Some foot care practices such as duration of foot washing with water (p=0,719), using nail clipper to cut nails (p=0,362), monitoring water temperature (p=0,552), warming feet in winter (p=0,703), wearing comfortable cotton socks (p=0,314), and closed shoes (p=0,076) did not show any correlation with patients'knowledge about diabetic foot injury. The patients performed these practices despite their poor background knowledge. This result wasn't consistence with the result of other studies.(4)

Regarding self-examination of foot, there is no marked correlation between self-

examination of foot with	there is with gender(p=0.9) ,education (p=0.2) and age						(p=.1). the
percentage of self-examination negligence	was almost the same between male						and female
participants . (table 9)							
	<b>Self-examination of foot</b>						p
	Not at all		In case of		Regularly		
				pain			
<b>Gender</b>		<b>N (%)</b>		<b>N (%)</b>		<b>N (%)</b>	
Male	51	(23,1)	121	(54,8)	49	(22,2)	0.9
Female	32	(23,0)	75	(54,0)	32	(23,0)	
<b>Education level</b>							
Elementary education	24	(20,0)	68	(56,7)	28	(23,3)	0.2
Secondary education	15	(31,9)	21	(44,7)	11	(23,4)	
Higher education	9	(19,1)	26	(55,3)	12	(25,5)	
Academic education	8	(13,8)	37	(63,8)	13	(22,4)	
Illiterate	27	(30,7)	44	(50,0)	17	(19,3)	
	<b>Mean (SD)</b>		<b>Mean (SD)</b>		<b>Mean (SD)</b>		
<b>Age</b>	58.8	(12.5)	57.5	(13.6)	57.2	(13.1)	0.1

Table 9 : Relationship of Self examination of foot with gender ,education and age .

**Discussion:-**

Our current finding revealed that over half of the participants had a basic knowledge about diabetic foot injury. The majority of these knowledgeable participants were having high household income in addition to having an academic degrees. only minority of them were illiterate. the educational level (p=0,001) and household income (p=0,001) of the participants had shown an impact on patients' knowledge about diabetic foot injury .The results of our study exposed that the most educated patients are the most knowledgeable about diabetic foot injuries, which come in consistence with the results of other studies. [3,6]

The majority (57,8%) of responders were on oral hypoglycemic drugs alone or in combination with insulin (21,7%). A smaller number (15,0%) were on insulin therapy alone. only little number of participants (5,6 %) was on diabetic

diet. Among these participants, the mean Hb A1C level was (7,8) which indicates that their serum glucose level is not well controlled. This could be a result of medication adherence failure due to lacking of knowledge about the importance of taking medication on regular pattern .

Foot care practices did not show any correlation with patients' knowledge about diabetic foot injury. The patients performed these practices despite their poor background knowledge.. A study have found similar result and attributed this result to basis of Islamic rituals .patients were performing some of these practice religiously without knowing their benefits to their own health  
(6)

Worldwide, there are more than 1 million lower extremities amputation (LEA) surgery per year, at the rate of one every 30 seconds (9) up to 50% of the diabetic patients require another lower LEA within 3–5 years from the first LEA . Furthermore, the 5-year mortality rate after LEA on diabetic patients is ~50% (10). despite these facts , only 63 (17,5%) of patients received foot examination at each visit to the doctors and similar percents 61 (17%) of patients had not received any examination even if they had a complaint. additionally , our study reveled that there is a paucity of knowledge among participants with previous foot injuries and surgeries due to diabetes. Previous foot injury ( $p=0,131$ ) and previous feet surgery ( $p=0,560$ ) due to diabetes were not significantly associated with better knowledge or foot care practices .This result is similar to the result of study done in India. (11) .Taking in consideration that up to up to 85% of the LEA are completely preventable by simple foot care practices , (12) diabetic patients are in need for effective awareness strategies taken by medical facilities .

More than half of the respondents 214 (59,6%) reported having knowledge about diabetic foot injuries .But when they further asked about the risk factors diabetic foot injuries ,Most of them (64,9%) were found to be lacking of knowledge about the risk factors. The rest of them were found to have poor knowledge about the risk factors.

Duration of having diabetic mellitus was believed to be as a risk factor by (63,2%), were walking bare foot (49,6%) and wearing inappropriate shoes (31,2 ) was the lest to be known as risk factors. Which approves the result of a study carried out in Africa. (13) 212 (59,1%) of the respondents reported obtaining proper awareness about diabetic foot injuries . The majority of them obtained their awareness from doctors 83 (56,5%) and relatives 32 (21,8%) , while the least number of them obtained it either from social media 27 (18,4%) or health education campaign 19 (12,9%) .on the other hand , 147 (40,9%) of the participants did not obtain any awareness . Indicated that the Saudi population need to be aware on the problem size and its impact on the quality of life . There should be awareness campaigns in the hospitals , public area and on social media coupled with educational programmers at the schools and universities ,to highlight the risk factors of diabetic foot injuries and put more emphasis on the urgent need for serious preventive strategies. Furthermore , The provided information through the educational programs should correspond with educational background of patients without affecting the amount or the quality of the provided information .

### **Conclusion:-**

The results from our study revealed that patients are unaware of diabetes foot risk factors and the importance of foot care practices to their health . Awareness programs should be implemented in all hospitals to help to overcome the paucity of knowledge among the participants coupled with regular assessment of the patients foot at each visit to lower the rate of diabetic foot injuries . in addition to enhancing the role of educational campaigns and social media in improving the level of awareness among Saudi population . furthermore , serious preventive steps should be taking by the Saudi population and ministry of health to lower the risk of diabetic foot injuries as well as the complication of T2DM.

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### RESEARCH ARTICLE

#### FOURNIERS GANGRENE CAUSED BY BACTERIA AND FUNGY (CASE REPORT).

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#### Manuscript Info

#### Abstract

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#### Introduction:-

Fournier's gangrene characterized by fulminant necrotizing fasciitis of the perineal, genital or perianal regions, is generally caused by aerobic and anaerobic bacteria. Although it is thought to be an idiopathic process, Fournier's gangrene has been shown to have a predilection for patients with diabetes mellitus is reported to be present in 20–70% and chronic alcoholism in 25–50% patients and immunocompromised patients%. [1] The focus of infection is usually located in the genitourinary tract(20-40%), lower gastrointestinal tract(30-50%) or skin(20%). The development and progression of the gangrene is often fulminating and can rapidly lead to multiple organ failures and death(7.5-50%). Characteristically in Fournier's gangrene exists synergism between theoretically low aggressive bacteria alone. For example, one microorganism might produce the enzymes necessary to cause coagulation of the nutrient vessels. Thrombosis of these nutrient vessels reduces local blood supply. Thus, tissue oxygen tension falls. The resultant tissue hypoxia allows growth of facultative anaerobes and microaerophilic organisms. These latter microorganisms, in turn, may produce enzymes (e.g., lecithinase, collagenase), which lead to digestion of fascial barriers, thus fueling the rapid extension of the infection [2,3]. The most commonly isolated aerobic microorganism are *Escherichia coli*, *Klebsiella pneumonia*, *Staphylococcus aureus*, *Proteus* spp, *Corynebacterium* spp, *Enterococcus* spp. The most commonly isolated anaerobic microorganism is *Bacteriodes fragilis*, *Clostridium*, *Fusobacterium*. [4,5]. Actually both aerobes and anaerobes are present in the tissues but anaerobes are less frequent isolated because these samples are more difficult to preserve. In some series, a mean of four different organisms is cultured from each patient [6]. Rare reports of other organisms being cultures include *Candida albicans* and *Lactobacillus gasseri* . [7.8]

#### Clinical Case Report:-

We report a case of Fournier's gangrene caused by *Candida albicans* and *Klebsiella pneumoniae*. A 41-year-old man with diabetes mellitus was admitted to the First University Hospital at Urology Department with following

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complains: common weakness, body temperature 39°C, pain in the scrotal region. A 10 days before he was hospitalized, a patient started suffer from 2 cm perineum erythema and pain in the perianal region. On examination, he was conscious. There was no pallor, icterus, and lymphadenopathy. His pulse was 105 /min, regular, and good volume. His blood pressure was 150/90 mm Hg. Systemic examination revealed no abnormality. Local examination of the scrotum revealed that scrotum was enlarged, edematous, and tender along with palpable crepitations. There was 8 cm necrotic skin lesions over the scrotum and foul-smelling purulent discharge. A provisional diagnosis of FG was made. Fournier's gangrene severity index (FGSI) was 8. A score of less than 9 is associated with 78% probability of survival. (Picture 1) He was prepared for emergency surgical debridement. Blood haemogram revealed hemoglobin 15.5g/dl, white cell count— $12.0 \times 10^3/\mu\text{l}$ . Biochemical parameters: serum creatinine- $104\mu\text{m/l}$ , random blood sugar- 500mg%. Operative techniques under general anesthesia included: revision of scrotum and testicles with opening tunica vaginalis, drainage, resection of scrotum, necrectomy. Pus was taken for a bacteriological research under compliance with the appropriate protocol and sent for culture and sensitivity test. Empirical treatment was started with Piperacilline and Tazobactam and metronidazole. The bacteriological research included: isolation of a pure culture, Gram staining, use of the rapid identification systems (api20E, api20Caux, biomérieux) and Antimicrobial Susceptibility Testing (AST) determination through Kirby-Bauer method by using of standard discs (EUCAST guidelines). Pus was cultured on the enrichment and differential-diagnostic medium. After 18-24 hours of aerobic and anaerobic (Gen-Bag biomérieux) incubation at 37 °C, appeared growth of mucoid colony on the bloody agar (TSA 5% with sheep blood) and on Endo agar (for Enterobacteriaceae family) which were stained by use of Gram procedure and bacteria were identified by the amplification profile index special panel (api20E), identification of the bacteria was determined by Apiweb. The isoaited was a Gram-negative, nonmotile, encapsulated, lactose-fermenting, facultative anaerobic, rod-shaped bacterium *Klebsiella pneumoniae*  $10^5/\text{ml}$ . Fungi *Candida albicans*  $10^8/\text{ml}$  was isolated on Sabouraud dextrose agar. Since pus culture revealed *C. albicans*, fluconazole was added to the therapy. Antibiotic therapy regimen included Piperacillin and Tazobactam, metronidazole and fluconazol. He responded to the treatment very well. Regular wet dressing was done along with topical application of povidone iodine. (Picture 2) He was discharged on 6nd postoperative day with pentose drain to prevent the build up of fluid, which was removed after three days from discharg. After 2 weeks the wound was completely healed, scrotum return in the normal size and shape, painless (Picture 3).

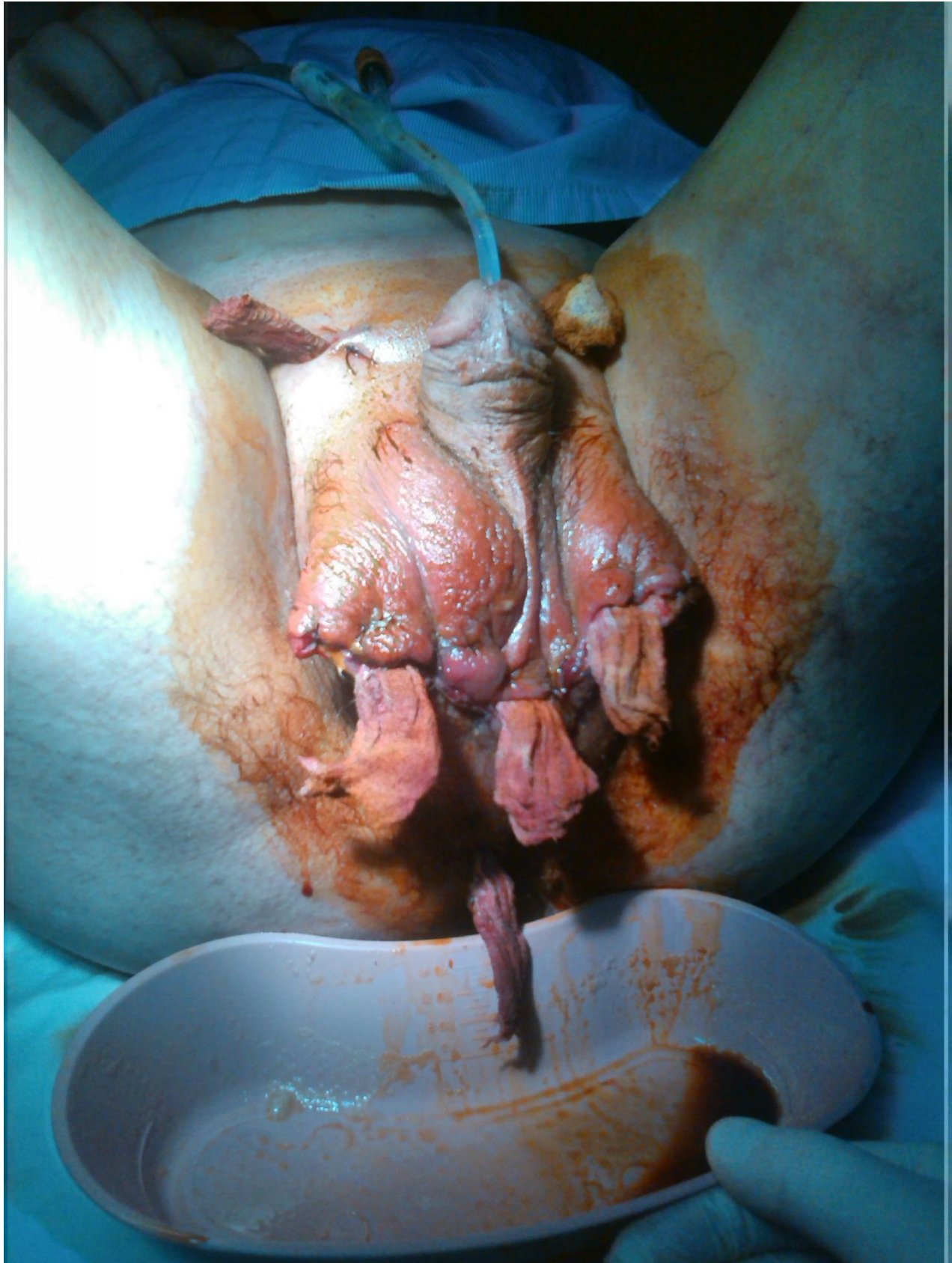
### Conclusion:-

In our opinion this case is interesting because of *Candida albicans* caused Fournier's gangrene is very rare; This case has been reported to emphasize that yeasts should be considered as pathogenic agents in diabetic patients with gangrene. Fungal infections should be considered as rare causes of necrotizing fasciitis and antifungal treatment considered in at-risk immunodeficient individuals. FG with diabetes mellitus always poses a greater challenge in reducing morbidity and mortality. It is recommended to adopt a multidisciplinary approach in treating a case of FG to achieve a low morbidity and mortality, especially in presence of the comorbidity like diabetes and multi organ failure.

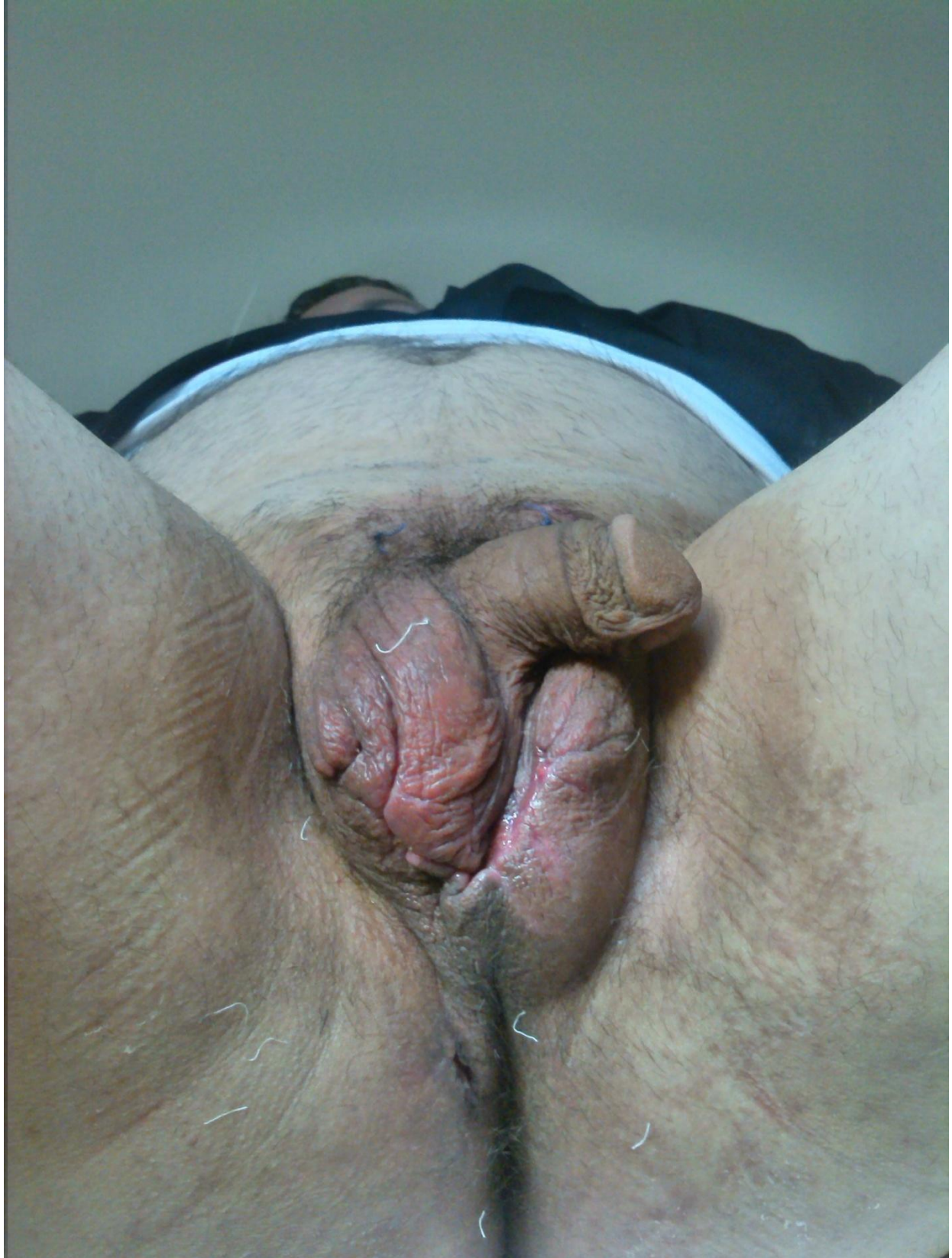












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## RESEARCH ARTICLE

### LANGUAGES IN CONTACT: THE INFLUENCE OF ARABIC ON MODERN ISRAELI HEBREW SLANG.

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#### Abstract

Ongoing contact between the Arabic and Hebrew languages in the Land of Israel has engendered interesting linguistic phenomena in diverse fields. Prominent among these is the penetration of words of Arabic origin into Modern Hebrew slang. Lexical borrowing and penetration from one language to another have existed since ancient times. However, the complex reality in Israel, particularly the phenomenon of bilingualism, has contributed to the enrichment of the Hebrew vocabulary, on all levels, with words drawn from Arabic. The use of slang words of Arabic origin is not the exclusive preserve of any specific population, but can be found among all Hebrew speakers, in both the written and spoken languages, in the media and on social networks. Most slang words of Arabic origin undergo changes in the semantic sphere, and some are employed in a metaphoric sense. These words are declined according to Hebrew rules, but their declension for gender, number, the construct case, and definiteness is usually irregular. The use of slang words meets linguistic functions required by speakers: they contribute to broadening forms of word formation and allow the derivation of new values, the borrowing of expressions, extensions of meaning, and so forth. Regular morphology, alien sounds, borrowed consonants, an unusual social structure, and arbitrary patterns of definiteness are just some of the more prominent characteristics of slang words of Arabic origin in Modern Hebrew. Slang changes according to fashion, is influenced by its surroundings, and can be found in diverse forms in the language of politicians and statespeople, correspondents and interviewees, and all members of the language community.

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#### Introduction:-

Discussion of Hebrew slang, specifically slang of Arabic origin, has been significantly enriched since Israel's establishment by the growing use of slang among Jews of Arabic origin. Linguistic scholars tend to define the concept of "slang" as a collection of strange words – vulgar language that creeps into standard language, impairing the articulacy of the language and its clarity of expression (Yannai, 1990). Conversely, others argue that slang is the birthplace of new words, changing constantly, and constituting evidence of a natural language or a type of language current among people who are young in age or in spirit. The use of slang constitutes a deliberate deviation from institutionalized and standard language, and accordingly represents a voluntary and deliberate register (Nir, 1999).

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Slang can be seen as a sociolinguistic mechanism that enables speakers to depart from social formality and make utterances that are not otherwise allowed by social norms (Rosenthal, 2008). Sapan defines slang as words and expressions on the margins of the spoken language that are considered improper and unworthy of inclusion in decent or formal speech (Sapan, 1974). Nir notes that slang is not characterized solely by the use of substandard forms; indeed, it is sometimes accompanied by a certain sense of intellectual superiority, not only in lexical terms but particularly in various aspects of grammar (Nir, 2003). Muchnik (2001) defines slang explicitly as substandard language used in unofficial situations by diverse groups of speakers, including young people, students, soldiers, professionals, the elderly, and so forth. However, she adds that recently slang has noticeably expanded into the remaining sectors of the population.

Hebrew slang has enjoyed particular attention in the Israeli consciousness thanks to the vigorous work of Dan Ben-Amotz and Netiva Ben-Yehuda, who undertook a historical enterprise that enjoyed surprising success (Ben-Amotz & Ben-Yehuda, 1972). This process is not unusual in the history of languages and is a natural phenomenon. Today, cub reporters make extensive use of common slang, a practice that has become a norm of journalistic writing and is also accepted by younger editors (Rosenblum, 1992).

Hebrew-speaking Israeli society uses slang expressions extensively; this is illustrated by the growing use of slang by many politicians for social purposes. Over the past decade, slang has penetrated the language of media, advertising, and even literature (Rosenthal, 2008). No external body can determine which slang word will be adopted and which will be rejected. The speakers are exclusively responsible for determining the fate of migrant and new words. Very few slang words become part of the standard language, but many of them show resilience in their slang function—words drawn from Arabic particularly so.

Initially, slang words were collated in separate dictionaries, such as Ben-Amotz & Ben-Yehuda (1972); Ahiasaf, Radar et al. (1993), Rubik & Rosenthal (2005), and EetaYisraeli (2005). Later, slang words were admitted to the Even Shoshan dictionary (2004 edition), which included numerous slang terms. Some of these slang dictionaries preserve forgotten words, many of which are no longer in use, while at the same time new words have penetrated the language from every possible direction and field. This highlights one of the features of spoken Hebrew as a language that often reflects the social changes experienced by the Jewish people, particularly in the Land of Israel. Thus Hebrew dictionaries also reflect sociolinguistic changes.

### Israeli slang:

One of the key questions raised by study of Israeli slang is why words such as telephone, fax, and television, that entered Hebrew from English, have been accepted in Hebrew as standard words in the language, whereas words that entered from Arabic, such as *deh̄ilak*, *saḥ̄bi*, and *maskhara*, were repelled to the margins of the language (Muchnik, 2004; Haramati, 2000). Israeli Hebrew slang has been influenced mainly by English, Yiddish, and Arabic. Initially, Yiddish was the most influential language, but today it has been surpassed by Arabic, due to the protracted contact between the two languages in the Israeli domain.<sup>1</sup> Since the 1990s, there has been a noticeable increase in slang of Arabic origin, which is present in impressive proportions in the group of emotional words, greetings, exclamations, and curses (Dana, 2008).<sup>2</sup> The encounter between the Israelis and the Arabs who lived in the country had a profound influence on slang, leading to the adoption of words such as *deh̄ilak*, *inshallah*, *ṣaḥ̄tein*, *mabṣuṭ*, *aḥ̄la*, *ahbal*, *majnun*, *fadiḥa*, *kasah̄*, and *freḥa*. A significant portion of the Hebrew slang vocabulary has its origins in colloquial Arabic (Netzer, 2007; Marai, 2008).<sup>3</sup> It is difficult to find a Hebrew speaker who does not use greetings of Arabic

<sup>1</sup> Sapan's study (1963) found borrowings at a level of 40 percent from Yiddish, 39 percent from Arabic, and very small percentages from European languages such as English, Russian, and French. An updated study might yield different results due to the significant changes in Israeli society over recent decades. Rosenthal (2005) claims that 35 percent of the slang vocabulary can be attributed to Arabic, 31 percent to English, and only 21 percent to Yiddish. It would seem that the dwindling of the generation connected to Yiddish has led to a reduction in the use of slang from Yiddish in favor of the contact with the Arab population.

<sup>2</sup> Dana lists diverse curses that have passed from Arabic to Hebrew, with phonological changes and even metathesis.

<sup>3</sup> Netzer (2007) categorizes slang according to its sources, discussing the Arabic source. Marai provides an impressive review of the forms of integration of Arabic in Israeli slang, arguing that to date the Arabic source has been mentioned only in footnotes that cannot paint the full picture.

origin, despite the fact that expressions of politeness constitute a social value in every civilization, and although every culture has a different definition as to what is considered polite. Hebrew has also been influenced by slang of English origin; in particular, many English words were absorbed during the British Mandate period. Words and phrases such as “fifty-fifty” and “trem” (i.e. “tramp,” meaning “hitchhike”) remain from this period. During the 1970s, Hebrew was influenced by words borrowed from English through the field of rock and pop music, while in the 1990s new technology served as the vehicle of penetration (Fischerman, 2004; Koren, 2010-2011). Another source that has enriched slang vocabulary in Israeli Hebrew is military slang. The military creates ideal opportunities for the emergence of slang, since it constitutes a closed framework of young people who undergo an intensive and challenging experience—one that is shared by most speakers of Modern Hebrew. Some of the words, expressions, acronyms, and verbs created from words that emerged in the military setting have since become part of general Israeli slang—these include *leshapitzer* (“to improve, touch up”) and *jobnik* (a soldier or worker who performs an undemanding and safe function) (Almog, 1993; Eldar, 1994; Granot, 1993; Sapan, 1966). Since the 1980s, there has been a sharp fall in the influence of military slang and a rise in subtle and elusive slang drawn from the language of young people. Another factor that has contributed to slang vocabulary is the technological revolution and the emergence of social networks. Most of the words from this field are taken from English, and this source functions as a type of media “highway” (Rosenthal, 2008, 2013; Marai, 2013).

### Characteristics of slang use:-

Studies show that the use of slang is usually spontaneous and is often shaped by the specific situation in which the conversation takes place or by its purpose. Motives such as amusement, entertainment, or adapting the discourse to the addressee increase the use of slang. The following are some key characteristics:

- Linguistic and cultural reasons and political or geopolitical changes (Marai, 2015).<sup>4</sup> Slang plays an important role in shaping the humor of different societies and cultures. The use of a slang term often has an amusing effect.
- In the context of Jewish settlement in the Land of Israel, slang played a unique function against the background of the use of other languages brought by Jewish immigrants from Arab and European countries. Slang helped bypass the prevailing position at the time that foreign elements ought not be included in the Hebrew language (Rosenthal, 2007). Despite this position, words from Arabic, Russian, Yiddish, and English penetrated into Hebrew during different periods, under the influence of extralinguistic factors (Muchnik, 1994; Schwartzwald, 1998).<sup>5</sup>
- Slang provides words and expressions that are absent in the intermediate and elevated language. In some cases, it even provides speakers with alternatives for words and expressions that exist in the standard language but are not used, for various reasons.
- Slang is the main tool used to facilitate discussion of taboo topics such as racism and violence, as illustrated in the slang words *zapta* and *box* (both of which mean “a blow”) (Rosenthal, 2007; Netzer, 2007). Slang can be regarded as a sociolinguistic mechanism that enables speakers to break norms without threatening social values (Ben Yehuda, 1984). The younger generation is often seen as the main conduit through which slang creeps into spoken Hebrew, though in recent years a tendency to use slang has also become increasingly apparent among media workers, politicians, and other social strata.
- Speakers feel a need to create a stronger impact on the listener than is possible using the standard and routine word. This phenomenon is reflected in the replacement of the usual expression with a more forceful or vigorous one. Examples of such pairs include *tov* (“good”) and *kabir* (“wicked”); *barur* (“obvious”) and *ashkara* (“totally”); or *meluchlach* (“dirty”) and *ma’afan* (“grotty.”) Others see this phenomenon as an example of the principle of economy in speech: the natural tendency to alleviate the physical and psychological effort involved in speech encourages the emergence of truncated forms or acronyms (Sapan, 1963).

<sup>4</sup> Marai explains that the linguistic reasons are that Hebrew and Arabic are sister Semitic languages, while the cultural reasons are that Arabic served as a mother tongue and traditional language for many members of the Mizrahi Jewish communities. Political changes refer to the nature of the contact with the Arab population in Israel.

<sup>5</sup> Muchnik notes that Ben Yehuda showed a tolerant attitude and positive discrimination in favor of the adoption of words of Arabic origin, in contrast to the European languages. She identifies two key periods in terms of Arabic influence: the pre-state period, which was dominated by wars with the Arabs, and the period following independence, which was marked by coexistence between Arabs and Jews who arrived from the Arab countries.



- The absence of words for everyday use; the emergence of closed societies in Israel; rebellion and protest and accepted rules of courtesy and conduct, ideology and language; and a longing for rough and down-to-earth speech are all key reasons for the use of slang (Shalev, 1962).
- Ostrovsky (2006) remarks that speech characterized by the use of slang expressions reflects the Israeli ethos. Accordingly, the characteristic violence of this society is manifested in slang, as for example in the use of the word *kasakh* (“kick ass.”) Similarly, the use of the term *khafif* (“half-ass”) reflects a culture of superficiality, an attempt to impress others, and hedonism, and even implies a sense of dissatisfaction with a given situation.
- Sometimes speakers deliberately aim to be incomprehensible to an alien or hostile environment. An example of this is the jargon used by thieves, prisoners, and criminals, and this explains the use of slang among these groups. The use of slang may also be perceived as an act of social identification by speakers from higher social circles with other parts of the people. It is hardly surprising that many speakers view slang as a sub-language that characterized lower-class sections of the population – but one only needs to watch television to realize that this is a mistaken view.

### Arab vocabulary in Israeli slang:-

Slang words of Arabic origin that have penetrated Modern Hebrew are today used by speakers from all sections of society. They have penetrated the language through media such as television, radio, newspapers, and the internet. These words are used by speakers from diverse backgrounds and classes and are no longer the exclusive preserve of any particular section of the population. The following list presents the main slang words of Arabic origin used by Jewish speakers, divided according to word classes:<sup>6</sup>

D.1. Slang words from Arabic used in Hebrew as nouns: *intifada* (literally “uprising,”<sup>7</sup> *bassa* (“too bad,”) *basta* (“market stall,”) *jura* (“drain,” “big mouth”), *jama’a* (“gang,”) *dakhkot* (“laughs,” “pranks,”) *dawin* (“an attempt to impress,”) *zubur* (“hazing,”) *khalita* (“blanching”) *khamisa* (“charm against the evil eye,”) *khafila* (“rave,”) *kharta* (“crap”) *khirba* (“dump,” “hovel,”) *keyf* (“fun,”) *mukhtar* (“big boss,”) *musayra* (“politeness,”) *mangal* (“barbeque,”) *maskhara* (“wheeling-and-dealing,”) *nagla* (“round,”) *sababa* (“cool,”) *sulkha* (“make-up,” “ending feud,”) *fadikha* (“bad,” “shame,”) *fanan* (“laid back,”) *fashla* (“cock-up,” “error,”) *shakhta* (“toke” [on a cigarette or joint].)

D.2. Slang words from Arabic used in Hebrew as adjectives: *abadai* (“tough [guy],”) *agbar* (“great [guy],”) *ahbal* (“bird-brain,”) *akbar* (“greatest,”) *asli* (“100%,”) *buma* (“owl”) *baladi* (“original,” “country-style,”) *darwish* (“sumple”) *wakhad* (“helluva,”) *zabala* (“crap,”) *zift* (“garbage,”) *khabub* (“mate,”) *khara* (“shitty,”) *khatyar* (“old,” “over-the-hill,”) *mabsut* (“happy,”) *majnun* (“crazy,”) *mal’un* (“cursed,” “damn,”) *mastul* (“wasted,” “high,”) *ma’afen* (“grotty,”) *nakhs* (“bad,” “luckless,”) *sakhbaki* (“[over]-friendly,”) *ars* (“pimp,” “hood,”) *frekha* (“bimbo,”) *kakhba* (“whore,”) *sharmuta* (“slut,”) *ta’aban* (“beat,” “tired,”) *khafif* (“half-assed,”) *rasmi* (“above-board.”)

D.3. Slang words from Arabic used in Hebrew as verbs:<sup>8</sup> *uskut* (“shut it,”) *hitkharfen* (“went crazy,”) *histakhbek* (“was a buddy with,”) *shuf/shufuni* (“look [at me,]”) *tezamber* (“you screw over,”) *tislam* (“way to go,”) *tfadal* (“go ahead,”) *kise’akh* (“beat the crap out of,”) *khifeff* (“did something in a half-ass way.”)

D.4. Slang words from Arabic used in Hebrew and not included in the other categories. These words include exclamations, curses, greetings, statements of amazement, requests, and other expressions: *abu Ali* (“strongman,”) *akhulmanyuk* (“sonofabitch” [in positive sense,]) *in’al* (“curse,” [often accompanied by “your father,” “your God,” etc.,]) *inshallah* (“God willing,”) *eshhada* (“whassat,”) *ashkara* (“totally,”) *bekhyet* (“for the life/sake of” [often accompanied by “your God,” “your father,” etc.,]) *dugri* (“on the real,”) *dekhil* (“for the sake of” [often accompanied by “your God,” etc.,]) *dirbalak* (“mind out,”) *walla* (“really,”) *khalas* (“enough,” “cut the crap,”) *ya Allah* (“Oh my God!”) *yawilli* (“my lord,”) *yazalameh* (“you guy,”) *ya haram* (“too bad,”) *ya salaam* (“no way,”) *yaieini* (“my dear,”) *ya-balash* (“for nothing,”) *ya-khabibi* (“my man,”) *yarabak* (“[for the sake of] your God,”) *ya’anu* (“like,” “kind of,”)

<sup>6</sup> The items in the following lists are transliterated according to the usual pronunciation by Jewish speakers of Modern Hebrew (see also section E below).

<sup>7</sup> In the figurative sense of the term, referring to mess or disorder.

<sup>8</sup> Verbs derived from nouns will be presented separately below. This paragraph lists borrowed verbs.

*kus* (“pussy,” often accompanied by “your mother’s,” “your sister’s,” etc.) *mabruk* (“way to go,”) *sakhtein* (“good for you,”) *ma’alesh* (“no sweat,”) *min ayuni* (“I really mean it,”) *min Allah* (“from God,” “fate,”) *salamtak* (“thanks,”) *ahalanwasahalan* (“welcome,”) *akhushilling* (“wicked,” “amazing,”) *eyzehbatikh* (“what a bummer,”) *ilifaatmaat* (“water under the bridge,”) *al khamdulillah* (“thank God,”) *Allahuakbar* (“God is great,”) *Allah yustur* (“God forbid,”) *anaaref* (“what do I know,”) *hada min Allah* (“it’s from God,”) *zubi* (“my dick,” “no way,”) *yomasal – yom basal* (“one day up and the next day down,”) *yomnakhs* (“a shitty day,”) *ala kefak* (“fun,” “cool,”) *ala rasi* (“on my head” = “I promise,”) *shufuniyanas* (“look at me, guys,”) *tamam* (“okay,”) *akhla* (“great,”) *ala fadi* (“for no reason,” “pointless,”) *aleyhum* (“picking on someone.”)

### Characteristics of the slang words in Hebrew discourse:-

**1. Words that undergo phonological and phonetic changes:** Some slang words of Arabic origin underwent phonetic or phonological changes following their absorption in Hebrew discourse in order to adapt to Hebrew pronunciation. By way of example:

- ض (d) > ד (d): The Hebrew plural form *dakhkot* (“laughs,” “pranks”) is taken from the Arabic singular form *ḍahka*, which begins with the Arabic consonant ض (d). This phoneme is absent in Hebrew, and accordingly it was replaced by d. The same applies to قیضای (*q*) *abaday*, which in Hebrew becomes *abaday*.
- ظ (z) > ד (d): The Hebrew *fadikha* (“bad,” “shame”) reflects the Arabic فظیحة *faziḥa*. The same change is seen in تفضال *tefaḍal* > *tfadal* (“go ahead”), علفاظی *ala fazi* > *ala fadi* (“pointless”), and انتفاضا > *intifada* (fig. “mess.”)
- ق (q) > گ (g): The Arabic *naqla* was absorbed in Hebrew in the form *nagla* (“round,”) reflecting the pronunciation of ق as g in some Arabic dialects. This change is not universal. *Kahba* (whore), for example, uses g, which is closer to the original Arabic q.
- ص (s) > א (s): عرص *arṣin* Arabic could have been absorbed as *artz*, but in fact appears as *ars* (“pimp,” “hood.”) Similarly: *ašli* > *asli*, *şulḥa* > *sulkha*, *şababa* > *sababa*, and *ba’aşa* > *bassa*.
- غ (gh) > ג (g): دغری *dughri* > *dugri* (“on the real.”)
- خ (kh) > כ (k) (usually pronounced kh): *maskhara* (“wheeling-and-dealing,”) *kharta* (“baloney,”) *khara* (“shit,”) *frekhat* (“bimbo,”) *khetyar* (“old,”) *manfukh* (“show-off,”) *khafif* (“half-ass,”) *hitkharfen* (“go ape-shit.”)
- ذ (dh) > ד (d): *eshhadha* > *eshhada* (“whassat.”)

### Use of borrowed consonants or sounds that do not exist in Hebrew and that preserve the Arabic pronunciation:-

Words such as *jama’a* (“gang,”) *jura* (“drain,”) *majnun* (“crazy”) and the relate *janana* (“crazed state,”) and *ajbar* (“tough guy”) all maintain the “j” sound from Arabic, which does not exist in standard Hebrew. This is one of the most notable phenomena of slang words.

### Absence of grammatical declension:-

Most functional words, greetings, and exclamations of Arabic origin used in Hebrew do not have a plural form or other declensions. For example, words such as *aleyhum*, *sakhtein*, *rasmi*, *dugri*, *wallah*, *khalas*, *mabruk*, and others do not have a plural form and cannot take the possessive suffixes. Thus the absorption of these words in Hebrew is evidently incomplete and, to an extent, arbitrary. Many nouns do not decline for possession as do “regular” Hebrew nouns. For example, the Arabic *fashla* (“cock-up,” “error”) can be declined for possession of any person, number, and gender by use of the usual enclitic pronouns. Arabic speakers can say *fashli* (“my error,”) *fashleh* (“his error,”) and so forth. In Hebrew, it is not possible to use the analogous forms: instead of \**fashlato* (“his error,”) for example, Hebrew speakers use the construction with the separate possessive pronouns: *fashlasheli* (“my error.”) Similarly, \**fashlshelo* is used for “his error.” The same applies to nouns such as *fadikha*, *khafila*, *sulkha*, *basta*, and *khashish* (grass).

### Non-use of the definite article:-

Slang words used in Hebrew as adjectives do not take the definite article. The word *akhlais* used as an adjective in Hebrew, for example in phrases such as *akhlaokhel* (“great food.”) Regular Hebrew adjectives can take the definite article, but *akhla* does not do so. The same applies to *akbar*, *agbar*, and other slang words of Arabic origin. These words express quantity or degree and would be expect to serve as functional words, but in fact their quality is

<sup>9</sup> The three Arabic consonants ص, ض, and ظ amalgamated in Hebrew in the consonant ז. Here, however, the “d” sound, which is phonetically more similar to the consonant ض, has instead been used.



adjective. When the adjective appears before the noun, as in *akhlaokhel*, the definite article is not used, while when it follows the noun, as in Hebrew, the article may be used.

#### Use of the dominant gender form:-

Slang words used as adjectives usually appear in the dominant gender form, without agreement for the less common gender. For example, words such as *asli*, *baladi*, *majnun*, *ta'aban*, *mastul*, *mabsut*, and others usually appear in the masculine, although it is also possible to use the feminine forms – *aslit*, *baladit*, *majnuna*, and so forth.

#### Creating new words using Hebrew lexical patterns:-

abstract nouns are derived from adjectives borrowed from Arabic using the standard Hebrew suffix *-iyut*. For example, *dugriyut* (“straight-upness,” “honesty”) is formed from *dugri*, and similar forms include *khafifnikiyut*, *asliyut*, *arsiyut*, *baladiyut*, and so forth. Similarly, adjectives are derived from nouns by adding the Hebrew suffix *-i*, creating such words as *keyfi*, *arabushi* (“Arab” as an adjective,) *frekhit*, *khafifniki*, and *ahbali*. New nouns can be created using the suffix *-iya*, such as *khumusiya* (“humus joint”) or *sakhbakiya* (from *sakhbak*, meaning “relaxed and friendly atmosphere.”)

#### Preference for the singular:-

While the original Arab words are used freely in singular or plural, the tendency in Hebrew is to prefer the singular. *Maskharais* much more common than *maskharot*; Hebrew speakers refer to a *sulkhabut* rarely to *sulkhot*; and the same is true of such slang nouns as *zubur*, *sababa*, *ma'aruf* (“favor,”) *keyf*, *khashish*, *jama'a*, *bassa*, and others.

#### Changes in semantic field:-

Some slang words show changes in their semantic field and meaning by comparison to the Arabic original:

- The word *akhlain* Arabic means “most beautiful” or “sweetest.” In Hebrew, it is used to mean “best” or “excellent” in all instances.
- In Arabic, *shahtameans* “line,” “small stripe,” and also “itch.” In Hebrew, a process of lexical reduction has led to the use of *shakhtato* refer solely to a “toke” on a cigarette; today, the word is used mainly in the context of the use of soft drugs.
- The Arabic word *dawawinis* used to refer to a collection of art works, and by extension came to refer to frivolous things. The Hebrew form *dawinim* refers to vacuous behavior intended to attract attention.
- In Arabic, *jama'a* refers to any group of people – friends, family, and so forth. In Hebrew, the term is used mainly in a delinquent context. The process here is one of lexical reduction and metaphorical adaptation.
- *Jura* in Arabic refers to a pothole in a road, a ditch, or a pool for collecting sewage. In Hebrew, it is often used to refer to a “big mouth” – someone who talks nonsense or is excessively fond of cursing.
- In Arabic, the word *shakbaki*, from *shakib* (“friend,”) means a “friend” in a positive sense. In Hebrew, *sakhbaki* usually refers to someone who acts informally when the occasion demands formality. Thus the sense has been inverted from the positive to the negative.
- The Arabic *freha* comes from *farah*, meaning a chick or gosling. The Hebrew *frekha* has come to be used to refer to a young woman who behaves in a “common” or undignified way – a metaphorical extension.

#### Preservation of the Arabic meaning:-

It emerges that many words of Arabic origin are used in Hebrew slang in an identical sense to the Arabic. These words have penetrated Hebrew without difficulty and are widely used without any significant change in their form or meaning. This pattern is particularly common in the case of expressions, proverbs, explanations, and supplications. The words involved convey diverse connotations and accordingly are used extensively. Examples include *ahlanwasahlan*, *nakhs*, various curses, *mastul*, *mabsut*, *ashkara*, *yomasalwayom basal*, *alayhum*, *shufuniyanas*, *ala fadi*, *majnun*, *inshallah*, *anaaref*, *sulkha*, and many others.

#### Changes in word class:-

Some of the slang words are used in Hebrew in a different word class to the Arabic original. This is possible since, in many cases, the meaning of the word changes, thereby requiring or facilitating a change in word class. In most cases, these words are still used in the original word class in certain contexts. For example, in a Hebrew sentence such as *hudiberelavdugri* (“he spoke to him straight-up,”) *dugri* functions as an adverb. However, in a sentence such as *dugri, magi'alahemlehafsid* (“straight-up, they deserve to lose,”) it is used as an exclamation or parenthesis. Similar usages can be seen with such words as *rasmia* and *ashkara*. The words *sharmuta*, *kahba*, and *freha* are nouns

in Arabic but in Hebrew are used both as nouns and adjectives. *Ahla*, *akbar*, and *ajbar* are superlative adjectival forms in Arabic, whereas in Hebrew they are usually used in a simple adjectival context.

#### Words and expressions used in a fixed form similar to the Arabic:-

The duplicated verbal form *shufshuff* ("look look") is used in Arabic to express surprise, and serves the same function in Hebrew. This category also includes many of the expressions and proverbs, such as: *ala fadi*, *shufuniyanas*, *illifaatmaat*, *min ayuni*, as well as interjections beginning with the vocative particle *ya*, such as *ya Allah*, *yarabak*. The forms *uskut*, *tfadal*, and *tislamare* used solely in the second person.

#### Portmanteau and compound word formation:-

These forms are particularly common in the case of exclamations with strong emotional connotations of compassion, mercy, anger, surprise, excitement, and so forth, as well as in curses. In most cases these forms are used in a similar form to the Arabic original, without significant changes in form or content:<sup>10</sup>

- *Ya* particle + base (slang): Used in direct speech, particularly among friends. *Ya + zalama*, *ya + sakhbi*, *ya + khabibi*, *ya + balash*, *ya + kharam*, *ya + willi*, *ya + salaam*, *ya + eini*.
- *In'al* ("cursed") + base from Arabic: used to form curses: *in'alabuk*, *imak*, *ukhtak*, *dinak* ("damn your father/mother/sister/religion,") etc.
- *Bekhyet* ("for the life of") + base from Arabic: used to form requests, such as *bekhyetabuk*, *rabak*, *dinak* ("for the life of your father/God/religion.")
- Preposition *ala* ("on") + base from Arabic: used to form expressions of surprise, exclamations, etc., such as *ala eini*, *rasi*, *fadi*, *abuy*, *dinak* ("by my eye / my head/ nothing / my father / your religion.")

#### Pronunciation of consonants contrary to standard Hebrew in order to preserve the original form of the word:-

According to standard Hebrew rules, the consonant pairs b/v, p/f, and k/kh are allophones; the voiced consonant in each pair is required at the beginning of a word and in certain other contexts, while elsewhere the unvoiced consonant is used. Despite this, the form *fishel* ("he screwed up") is used rather than *\*pishel*, and *lekayeff* ("to have fun") and not *\*lekhayef*, thereby preserving the sound of the original Arabic. Similarly, *lehikhafeff* ("to do something half-ass") is used, rather than *\*lehikafefas* required by standard Hebrew grammar; *lekase'akh* ("to beat the crap out of") and not *\*lekhase'akh*; *fanan* and not *\*panan*; *fadikhar* rather than *\*padikha*; *frekha* and not *\*prekha*, and so forth. This phenomenon is common in the use of slang in general, and particularly in the case of slang words of foreign origin.

#### Fixed stress not shifting in declension:-

Slang words of Arabic origin maintain their stress even when the word is declined. For example, the plural of *'fashlais* *'fashlot* – the stress remains on the first syllable, despite the fact that the feminine plural suffix *-otis* always stressed in standard Hebrew. The same principle is reflected in the plural forms *'dakhkot*, *mab'sutim*, *'ahbalim*, *'frekhot*, *shar'mutot* and many other words. Arabic slang words here follow the pattern seen in slang words of foreign origin in general.

#### Unusual syllable structure:-

Slang words create unusual patterns in stress and syllables. Multisyllabic words ending in a vowel have penultimate stress:<sup>11</sup> *in-ti-'fa-da*, *shar-'mu-ta*, *fa-'di-kha*, *'sul-kha*, *'ju-ra*, *'ba-ssa*, and many others. These words maintain the stress of the original Arabic, along with other components of its structure. This helps a speaker who is unable to identify the unusual stress of the word. This pattern leads to some forms that have antepenultimate stress, contrary to the rules of standard Hebrew, such as: *mu-'sa-ye-ra*. Some multisyllabic words have final stress, such as *akhulman'yuk*, whereas in standard Hebrew penultimate stress is more common. Similarly, masculine plural nouns often have penultimate stress, contrary to the norm in Hebrew: *da'winim*, *mab'sutim*, *'ahbalim*, etc.

<sup>10</sup> This is generally the case in formulas of politeness (Avidor, 2000).

<sup>11</sup> This pattern may suggest that Arabic words have preserved the stress of their proto-Semitic ancestors. During the third stage of the development of stress in Hebrew, when most words had penultimate stress, final vowels were dropped, thereby creating a final stress pattern, with the exception of words ending in open syllables and long vowels, which maintained their penultimate stress within the verb system. A similar pattern can be seen in the words examined here. For more detailed discussion, see: Blau, 1970.

**Regular morphology:-**

Feminine forms ending in *-a*: *sharmuta*, *frekha*, *basta*, *fashla*, *fadikha*, *maskhara*, *nagla*. All these words have penultimate stress, as in Arabic, despite the fact that the feminine suffix in Hebrew is usually stressed. Similarly, adjectival forms ending in *-ido* do not have final stress, again contrary to the Hebrew norm: *'asli*, *'baladi*, *'sakhbaki*.

**“Orphan” words without related terms in Hebrew:-**

The noun *mukhtar* (“big boss,”) borrowed from Arabic, has no related words used in Hebrew. The native Hebrew word *mukhtar* (“crowned”) has an extensive family of connected words: *keter* (“crown,”) *hakhtara* (“enthronement,”) *hikhtir* (“he enthroned,”) *koteret* (“title.”) The borrowed word *fashla* has no relatives in Hebrew, while a native word such as *pesila* (“disqualification”) has many related terms.

**Multiple root letters:-**

many slang words have a larger number of root letters than is common in Hebrew. Examples include *dawinim*, *sharmuta*, and *intifada*. Although this phenomenon is encountered in Hebrew, it is rare, and usually the product of the secondary production of verbs from nouns.

**Derivation of Hebrew verbs from slang words of Arabic origin:-**

Many verbs in Hebrew slang were formed from slang words that penetrated Hebrew from Arabic and were later absorbed in the Hebrew verb system. The formation of verbs from nouns and adjectives is more common than the direct borrowing of verbs, which is a separate subject:

- The word *bassawas* used to form the verbal form *hitba'ess* and associated conjugations, meaning “to be bummed off.”
- The noun *khartawas* used to form the verb *khirtet*, meaning “to lie” or “to hoodwink.”
- From *khafif* comes the verb *khifef*– “to do something half-ass.”
- From *kasakh* comes the verb *lekase'akh* – “to beat the crap out of.”
- From *mastul* comes *hitmastel*– “to get wasted/stoned.”
- The noun *mangal* was used to form the verb *mingel*– “to barbeque.”
- From *fashla* comes the verb *fishel*– “to screw up.”

**Conclusion:-**

This study highlights the absorption of slang words of Arabic origin in all areas of Hebrew speech. However, a clear quantitative distinction can be seen between the different word classes. The borrowing of nouns and adjectives is extremely common. Words denoting both concrete and abstract entities are adapted from Hebrew for use in spoken and written Hebrew in all registers. By contrast, the penetration of Arabic verbs and adverbs into Hebrew slang is extremely limited and examples are few. Most of the verbs used in Hebrew slang were formed by derivation from nouns using the standard Hebrew patterns, though the noun in question is of Arabic origin. This pattern underscores the closed character of the verb system, which does not usually allow changes, whereas the Hebrew noun system is rich and open to change. Numerous expressions used for exclamation, greeting, and requests have also found their way into Hebrew and are popular among speakers. This group shows a high level of borrowing alongside frequent usage. Slang words that have penetrated Hebrew have adopted Hebrew rules and attempt to behave like “natives,,” although in many cases this is difficult due to the significant differences between the two languages in morphology, phonetics, phonology, and semantics. The diverse characteristics of slang words of Arabic origin show that alongside full integration in the colloquial register, the resilience of a word depends on various factors and does not predict the extent to which the word will be absorbed in the standard language. These factors include the ability of the word to survive on an ongoing basis in the media and a morphological and phonetic structure facilitating the application of Hebrew grammatical words without restrictions, particularly for frequent use in written and official Hebrew (examples include *rasmia* and *sulkha*). Many words may be used by numerous speakers in the spoken register only, over an extensive period. Moreover, it is difficult to predict the extent to which a particular word will be absorbed in Hebrew slang. Nevertheless, such absorption clearly depends on the timing of its use in the media; the extent of exposure of speakers; and the diverse connotations for which it is employed. The successful combination of these factors may increase the likelihood that a word will be absorbed.

The scope of this study did not permit a broader investigation of the attitudes of native Jewish speakers toward the use of slang, on the one hand, and toward the status of words in language, on the other. It will be informative to

undertake a comprehensive examination of these attitudes and usages, and such an examination will indeed be forthcoming.

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### RESEARCH ARTICLE

#### THE CONCEPT OF BRAIN DEATH FOR MEDICAL STUDENTS IN THE COLLEGE OF MEDICINE IN IMAM MOHAMMED BIN SAUD ISLAMIC UNIVERSITY IMSIU 2013.

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##### Key words:-

Imam University, medical students, brain death, I, II, III and 4<sup>th</sup> year.

#### Abstract

**Background:** The brain death is the colloquial term for the determination of human death by showing the irreversible cessation of the clinical functions of the brain. This research from which we want to know what is the concept of brain death for medical student in college of medicine in Mohammad bin Saud Islamic university.

**Material and method:** in this randomize sampling study the survey was taken from four levels of preclinical years.

**Results:** 81.5% of participant had knowledge about the concept of brain death. 72.2% of participant had knowledge about the organ donation, 7.4% of participant had donated blood and 92.6% had never donated out of these donors 11.1% had donated due emergency and 1.9% of donors developed complications post donation. Nevertheless, the number of respondents in this study, but we found a very appropriate number for their understanding of the subject.

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#### Introduction:-

The colloquial term for the determination of human death by showing the irreversible cessation of the clinical functions of the brain, has been practiced since the 1960s and is growing in acceptance throughout the world. Of the three concepts of brain death--the whole-brain formulation, the brain stem formulation, and the higher brain formulation--the whole-brain formulation is accepted and practiced most widely. For medical students especially for medical students at the Imam Muhammad bin Saud Islamic University This study is very modern in this university, especially given that college of Article called brain death. Given for one semester only through which to promote , explain and enhance this concept, through it we have this research note that there are several institutes, universities and hospitals outside the Kingdom, especially in Western countries are in the research and dear this concept in their communities and universities.

#### Objectives:-

1. Definition of Brain Death concept.
2. Awareness of Medicine students' community of Brain death.
3. Awareness of Medicine students' community of Organ Donation.
4. Enhancement of Medicine students' community of Brain death and Organ Donation.

**Material and Methods:-**

The study was randomized sample descriptive survey from first, second, third and fourth year from IMSIU College of medicine in Riyadh, KSA. The data was selected randomly so that was distributed 54 paper survey. After that all the data has been collected and incorporated in the program SPSS Version 21 in an accurate and correct method.

**The Result:-**

The end result of this study showed the following:

- 1- 81.5% of participant had knowledge about the concept of brain death.
- 2- 72.2% of participant had knowledge about the organ donation
- 3- 7.4% of participant had donated blood and 92.6%. Had never donated.
- 4- 11.1% of participant had donated due emergency.
- 5- 1.9% from donors developed complications post donation.

Statistics						
		Age	Academic Year	Did You Know About Brain Death	Did You Know About Organ Donation	Have You ever Donate
N	Valid	54	54	54	54	54
	Missing	0	0	0	0	0
Mean		22.70				
Median		21.50				
Mode		21				
Std. Deviation		3.385				
Range		16				
Minimum		19				
Maximum		35				
Percentiles	25	21.00				
	50	21.50				
	75	23.00				

Statistics					
		If Yes Then The Donation For Relative	Did The Donation Due To ER Causes	Did You Have Any Problem After Donation	Did Anybody Ask You For Donation
N	Valid	54	54	54	54
	Missing	0	0	0	0
Mean					
Median					
Mode					
Std. Deviation					
Range					
Minimum					
Maximum					
Percentiles	25				
	50				
	75				

<b>Statistics</b>		Did You Know The criteria Of Donors selection	Have You Visit The Donation Centre	If Yes Have You Visit Saudi Centre For Organ Transplantation
N	Valid	54	54	54
	Missing	0	0	0
Mean				
Median				
Mode				
Std. Deviation				
Range				
Minimum				
Maximum				
Percentiles	25			
	50			
	75			

**Frequency Table:-**

<b>Age</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	18-23	42	77.77	77,77	77,77
	24-29	9	16.66	16.66	94,43
	30-35	3	5.5	5,55	99.98
	Total	54	100.0	100.0	

<b>Academic Year</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	first year	10	18.5	18.5	18.5
	second year	5	9.3	9.3	27.8
	third year	37	68.5	68.5	96.3
	fourth year	2	3.7	3.7	100.0
	Total	54	100.0	100.0	

<b>Did You Know About Brain Death</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	44	81.5	81.5	81.5
	No	10	18.5	18.5	100.0
	Total	54	100.0	100.0	

<b>Have You Ever Donated</b>					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	7.4	7.4	7.4
	No	50	92.6	92.6	100.0
	Total	54	100.0	100.0	

**If Yes Then the Donation for Relative:-**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	4	7.4	7.4	7.4
	No	26	48.1	48.1	55.6
	Empty	1	1.9	1.9	57.4
	Empty	23	42.6	42.6	100.0
	Total	54	100.0	100.0	

**Did The Donation Due To ER Causes:-**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	6	11.1	11.1	11.1
	No	31	57.4	57.4	68.5
	Empty	17	31.5	31.5	100.0
	Total	54	100.0	100.0	

**Did You Have Any Problem After Donation**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	1	1.9	1.9	1.9
	No	32	59.3	59.3	61.1
	Empty	21	38.9	38.9	100.0
	Total	54	100.0	100.0	

**Did Anybody Ask You For Donation**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	27.8	27.8	27.8
	No	37	68.5	68.5	96.3
	Empty	2	3.7	3.7	100.0
	Total	54	100.0	100.0	

**Did You Know The Criteria Of Donors Selection**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	18	33.3	33.3	33.3
	No	36	66.7	66.7	100.0
	Total	54	100.0	100.0	

**If Yes Have You Visit Saudi Centre For Organ Transplantation**

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	12	22.2	22.2	22.2
	No	42	77.8	77.8	100.0
	Total	54	100.0	100.0	

**Have You Visit The Donation Centre**

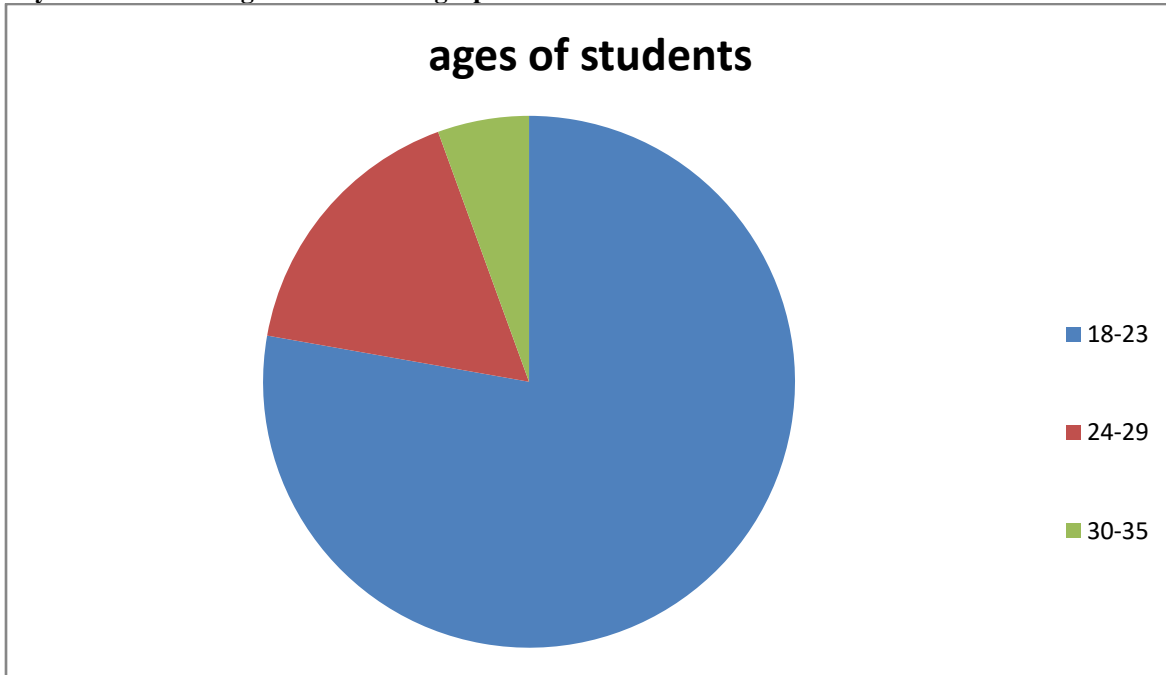
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	15	27.8	27.8	27.8
	No	39	72.2	72.2	100.0
	Total	54	100.0	100.0	

**Discussion:-**

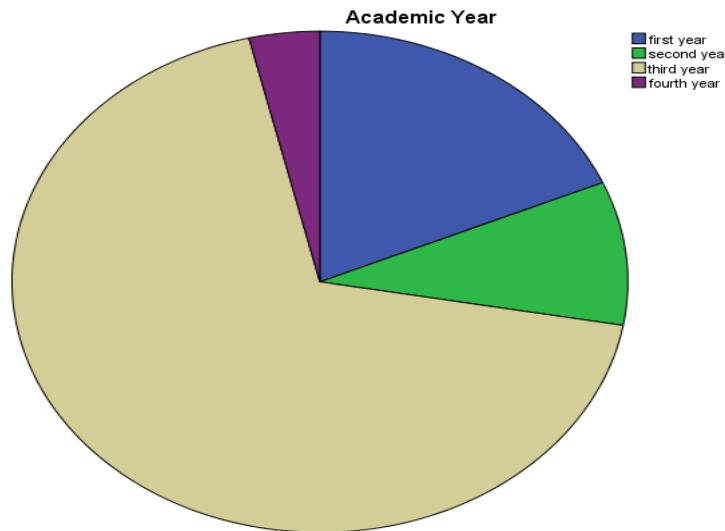
Brain death and organ donation concept are taking into the consideration since there is a high demand of organ donation in Saudi Arabia and it is a cost effective process in Saudi health care system, thus the study is designated to promote, educate and recognize the current status of Brain death and Organ donation concept in our Saudi society among Medical student since they are involved in the future as a physician who is responsible to promote and educate society regarding the concept of Brain death and organ donation .



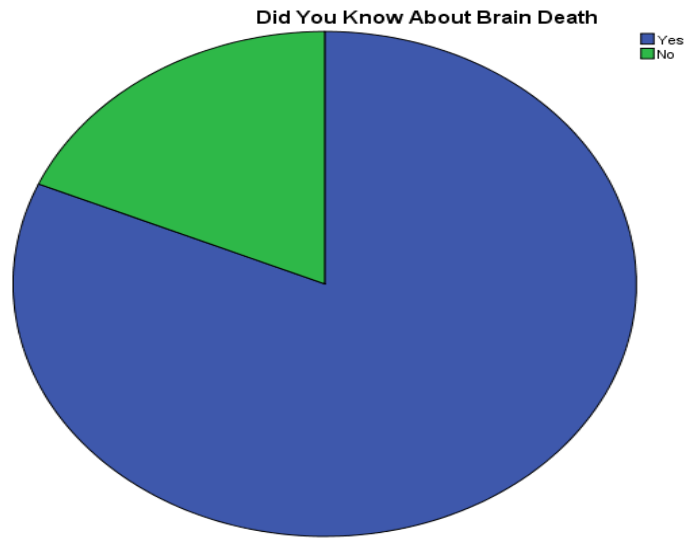
Regarding the age of the students it was varying proportionally were certain percentage of the majority of students were between 18-23 years 77.77%, then followed by 24-29 years 16.66% and the lowest one was 30-35 years 5.5% in the green color as in graph below.



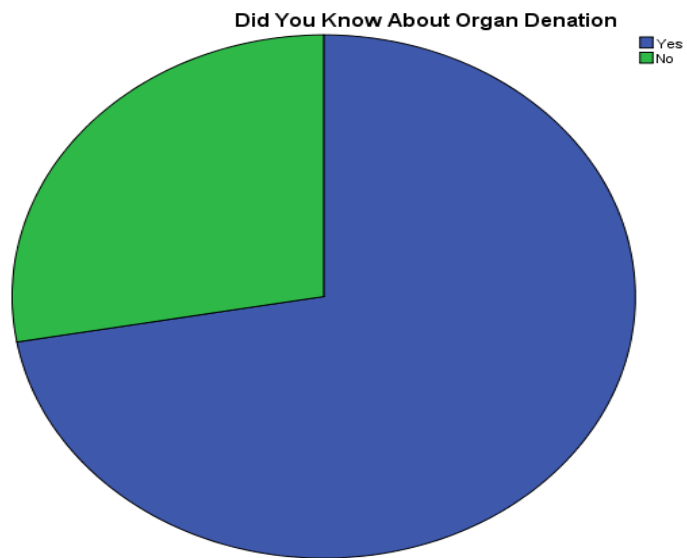
The majority of students are the third year students and represents 68% while the minority is the Fourth year students 3.7% as seen below.



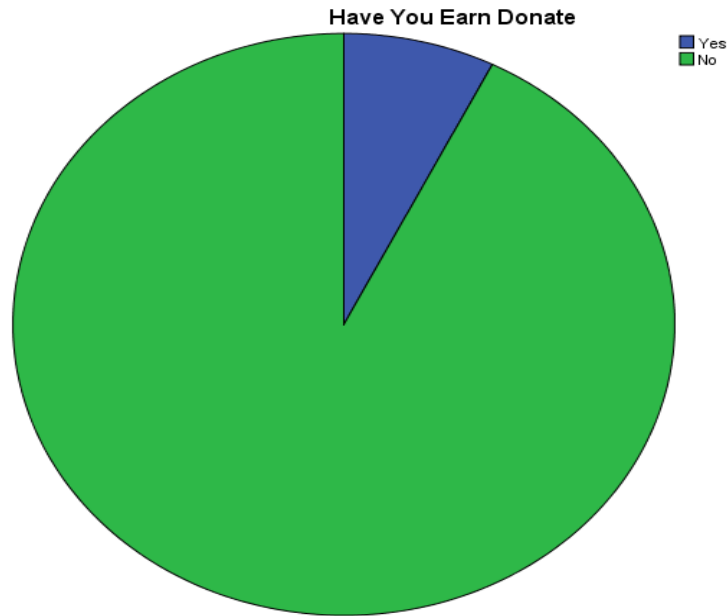
81.5% of students acknowledge that they knew about the concept of brain death.



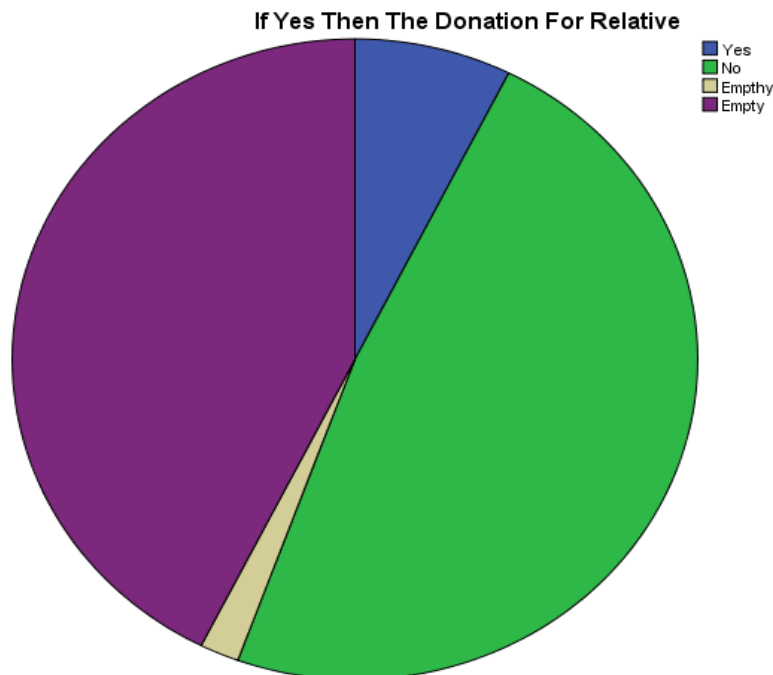
72.2% of students acknowledge that they knew about the concept of organ donation.



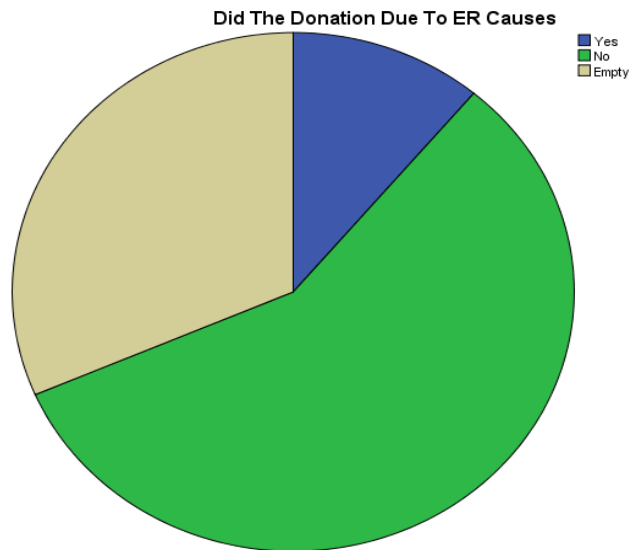
7.4% of students answered yes for the donation and 92.6 of students answered no. All the donations were blood donation among to those students who answered yes.



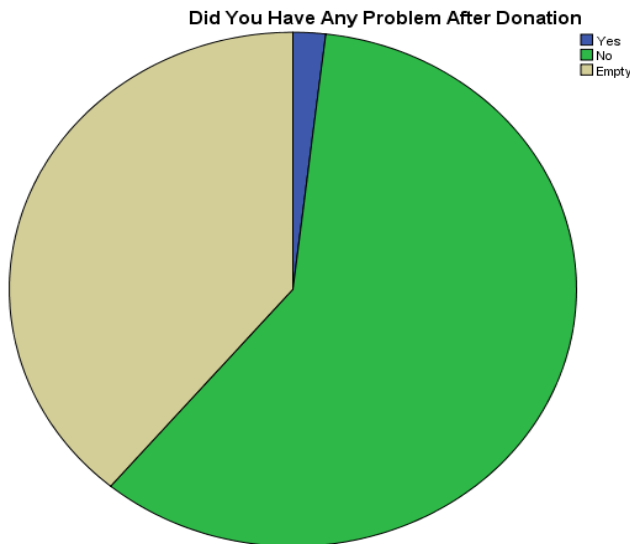
7.4% of students donated for relative, 48.1% of students donated for a non relative and 42.6% of students not answered



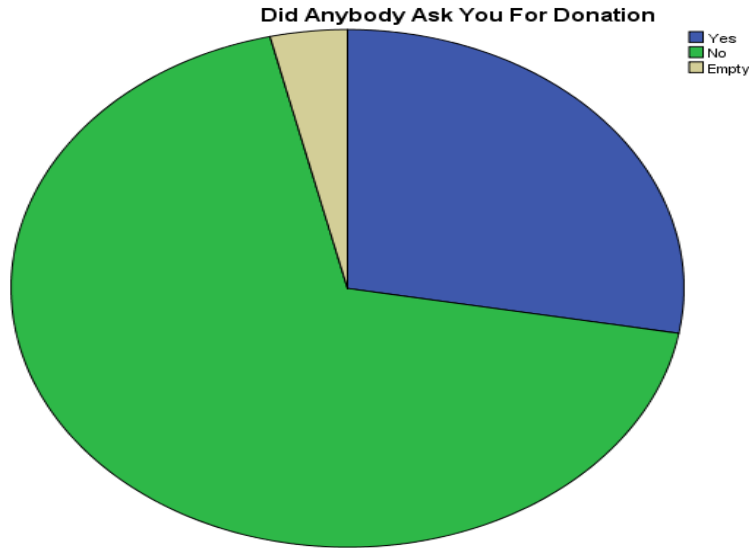
11.1% of students' Donation due to emergency, 57.4% of students' donation were not urgent and 31.5% of students not answered.



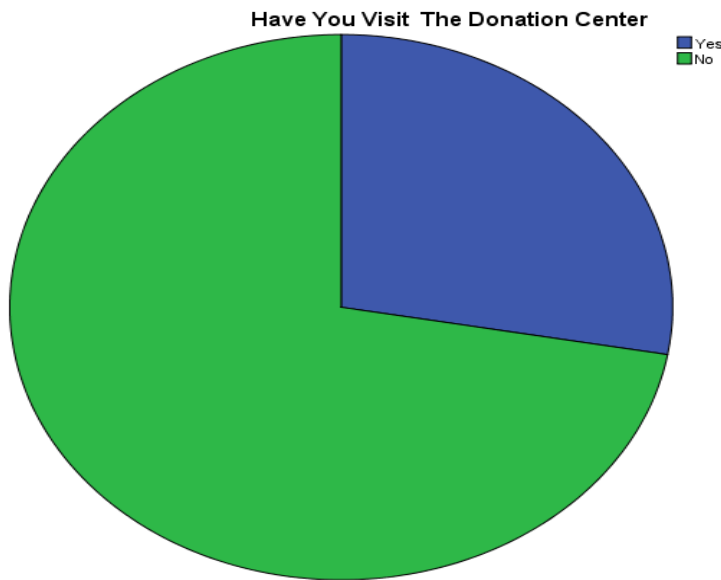
1.9% of students developed complication post donation, 59.3% of student are free of complication and 38.9% not answered .



66.7% of students were not asked for donation, 27.8% of students asked for donation and 3.7% of students had not answered.



66.7% of students had visited the donation centre and 33.3% of students had not.



**Conclusion:-**

We concluded that there is a high percentage of the student who had an adequate information and knowledge about the brain death. A high percentage of these students, understood the concept of organ donation versus

A small percentage of students did not understand the purpose of the survey duo to their beginner’s status in medical school.

Despite the high percentage of students knew and understood the concept of brain death and organ donation, there are those who didn’t understand or know about the topic. We advice that the topic should be included in the medical school curriculum .

**Limitations:-**

We were not able to provide an information guide to the participants, also one of our limitations is that we were not able to communicate with the first year student to understand what was difficult in our survey.

**Acknowledgment:-**

We would like to thank everyone who helped us in this Research project  
And we would like to thank all of our follow students for their time and effort

**Thank you**

**Survey sample**

**1-Age:**

**2-Academic year:**

1-First 2-Second 3-Third 4-Fourth

**3-Did You Know About Brain Death?**

1-Yes 2-No

**4-Did You Know About Organ Donation?**

1-Yes 2-No

**5-Have You Earn Donate?**

1-Yes 2-No

**6- If Yes Then the Donation for Relative?**

1-Yes 2-No

**7-Did The Donation Due To ER Causes?**

1-Yes 2-No

**8-Did You Have Any Problem After Donation?**

1-Yes 2-No

**9-Did Anybody Ask You For Donation?**

1-Yes 2-No

**10-Did You Know The Characteristic Of Donors?**

1-Yes 2-No

**11-Have You Visit The Donation Center?**

1-Yes 2-No

**12-If Yes Have You Visit Saudi Center For Organ Transplantation?**

1-Yes 2-No



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### **RESEARCH ARTICLE**

#### **DEVELOPMENT, PILOTING AND EVALUATION OF A FRAMEWORK FOR INCREASING UTILIZATION OF SKILLED MATERNAL HEALTHCARE SERVICES: STUDY IN SIAYA COUNTY**

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##### **Key words:-**

Utilization, maternal health, antenatal care, skilled delivery, postnatal care and context specific framework.

#### **Abstract**

Utilization of skilled maternal healthcare services during pregnancy, delivery and post delivery can reduce maternal deaths from preventable conditions. However, despite the usefulness of utilizing the skilled maternal healthcare services, utilization has remained low in Siaya County while women continue to die from preventable conditions. The aim of this study was to identify the correlates of utilization of skilled maternal healthcare services in Siaya County and consequently develop, pilot and evaluate a context specific framework for increasing utilization of skilled maternal healthcare services in Siaya County.

**Method:** The study followed a three (3) phased approach, whereby baseline data was first collected from the study participants to ascertain their past maternal health services utilization experience ( antenatal, delivery and postnatal care services), followed by development and piloting of the framework which was informed by the findings of the baseline, and finally evaluation of the effectiveness of the framework. The framework was piloted through a longitudinal study involving 517 pregnant mothers with previous delivery experience from selected community health units in Siaya County. Statistical package for social sciences (SPSS) version 22 was used to analyze both descriptive and inferential statistics.

**Result:** Indicate that both community and health facility factors affect utilization of skilled maternal healthcare services. Compared to the baseline, 4<sup>th</sup> Antenatal visits increased from 58.7% to 63.9%, skilled deliveries from 55.7% to 64.6% and postnatal care services from 23.6% to 47.4%. Knowledge on available maternal healthcare services and danger signs also increased by 28.6% and 26.4% respectively. Of note is that compared to the baseline, continuum of care was also enhanced as the number of households visited by community health volunteers (CHVs) increased from 83.7% to 93.5%. an indication that there was increase in uptake of skilled maternal healthcare services.

**Conclusion:** The framework was effective in increasing utilization of skilled maternal healthcare services in Siaya County and will be useful in providing guidance on designing and integrating context specific

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Interventions for optimizing care continuum and increasing utilization of skilled maternal healthcare services in Siaya County.

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**Introduction:-**

Globally, a woman dies every two minutes from complications related to childbirth (WHO, 2012). Of note, approximately 800 women die from preventable causes related to pregnancy and childbirth every day, with most of the deaths and disability occurring among women of reproductive age in the developing countries of the world (U. WHO, UNFPA, The World Bank and the United Nations Population Division, 2014). Previous studies have shown that a woman's lifetime risk of dying in pregnancy or childbirth is 1 in 150 in developing countries compared to 1 in 3800 in developed countries (WHO, 2012). This is partly due to inadequate utilization and poor quality maternal health care, antenatal care, skilled attendance at birth and postnatal care (W. Wang, Hong, Rathavuth, 2015; Zohra et al., 2015). Hence there is a need for women to maximize utilization of skilled maternal healthcare services (antenatal care, skilled attendance at birth and postnatal care) in order to prepare physically, mentally and even logistically for childbirth. Studies have shown that antenatal care is critical in improving maternal and neonatal health outcomes (W. Wang, Hong, Rathavuth, 2015; Zohra et al., 2015) through delivery of targeted interventions and use of emergency obstetric care services at the health facilities (W. Wang, Hong, Rathavuth, 2015).

The World Health Organization (WHO) recommends a minimum of four antenatal care visits, based on reviewing the effectiveness of different models of service delivery (Villar et al., 2001). WHO guidelines also specify the content of antenatal care visits, which should include blood pressure measurement, urine testing for bacteriuria and proteinuria, and blood testing to detect syphilis and severe anemia (WHO, UNFPA, The World Bank and the United Nations Population Division, 2014). Some other services, including giving tetanus immunization, providing iron and folate tablets and teaching women about danger signs of pregnancy complications, are also important to improve both maternal and newborn health (Wang et al., 2010). Access to skilled delivery care is key to reducing maternal mortality, particularly in sub-Saharan Africa, where 99% of maternal deaths occur (WHO, UNFPA, WORLD BANK, 2012). Evidence suggests that skilled attendance at birth, access to emergency obstetric care and postnatal care are key factors in reducing the risk of maternal death, in both industrialized and developing countries (Graham, Moodley, & Selipsky, 2012; Wang et al., 2010; WHO, ICM, & FIGO, 2004). However, utilization of skilled attendance at birth in developing countries low with only 34% in the least developed countries delivering in a health facility providing skilled care (WHO, 2012). Compared to antenatal care and skilled attendance at birth, postnatal care has been largely neglected in safe motherhood programs in developing countries (Wang et al., 2010). Postnatal care, especially within the first 48 hours after birth, is critical to the management of postpartum hemorrhage, an important cause of maternal deaths in developing countries (Wang et al., 2010). Postnatal care is an important opportunity to assess the physical and psychosocial health of the mother and baby and has been shown to be a key strategy for reducing maternal mortality although the majority of women in developing countries do not receive it (Simkhada B, 2008;WHO, 2014).

Continuum of care throughout pregnancy, childbirth and postnatal period is also considered key in improving maternal and newborn health in order to reduce maternal and child morbidity and mortality (Siddharudha Shivalli, 2015; WHO, 2011). According to partnership for maternal, newborn and child health, 2011; Community Health Volunteers are important in identification of pregnant mothers and referrals, follow up and provision of community maternal health care services(WHO, 2011). Previous studies and reviews have showed that that community health workers are important in provision of a continuum of care for maternal and child health services(Gilmore B, 2013; Glenton C, 2013; Lewin S, 2010; Yeboah-Antwi et al., 2014). An effective continuum of maternal health care services that includes intervention packages from pre-pregnancy through to delivery and post delivery and from health facility to household has also been proven to be effective in improving the life of the mother and the baby (PMNCH, 2010; Annie and Carlo, 2003). Other studies have also shown that strengthened linkage between health facility and community enhances care continuum thus reducing morbidity and mortality (WHO, 2013). In limited resource settings, community-level interventions are also potentially effective to address the problem at its roots, as decisions to seek and access health care are strongly influenced by the socio cultural environment (John, Guadalupe and Stewart, 1999). Engagement of community health volunteers (CHWs) has proven to be effective in improving health status of the community (Beam & Tessaro, 1994; Bhutta, Lassi, Pariyo, & Huicho, 2010; Haines et al., 2007).



Kenya is one of the Countries with high maternal mortality levels approximated at 495 per 100,000 live births (Kenya National Bureau of Statistics et al., 2015b), well above the MDG target of 147 per 100,000 by 2015 (Statistics, 2013). Kenya was rated among the top ten countries that contributed to 58% of the global maternal deaths reported in 2013 (U. WHO, UNFPA, The World Bank and the United Nations Population Division., 2014), with over 6,000 women dying every year due to pregnancy related conditions despite the launch of Safe Motherhood campaigns twenty years ago (Macro, 2010; Starrs, 2006). In addition, it is estimated that another 20-30 women suffer serious injury or disability due to complications during pregnancy or delivery in Kenya (Human Rights., 2012). These high rates have persisted despite improvements in other health indicators over the past decades (Health, 2014). This problem is partly due to lack of access to skilled maternal health services, including ante-natal care, skilled delivery, and post-natal services (Health, 2014). Although there has been increased growth of health sector infrastructure, many women still face various barriers to accessing skilled maternal health services (Bourbonnais, 2013; Health, 2014; M. A. Pell C, Were F, Afrah NA, Chatio S, Manda-Taylor L, et al. (2013) 2013), This is attributed to supply-side and demand-side factors including individual and household factors, socio-cultural factors and health facility factors (Health, 2014; M. G. Kenya, 2010; M. o. H.-. Kenya, 2012). In Kenya there are major gaps and challenges associated with supply-side and demand-side factors leading to geographical disparities in coverage of health services between counties, urban and rural residents and different population groups (Kenya National Bureau of Statistics et al., 2015a). In attempt to address the identified challenges affecting uptake of skilled maternal healthcare services, the government of Kenya introduced community health strategy to empower individual and families to take responsibility for their health (Health, 2006) and also introduced a policy of free maternity services in all public facilities (Bourbonnais, 2013). As recommended by Kerber et al., 2007; the continuum of care for maternal, neonatal, and child health requires access to care provided by families and communities, by outpatient and outreach services, and by clinical services throughout the lifecycle, including adolescence, pregnancy, childbirth, the postnatal period, and childhood. Saving lives depends on high coverage and quality of integrated service-delivery packages throughout the continuum, with functional linkages between levels of care in the health system and between service-delivery packages, so that the care provided at each time and place contributes to the effectiveness of all the linked packages (Kerber et al., 2007).

While it is acknowledged that most causes of maternal deaths could be prevented through utilization of skilled maternal healthcare services (Graham et al., 2012; Wang et al., 2010; WHO et al., 2004); utilization of skilled maternal healthcare services have remained low in Kenya especially in counties like Siaya County despite massive investments on interventions to increase uptake of these services while mothers continue to die from preventable causes (DHIS 2014). Siaya County in Kenya is one of the counties with high MMR of 691 deaths for every 100,000 live births that is above the national average of 495 deaths for every 100,000 live births with most of these deaths occurring at home (MICS4 2011). Previous studies and reports in Siaya County associated the low uptake of skilled maternal healthcare services to poor communication between health workers and women, socio cultural beliefs, distance to health facilities and quality of ANC services (Pell *et al.*, 2011; Bottleneck analysis 2012; Siaya investment case for MNCH 2013). However despite attempts to address the identified barriers, uptake of skilled maternal healthcare services has remained low (DHIS, 2014). The high maternal mortality ratio in Siaya County has been mainly attributed to low utilization of skilled maternal healthcare services (DHIS, 2014). Data indicate that the proportion of women attending at least one ANC visit are 85%, those attending four ANC visits are 45%, 52% receive skilled care during delivery while only 30% receive postnatal care within two days after delivery (DHIS, 2014).

Different policies, frameworks and strategies have emerged to respond to the growing concerns on low utilization of skilled maternal healthcare services coupled with high maternal mortality levels in developing countries (Aday, 1974; Andersen, 1995; MOH, 2006; MOH, 2007; KNHSSP 11, 2005; WHO, 2006; MOH, 2014; WHO and PNMCH, 2011). However, despite massive investments in strategies to increase utilization of skilled maternal healthcare services and reduce maternal mortality, the gains have been very minimal (Siaya Health Department Performance Report 2013/14; Siaya County Integrated Development Plan, 2013 – 2017).

The use of community health workers in creating demand for skilled maternal health care services in Siaya County began in 2006 after the launch of the second Kenya national health sector strategic plan (KNHSSP 11). However despite all the effort, Counties like Siaya County continue to have high maternal deaths (691/100,000 live births) above the national average of 495 deaths for every 100,000 live births, with most of these deaths being attributed to home deliveries and low utilization of skilled maternal healthcare services (Statistics, 2013). Previous studies done in Siaya County to establish factors affecting utilization of antenatal care services associated low uptake of antenatal

care with uncertainty about pregnancy, poor communication between health workers and women, cultural and religious beliefs, vague knowledge and quality of ANC services among others (M. A. Pell C, Were F, Afrah NA, Chatio S, et al., 2013; UNICEF, 2013). However, the researcher could not trace any study related to uptake of skilled delivery and postnatal care services in Siaya County despite the worrying trend.

In the quest to increase utilization of skilled maternal health services in Siaya County, the health department managed to scale up implementations of key interventions such as provision of free maternity services, training of healthcare providers on focused antenatal care, 100% scale up of community healthcare services and payment of monthly stipend to all community health volunteers to motivate them to further intensify demand creation (Siaya, 2013; www.hiskenya.org, 2013/14). However despite the investments, utilization of skilled maternal healthcare has remained low; 4<sup>th</sup> antenatal care- 45%, skilled delivery -52% and postnatal care- 30% (www.hiskenya.org, 2013/14) while mothers continue to die from preventable conditions. Taken together the above observation, the aim of this study was to develop and evaluate the effectiveness of context specific interventions to enhance maternal healthcare continuum and optimize utilization of skilled maternal healthcare services in Siaya County,

## **Methods:-**

### **Study design:-**

This was a longitudinal retrospective – prospective study conducted in 8 selected community units (CU) and their link health facilities in Siaya County. The baseline took 21/2 months, framework development 2 weeks and framework piloting/ intervention took 12 months from 27<sup>th</sup> March 2015 to 27<sup>th</sup> February 2016. The community health volunteers (CHVs) and the healthcare providers were sensitized on the study before commencement of the study and at every stage updated on the progress and their roles. The mothers were followed up by community health volunteers (CHVs) to ensure that they received all the recommended skilled maternal healthcare services which include 1<sup>st</sup> to 4<sup>th</sup> antenatal care visits, skilled delivery services and postnatal care services.

### **Study setting:-**

Siaya County is one of the counties in Kenya located in the western region of the Country. It has six sub counties namely Ugenya, Ugunja, Gem, Siaya Alego, Rarieda and Bondo with an estimated population of 935,555 (KNBS, 2009). The county has sex-balanced ratio of female: male (52:48) with the population being predominantly youthful and 23 percent of the population is made up of women of reproductive age 205,356 (15-49). The estimated no of pregnant women is 37,592 and estimated deliveries is 37,592(www.hiskenya.org, 2013/14). The study was conducted in selected community Units and their link health facilities. The County has a total of 156 health facilities out of which 122 are government facilities. The County has 187 community units (an equivalent of a sub location) linked to the government health facilities and 2148 Community health volunteers (CHVs) who provide community based healthcare. Each community unit has approximately 10 CHVs who manage about 100 households each. The study sites included Ndori community unit linked to Akala Health Center in Gem Sub County; Nyawita Community Unit linked to Nyawita dispensary in Bondo sub county; West Katweng'a Community Unit linked to Chianda Dispensary in Rarieda Sub County, Gongo community unit linked to Gongo Dispensary in Gem Sub county and Ulafu and Umala community unit linked to Umala dispensary in Alego Usonga sub county, Marenjo community Unit linked to Midhine dispensary and Yiro west community unit linked to Sikalame dispensary in Ugunja sub county. The term community unit referred to in this study is an equivalent of a sub location (MOH, 2010)

### **Study participants and recruitment:-**

A total of 517 pregnant mothers living within the selected community units were purposively recruited for the study. For purposes of knowing the previous maternal health services utilization status, only pregnant mothers who had had experience of giving birth previously (*Not pregnant for the first time*) were given the chance to participate. The participants were recruited through a combination of random and purposive sampling methodology. Some were invited to participate in the interview after being attended to at the link health facility; others were identified through snowballing technique and others through household's visitation.

### **Sampling and sample size calculation:-**

The desired sample size was determined using the formula of Fisher et al 1991 as cited in Mugenda and Mugenda 2003: The target population was pregnant women in Siaya County while the accessible population was pregnant women from the selected community units. Since Siaya County has a population of 939,793(Siaya AWP3, 2014) and women of child bearing age form 23% = 216,153 (Siaya Annual Work Plan 3- 2014/15). The target population is pregnant women who account for 4% of the total population = 4% of 939,793 = 37592

**Calculation:-**

$$n = \frac{N}{1+N(e)^2}$$

$n$  = the desired sample size (if the target population is greater than 10,000)

$N$  = Population size

$e$  = Accepted level of error taking alpha as 0.05

therefore:

$$n = \frac{37592}{1+37592(0.05)^2}$$

$$n = 400$$

The sample size was increased by 20% to take care on non-response and fall outs. A final minimum sample size of 480 was obtained. However since the study was longitudinal with the likelihood of having fall out, all pregnant women who were willing to participate were enrolled for the study thus bringing the number to 517.

**Study sites:-**

The study sites were selected using multistage simple random sampling methodology. From a sampling frame of all community units per sub-county, one community unit was randomly picked from the list in each sub county and having calculated that each community unit would have approximately 50 pregnant mothers, for the study to achieve the recommended target of 400, an additional of 2 community units had to be selected randomly to be included. In total 517 sampled pregnant mothers who were willing to participate in the study were interviewed using structured questionnaires. All the questions were directed to the women's maternal health utilization experience in the previous pregnancy.

**Data Collection:-**

Data was collected using structured questionnaires focusing on the use of maternal healthcare services (antenatal care, skilled attendance at birth and postnatal care), participant's awareness and knowledge on maternal health, and continuum of care situation.

**Informed consent process:-**

Detailed information about the study was given to the participants by research assistants before being asked to decide on whether to participate or not. The consent was then read to the participant in the local language (Luo) after which those who accepted to participate were requested to sign. The study questionnaires and key informant interviews were administered thereafter.

**Data analysis:-**

The quantitative data was analyzed using both descriptive and inferential statistics. The descriptive statistics was used to describe and summarize the data in form of tables, frequencies and percentages. The inferential statistics was used to help make inferences and draw conclusions. Statistical tests including chi-square test, bivariate and multivariate logistic regression analysis was carried out to identify barriers associated with utilization of maternal health care services. All tests of significance was computed at  $\alpha = 0.05$ . The Statistical Package for Social Sciences (SPSS) version 22 was used to analyze the data.

**Ethical consideration:-**

The study was approved by the ethical review board of University of East Africa Baraton (REC: UEAB/05/02/2015). All the study participants parents and legal guardians gave their written informed consents.

**Results:-****Phase 1: Baseline findings****Characteristics of Participants:-**

As shown in table 1, most women (32.5%) were aged between 15-19 years, 72.5% were married and 39.1% were farmers. Most of the women and their partners or husbands had primary education 64% and 46% respectively while a majority (57.3%) walked to the health facility. In addition for most (38.7%) women it is their husbands who had authority over health issues.

**Table 1:-** Summary of Socio-demographic characteristics of respondents (n=517) and utilization of maternal healthcare services in Siaya County.

Characteristics	n (%)	P Value
<b>Age</b>		
15-19 years	168 (32.5)	0.4931
20-24 years	162 (31.3)	
25-29 years	82 (15.9)	
30-34 years	58 (11.2)	
>35 years	47 (9.1)	
<b>Marital Status</b>		
<b>Married</b>	<b>375 (72.5)</b>	<b>0.0001</b>
Single	115 (22.2)	
Widow	22 (4.3)	
Separated	5 (1.0)	
<b>Source of income</b>		
None	102 (19.7)	0.6321
Farming	202 (39.1)	
Trading/self employed	140 (27.1)	
Salaried	73 (14.1)	
<b>Level of education completed</b>		
None	7 (1.4)	0.0023
Primary	331 (64.0)	
Secondary	166 (32.1)	
Tertiary	13 (2.5)	
<b>Husbands / Partners Education</b>		
None	100 (19.3)	0.0016
Primary	238 (46.0)	
Secondary	160 (30.9)	
Tertiary	19 (3.7)	
<b>Authority over health/Autonomy</b>		
Self		
Self	124 (24.0)	0.02
Husband	200 (38.7)	
Family member	92 (17.8)	
Grand parents	97 (18.8)	
Significant others	4 (0.8)	
<b>Means of transport to facility</b>		
Walked	296 (57.3)	0.0042
Bicycle	25 (4.8)	
Motorbike	193 (37.3)	
Private car	3 (0.6)	

Values in parentheses indicate % of total (n = 517). Chi-square test was used to test association between socio-demographic characteristics and utilization of maternal health services and other group. Bold font indicates “significantly associated at  $p < 0.05$ .”

#### **History of utilization of skilled maternal health care services in the last pregnancy:-**

Out of the 517 respondents, 439 (84.9%) of the mothers received antenatal care (ANC) services, 288 (55.7%) received skilled delivery while only 122 (23.6) received post-natal care. Out of the 517 respondents, 439 (84.9%) of the mothers received Antenatal care (ANC) services while 15.1% did not receive the ANC services. Out of those who received ANC services, 53.2% received  $\geq 4$  ANC visits while their counterpart's 46.9% received  $< 4$  ANC services. Moreover, out of the 288 (55.7%) of the mothers who had Skilled delivery services; 47.7% of them had  $< 4$  ANC visits while 52.3% of the mothers had  $\geq 4$  ANC visits. Again, out of 122 (23.6%) of the mothers who managed to have Postpartum care services, 55.2% of them had  $< 4$  ANC visits while 44.8% of the mothers had  $\geq 4$  ANC visits (Table 2).

**Table 2:-** Previous skilled maternal healthcare services utilization history

Maternal Health services	Total, n (%)	<4ANC (%)	≥4 ANC (%)	P value
				<b>0.003</b>
Antenatal care (ANC)	439 (84.9)	46.9	53.2	
Skilled delivery	288 (55.7)	47.7	52.3	
Postpartum care	122 (23.6)	55.2	44.8	

**Association between knowledge and utilization of skilled maternal health care services.**

Knowledge plays a very important role in enhancing utilization of maternal health care services. Our data indicate that a majority of the respondents at 338 (65.4%) had **inadequate** knowledge on maternal health services. Furthermore, a majority (58.7%) of the respondents who were knowledgeable attended  $\geq 4$  ANC. The findings revealed significant ( $p=0.007$ ) association knowledge and utilization of ANC services. Out of 517 mothers who participated in the study, 55.9% had adequate information on maternal health danger signs while 44.1% had inadequate. Out of the 55.9% of the mothers who had adequate information on danger signs; majority of them at 62.4% attended  $\geq 4$  ANC visits. The findings further revealed that there is association between knowledge of danger signs and utilization of maternal health care services ( $p = 0.001$ ).

**Table 3:-** Knowledge and utilization of antenatal care services

Characteristics	Total, n (%)	<4ANC (%)	≥4 ANC (%)	P value
Knowledge on importance of maternal health services				0.007
Adequate	179 (34.6)	41.3	58.7	
Inadequate	338 (65.4)	58.1	41.9	
Information on danger signs				0.001
Adequate	289 (55.9)	37.6	62.4	
Inadequate	228 (44.1)	62.8	37.2	

**Participants profile and utilization of skilled maternal health services;-**

Multivariate regression analysis revealed that those with no source of income (aOR=0.96, 95% CI: 3.21–8.27) and those who were farmers (aOR=0.37, 95% CI: 7.32–6.74) were less likely to utilize maternal healthcare services relative to traders/self-employed and salaried. Further analysis showed that those with is secondary (aOR=2.62, 95% CI: 4.33–4.58) and tertiary (aOR=1.43, 95% CI: 2.87–4.63) education were more likely to utilize maternal healthcare services relative to those with no education and those with primary education. Similarly, the respondents' whose husbands had no education (aOR=0.89, 95% CI: 2.07–1.60) or had primary education (aOR=0.89, 95% CI: 2.07–1.60) were less likely to utilize maternal healthcare services relative to those whose husbands had secondary or tertiary level of education. Those who walked (0.91 (1.62-2.88) or used bicycle 0.84 (1.69-2.02) were less likely to utilize skilled maternal health services compared to those who used motorbike or private car.

**Table 5:-** Factors associated with utilization of maternal health care Services

Variables	Yes, n (%)	Unadjusted odds ratio (95% CI)	Adjusted odds ratio (95% CI)
<b>Main Source of Income</b>			
None	102 (19.7)	0.21 (3.25–5.50)**	0.96 (3.21–8.27)**
Farming	202 (39.1)	0.33 (5.41–8.13)**	0.37 (7.32–6.74)**
Self-employed	140 (27.1)	1.00	1.00
Salaried	73 (14.1)	1.00	1.00
<b>Level of education completed</b>			
None	7 (1.4)	1.00	1.00
Primary	331 (64.0)	1.00	1.00
Secondary	166 (32.1)	3.23 (3.15–6.51)**	2.62 (4.33–4.58)**
Tertiary	13 (2.5)	2.05 (3.25–4.50)**	1.43 (2.87–4.63)**
<b>Husbands / Partners Education</b>			
None	100 (19.3)	0.91 (3.97–4.23)**	0.12 (4.23–2.59)**
Primary	238 (46.0)	0.13 (3.84–3.62)**	0.89 (2.07–1.60)**
Secondary	160 (30.9)	1.00	1.00
Tertiary	19 (3.7)	1.00	1.00
<b>Means of transport to facility</b>			
Walked	296 (57.3)	0.33 (2.94–3.41)*	0.91 (1.62–2.88)*
Bicycle	25 (4.8)	0.67 (1.21–2.60)*	0.84 (1.69–2.02)*
Motorbike	193 (37.3)	1.00	1.00
Private car	3 (0.6)	1.00	1.00

**Maternal healthcare continuum:-**

On the continuum of care situation, Table 4 below shows that the majority of the mothers 438 (84.7%) had a CHV attached to their household. In addition, out of the 438 (84.7%) of the mothers who had a CHV attached to their household, only 119 (23%) of the mothers had been referred to the health facility by a CHV for pregnancy related care. In addition, all the mothers who participated in this study had no book/document in their household where health services provided by the CHVs or other providers who visit the household were recorded or referred to for continuum of care purposes. In addition, 434 (83.9%) of the mothers had the opportunity of being visited in their households by other health providers other than the CHV. However, only 6.4% received pregnancy related services from these providers.

**Table 4:-** Continuum of care

Characteristics	Yes, n (%)	No, n (%)
Do you have a CHV attached to your HH?	438 (84.7)	79 (15.3)
Were you ever referred to the health facility by a CHV in your last pregnancy?	119 (23.0)	398(77.0)
<b>If Yes, For what purpose</b>		
Pregnancy related care	14 (12.0)	105 (88.0)
Immunization services	14 (12.0)	105 (88.0)
Curative services	14 (12.0)	105 (88.0)
Family Planning, Eye Care, Cervical cancer screening	77 (64.7)	42 (35.3)
<b>Are there any book/ document in your household where services provided by the CHVs are usually recorded?</b>	0	517(100.0)
<b>Are there health providers who have visited your household in the past, other than the CHV?</b>	434 (83.9)	83 (16.1)
<b>If Yes, For what purpose?</b>		
Pregnancy related services	28 (6.4)	386 (93.6)
Health promotion	59 (13.5)	375 (86.5)
HIV Counseling and testing	65 (15.0)	369 (965.0)
National immunization days	329 (75.8)	105 (24.2)
Malaria testing and treatment	28 (6.4)	406 (93.6)
Net distribution	66 (15.1)	368 (84.9)

The strategies outlined in the framework below were implemented for a period of twelve months with intensive follow up after which an evaluation was carried out and results shown below.

### Phase 2:-

#### Developed context specific framework;-

The development of the piloted integrated framework was informed by both the baseline findings and the suggestions from the users and maternal healthcare providers. The proposed strategies for increasing utilization of skilled maternal healthcare services were fed into the design of the framework. The framework took into considerations those interventions that target both the supply and demand side barriers to utilization of skilled maternal healthcare services. Included are also suggestions made by key informants and focus group discussants within the selected study sites. The framework contains six prioritized interventions which are interconnected. In line with the available structures, six strategic areas for enhancing maternal healthcare continuum and optimizing utilization of skilled maternal healthcare services were identified by the study and evaluated. They include 1) use of maternal health job aids for guidance at the health facility and community, 2) mother baby booklet, 3) use of referral tools, 4) empowering CHVs to educate the women and provide basic community maternal healthcare services 5) testing for pregnancy at the community/household level and 6) availing documentation tool at the households for reference and care continuum.

The framework explicitly defined how one intervention informs the other and the feedback mechanism. The interventions were addressing both community and facility bottlenecks which included: Increasing women's awareness on importance of maternal health; Availing 24 skilled delivery services at the health facilities; Improving the quality of interaction between healthcare providers and community; Strengthening community – facility linkage by use of a household log book to document health services provided ; Empowering community health volunteers to educate women and provide community maternal healthcare services and pregnancy testing services at the household to enhance early identification of pregnant women for early initiation of antenatal care, and use of antenatal and postnatal care job aids both the health facilities and community health workers as shown in Table below:-

**Table 1:-** Framework for increasing utilization of skilled maternal healthcare services

Strategy	Justification	Key findings that support the strategy	Recommendations for service delivery (practice)
(1) Increasing women's awareness on available maternal health services and danger signs	i) Studies have shown that one of the major barriers to utilization of skilled maternal healthcare service is lack of awareness of the available and importance of skilled maternal health services (Mpembeni, 2007; Tsawe, 2014)	i) Baseline findings showed that only 34.6% of the women in the study had adequate knowledge on available maternal health while 55.9% had adequate information on maternal health danger signs. ii) Baseline findings also revealed that 83.9% of pregnant women had had the opportunity of being visited at their households by other health providers other than the CHVs to offer other services not pregnancy related. This is an indication that opportunities exist that could be used to disseminate maternal health information by integrating the services during the household visits.	i) Every opportunity that either a skilled provider or a community health worker interact with the women should be used for education and review of women's understanding of maternal health. ii) Women should continuously be given information on maternal health and treated with respect so as to reduce fears and increase the uptake of skilled maternal healthcare services. (iii) Every health provider who visits a household having a woman of reproductive health is encouraged to provide information on importance of skilled maternal health services.
(2) Improving quality of	i) Cases of missed opportunities exist as evident	(i) Previous studies in Siaya County revealed that quality	(i) Train providers on respectful maternity care

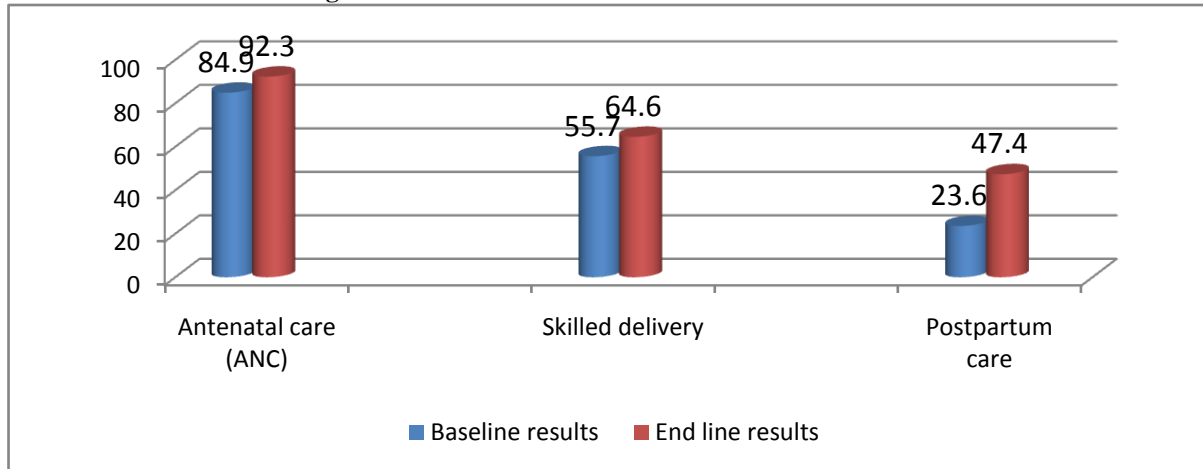
providers and users interaction and positive attitude change	in the DHIS, 2004 data that shows that whereas 82% of women attend first antenatal care visits, only 45% attend 4 <sup>th</sup> antenatal care visits and 52% receive skilled delivery services.	of interaction between provider and pregnant women was poor as women had vague information about services offered even after interacting with skilled providers (Pell C, 2011) (ii) Baseline findings revealed that although 84.9% of the women received antenatal care, only 55.7% and 23.6% received skilled delivery and postnatal care respectively.	(ii) Promote use of antenatal and post natal job aids to enhance quality interaction.  iv) Efforts should be made to enhance maternal healthcare continuum by strengthening community-facility linkage by ensuring there is effective communication between the skilled provider and the community health volunteer. (Documentation in the mother baby book to be strengthened as part of communication enhancement).
(3) Introducing the use of a household log book for documentation of all health services provided at the household level (Strengthening community – facility linkage)	(i) There has not been any tool at the household level where services provided at the household are documented thus different providers who visit the household have no reference document for enhancing care continuum and also ascertaining which services have been offered at the household has been a challenge.	i) Reports indicate that all (100%) of households in Siaya County have a CHV who visits on monthly basis and who is paid stipend by the County government. However, baseline findings revealed that 15.3% of the households had never been visited by a CHV which is an indication that some CHVs do not carry out their mandate.	i) Development, sensitization of providers, community and the mothers, and distribution of a household health visitors log book for documentation of all services provided at the household level and for reference. ii) Provide referral tools to all CHVs and provide space for skilled provider's comments and assignment to CHVs in the mother baby booklet.
(4) Empowering community health volunteers with knowledge on maternal health and danger signs	(i) The majority of the CHVs have not been trained on maternal healthcare and therefore they may not be confident to share the information with the mothers/women during household visits.	(i) Baseline findings revealed maternal health knowledge gap amongst the study participants which may be attributed to lack of opportunities for education on maternal health.	i) Training of CHVs on Community maternal health. ii) Development and promotion of use of antenatal and postnatal care job aids to guide CHVs when providing maternal health education.

### Phase 3:- Evaluation of the effectiveness of the framework

End line results have indicated that the majority of the mothers at 468 (92.3%), 328 (64.6%) and 241(47.4) received Antenatal care (ANC), Skilled delivery and postnatal care respectively compared to the baseline where mothers who received maternal healthcare services were 439 (84.9%) , 288 (55.7%) and 122 (23.6%) respectively. The findings imply that after intervention, more mothers received skilled maternal healthcare services at the various health facilities in Siaya County.

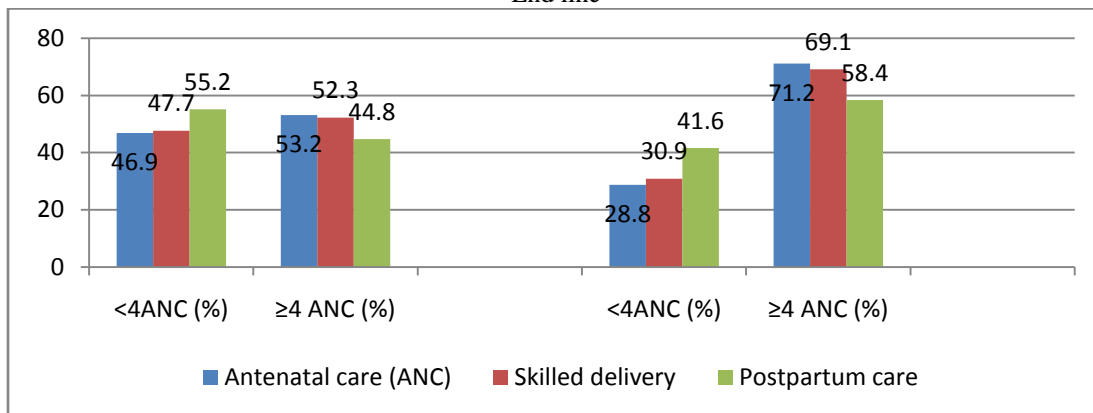


**Figure 1:-** Utilization of skilled maternal health care services



The results below indicate that the number who utilized the recommended 4 antenatal care visits or more ( $\geq 4$ ) at end line increased by 18%, an indication that the framework was effective in increasing uptake of skilled maternal health services.

**Figure 2:-** Utilization of skilled maternal healthcare services Vs Antenatal care services received at Baseline and at End line



Compared to the baseline where only 179 (34.6%) mothers had adequate knowledge on maternal health; intervention findings revealed that 321 (63.2%) had adequate knowledge on available skilled maternal health services. In addition, those who utilized  $\geq 4$  ANC visits increased from 58.7% to 63.9%. Moreover, those who had knowledge on maternal healthcare danger signs also increased from 289 (55.9) to 418 (82.3) with an increase from 62.4% to 78.8% amongst those who took up  $\geq 4$  ANC visits. The findings revealed highly significant positive relationship between knowledge on availability of skilled maternal healthcare services, knowledge on maternal danger signs and number of antenatal care services received ( $p < 0.04$  and  $p < 0.002$  respectively).

**Table 2:-** Knowledge on maternal health services (MHS) Vs Antenatal care (ANC) services received at Baseline and at End line

Variables	Baseline results				End line results			
	Total, n (%)	<4ANC (%)	$\geq 4$ ANC (%)	P value	Total, n (%)	<4ANC (%)	$\geq 4$ ANC (%)	P value
<b>Knowledge on available MHS services</b>				<b>0.007</b>				
Adequate	179 (34.6)	41.3	58.7		321 (63.2)	36.1	63.9	
Inadequate	338 (65.4)	58.1	41.9		187 (36.8)	52.8	47.2	
<b>Knowledge of maternal danger signs</b>				<b>0.001</b>				
Yes	289 (55.9)	37.6	62.4		418 (82.3)	21.2	78.8	
No	228 (44.1)	62.8	37.2		90 (17.7)	49.0	51.0	

### The findings on the maternal healthcare continuum situation:-

On the continuum of care situation among the mothers, the researcher designed a questionnaire to collect views of the respondents on the same. The mothers' respondents were presented with statements that had continuum of care situation connotations with different answering techniques. The researcher computed percentage frequencies of the responses from the mothers and was tabulated as shown in the table 3 shown.

**Table 3:-** Continuum of care situation

Variables	Baseline results		End line results	
	Yes, N (%)	No, N (%)	Yes, N (%)	No, N (%)
<b>Do you have a CHV attached to your HH?</b>	438 (84.7)	79 (15.3)	475 (93.5)	33 (6.5)
<b>Were there services (MHS) offered to you at home during the time you were pregnant?</b>	376 (72.7)	141 (27.3)	408 (80.3)	100 (19.7)
<b>Are there any book/ document in your household where services provided by the CHVs are usually recorded?</b>	-	517(100.0)	414 (81.6)	94 (18.4)

The descriptive statistics on cross tabulations indicates that the number of mothers with CHWs attached to their households in Siaya County increased from 438 (84.7%) to 475 (93.5%) during the end line. However, 33 (6.5%) of the mothers still did not have any CHV attached to their household at end line compared to 79 (15.3%) at baseline as indicated in Siaya County 2014-15 performance report. Of note, compared to baseline, the number of households with health visitor's documentation booklets increased from 0% at baseline to 81.6% at end line

### Discussion:-

The results of this study show that the context specific framework was effective in increasing utilization of skilled maternal healthcare services in Siaya County. Whereas at baseline, those who received at least one antenatal care visit were 84.9%, skilled delivery were 55.7% while only 23.6% received post-natal care within 48 hours of delivery, at end line antenatal care (ANC) increased to 468 (92.3%), skilled delivery to 328 (64.6%) and postnatal care to 241(47.4) respectively. The baseline findings were consistent with data in DHIS which reflected low utilization of skilled maternal healthcare services in Siaya County ([www.hiskenya.org](http://www.hiskenya.org)). Of note was that compared to baseline where only 53.2% received the WHO recommended  $\geq 4$  ANC visits, at end line 71.2% received  $\geq 4$  antenatal care visits. The above findings are similar to findings from previous studies which revealed that knowledge on maternal health, awareness of importance of maternal healthcare services, knowledge on danger signs and enhanced continuum of care can increase utilization of skilled maternal healthcare services (Jerome, Per-Olof, Eleanor, & Karen, 2011; Mwangome, Holding, Songola, & Bomu, 2012; Pembe et al., 2009; Shahram, Hamajima, & Reyer, 2015; Stevens, 2000).

Similar to previous studies that showed that utilization of skilled maternal healthcare services is influenced by a multiplicity of factors including economic status of the mother, mothers education, husbands income, husbands education and distance to health facility/ transport costs (Deo KK, 2015; Doku, Neupane, & Doku, 2012; Idris, Sambo, & Ibrahim, 2013; KC et al., 2011; Malhotra, 2014; Siddharudha Shivalli, 2015; Titaley, Dibley, & Roberts, 2009), the findings of this study showed that participants with no source of income (aOR=0.96, 95% CI: 3.21–8.27) and those who were farmers (aOR=0.37, 95% CI: 7.32–6.74) were less likely to utilize maternal healthcare services relative to traders/self-employed and salaried. Women with secondary (aOR=2.62, 95% CI: 4.33–4.58) and tertiary (aOR=1.43, 95% CI: 2.87–4.63) education were more likely to utilize maternal healthcare services relative to those with no education and those with primary education. Similarly, women whose husbands had no education (aOR=0.89, 95% CI: 2.07–1.60) or had primary education (aOR=0.89, 95% CI: 2.07–1.60) were less likely to utilize maternal healthcare services relative to those whose husbands had secondary or tertiary level of education. In consistent with other studies, the findings of this study also revealed that means of transport/ means of reaching the facility had effect on utilization of skilled maternal healthcare services ( Kawakatsu. et al, 2012; Worku et al, 2013; Ayele et al, 2014). Those who walked (aOR= 0.91 (1.62-2.88) or used bicycle (aOR=0.84 (1.69-2.02) were also less likely to utilize skilled maternal health services compared to those who used motorbike or private car.

The findings corroborate with previous studies, that knowledge on available skilled maternal health services and knowledge on maternal health danger signs is associated with utilization of skilled maternal healthcare services ((Jerome et al., 2011; Mwangome et al., 2012; Pembe et al., 2009; Shahram et al., 2015; Stevens, 2000), this study

showed that at baseline when only 36.4% had adequate knowledge on importance of skilled maternal healthcare while 55.9% adequately knew the maternal danger signs; utilization of skilled maternal healthcare services was also low. Whereas at end line where 63.2% of participants had adequate knowledge on importance of skilled maternal healthcare; utilization of skilled maternal healthcare services increased.

Although it is acknowledged that community-level interventions are potentially effective ways to address the problem at its roots, as decisions to seek and access health care are strongly influenced by the socio-cultural environment (Lawn *et al.*, 2005; John *et al.*, 1998) and that Saving lives depends not only on high coverage but also on the quality of care delivered through the continuum (PNMCH, 2010; Portela *et al.*, 2003), the baseline findings showed that contrary to reports in Siaya County which shows that all households receive CHV services in Siaya County (Siaya County health department performance review report (2014/15), some households (15.3%) had never been visited by a community health volunteer at all. This is an indication of disconnect in the continuum of care (Siaya County health department performance review report (2014/15). However, at end line, the results showed some improvement although 6.5% still did not have an opportunity to be visited by a CHV despite the emphasis that all be followed up. More puzzling was the finding at baseline that, there was no (0%) book/document/evidence in all the households where services provided by the CHVs and other health providers were recorded or could be referred to for continuum of care purposes. However, at end line after intervening, the majority (81.6%) had the household booklets for documentation of all health services provided at the households. The context specific framework was found to be suitable for increasing utilization of skilled maternal healthcare services. However there is still room to further refine it to include other strategies proposed by previous scholars.

The implications of these findings are that each strategy contributes some percentage increase in utilization of skilled, maternal health care services. Therefore integration of several strategies brings synergy and yields better results. The context specific framework should be considered for programming towards increasing utilization of skilled maternal healthcare services.

### **Conclusion:-**

Based on the findings of the longitudinal study carried out between March 2015 and December 2015, it is evident that no single intervention is by itself sufficient to increase utilization of skilled maternal healthcare services. Context specific, evidence based framework maximizes the benefits of a range of interventions which complement each other resulting in enhanced continuum of care and increased utilization of skilled maternal healthcare services.

### **Declarations**

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### **Ethical considerations:-**

Ethical clearance was obtained from Research Ethics Committee of University of Eastern Africa, Baraton, Eldoret (REC: UEAB /05/02/2015). The research assistants were trained on research ethics. Informed written consent from the study participants was obtained and the objective of the study was explained to them. Privacy and confidentiality of collected information was ensured at all levels.

### **Consent to publish:-**

Consent to publish was obtained from Research Ethics Committee of University of Eastern Africa, Baraton, Eldoret (REC: UEAB /05/02/2015).

### **Competing interests:-**

The authors declare that there are no competing interests.

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### **Author Contributions:-**

OEO conceptualized the paper, searched literature, and wrote the manuscript draft. ASO contributed to the design of the study and provided advice regarding data interpretation. FAA helped develop the data analysis framework and

also helped train field researchers for data collection. OEO and ASO analyzed the qualitative data. AK made critical revisions to the paper and provided advice regarding data interpretation. OSO participated in data collection and helped write the results and discussion sections. All authors read and approved the final manuscript.

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### RESEARCH ARTICLE

## DIFFERENCE IN PERCEPTION OF AVOIDANCE STRATEGIES AGAINST SEXUAL HARASSMENT AMONG UNDERGRADUATE FEMALES STUDENTS IN WOMEN AND CO-EDUCATIONAL COLLEGE IN DELHI.

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#### **Manuscript Info**

##### **Manuscript History**

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##### **Key words:-**

Young female adults, Awareness of sexual harassment, Avoidance strategies for sexual harassment.

#### **Abstract**

Young female adults are most vulnerable to harassment and violence towards them. These strategies could be learned either from circumstances surrounding or by some organized training. A descriptive, cross sectional survey design on 200 female undergraduate students from two women colleges and two co-educational colleges from University of Delhi, India was undertaken using convenient sampling technique. A semi structured interview and a structured awareness questionnaire developed by researcher was used. Results: Awareness was not found to be correlated to any of the variables and the type of college (women or co-educational college) they attended. Females in coeducational college had more awareness regarding description of sexual harassment, identification of high risk situation, actions against sexual harassment and prevention of sexual harassment. Female in women college had a view to ignore sexual harassment incidence than co-educational college females. Implications: Youth need to be aware and avoid risk factors for safety of self and how to report the incident to prevent further harassment. Conclusion: Awareness about avoidance strategies of coeducational college females was more in some selected aspects of awareness about avoidance of sexual harassment.

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#### **Introduction:-**

Strategies for avoidance of sexual harassment are essential for everyone, whether female or male right from childhood. Strategies are identification of risk before the incidence occurs. Perception of threat from a situation makes an individual alert and decides when to take action for self safety<sup>i</sup>. The situation of facing harassment might differ in type of college females are studying. In co educational colleges females are more exposed to situations of sexual harassment and they learn from their experiences and are prepared to deal such situations in future where as in all women college female tend to ignore such situations to avoid embarrassment. A study done among college student in Bangalore reported that students from co-education colleges faced sexual harassment more as compared to those who study only in Women Colleges<sup>ii</sup>. The objectives of the study were: To find out the association between awareness of young female adults about strategies for avoidance of sexual harassment with type of college (women/Co-ed).

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### Methodology:-

A quantitative approach, cross sectional survey was used and 200 young female adults studying in degree courses in the age group of 17-21 years from four selected colleges of Delhi University, two co-educational colleges and two women colleges were included by convenient sampling method. Students unwilling to participate were excluded from the study.

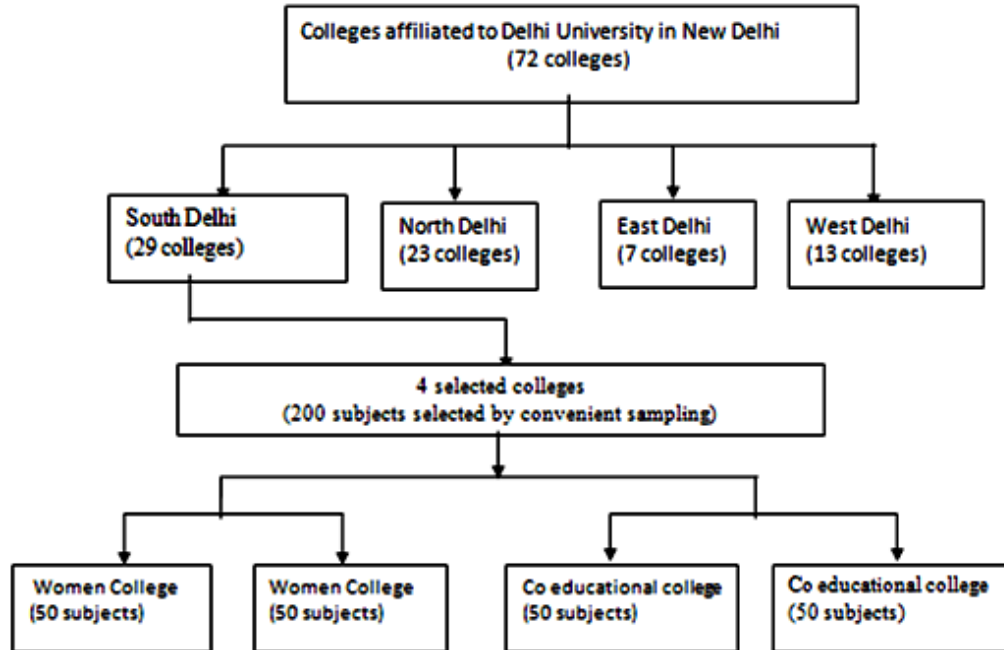


Fig no.1:- Sampling design

### Tools used:-

Subject data sheet: structured questionnaire for socio demographic profile and selected variables of the subjects and informed consent form. Tool 1: Interview schedule (IS) (05 items) to assess previous experience with sexual harassment either on self or observed by subjects and preferred action against sexual harassment and whom they would like to inform in a situation of sexual harassment. Tool 2: Structured questionnaire (AQ) (40 items-12 single answer questions and 28 multiple answer questions) for assessing the awareness of Young female adults about avoidance strategies for sexual harassment divided into seven groups (Table no 1). Each item was given a score of one and maximum score could be 172. The awareness was scored on five point scale, some<36, slightly(36-72), fair (73-108), just enough (109-144), good(145-172) and was further categorized as awareness levels- Excellent- good awareness scores, Satisfactory-just enough awareness scores and less than satisfactory-fair awareness scores. The content validity was done and reliability of the tool was assessed by test retest method by McNemer Chi square test and p value was found not significant for all questions. Pilot study was done on 30 subjects and was found to be feasible. Ethical clearance was obtained from ethical committee of AIIMS, New Delhi and informed consent was obtained from subjects. The data was collected from June to November 2014. Data were analysed using STATA 16.1 by appropriate descriptive statistics-frequency, percentage and inferential statistics- Pearson's chi square test and Fisher exact test.

### Description of the subjects:-

Mean age of the subjects was  $18.77 \pm 1.118$  years and the maximum age was 21 years and minimum was 17 years. All (100%) subjects were unmarried. Almost half (54%) of the subjects monthly family income was greater than Rs 60,000 /- Most (89.5%) of the subject belonged to Hindu religion and Most (65%) of the subjects were residing in urban area in Delhi NCR .

### Results:-

Nearly half of subjects in women's college had slight awareness and one tenth of subjects had just enough awareness about avoidance strategies for sexual harassment. Among subjects from co- educational college 34% of subjects had slight awareness, half of subjects had fair awareness and one fifth of the subjects had just enough



awareness about avoidance strategies for sexual harassment. There was no statistically significant difference between awareness of the subjects studying in women's college and coeducational college hence the knowledge of two groups is comparable. (table no 1)

Out of total 40 item awareness questionnaire a statistically significant difference was found in 13 questions among awareness of subjects about avoidance strategies for sexual harassment in women's college and co-educational college. Women in coeducational college had more awareness than in women only colleges in areas like definition of sexual assault, danger of sexual harassment from known to persons like neighbours and co-workers, place like crowded markets and office of officials need to be avoided as a prevention method, regarding informing media like radio and print media regarding incidence and were more aware regarding legal facilities against sexual harassment, regarding alarming signs for a date rape and importance of raising an alarm and asking help from others in an incidence of sexual harassment. Whereas females of women college had had a view to ignore an incidence of sexual harassment. (table no.2)

**Table no.1:-** Association of awareness of avoidance strategies among two women's college and two co-educational college (n=200)

Group	Awareness scores			
	Slight	fair	Just enough	P value
Females in women's college (n=100)	41(41%)	45(45%)	14(14%)	p=0.573
Female in co-educational college(n=100)	34(34%)	49(49%)	17(17%)	

**Table no.2:-** Comparison of awareness of subjects about avoidance strategies for sexual harassment among two women college and two co-educational colleges (n=200)

Areas of avoidance strategies	Awareness of avoidance of sexual harassment	Group 1(n1=100)	Group 2(n2=100)	p value
Description of sexual harassment	Sexual assault is sexual contact that uses force or coercion	41	67	0.005
Identification of high risk situation	There is need to be aware from neighbours for fear of sexual harassment	48	62	<.0001
	There is need to be aware from co-workers for fear of sexual harassment	49	64	0.047
	Sexual harassment can take place in crowded market	44	59	0.032
	One should avoid office of official due to fear of harassment	25	40	0.024
Actions against sexual harassment	If sexual harassment occurs outside office building by work related personnel, victim can file for harassment	83	96	.003
	Victim of sexual harassment should inform media like radio	24	13	0.045
	Victims of sexual harassment should inform media like newspaper journalist	30	14	0.006
	Women facing sexual harassment suffer from mental distress	85	94	0.038
	Aware of legal facilities against sexual harassment	34	50	0.022
	Victim should ignore unwanted sexual advances	17	07	0.030
Prevention of date rape	Getting a double meaning from friend on a date is alarming sign for possible harassment	50	66	0.022
Training to prevent and combat sexual harassment	Raising an alarm and taking help from others would be most useful to avoid sexual harassment	56	70	0.040

**Conclusion:-**

The female studying in co-educational colleges seems to be more prepared to deal a situation of sexual harassment. Women colleges need to introduce more awareness among their students about avoidance of sexual harassment.

**Implications:-**

School and college teachers need to identify early signs of harassment and take preventive steps in college premises. Youth need to be aware and avoid risk factors for safety of self and how to report the incident to prevent further harassment. In all institutional settings there need to identify signs of harassment, counsel the victim and referring to social worker and counselors for further services. Gender sensitization should be included in curriculum and in service education.

**Remedial actions taken:-**

During data collection all doubt pertaining to sexual harassment and avoidance strategies were explained if asked by subjects.

**Limitations:-**

No follow up counseling could be given to those subjects who required it due to time constraints.

**Recommendations:-**

Similar study can be done with larger sample size, with a qualitative approach, among different college going population, general population among boys and men.

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<sup>i</sup>Strategies for preventing sexual abuse [Internet]. [cited 2015 Jan 17]. Available from: <https://www.k-state.edu/media/webzine/Didyouhearyes/Strategies.html>

<sup>ii</sup>“Research Study on college student perspective of Sexual Harassment in Bangalore City” supported by NCW (2012-13) | Women Power Connect [Internet]. [cited 2015 Jun 8]. Available from: [http://www.womenpowerconnect.org/?page\\_id=388](http://www.womenpowerconnect.org/?page_id=388)



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### RESEARCH ARTICLE

#### EFFICACY OF VACUUM ASSISTED CLOSURE IN THE TREATMENT OF ULCERS OF LOWER LIMB.

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##### Manuscript History

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##### Key words:-

NPWT-negative pressure wound therapy.

#### Abstract

**Introduction:** Vacuum Assisted Closure (VAC), sometimes referred to as Micro Deformational Wound Therapy (MDWT) or Negative Pressure Wound Therapy, has revolutionized the way wounds are treated over the last decade<sup>1</sup>.

**AIM:** To study and compare number of secondary amputations and number of debridements required between VAC and conventional moist dressing.

**Material and Methods:** 30 patients were selected. VAC was applied in 15 patients and changed every 3<sup>rd</sup> day and conventional dressings were done in 15 patients and dressings were changed twice daily.

**Results:** Number of secondary amputations and debridements has significantly reduced in Vac therapy than conventional.

**Conclusions:** Use of Vac in our study led to significant results and better outcome.

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#### Introduction:-

In 1993, Fleschman et al., first documented the use of sub-atmospheric pressure to manage chronic wounds<sup>2</sup>. Argenta expanded this method by publishing a clinical report on effect of NPWT on complicated wounds<sup>3</sup>. It works on the principle of application of micromechanical forces that promote wound healing<sup>4,5</sup>.

In separate studies, Saxena et al<sup>6</sup> and Greece et al.<sup>7</sup> have further elucidated the role of open pore foam dressing in the creation of micromechanical deformations of the wound surface. These microdermal deformations are caused when negative pressure draws tissue into the foam pores. This stretches cells and promotes cell division that stimulates granulation tissue formation<sup>6</sup>. The rate of granulation tissue is faster in the later setting than the former<sup>8</sup>.

VAC dressings should be changed every 2-3 days. This hastens the wound healing by a) increasing the rate of growth of granulation tissue, b) stimulating proliferation of capillaries (angiogenesis), c) increasing local blood flow, d) applying mechanical pressure to promote wound closure, e) reducing bacterial load in the wound, f) suctioning matrix metalloproteinase in wound credentials, g) maintains a moist micro environment, beneficial for wound closure.<sup>9,10,11</sup>

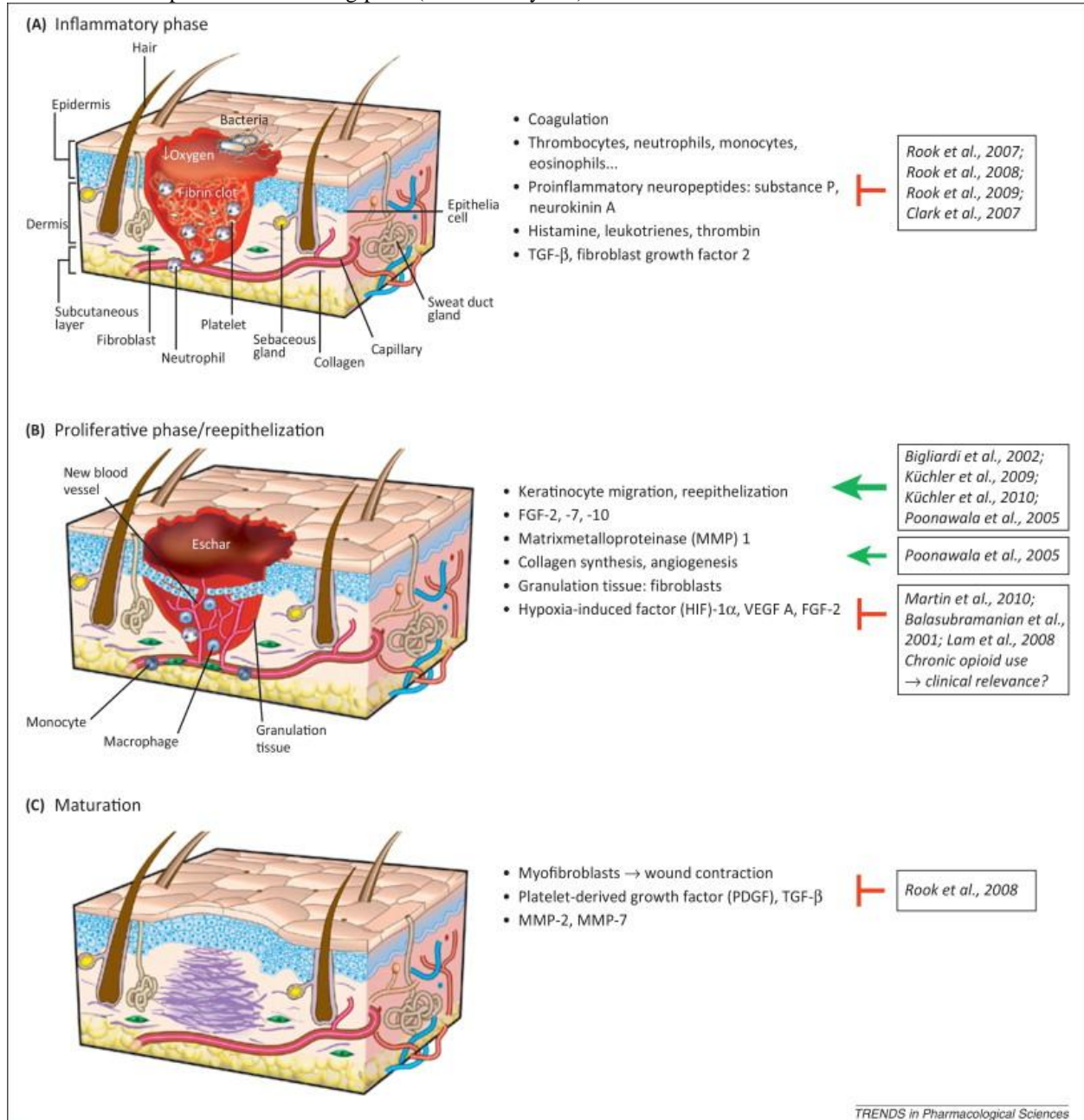
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Wound healing is the summation of a number of processes that follow injury<sup>12</sup>. The same events, in the same order, occur in every healing process in all the tissues. Duodenal ulcers, myocardial infections, cellulitis, long bone fractures, surgical incisions and traumatic wounds all undergo the same reparative processes<sup>13</sup>.

**Sequence of healing process:-**

1. Inflammatory phase or reactive phase(1-6weeks).
2. Proliferative phase or regenerative phase(2weeks- 2years).
3. Maturation phase or remodeling phase(6months- 2years).



Clinical factors affecting wound healing<sup>13,14,15</sup>

**Local factors:-**

Infection,presence of necrosis,foreign body,site of wound-excess local morbidity (such as over the joint),venous and lymph stasis due to poor drainage,recurrent trauma,inadequate blood supply,poor surgical apposition,wound dehiscence.

**General factors:-**

elderly age,hypoxemia-anemia, hypovolemia,shock of any cause,coronary heart disease leading to peripheral shut down,congestive heart failure causing odema and fluid over load,C.O.P.D causing reduced O<sub>2</sub> saturation of the blood,acute respiratory disease such as pneumonia,malnutrition,diabetis with poor glyceemic control,immunodeficiency,obesity and smoking.

**Chronic leg ulcers**<sup>14,15, 16,17,18</sup>

A chronic leg ulcer is a loss of skin below the knee on the leg or foot which takes longer than 6 weeks to heal despite of standard treatment of underlying disease and local wound care.However the SIGN(1998) guidelines consider 4 weeks to be definitive.

**Complications of vac<sup>6</sup>:-**

Common complications include bleeding,infection,pain,foam retention within the wound,tissue adherence.other less complication include hypergranulation.

**Aim:-**

To compare the efficacy of VAC over regular conventional dressing.

EFFICACY includes:number of debridements required and the number of secondary amputations required and graft uptake.

**Materials and Method:-**

Out of 60 pateints presenting with ulcer over a period of 5 months,30 patients were selected.

*Criteria for exclusion:*Patients with malignant ulcers, with venous ulcers,with peripheral arterial occlusive disease,with ICU stay,with ulcers greater than 15cm size in largest dimension,with more than one ulcer,with chemical burns,charcot`s disease.

In experimental group after surgical debridement, simplified VAC was applied and changed every 3 day.

In control group saline soaked guaze dressings were applied at the time of surgical debridement and changed twice daily.

**Method:-**

VAC –procedure

- Placing a sterile,polyurethane foam dressing,into the wound defect after it has been trimmed to shape.
- Adhesive drape was used to cover the foam and additional 3 to 5cm of surrounding intact skin.
- A slit measuring 1 to 2 cm long was created in the drape –it acted as the diameter of the circular hole which was cut in the drape.The non-collapsible tube was placed directly over the hole in the drape and connected to the electronic vacuum pump.
- Finally,negative pressure was applied to the wound via the therapy unit,causing the dressing to collapse into the wound.
- A standard negative pressure of -125mm of hg was applied to the wound,continuously.
- Change of dressing was performed every 48 to 96 hours in the ward for the patient by a trained technician from KCI wound care in the presence of doctor/nurse.



**Conventional dressings:-**

- Conventional dressing used cleansing of wound with hydrogen peroxide or normal saline and application of betadine.
- Wound dimensions were measured with a ruler. Examination was done on the day following first debridement for control and on the day of application of VAC for study group. Graft uptake was assessed on the day of discharge.

**Factors Assessed:-**

- Number of redebridements that followed.
- Number of amputations that followed.
- Graft uptake.

Data analysis: A t-test was used to compare means of variables in between the groups and z-test used to compare proportions.

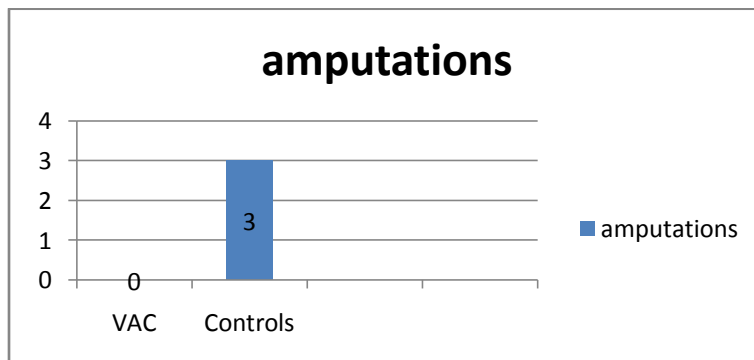
A p value of 0.05 was used to determine statistical significance.

**Results:-**

Number of total cases: 60

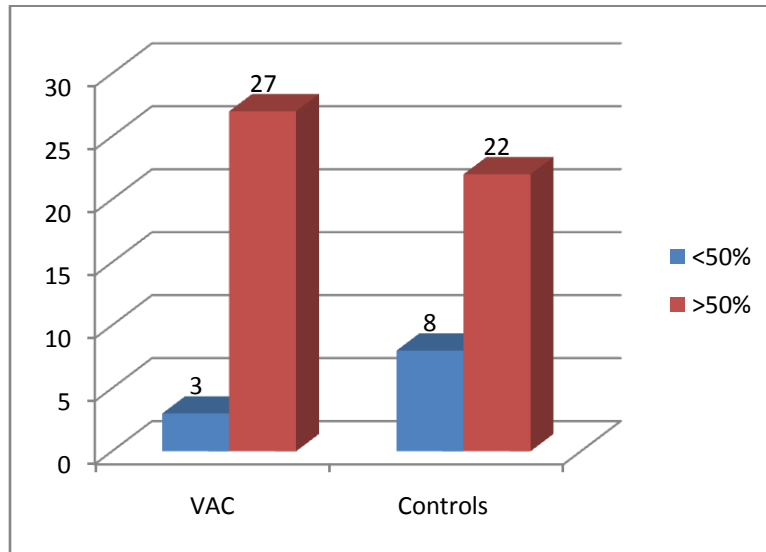
Cases included in the study: 30

**Amputations:-**

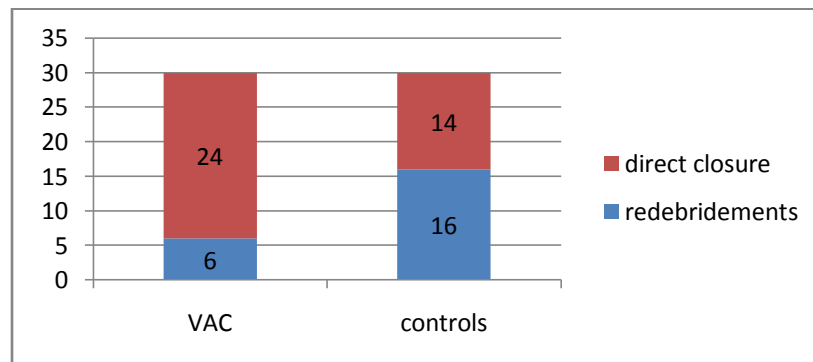


p=0.0378

3 patients in control group had to undergo amputations in the lower limb whereas none of the patients in VAC had to undergo amputation.

**Graft uptake:-**

In 27 patients in VAC group and 22 patients in control group had graft uptake of more than 50%.

**Redebridements:-**

$p=0.0004$

6 patients in VAC group had to undergo a second debridement following application of VAC where as 16 patients in control group had undergone a second debridement.

**Discussion:-**

- Vac therapy resulted in significant reduction in number of amputations.
- Vac therapy resulted in statistically significant improvement in graft uptake.
- Vac therapy resulted in significant reduction in number of surgical debridements.

**Comparison with other studies:-**

A randomized control study by Ali et al (2014)<sup>19</sup> concluded that VAC therapy results in faster appearance of granulation and fewer amputation, a conclusion similar to our study.

A multicentre randomized control study by Blume et al<sup>20</sup> concluded that Vac therapy results in reduced amputations, a conclusion similar to our study.

Demerits: The difference in the wound characters were not studied at histopathological level. Study has observer bias as it is not a blinded study.

**Conclusion:-**

The efficacy of NPWT in promoting healing of ulcers of lower limb has been largely accepted by clinicians. We believe that advances in mechanobiology, the science of wound healing, the understanding of biofilms, and advances in cell therapy will lead to better care of our patients.

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## RESEARCH ARTICLE

### PREVALENCE OF INSOMNIA IN SAUDI GENERAL POPULATION.

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#### Abstract

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#### Introduction:-

##### Insomnia:-

Insomnia comprises complaints of disturbed sleep despite optimal time and conditions for sleep." According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR®), primary insomnia is defined as difficulty initiating or maintaining sleep, or nonrestorative sleep, at least 3 times a week for at least 1 month that does not occur in the presence of another mental disorder or comorbid medical condition and results in next-day functional impairment. The patient's experience of insomnia may be related to sleep onset (difficulties in falling asleep) maintaining sleep (uninterrupted sleep without nocturnal awakenings), or total sleep time (inadequate amount of time asleep or waking too early). All of these circumstances can result in complaints of poor daytime functioning. More than one study showed that women were reported more than men to have insomnia with day time disfunction. Other study showed that People with severe nocturnal awakenings who were unable to return to sleep were more likely to suffer from daytime sleepiness (odds ratio [OR], 2.1), cognitive difficulties (OR, 2.8), moderate or

Severe fatigue (OR, 2.6), depressive disorders (OR, 2.5), or anxiety disorders (OR, 1.9) than were those who awoke frequently and could return to sleep. Insomnia associated positively with age, female gender and lower education. It is also found to be more in urban residents more than in rural people. About one forth is the prevalence of insomnia in studies were conducted USA, Austria, Taiwan and Poland.

Sleep apnea:

Obstructive sleep apnea (OSA) is a common disorder. There are important clinical consequences for affected individuals. A characteristic is repetitive collapse of the pharyngeal airway during sleep yielding hypoxia and hypercapnia and to reestablish airway patency arousal is required. Consequences are daytime sleepiness, decreased cognitive performance, decreased quality of life and a higher risk of car accidents. OSA may also lead to adverse cardiovascular consequences such as hypertension, myocardial infarction and stroke[3]. Sleep disordered breathing (SDB) is an abnormal breathing pattern during sleep that is often quantified as the apnea-hypopnea index (AHI). The presence of SDB and symptoms of sleep disruption are required for the clinical diagnosis of OSA. The term

SDB refers to the physiological abnormality observed in patients with the clinical syndrome of OSA[4]. In the general population the occurrence of SDB concerns about 9% of middle-aged women and 24 % of middle-aged men. Only 2% of women and 4% of men complain also of daytime sleepiness and meet the strict criteria for OSA. Older and more obese populations have a higher prevalence [4]. Diabetes and obstructive sleep apnea (OSA) are common disorders and coexist very often. The presence of the shared risk factors, i.e. obesity, may be the reason for this overlap. Maybe there is also a more complex relationship between these conditions in which an underlying metabolic disorder predisposes to both or in which metabolic and autonomic abnormalities associated with one influence the development of the other. There is a possibility that the presence of both conditions results in additive or even synergistic health risks, because diabetes and OSA are associated with increased cardiovascular morbidity and mortality. Patients with diabetes suffer very often from sleep apnea. According to research 50% of male patients with diabetes have sleep apnea [2] The prevalence of SDB (AHI>20) was 36% in patients with diabetes compared with 15% in normoglycemic subjects , reported in a study among middle aged men. Therefore increased awareness of symptoms and signs of OSA in a diabetic patient population[4].

with diabetes compared with 15% in normoglycemic subjects , reported in a study among middle aged men. Therefore increased awareness of symptoms and signs of OSA in a diabetic patient population[4].

**Statement of need:-**

- Many studies were made worldwide to determine
- the frequency of insomnia , but none of these studies were done
- locally . This study was made to correct this
- defect.

**Objectives:-**

**Specific Objectives:-**

**To Determine:-**

- The frequency of insomnia in a large Saudi population presenting directly to the general physician (GP).
- The impact of insomnia on the quality of life, on the use of health-care resources and on co-morbidity.
- To assess the prevalence of sleeping problems and their relation to sociodemographic characteristics in the Saudi population.
- To differentiate poor from good sleepers.
- To find the association between depression and insomnia.
- To assess the level of insomnia among Saudi population

**Secondary Objectives:-**

To assess whether co morbid factors were associated with sleep disorders in this population.

**Methodology:-**

This study was conducted at systemically random chosen primary care Centers, in Riyadh. patients who met our inclusion criteria were interviewed at each site.. The interviewer explained the objectives of the study and obtained patient consent for enrollment in the study. The data collection was carried out by personal interview, using a structured questionnaire adapted from earlier relevant published studies. All questions were accurately specified and thoroughly discussed and reviewed with the survey conductors before the study started.

This questionnaire has been translated into Arabic and validated.

**Study Design:-** Quantitative observational cross-sectional.

**Sampling Method:-**

The primary centers were chosen systemically random depending on the 5 region in that city (north, south ,west, east and central) . And the days of a week were chosen systemically random.

**Study Subjects:-**

**Inclusion criteria:-**

We will enroll all patients of age >18 years.

**Exclusion Criteria:-**

1. Patient refusal.
2. Psychiatric disorders

**Sample Size:-**

We interview all consecutive patients who met our inclusion criteria at systemically chosen primary centers in Riyadh. Our aim is to have 400 patients.

**Location and time :-**

.....of this sample were taken from Iry care clinic in king Fahad National Guard hospital , ..... Were taken from Iry care clinic in King Khalid hospital and ..... were taken from Iry care clinic King Saud complex hospital the sample was divided to..... male and ..... female in each hospital

The sample was selected mainly in the time from 7am to 4pm in all the hospitals.

**Data Collection tool:-** Questionnaire

The study questionnaire is divided into 5 sections as follows:

**Section 1:-**

Includes questions on common demographic characteristics such as age, gender, and height, weight, education level, marital status, employment, special habits.

**Section 2:-**

Includes questions in past medical history ,chronic illnesses and medication taken.

**Section 3:-**

Includes questions about insomnia. It consists of five validated questions[11] The first three questions about symptoms of insomnia, difficulties falling sleep. Awake up too early, if they have difficulty falling a sleep after awakening. The other 2 questions are about second daytime dysfunction (mood change, or tiredness) due to insomnia

Patients are considered having insomnia (level one) if answered yes to any of the first three questions and considered to have insomnia with daytime dysfunction (level two), if answered yes to at least four of the five questions.

**Section 4:-**

It is the Epworth Sleepiness Scale

The aim of this questionnaire is to get a measure of your sleepiness during the day. This helps distinguish between normal everyday tiredness and an abnormal level of sleepiness.For each of the situations below please indicate how likely you are to doze off or fall asleep. This refers to your usual way of life in recent times. If your sleepiness is variable (for example if you work shifts) then try and give an average.If you have not done some of these things,try and imagine how they would have affected you.

**Use the following score to indicate the most appropriate Answe:-**

- 0 = would never fall asleep in that situation.
- 1 =there is a slight chance of falling asleep in that situation.
- 2 = there is a medium chance of falling asleep in that situation.
- 3 =there is a high chance of falling asleep in that situation.

**Section 5:-**

Quality Index (PSQI) [13]. Nineteen individual items generate seven “component” scores: subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction. The sum of scores for these seven components yields one global score.

Patients with a PSQI score  $>5$  are conventionally defined 'poor sleepers', whereas those with a score  $<5$  are considered 'good sleepers'.

#### **Section 6:-**

This section includes questions about depression using rapid screening for depression questionnaires developed for medical patients by Jefford, M et al .

#### **Data Analysis:-**

##### **software used:-**

##### **sampling technique:-**

##### **▪ Pilot Study:**

#### **Report:-**

The pilot study was conducted to test the translation of the questions, to see if there is any difficulty in understanding the questionnaire ,and to gain feedback from the participants.

We did the pilot study in period interval of 2 days from                    to                    in the same location as the main study was conducted, in primary care centers that were chosen by systemically random from Riyadh city, and the primary care centers were King Saud Complex Hospital, King Fahad National Guard hospital ,and King Khalid University Hospital.

We divided the team into three group ,each group composed of 3 to 4 students , and each group was given one location from the three main primary care center.

We interviewed the participants from 8 a.m. to 3 p.m. for 2 days, and the total participants were 50 person that have been chosen randomly , and the time taken for each interview was ranged from 8 to 20 minutes with average of 14 minutes.

The male participants were more cooperative and no difficulties were found in interview and giving feedback about the questionnaire.

#### **Team observations:-**

1. Getting permission will make the work more feasible, less time consuming, and of course more official.
2. Difficulties in contacting and communicating females, and no comments were earned
3. There were many refusals, because they were afraid to miss the scheduled appointment if they had the interview.
4. And also there were many interruptions because the participants had to stop the interview to see his or her doctor when the time of the appointment came.

#### **Participants' suggestions:-**

- First, many participant said that the interview method was a better way to understand the questions that the self-administered form.
- Second, most of them suggested to conduct the interview after the participant get out from his or her appointment to prevent any interruption.

#### **Results:-**

- After analyzing the answers given by the sample that we chose to conduct our study on, we came to these results:
- About 77% of the sample is suffering from insomnia in age ( $34.9 \pm 14.5$ ). It is been shown a high prevalence among the people who are poor sleepers (PSQI $>5$ ). About 48% of insomniac has a depression (more in female) & BMI ( $27.3 \pm 5.3$ ). There is no deference between the insomniac & normal people according to their neck size ( $14.5 \pm 2$ :  $14.8 \pm 2$ ), ESS & BMI. The ratio between male & female is almost equal.

#### **Discussion:-**

- The prevalence of insomnia in Saudi general population were similar to what has been reported in literatures.
- About 77% of the sample is suffering from insomnia in age ( $34.9 \pm 14.5$ ). It is been shown a high prevalence among the people who are poor sleepers (PSQI $>5$ ). About 48% of insomniac has a depression (more in female) &

BMI ( $27.3 \pm 5.3$ ). There is no difference between the insomniac & normal people according to their neck size ( $14.5 \pm 2$ :  $14.8 \pm 2$ ), ESS & BMI. The ratio between male & female is almost equal.

**Table 1:-**

Attributes	Insomnia		P-Value
	No (n=75)	Yes (n=245)	
Age(year)	$31.4 \pm 11.8$	$34.9 \pm 14.5$	0.0613
BMI	$26.9 \pm 6.1$	$27.3 \pm 5.3$	0.6567
Neck Size (inch)	$14.8 \pm 2$	$14.5 \pm 2$	0.3075
ESS	$6.4 \pm 4.1$	$6.3 \pm 4.3$	0.8318
PSQI*	$4.6 \pm 2.7$	$6.4 \pm 3.2$	0.0000
Sex (Male)	50 (67)	163 (67)	0.9830
Obese (BMI $\geq$ 30)	19 (25)	71 (29)	0.539
ESS $\geq$ 10	18 (24)	47 (19)	0.364
Poor Sleeper (PSQI $>$ 5)*	32 (43)	172 (70)	0.000
Depression	32 (42.7)	118 (48.2)	0.404

Comparisons on the basis of insomnia presence

Attributes	Sex		P-Value
	Male (n=213)	Female (n=107)	
Age(year)	$35.1 \pm 14.7$	$32 \pm 12.2$	0.0566
Neck Size (inch)	$14.6 \pm 2.1$	$14.6 \pm 1.9$	0.7922
BMI	$27.4 \pm 5.7$	$26.7 \pm 5.2$	0.2773
ESS*	$5.9 \pm 3.8$	$7 \pm 4.9$	0.0236
PSQI*	$5.6 \pm 2.9$	$6.7 \pm 3.6$	0.0022
Insomnia	163 (77)	82 (77)	0.9830
Obese (BMI $\geq$ 30)	60 (28)	30 (28)	0.980
ESS $\geq$ 10*	36 (17)	29 (27)	0.0320
Poor Sleeper (PSQI $>$ 5)*	127 (60)	77 (72)	0.030
Depression*	78 (37)	72 (67)	0.000

\* p<0.05

**Table2: Comparison on the basis of Sex**

### Conclusion:-

Insomnia in the population is a major health problem with a high prevalence among poor sleepers & depressed persons.

Poor sleeping & depression are risk factors to develop Insomnia. However, the problem is still under diagnosed in the population. Therefore, we recommend to train the GP in primary clinics to diagnose chronic sleep disorders such as Insomnia & do more health education for the society to know how problem is big.

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### RESEARCH ARTICLE

#### PEDIATRIC CASE OF ACCIDENTAL ORAL OVER DOSE OF METHOTREXATE.

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#### **Manuscript Info**

##### **Manuscript History**

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#### **Abstract**

We present the second youngest reported case of a single oral overdose of methotrexate in otherwise well 19 month old child. Initial history revealed possible ingestion of 10 tablets, each containing 2.5 mg. The peak methotrexate level was 92 mmol/L measured 8 hours following ingestion.

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#### **Introduction:-**

paediatric cases of accidental overdose has been one of the most common causes of injury in children less than 5 years of age (1). Although preventive measure has decrease the incidence of paediatric overdose, it continues to occur. Early recognition and treatment is essential to prevent morbidity and mortality. Our case is an accidental oral overdose of MTX, the management is not well established, it's mainly based on experience following parenteral overdose of methotrexate in children.

#### **Case Report:-**

A 19 month old girl presented to the paediatric emergency of King Fahad Hospital of the University 2 hours after she was discovered by her mother that she was playing with her grandmother methotrexate tablets that had fallen to the floor, and some in her mouth. The exact number of tablets was not known, but each tablet contains 2.5 mg of methotrexate. The total tablets were 50, the possible ingestion of 10 tablets. There were no symptoms between ingestion and presentation to local hospital. Patient was given activated charcoal and sent home, but she presented to the emergency department. The child was otherwise well with no significant medical history. The child had no history of nausea, vomiting, abdominal discomfort or stool changes, and was not on any medication.

She appeared well and alert with normal observation. Her weight was 11.2 kilogram and clinical examination was unremarkable. The patient was admitted for observation. A peripheral intravenous line was established and blood sample were sent for routine laboratory studies with determination of methotrexate levels at a reference laboratory. With serial laboratory result (Table 1), the initial methotrexate level was not available from a reference laboratory; however, because the patient could have taken up to 25 mg of methotrexate (51 mg/m<sup>2</sup>), she was admitted to the paediatric ICU for monitoring. Serial laboratory studies and leucovorin therapy given as needed. She was managed initially with IV hydration with sodium bicarbonate (40 mg/l) and folic acid given orally in a dose of 1 mg/day.

The following morning it was decided to start treatment with 10 mg of calcium folinate infusion (leucovorin) every 8 hours which is equal to 40 mg/day equivalent to the maximum dose of methotrexate ingested (1 mg/mg MTX).

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The child remained in the paediatric ward while she completed 72 hours of leucovorin rescue. Later that first day of admission, the methotrexate level from the initial blood test confirmed a toxic level  $0.92 \mu\text{mol/litre}$ . The dose of calcium folinate was  $10 \text{ mg six hourly on day 2}$ , and  $15 \text{ mg six hourly on day 3}$  based on the corresponding methotrexate level. On day 4, the methotrexate level was less than  $0.02 \mu\text{mol/litre}$  and calcium folinate discontinued.

### Discussion:-

Methotrexate (MTX), a folic acid analogue and antagonist, is used in the treatment of particular cancers, autoimmune diseases, placenta accrete and ectopic pregnancy. MTX binds to the enzyme dihydrofolate reductase (DHFR), inhibiting the formation of reduced folate and thymidylate synthetase, resulting in the inhibition of de novo thymidylate, purine and protein biosynthesis.

At oral doses of  $< 20 \text{ mg/m}^2$ , MTX is rapidly absorbed by an active saturable transport mechanism with a bioavailability of 50–95%, a peak concentration of  $0.3\text{--}2.2 \text{ mmol/l}$  being reached within 1.5–2.5 h from intake, and an elimination half-life of 4–6 h, which is dependent on numbers of factors including age, concentration, duration of exposure, and renal function.

There is great variability in blood levels, toxicity and response among patients receiving the same dose per weight or body surface area. This diversity can, to some extent, be linked to some extent to the sequence of variations in genes involved in drug absorption, metabolism, excretion, cellular transport, and effector targets or target pathways.

Millimolar concentrations of MTX for minutes or hours may lead to acute renal, CNS, and liver toxicity, whereas concentrations of  $0.05\text{--}0.1 \mu\text{mol/l}$  for more than 24–48 h will result in haematological and gastrointestinal toxicity. DNA synthesis in bone marrow and intestinal epithelium will be inhibited if MTX concentration was greater than  $10 \text{ mmol/L}$ .

Oral ingestion of MTX results in little toxicity. This may be attributable to the pharmacodynamics of MTX. Toxicity from overdose, however, as its indications for use increase, more accidental overdoses can be expected. MTX toxicity can affect multiple organ systems including bone marrow, liver, intestinal tract, kidneys, lungs, skin, and blood vessels, resulting in death in severe cases.

The physical side effects of MTX in children are the same as in adults, though children generally tolerate MTX well. The most common side effects involve the gastrointestinal tract, including nausea and vomiting, transient elevation of liver-associated liver enzyme levels, usually occurring within the first 24 hours. Most cases are mild, cause no symptoms, resolve within 7 to 10 days, and result in no permanent liver damage. Large overdose can result in acute hepatitis.



**Table.1** Result of blood tests including methotrexate levels taken at this times shown post ingestion

	Time postingestion							
	8h	24h	Day 2	Day 3	1 week	2 week	3 week	4 week
Methotrexate, $\mu\text{mol/l}$	0.92	0.04	0.01	0.01	Nil			
Heamoglobin, g/dl (10.5-13.5)	13.1	12.6	11.8	11.0	10.5	10.5	12.6	12.5
White cell count, $\times 10^9/\text{l}$ (4.5-15)	13.1	11.4	9.9	10.9	10.3	9.6	10.1	8.3
Platelets, $\times 10^9/\text{l}$ (150-450)	225	237	264	281	320	274	370	294
Nuetrophil, $\times 10^9/\text{l}$ (.50-8.00)	28.0	55.6		50.1	22.0	19	27	25
Lymphocyte, $\times 10^9/\text{l}$ (1.50-6.80)	62	37.3		43.7	64.7	74	66	64
Sodium, mmol/l (135-145)	140	136	137	138	134	138	136	138
Potassium, mmol/l (3.6-5.3)	4.3	4.9	3.7	4.9	5.0	4.5	4.0	4.1
(Urea, mmol/l (1.7-6.7	10.0	7.0	4.0	17	21	14.0	9.0	7.0
Creatinine, $\mu\text{mol/l}$ (8-56)	0.4	0.3	0.3	0.3	0.3	0.3	0.5	0.5
Albumin, g/l (35-50)	4.3	3.4	3.5	3.6	3.4	3.9		3.9
Bilirubin, $\mu\text{mol}$ (<20)	0.2	0.5	0.7	0.2	0.2	0.2		0.3
Alkaline phosphatase, IU/l (30-350)	375	318	282	255	269	368		326
Alanine phosphatase, IU/l (5-40)	57	50	56	34	40	46		44
GT, IU/l (7-32)	16	13	12	15	14	14		12
LDH	387	326	317	296	384	349		282
Corrected calcium, mmol/l (2.20-2.65))	9.5	9.6		9.4	10.1			10.0
Phosphate, mmol/l (1,20-1.70)	5.7	5.1		3.8	5.1			5

Few data exists in the literature to guide management of oral MTX overdose in children or to inform prognosis. (6)

Treatment recommendations for pediatric MTX exposures do not differentiate between routes of exposure. Management of symptomatic patients involves supportive care, if available the administration of antidotes, and the removal of the offending drug from the body. (7)

In this case the patient was asymptomatic and had ingested unknown amount of MTX. Her initial serum level of 0.92 mmol/L, reported after admission, was 10 times the threshold for toxicity. Leucovorin rescue at a dosage equal to the maximum amount of MTX ingested has been initiated along with urine alkalinisation and diuresis to enhance elimination. Additional care includes continued leucovorin treatment, activated charcoal in ER and monitoring of MTX levels. The available recommendation of managing oral overdose of MTX includes the use of activated charcoal, gastric lavage, folic acid rescue and urinary alkalinisation. The factors which are important to be addressed in the management of MTX poisoning are the time of presentation and severity of toxicity. (10)

In case series of mainly adult oral overdoses of methotrexate there were no adverse outcomes in patients where folic acid rescue was withheld; however, there is no information regarding ingested amounts or serum methotrexate concentrations and is therefore of limited value. (11)

In the context of MTX poisoning leucovorin is given within a time period of 4 hours of the overdose with most of its therapeutic effectiveness occurring within the first hour of the overdose. Moreover, the initial doses should be equal or greater than maximum possible dose of MTX ingested. (4)

The favourable outcome seen in our patient despite delayed folinic acid rescue brings into question the urgency and the level of treatment required following a single oral overdose of methotrexate. Low to moderate level of MTX and the limited time of exposure following single oral overdose of MTX may contribute to the benign outcome in this case.

There is probably insufficient data in children at the current time to avoid intravenous leucovorin therapy and monitoring for toxic side effects. However, supportive care and observation only should be considered the mainstay of treatment. (6)

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**RESEARCH ARTICLE**

**TRANSFORMATION FROM MICRO FINANCING UNIT TO BANK: CASE STUDY OF BANDHAN, KOLKATA.**

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**Key words:-**

Microfinance, Formal banking system, Borrowers, Small business.

**Abstract**

Microfinance institutions serve as an addition to banks and in some sense a superior because along with providing credit they also offer other financial services like savings, insurance and non-financial services like personal counseling provide guidance and support to start small business etc. Central government and state governments are taking efforts for poverty alleviation. Many programs are currently active in various regions of India. Along with them the microfinance is also contributing through their work towards financial inclusion. In the past few decades it has actually provided money to the unnoticed communities and thereby helped to get rid of poverty. Mr. Chandra Shekhar Ghosh founded Bandhan Financial Services Limited (BFSL) in the year 2001. This micro finance institution is involved in providing loans to small customers, those who have no or less way in to official banking services. In June 2015, the banking regulator gave its final permission. Bandhan Financial Holdings is owned by Bandhan Financial Services Limited (BFSL), the largest micro finance organization in India. The bank focuses on Eastern India as banking penetration is still poor in the region but at the same time want to expand their loan portfolio by increasing lending funds to retail business and Micro and Small Medium Enterprises.

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**Introduction to Microfinance:-**

Basically microfinance is a channel which provides fund to the community or group who do not have approach to banking services. Micro-credit, by definition, means short term loans that are advanced to poorer sections of the society for the purpose of self-employment or any activity plan which help them to earn income and take care of their families.

Over the past few decades, Microfinance sector has grown rapidly. In 1976, Muhammad Yunus, established Grameen Bank, Bangladesh which was considered as the foundation of the modern MFIs. This bank was established with the objective of providing financial facilities to the needy and weaker sections of the society. This bank focuses more on women to help them increase their standard of living, earn profit and become financially strong and independent. According to Yunus, poor people are like 'human bonsai'. They were deprived because society had not accepted their existence and left without the real social and economic support to develop. Grameen Bank took effort to shift the neglected community to the main stream of the society. For the pioneering work on micro-finance, Nobel Prize was awarded jointly to Mr. Mohammad Yunus and Grameen Bank in the year 2006.

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Today, this micro finance business has progressed into a vibrant industry. By providing short term loans to promising entrepreneurs, this sector helped them to establish new businesses. When talking about giving refinance facility to MFIs significant role has been played by the Non-Banking Financial Companies, Regional Rural Banks, Commercial Banks, Co-operative societies etc.

Microfinance sector has become imperative sector. It was initially started with micro investments, micro saving then it was engaged in micro credit. Now they transformed into micro enterprises. This continuous progression has created a chance to the rural people to develop and achieve reasonable monetary, societal and educational empowerment. Thus, it has helped them in moving toward improved standard of living and quality of their life.

### **Role of Microfinance:-**

The latest research of World Bank highlights that, India is a country with almost one third of the world's poor. Central government and state governments are taking efforts for poverty alleviation. Many programs are currently active in various regions of India. Along with them the microfinance is also contributing through their work towards financial inclusion. In the past few decades it has actually provided money to the unnoticed communities and thereby helped to get rid of poverty. Government Reports be evidence for the progress of the people who have taken advantage of micro credit facility and have been able to enhance their earnings and hence the standard of living.

Through 'Pradhan Mantri Jan-Dhan Yojna' the government is taking efforts to attract more and more public for opening their saving accounts with zero balance, total 21.61 crores account opened till date i.e. 21<sup>st</sup> Sept., 2016. This indicate that yet major portion of the Indian population still don't have their savings account in banks and thus unable to avail all banking services. Underprivileged communities also require monetary services to accomplish their wants like spending, construction of property and security against future uncertainty. Microfinance institutions serve as an addition to banks and in some sense a superior because along with providing credit they also offer other financial services like savings, insurance and non-financial services like personal counseling provide guidance and support to start small business etc. The borrower gets all mentioned services at their door step and many time the MFI design repayment schedule in such a way which borrower find convenient. But important drawback lies with these institutions that all services & facilities come at high cost. The interest rates charged by them are higher than commercial banks and vary widely from 10 to 30 percent.

### **Case Study of Bandhan:-**

"Bandhan is about togetherness, we work for inclusive growth" Mr. Chandra Shekhar Ghosh, Managing Director and CEO of Bandhan Bank.

### **Background:-**

With the desire of changing Kolkata's agrarian surroundings, Mr. Chandra Shekhar Ghosh founded— Bandhan, India's largest tiny loans giver.

Mr. Chandra Shekhar Ghosh founded Bandhan Financial Services Limited (BFSL) in the year 2001. This micro finance institution is involved in providing loans to small customers, those who have no or less way in to official banking services. From past 15 years, BFSL is funding for small business entrepreneurs and women borrowers. Thus, it has earned trustworthiness and many great compliments for their contribution for the development of the community who are unnoticed by the formal banking system.

The organization has a network of 2,022 branches spread across 22 Indian states and Union territories, serviced by over 15,000 employees.

### **Management:-**

Dr. Ashok Lahiri is the Chairman of Bandhan Bank. And Chandra Shekhar Ghosh is acting as the managing director and chief executive officer of the bank.

### **Interest Rates (August, 2015):-**

- The interest rate for the savings bank account has been fixed at 4.5% for a balance of up to Rs. 1 lakh and 5% for balance above Rs. 1 lakh

- The interest rate for term deposit has been fixed at 8.5% for 1-3 years. It will also give additional benefits of 0.5% extra interest to senior citizens.

### **Its Progress & Transformation:-**

Bandhan has its headquarter at Kolkata; it is the first bank to be set up in eastern part of India after Independence. Bandhan bank's two-third branches and three fourth of its loans are in West Bengal, Assam and Bihar. It had a gross loan portfolio of about Rs 5,700 crore as of March 2014 though it functions in under-banked regions of India.

Bandhan received the in-principle approval of the Reserve Bank of India (RBI) for setting up a universal bank in April 2014. Then Bandhan Bank Limited was incorporated on 23rd December 2014 as a wholly-owned subsidiary of Bandhan Financial Holdings Limited. In June 2015, the banking regulator gave its final permission. Bandhan Financial Holdings is owned by Bandhan Financial Services Limited (BFSL), the largest micro finance organization in India.

As per the RBI licensing norm, capital limit to start a new bank is Rs. 500 crore. But the Bandhan Bank started with a capital base of Rs. 2,570 crore. As on 31 March, 2015, Bandhan Financial Services Limited had provided loan of about Rs. 9,524 crore and the repayment rate is over 99%.

The BFSL 2,022 branches have transformed into door step service centers for Bandhan Bank. The Bandhan bank has thus started with 501 branches and 50 ATMs on day one. Now the total staff strength of the bank is around 19,500. The bank had made net profit of Rs. 275 crore during eight months period i.e. August 2015 to March 2016.

Bandhan Bank expects to propose its outstanding banking products and services to all different sectors of the society. Though it is a bank for all, yet they want to continue their focus on providing funds to meet the financial requirements of community who are ignored by the formal banking system. Also they expect to extend their services by focusing more on generating better education, wellbeing and self-employment opportunities to the poorer sections of the society.

The management of the Bandhan bank now desires to expand the loan portfolio by increasing lending funds to retail business and Micro and Small Medium Enterprises.

### **Investors:-**

Besides its founder, Chandra Shekhar Ghosh, Singapore Sovereign Wealth Fund GIC, World Bank's International Finance Corporation (IFC), North Eastern Financial Inclusion Trust, Bandhan Employees Welfare Trust and Small Industries Development Bank of India (SIDBI) are the main investors of the bank.

### **Conclusion:-**

Micro finance institutions are basically established with the objective of providing financial facilities to the needy and weaker sections of the society. They helped the government to get rid of poverty and achieve economic development of the country.

The banking sector gives the impression to get a new competitor and a boost in the economy in India. After 11 years, India has got a new private bank – Bandhan Bank. The bank is a full-blown commercial bank that came into being recently. Bandhan is also the first microfinance company in India that has been transformed into a bank. It got a banking licence from the Reserve Bank of India in 2014. The bank is set up to cater to the needs of the unorganized sector such as daily wage earners and women running small business. The bank focuses on Eastern India as banking penetration is still poor in the region but at the same time want to expand their loan portfolio by increasing lending funds to retail business and Micro and Small Medium Enterprises. In future, it expects to offer saving, insurance and remittance services to the needy people of the society.

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### RESEARCH ARTICLE

#### REVIEW ON BIOMETRICS TECHNOLOGIES.

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#### Abstract

This paper presents the introduction of Biometric and multimodal biometric system. Then this paper addresses various advantages and applications of Biometric system. It also discusses about various existing algorithm for image processing and voice recognition.

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#### Introduction:-

Security system can be used for Identity, Security and Time & Attendance. These systems can be used for all of your sites to accurately record time & attendance of all of your workers/solders including Home, Office and border.

Why do we use face and voice recognition?

1. Universal: Everyone has a face and voice, everyone can enroll.
2. Non-intrusive: A contact is not needed for verification process.
3. Incredibly Fast: Verification takes approximately 5 seconds.
4. Accurate: Better than humans at verifying identity, and able to work 24 hours a day.
5. Dependable: Successfully deployed in challenging real – life environments, overcoming usual biometric obstacles such as dust, dirt, grease, variable lighting and user co-operation.

#### Biometric system:-

Biometric consists of methods for uniquely recognizing humans based upon one or more intrinsic physical or behavioral traits. A biometric system is operates by acquiring biometric data from an individual. We are extracting a feature set from the acquired data, and comparing this feature set against the template set in the database. Depending on the application context, a biometric system may operate either in verification mode or identification mode. In the verification mode, the system validates a person's identity by comparing the captured biometric data with her own biometric template(s) stored system database. In the identification mode, the system recognizes an individual by searching the templates of all the users in the database for a match. Biometric system have now been deployed in various commercial, civilian and forensic applications as a means of establishing identity. These systems rely on the evidence of fingerprints, hand geometry, iris, retina, face, hand vein, facial thermo gram, signature, voice, etc. to either validate or determine an identity. (11) Most biometric systems deployed in real-world applications are unimodal, i.e., they rely on the evidence of a single source of information for authentication. These systems have to contend with a variety of problems such as: Noise in sensed data, Intra – class variations etc. (11)

Examples of some of the biometric traits associated with an individual Fig.1.1

- (a) Fingerprint,(b) face,(c) hand geometry,(d) signature,(e) iris and (f) retina

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Some of the limitations imposed by unimodal biometric systems can be overcome by including multiple sources of information for establishing identity. Such systems, known as multimodal biometric systems, are expected to be more reliable due to the presence of multiple, (fairly) independent pieces of evidence. These systems are able to meet the stringent performance requirements imposed by various applications.

#### **Multimodal biometrics:-**

A multimodal biometric system uses multiple applications to capture different type of biometrics. This allows the integration of two or more types of biometric recognition and verification systems in order to meet stringent performance requirements. A multimodal system could be, for instance, a combination of fingerprint verification, face recognition, voice verification and smart-card or any other combination of biometrics. This enhanced structure takes advantage of the proficiency of each individual biometric and can be used to overcome some of the limitations of a single biometric (14).

A multimodal system can combine any number of independent biometrics and overcome some of the limitations presented by using just one biometric as your verification tool. Multimodal are generally much more vital to fraudulent technologies, because it is more difficult to forge multiple biometric characteristics than to forge a single biometric characteristics. Multimodal biometric systems provide anti-spoofing measures by making it difficult for an intruder to simultaneously spoof the multiple biometric traits of a legitimate user. By asking the user to present a random subset of biometric traits (e.g., right index and right middle fingers, in that order), the system ensures that a “live” user is indeed present at the point of data acquisition. Thus, a challenge-response type of authentication can be facilitated using multimodal biometric systems.

#### **Modes of Operation:-**

A multimodal biometric system can operate in one of three different modes: serial mode, parallel mode, or hierarchical mode. In the serial mode of operation, the output of one biometric trait is typically used to narrow down the number of possible identities before the next trait is used. This serves as an indexing scheme in an identification system. For example, a multimodal biometric system using face and fingerprints could first employ face information to retrieve the top few matches, and then use fingerprint information to converge onto a single identity. This is in contrast to a parallel mode of operation where information from multiple traits is used simultaneously to perform recognition. This difference is crucial. In the cascade operational mode, the various biometric characteristics do not have to be acquired simultaneously. Further, a decision could be arrived at without acquiring all the traits. (14)

#### **Applications of biometric systems:-**

The applications of biometrics can be divided into the following three main groups:

Government applications such as national ID card, correctional facility, driver’s license, social security, welfare – disbursement, border control, passport control, etc.

Forensic applications such as corpse identification, criminal investigation, terrorist, identification, parenthood determination, missing children, etc. (14)

#### **Still-image versus video:-**

In the literature, two main forms of face recognition exist: Still image based face recognition and video face recognition. Still image face recognition relies on classifying an individual based on a single image obtained from a still shot camera. Conversely, video based face recognition relies on a sequence of frames to extract more information about the face of a subject.

An inherent advantage of using still-image-based face recognition over video based systems is that the images are of higher resolution. As a result, current face recognition algorithms are able to recognize a face more accurately. Further to this, still image based recognition is useful in controlled environments where pose and illumination are relatively fixed. One example of such an environment is while taking subjects photograph at the airport check in (8). The disadvantages of still-image-based face recognition occur when such a controlled environment is not easily attainable. An example of this scenario would be a security camera used to identify a subject in a public place. In this case, video-based recognition yields better results.

The clear advantage of video-based face recognition occurs in situations where the image resolution is low and the video feed is continuous. Video-based algorithms capitalize on both spatial and temporal variations in a subjects face.

Nevertheless, natural disadvantage is the low resolution of the images being captured (10). Since an individual might be located at a distance, the pixels that represent this individual's face might not constitute a sufficient information base for the algorithm to operate correctly. Hence, the need for the two different approaches occurs in different situations.

#### **Algorithms for face Recognition:-**

##### **Principle component analysis:-**

PCA is an algorithm developed by Turk and Pentland that treats face recognition as a two dimensional recognition problem(1). The correctness of this algorithm relies on the fact that the faces are uniform in posture and illumination. PCA can handle minor variations in these two factors, but performance is maximized if such variations are limited. The algorithm basically involves projecting a face onto a face space, which captures the maximum variation among faces in a mathematical form. During the training phase, each face image is represented as a column vector, with each entry corresponding to an image pixel. These image vectors then normalized with respect to the average face. Next, the algorithm finds the eigenvectors of the covariance matrix of normalized faces by using a speed up technique that reduces the number of multiplications to be performed. This eigenvector matrix is then multiplied by each of the face vectors to obtain their corresponding face space projections. Lastly, the recognition threshold is computed by using the maximum distance between any two face projections (8). In the recognition phase, a subject face is normalized with respect to the average face and then projected onto face space using the eigenvector matrix. Next, the Euclidean distance is computed between this projection and all known projections. The minimum value of these comparisons is selected and compared with the threshold calculated during the training phase. Based on this, if the value is greater than the threshold, the face is new. Otherwise, it is a known face (8)

##### **Linear Discriminant Analysis (LDA):-**

Another popular algorithm used in face recognition is LDA. Although this algorithm was initially developed for data classification, it has been adapted to face recognition. Whereas PCA focuses on finding the maximum variation within a pool of images. LDA distinguishes between the differences within an individual and those among individuals. That is, the face space created in LDA gives higher weight to the variations between individuals than those of the same individual. As a result, LDA is less sensitive to lighting, pose, and expression variations (22). The drawback is that this algorithm is significantly more complicated than PCA. As an input, LDA takes in a set of faces with multiple images for each individual. These images are labeled and divided into within-classes. The former captures variations within the image of the same individual while the latter captures variations among classes of individuals. LDA thus calculates the within-class scatter matrix and the between-class scatter matrix, defined by two respective mathematical formulas. Next, the optimal projection is chosen such that it "maximizes" the ratio of the determinant of the between-class scatter matrix of the projected samples to the determinant of the within-class scatter matrix of the projected samples"(7). This ensures that the between-class variations are assigned higher weight than the within-class variations. To prevent the within-class scatter matrix from being singular, PCA is usually applied to initial image set. Finally, a well known mathematical formula is used to determine the class to which the target face belongs. Since we have reduced the weight of inter-class variation, the result will be relatively insensitive to variations.

##### **Independent component analysis (ICA):-**

ICA is the third mathematically-based algorithm for face recognition. Whereas PCA depends on the "pair wise relationships between pixels in the image database," ICA strives to exploit "higher-order relationships among pixels." (8) That is, PCA can only represent second-order inter-pixel relationships, or relationships that capture the amplitude spectrum of an image but not its phase spectrum. On the other hand, ICA algorithms use higher order relationships between the pixels and are capable of capturing the phase spectrum. Indeed, it is the phase spectrum that contains information which humans use to identify faces (3). The ICA implementation of face recognition relies on the infomax algorithm and represents the input as an n-dimensional random vector. This random vector is then reduced using PCA, without losing the higher order statistics. Then, the ICA algorithm finds the covariance matrix of the result and obtains its factorized form. Finally, whitening, rotation, and normalization are performed to obtain the independent components that constitute the face space of the individuals. Since the higher order relationships between pixels are used, ICA is robust in the presence of noise. Thus, recognition is less sensitive to "lighting conditions, changes in hair, make-up, and facial expression"(4).



**Neural networks:-**

Unlike the above three algorithms, the neural networks algorithm for face recognition is biologically inspired and based on the functionality of neurons. The perceptron is the neural network equivalent of a neuron. Just like a neuron sums the strengths of all its electric inputs, a perceptron performs a weighted sum on its numerical inputs. Using these perceptions as a basic unit, a neural network is formed for each person in the database. The neural network usually consists of three or more layers (8). An input layer takes in a dimensionally reduced (using PCA) image from the database. An output layer produces a numerical value between 1 and -1. In between these two layers, there usually exist one or more hidden layers. For the purposes of face recognition, one hidden layer usually provides a good balance between complexity and accuracy. Including more than one such layer exponentially increases the training time, while not including any results in poor recognition rates. Once the neural network is formed for each person, it must be trained to recognize that person. The most common training method is the back propagation algorithm (8). This algorithm sets the weights of the connections between neurons such that the neural networks exhibits high activity for inputs that belong to the person its represents and low activity for others. During the recognition phase, a reduced image is placed at the input of each of these networks, and the network with the highest numerical output would represent the correct match. The main problem with neural networks is that there is no clear method to find the initial network topologies. Since training takes a long time, experimenting with such topologies become a difficult task (8). Another issue that arises when neural network are used for face recognition is that of online training. Unlike PCA, where an individual may be added by computing a projection, a neural network must be trained to recognize an individual. This is a time consuming task not well suited for real – time applications.

**Genetic algorithms:-**

Another biologically inspired algorithm that is commonly used for face recognition is the Genetic Algorithm (GA). While neural networks mimic the function of a neuron, genetic algorithms mimic the function of chromosomes. Like neural networks, genetic algorithms are only well suited for the recognition of a limited number of individuals and are generally not too scalable. To start with, the images are divided into two classes: those that belong to the target person and those that belongs to other people. Each of these images is transformed into a binary coded truth table. Within each of the above mentioned classes, the image 13 are further subdivided into F-tables and T-tables, where each image occupies a row in the table. Initially, the rows in F-tables and T-tables do not match. However, by gradually changing some of the F-table value to don't –cares, some rows end up matching with each other. Hence, the F-table obtains the generalization ability. The evolution process ensures that the modified F-table includes as many rows in the T-table as possible. Once evolution is complete, the modifications that the result in the best fitness are chosen for each category (target person and unknown people) and applied to the F-table (15). During the recognition phase, the input image is passed through the tables that correspond to both categories. Two counters keep track of the number of pixel matches in each of the categories and the counter with the highest value classifies the input face as belonging to the corresponding category (15). The obvious drawback of this algorithm is that entire tables have to be created whenever a new individual is to be detected. As in neural networks, the scalability of this algorithm is hindered by the exponential complexity involved when training for multiple target faces.

**Issue with face Recognition:-**

Although face recognition systems have advanced remarkable over the past few years, there still exist some major obstacles that need to be overcome. In general, still image face recognition accuracy fades away as image variations are increased. The main image variations are illumination levels, pose variation, and changes in facial expression. Moreover, the problem of face detection, or the extraction of a face from an image, is a required first step for face recognition. The illumination problem occurs in an uncontrolled environment where “the same face appears different due to a change in lighting” (5). The problem is emphasized when the variations in lighting are greater than the variations between people. One solution to this problem involves preprocessing the images and introducing contrast normalization and compensation. Another approach attempts to reconstruct all possible lighting variations from a selection of training images for each individual. A third method relies on creating a separate linear illumination subspace. This is similar to the space created to capture face variations, except that it captures lighting variations (8). Pose variation also impairs the face recognition process. Pose variation becomes especially pronounced when it is combined with illumination changes. One solution to the pose variation problem involves obtaining images with multiple views of an individual. In this case, multiple process are available during both training and recognition. During the recognition process, each pose is aligned with a similar pose in the database to achieve correct classification. The obvious drawbacks are that multiple views of an individual are not always available. A more popular solution involves using multiple poses during training but only a single pose during recognition. One such implementation creates and Eigen spaces for each pose to achieve pose-invariant recognition

(8). The problem of facial expression variation is also common in the literature. If only one image of an individual is available, recognition accuracy drops considerably. However, if many images are available, algorithms like PCA can absorb these changes. It is important to note that during expression changes, parts of the face remain largely unchanged. As a result, algorithms that segment the face are more robust to these variations (8). Many databases available today contain training images with multiple expressions, and face recognition systems have been capable of making accurate image classifications despite expression variations. Lastly, it is important to discuss face detection in the context of the face recognition problem. The need for face detection arises when one or more faces must be extracted from an image. Furthermore, face detection and extraction is essential to reduce external factors that might hinder the recognition process. One common method of face detection relies on the use of Haar classifiers. These classifiers sweep through the image and apply several filters to detect the presence of a face. Another method, mentioned earlier, relies on skin color to detect a face. As such, face recognition is a growing field with potential applications in security, entertainment, and personal identification. The recognition algorithms can be grouped in to mathematical/statistical (PCA, ICA, LDA) algorithms and biological (NN, GA) algorithms.(22) Many of these algorithms have been implemented by several researchers with high recognition rates and recognition times within the margin of real time applications. However, long training times and the scalability of face recognition has been a recurring concern in all of these implementations. Finally, common face recognition problems include illumination changes, pose variations, and the issue of face detection and extraction.

### **Speech Recognition:-**

Speaker recognition is basically divided in to two-classification: speaker recognition and speaker identification and it is the method of automatically identifying who is speaking on the basis of individual information integrated in speech waves (6). Speaker recognition is widely applicable in use of speaker's voice to verify their identity and control access to services such as banking by telephone, database access services, voice dialing telephone shopping, information services, voice mail, security control for secret information areas, and remote access to computer AT and T and TI with Sprint have started field tests and actual application of speaker recognition technology; many customers are already being used by Sprint's Voice Phone Card (7). Speaker recognition technology is the most potential technology to create new services that will make our everyday lives more secured. Another important application of speaker recognition technology is for forensic purposes. Speaker recognition has been seen an appealing research field for the last decades which still yields a number of unsolved problems.

### **Algorithms for Speech Recognition:-**

There are a lot of approaches to speech recognition. Algorithms like zero crossing, energy, measurement and feature extraction are based on the acoustic-phonetic approach. Algorithms such as template matching come under the pattern recognition approach, while algorithms that depend on knowledge sources, stochasticity of speech signals and neural networks are based on the artificial intelligence approach. However, an important approach to speech recognition is stochastic modeling, in particular stochastic using Hidden Markov Models (25) in conjunction with the Viterbi algorithm. Among these the most popular and accurate algorithm is the template based Dynamic Time Warping (25).

### **Zero-crossing and energy-based speech Recognition:-**

As compared to other approaches, zero-crossing and energy-based recognition systems require far fewer computations and fewer sets of parameters (30). For the purpose of recognition, sets of parameters are obtained from several frames of speech data. Parameters such as average zero-crossing rate, density of zero-crossings within frames, excess threshold duration, standard deviation of the zero-crossing within frames, mean zero-crossing within frames, and energy estimates for each frame have all been used. These parameters are then compared with fixed thresholds to determine the spoken word. For example, the zero crossing rate at the beginning of words starting with strong fricatives is higher than for words starting with weak consonants. This classifies a set of words into two groups and makes the process of recognition easier. A system develop by Chok-ki Chan (20) is based on the parameters such as zero crossing and energy. It is a speaker dependant, isolated Cantonese digit and words, limited vocabulary SR system, developed and implemented on a PC-386, with a recognition accuracy of 97.2%. This system works reasonably well for isolated digits but when tested to isolated words, the accuracy dropped to 76% (920). One more example of such a system is the one developed by Chan Y.T. (29) on an MC68000 microprocessor based system. It was a speaker independent, isolated-word, limited vocabulary SR system. The system when operated in speaker-dependent mode had an accuracy of 87%, but when operated in speaker independent mode, the accuracy dropped down to 78%. The system when developed for a 10 word vocabulary took around 6 minutes (19) to recognize a word but with inclusion of every 3 words in the vocabulary the recognition speed dropped by 40%.

**Feature-dependent speech recognition:-**

Feature-dependent speech systems are based on principles of human speech perception. These systems try to mimic human performance in recognizing speech. Some of the features that are used in such system are: frequency location of the first few formants, the maximum and minimum frequency of the first few formants, the duration of a periodic energy, formant transitions and the ratio of high frequency energy to low frequency energy. To obtain the above sets of features, parameters such as spectrum, pitch, zero crossings, total energy, energy in low, mid, and high frequency bands are produced using signal processing routines. The decision structure is arrived at by first selecting a set of measures that are likely to provide a clean grouping of letters into a set of classes. A recursive clustering algorithm is used to determine the optimal grouping of letters into clusters until the errors are minimized. An example of such a system is, FEATURE, a speaker independent isolated letter recognition system (21). This system performs recognition on an 80 letter vocabulary generated by 20 different speakers. The recognition accuracy of 85% was obtained across 2 speakers for a speaker-independent mode while an accuracy of 91% was observed when operated in dynamic adaptation mode]. The different algorithms for the system were implemented on a Fast Processor Array, Motorola 68000 microprocessor, and VAXI 1/750.

**Template-based speech Recognition:-**

Template-base speech recognition systems have a database of prototype speech patterns (templates) that define the vocabulary. The generation of this database is performed during the training mode. During recognition, the incoming speech is compared to the templates in the database, and the template that represents the best match is selected. Since the rate of human speech production varies considerably, it is necessary to stress or compress the time axes between the incoming speech and the reference template. This can be done efficiently using Dynamic Time Warping (DTW). In a few algorithms, like Vector Quantization (VQ), it is not necessary to vary the time axis for each word, even if any two words have different utterance length. This is performed by splitting the utterance into several different sections and coding each of the sections separately to generate a template for the word. Each word has its own template, and therefore this method becomes impractical as the vocabulary size is increased (500 words). Itakura of NTT (31) developed an SR system with the concept of TW for non-linear alignment of speech. The system performed a speaker-dependant isolated-word recognition task with a 97% accuracy on a 200-word vocabulary. Performance of this system degraded to 83%), when the vocabulary size was increased to 1000 words. A template-based system for connected speech was implemented by H. Sakoe (17). It was a speaker-dependent connected-digit large vocabulary speech recognition system that had an accuracy of 99.6%. It was implemented on a NEAC-3100 computer, with a memory requirement of 10 Kbytes per word, and had a vocabulary of 600-2500 words depending on the training set (17). This system performed well for speaker-dependent speech recognition, but one of the shortcomings of the system was that it took more than 150 minutes (25) to recognize a word with a vocabulary size of 600. For the same set of space. This represents a 130:1 reduction for the VQ recognizer would require around 250 Kbytes to 1.2 Mbytes of memory space. This represents a 130:1 reduction for the VQ recognizer over the DTW model. In some cases of template matching, no time alignment is needed to perform the recognition, as in the case of the system developed by J.E. Shore et.al. (21). It was a speaker independent, isolated word, limited vocabulary SR system, implemented using a VQ approach. It had an accuracy of 98% for speaker dependent recognition while for speaker independent recognition the accuracy reduced to 85%. The system was implemented on a DEC VAXI 1/750 with floating point accelerator. Template generation required 20-22 minutes, while classification of a single utterance with these templates took about 1-1.5 minutes.

**Knowledge –based speech Recognition:-**

Knowledge-based speech recognition systems incorporate expert knowledge that is, for example, derived from spectrograms, linguistic, or phonetics. The goal of a knowledge-based system is to include the knowledge using rules or procedures. The drawback of these systems is the difficulty of quantifying expert knowledge and integrating the multitude of knowledge sources (16). This becomes increasingly difficult if the speech is continuous, and the vocabulary size increases (16). A good example of a knowledge-based system is HEARSAY, developed on a PDP-11 microcomputer, at Carnegie-Mellon University. It was a speaker-dependent continuous-speech recognition system with a vocabulary of 1011 words. Using a very restrictive syntax (perplexity 4.5), it achieved a recognition accuracy of 87% (32). It took 13 hours to compile the algorithm developed for HEARSAY. Fifty knowledge sources were used to develop this system and the amount of storage required for each one was about 80 Kbytes. Comparing this storage requirement with that needed for the Vector Quantization algorithm shows a reduction (22) of the order of 30 or more. This would mean far less memory storage would be required for codebooks generated by VQ approach than by the knowledge sources in the above approach.

**Stochastic speech Recognition Systems:-**

Speech recognition based on stochastic modeling is another approach for Speech Recognition systems. Probabilistic models of speech are used in this approach to deal with incomplete information or uncertainty. The most widely used model is the Hidden Markov model (HMM) (11). The HMM uses states that model generic speech sounds and transitions between states with associated transition probabilities to model the temporal behavior of speech. This model assumes that speech was produced by a hidden markov process. To derive the transition probabilities, an efficient estimate-maximize algorithm, the forward backward algorithm, is often used (33). Though the HMM approach can give substantially accurate results, if the time factor is taken into consideration, then algorithms based on template matching using Vector Quantization or DTW prove to be much faster than the ones based on HMM (11). An example of a system based on the HMM approach is the one developed by Rabiner et al. at Bell Labs (12). The system used the techniques of Vector Quantization in conjunction with HMM in a speaker independent, isolated-word recognition system. It achieved an accuracy of 96.3% word accuracy for a 10 digit vocabulary. The system was implemented on a SUN-workstation. Despite the fact that the system could recognize words from any speaker, the system had a drawback, which was the large amount of time it took to train the system to a given set of words. For the given case, 10 digits took more than 15 hours to train the system (12). Another example of a system based on HMM and statistical methods (14) is SRI's DECYPHER system, which has a 1000 word vocabulary, is speaker independent, accepts connected speech input, and has a recognition accuracy of 95.6%. Since DECYPHER is a connected speech recognition system, the recognition algorithm involves more computation than a discrete recognition system (by a factor of 3 (23)), and real time performances is more difficult to achieve. In this system, a statistical bigram grammar is used that reduces perplexity to 60 (without grammar, any word can follow a given word). Using this grammar, the recognition accuracy for DECYPHER improves from 75.5% (no grammar) to 95.6%. This system was implemented on a microcomputer and required more than 16 Mbytes of workspace to perform calculations (14).

**Connectionist speech recognition systems:-**

Connectionist speech recognition is based on artificial neural networks that use learning strategies to organize and optimize a network of processing elements (neurons). These networks are used as classifiers or mapping functions to recognize the incoming speech. Thus the speech knowledge or constraints used for speech recognition are distributed among many, but simple processing elements (13). The concepts and ideas of applying neural networks to speech recognition are relatively new, and researchers are investigating a number of approaches. An example of connectionist system developed for keyword spotting (23) is the one implemented using a time-delay neural network (22). This speech recognition system, implemented on a PC-486, was compared to an HMM recognizer in the task to recognize the phones "B", "D", "G" out of a database of 5240 Japanese words. For different speakers, the HMM had a recognition accuracy of 90.9% to 97.2%, while the neural net achieved an accuracy of 97.5% - 99.1% (24). One of the advantages of neural network based speech recognition systems is that they can achieve the capability of handling a really large vocabulary (24). One of the disadvantages of the system, which is the same as that of an HMM-based system, is that a large time may be required for training the system.

**Speech Recognition using c#:-**

Speech recognition in C# we use Microsoft speech SDK tool. The tools use to speech enable would be the speech SDK 5.1. Speech SDK 5.1 is the latest release in the speech product line from Microsoft. Microsoft speech SDK is one of the many tools that enable a developer to add speech capability into applications. Speech SDK can be used in either C#, C++, VB or any COM compliant language. Speech recognition can be of two types based on the grammar that the recognition is based on. (Grammar is in other words the list of possible recognition outputs that can be generated.) An application can limit the possible combination of the words spoken by choosing proper grammar. In a command and control scenario a developer provides a limited set of possible word combinations, and the speech recognition engine matches the words spoken by the user to the limited list. In command and control the accuracy of recognition is very high. It is always better for applications to implement command and control as the higher accuracy of recognition makes the application respond better. In Dictation mode the recognition engine compares the input speech to the whole list of the dictionary words. For the dictation mode to have a high accuracy of recognition is it important that the user has prior trained the recognition engine by speaking in to it. The training or creating of a profile can be done by using the speech properties in the control panel.

**Hardware/software co design methodology:-**

G.F. Zaki, R.A. Girgis, W.W. Moussa and W.R. Gabran proposed that an embedded face recognition / verification systems has been implemented on an FPGA. Its small size allows us to apply these systems wide range of applications. The system is based on FPGA which offers high configurability in the design phase. The hardware/software co design methodology was used which enabled optimizing the system to meet different design constraints including size, cost, and power dissipation. A number of DSP algorithms were used or created to detect the face from a background, enhance the image and recognize the person. The principal component analysis algorithm was used for feature extraction (5).

Che Ming, Chang Yisong proposed that the implementations of a face detection algorithm on FPGA for eye mouse control system. An improved algorithm of skin color module and binary image projection is used to ensure real-time detection. The system is based on a hardware/software co-design, which consist of a dedicated hardware accelerator that solves the parts of the algorithm with higher computational cost and an embedded microprocessor that manages the control process and executes the rest of the algorithm. Several optimization methods have been accomplished to enhance performance. The system has been implemented on an Altera Cyclone 2 FPGA using a Nios embedded soft-core processor and it is benchmarked against a soft ware implementation.

**Objective:-****Aims and objectives of this dissertation work are summarized as follow:**

1. We have implemented a security system that based on both hardware and software along with wireless connectivity.
2. It's based on face and voice biometrics for recognition.
3. Soul of the system is based on PCA algorithm for face recognition and for voice recognition using Vb.net.
4. This security system based on microcontroller to reduce the cost and complexity of the system.
5. Comparing the result with FPGA based system.

**Conclusion:-**

This paper described the introduction of Biometric and multimodal biometric system their mode of operation, advantages and applications of Biometric system. The future, we will discuss about various existing algorithm for image processing and voice recognition. The last section of chapter presents the aim and objective of the dissertation work.



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### RESEARCH ARTICLE

#### WEIGHT REGAIN AFTER SLEEVE GASTRECTOMY

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Gastric size, sleeve, surgery

#### Abstract

**Background:** Gastric size determines the amount of dietary intake which in turn determines energy intake. Body weight loss depends on negative energy balance.

**Objectives:** The primary purpose of the present study was to assess body weight loss for 36 months in patients who underwent gastric sleeve surgery. A secondary purpose was to examine the impact of gender and age on weight changes before and after surgery.

**Methods:** A total of 309 patients were enrolled sequentially. Age, body weight, gender, BMI, and comorbidity were assessed before and after gastric sleeve surgery for 36 months.

**Results:** Results showed that body weight before and after surgery was influenced by both age category and gender. It was also noted that the rate of body weight reduction was faster during the 1<sup>st</sup> 12 months compared to the 2<sup>nd</sup> 12 months.

**Conclusions:** Based on the results of the present study, it can be concluded that prior and post gastric sleeve surgery body weight is influenced by age and gender. The rate of weight reduction after gastric sleeve surgery is faster during the first 12 months, compared to the second 12 months. Gastric sleeve affected body loss and that can be considered as effective treatment for obesity and obesity related diseases.

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#### Introduction:-

Sleeve gastrectomy is a surgical procedure that is performed in overweight individuals in which vertical segmentation of stomach is performed in order to reduce the stomach's surface area so that it greatly helps to modify BMI of an individual. Obesity is related to different morbid metabolic conditions hence sleeve gastrectomy provides an efficient way of reducing mortality in morbidly obese patients. It is performed through open and laparoscopic approach, laparoscopic being the modern way is more reliable. After surgery it depends on the person that how he couples up with his changing body requirement and eating habits. Once the surgery is performed dietary requirement is reduced to a great extent but bouts of binge eating may stretch the stomach musculature and cause weight regain that may lead to an alarming situation for the person who underwent sleeve gastrectomy once. In certain conditions re sleeve gastrectomy is to be performed keeping in view the weight regain due to unavoidable eating habits. Different researches have been done in different geographical areas of the world and study population includes individuals from both the genders so that results may be applied to general population undergoing sleeve

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gastrectomy. Based on physiology of human body stomach is made up of rugae, these are muscle layers which increases the surface area of stomach and as the person eats it causes a stretch response in the stomach's musculature and it causes an increase in the stomach's size which is reflected as a protruded abdomen. This protruded abdomen significantly depicts weight gain and this is a leading problem to other physiologic and metabolic disorders. Sleeve gastrectomy provides a way to prevent obesity by decreasing the capability of stomach to make room for food and thus decreasing or more appropriately limiting the food absorption. As a result of multiple surgeries multiple cases came forth. Some reported weight regain and some weight loss. All depends upon individual's dietary consumption and metabolic body requirements.

### Literature Review:-

Obesity is one of the high risk factor for many other morbidities and with the modern era of industrialization, obesity is expected to increase and the number of the people affected is raising with every passing day thus exposing the obese population to a compromised quality of well-being and health. Super obese patients are those who have a BMI greater than 50kg/m<sup>2</sup>. They are at a greater risk to develop hypertension, diabetes, arthritis, sleep apnea and pulmonary dysfunction as compared to people with BMI less than 50kg/m<sup>2</sup>. Obesity has led many people to develop inferiority complexes and psychological problems (Almogly et al., 2004). Sleeve gastrectomy is one of the surgical procedures performed in obese patients as an approach to limit the gain in weight. It is an effective method with little risk of post-surgical complications (Benaiges et al., 2015). Although sleeve gastrectomy is an affective procedure but it has been observed and reported in some studies that it's affects are short term and patients having a BMI greater than 60kg/m<sup>2</sup> have been reported a failure in maintaining a long term weight loss and weight regain has been the most common complication reported so far in many such cases (Regan et al., 2003). Sleeve gastrectomy cannot be considered as the only best surgical procedure for the weight reduction rather several approaches should be collectively employed for better and long term results. Roux-Y gastric bypass is another technique and a combination of both these surgical procedures may be employed to reduce comorbidities and reduce the risk of relapse and weight regain (Yang et al., 2008). Sleeve gastrectomy as compared to all other surgical methods that have been used to reduce the morbidity and obesity by far is the most favorite procedure for the surgeons because it is comparatively less invasive and has a shorter operating time. The risk of post-surgical complications is also less as compared to other methods but the only limitation is the relapse and recurrence because in this technique a part of the stomach is removed and an anastomoses is created with the duodenum thus the volume of the stomach is decreased but weight regain after sleeve gastrectomy is associated with widening or enlargement of the sleeve after surgery with increased capacity of the gastric tube (Weiner et al., 2007). Post- bariatric surgical procedure there is a lifelong threat of being obese again that persists throughout. Eating habits and behavior modulation also plays its role for the solution. Feeling hungry all the time when one urges for food that has high caloric value and low dietary fiber is also one of the problems that led to regain after surgery (Odom et al., 2010). Thus laparoscopic sleeve gastrectomy can be performed as a primary procedure if the aim is to get rid of excessive weight with the least post operating risks (Brethauer et al., 2009). Laparoscopy that has allowed the surgeon to insert a micro camera and made the surgical procedure easy for the surgeon, less invasive for the patient and every fine detail can be visualized through laparoscopy. Laparoscopic sleeve gastrectomy is also being used rather it has revolutionized the procedure and has further served to decrease the risk of per-operating complications and risks. Minor procedural errors can also be reduced and high level of precision can be achieved through laparoscopic surgical procedures (Rubin et al., 2008). Advantages of laparoscopic sleeve gastrectomy also include marked decreases in plasma ghrelin levels, Ghrelin is a growth hormone and is controlled by hypothalamus (Kojima et al., 1999). It is also an important factor for weight loss but the decrease is seen for the initial 6 months after which a stability in the level of ghrelin has been observed thus leading to no further weight loss. Behavior modulation and dietary habits at this stage should be monitored with great care otherwise a weight regain may be seen (Langer et al., 2005). Laparoscopic sleeve gastrectomy is being widely used for treating morbid weight gain. This method advocates lesser restrictions on dietary intake following surgery. Since no prosthetic or foreign materials have been implanted in this surgery so post-operation risk of complications is also greatly reduced which in turn renders this to be a superior method among the others for the treatment of morbid obesity. The only limitation that goes against this bariatric procedure is that it is short term and relapse has been reported in many cases (Skrekas et al., 2008). Nature has blessed us with a body that adapts to different physiologic and pathologic stressors quite well. It stretches under the conditions like excessive intake of food. In sleeve gastrectomy anastomosis of stomach and duodenum is made in such a way that stomach attains a very small size, typically it shapes like a banana. This is a logical observation that a stomach of a very small size will not be able to tolerate much food hence it causes weight loss which is a therapeutic surgery in case of morbidly obese patient. On the

contrary post surgically if the patient is non-compliant and eats junk and fatty food weight regain occurs but obviously this is a time taking procedure and does take a comparatively larger time than usual.

Its other name is roux en Y by pass. By pass means creating an alternative channel. There are specific pre requisites of this surgery to assure the desired results which are not the highlights of the topic under study but yes they do affect the outcome of the procedure under discussion (Kojima et al., 1999).

Indicators of noteworthy postoperative weight recover after bariatric surgery incorporate markers of pattern expanded nourishment inclinations, diminished prosperity, and worries over addictive practices. Postoperative self-checking practices are emphatically connected with opportunity from recapture. These information propose that weight recover can be expected, to a limited extent, amid the preoperative assessment and conceivably lessened with self-observing procedures after RYGB (Odom et al., 2010). Sleeve gastrectomy (SG) is getting noticeable quality around the globe as a bariatric technique both as a first-organize system in high-risk or super fat patients and as a fundamental operation. The potential purposes of enthusiasm of the SG are that it presents provoke control of caloric confirmation, does not require course of action of an outside body or require modifications, and can all around be performed in less time than required for avoid frameworks. The possible downsides of the SG consolidate the irreversibility, extended specialist peril differentiated and other restrictive frameworks, and unproved quality. The explanation behind the present efficient review was to evaluate the current evidence as for weight lessening, trouble rates, postoperative mortality, and co-terribleness a great many SG (Benaiges et al., 2015). Sleeve gastrectomy can be performed safely with commendable entrapment rates and awesome weight decrease. The rate excess weight decrease reported from this course of action of up to 66% at 3 years is engaging. We think about our audit quantifiable limitations as already recorded and the, 'as of recently, minimal patient numbers in the more amplified term. Reasonable examinations will continue with reference to what is the perfect bariatric strategy. Possibly a more supportive open thought could be on the assurance criteria for different sorts of bariatric method with respect to the individual patient's goals, conditions moreover, needs.

#### Statistical Analysis:-

Data were analyzed by using Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA). Continuous variables were expressed as mean  $\pm$  standard deviation and categorical variables were expressed as percentages. The t-test was used for continuous variables and chi square test was used for categorical variables. Changes were assessed at different study phases compared to baseline levels using adjusted analysis for pairwise comparisons using benferroni correction of repeated measures ANOVA. A p-value  $<0.05$  was considered statistically significant.

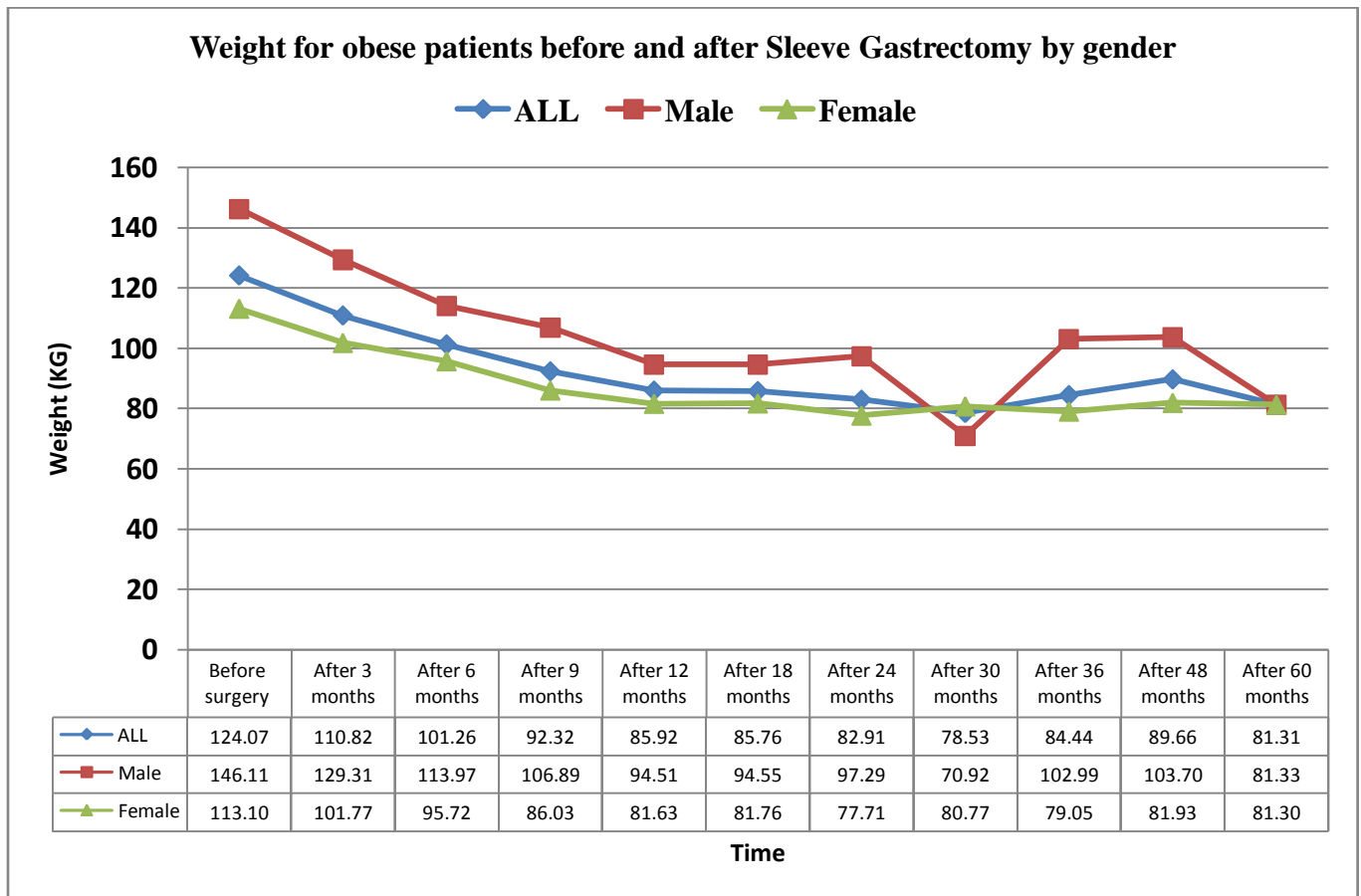
**Table 1:-** Baseline characteristics of the studied sample

	All 306		Male 100(32.68%)		Female 206(67.32%)		p value
	Mean(SD)		Mean(SD)		Mean(SD)		
Age	33.00	(10.86)	31.00	(11.00)	33.97	(10.69)	0.025
Age <25 (%)	92.00	(30.07)	40.00	(40.00)	52.00	(25.24)	
Age 25-34(%)	84.00	(27.45)	28.00	(28.00)	56.00	(27.18)	
Age 35-44(%)	79.00	(25.82)	18.00	(18.00)	61.00	(29.61)	
Age $\geq$ 45 (%)	51.00	(16.67)	14.00	(14.00)	37.00	(17.96)	
Weight	124.07	(27.27)	146.11	(31.13)	113.10	(16.51)	<0.001
BMI	46.49	(8.46)	49.77	(10.85)	44.80	(6.32)	<0.001
Comorbidities (%)							
HTN (%)	28.00	(9.15)	11.00	(11.00)	17.00	(8.25)	0.434
DM (%)	32.00	(10.46)	14.00	(14.00)	18.00	(8.74)	0.158
Dyslipidemia (%)	10.00	(3.27)	4.00	(4.00)	6.00	(2.91)	0.616
Other (%)	64.00	(63.67)	15.00	(15.00)	49.00	(23.79)	0.076



**Table 2:-** Long-term Results of Sleeve Gastrectomy for Obesity by gender

Weight	all		Male		Female		p value
	Mean(SD)	(SD)	Mean(SD)	(SD)	Mean(SD)	(SD)	
Before surgery	124.07	(27.27)	146.11	(31.13)	113.10	(16.51)	<.001
After 3 months	110.82	(26.07)	129.31	(30.42)	101.77	(17.72)	<0.001
After 6 months	101.26	(21.15)	113.97	(27.26)	95.72	(14.97)	0.001
After 9 months	92.32	(24.10)	106.89	(34.09)	86.03	(14.66)	0.011
After 12 months	85.92	(20.89)	94.51	(28.76)	81.63	(14.03)	0.039
After 18 months	85.76	(22.86)	94.55	(32.76)	81.76	(15.29)	0.067
After 24 months	82.91	(21.22)	97.29	(30.56)	77.71	(13.71)	0.02
After 30 months	78.53	(15.96)	70.92	(13.44)	80.77	(16.12)	0.086
After 36 months	84.44	(21.20)	102.99	(20.97)	79.05	(18.27)	0.002
After 48 months	89.66	(28.54)	103.70	(32.90)	81.93	(23.22)	0.04
After 60 months	81.31	(21.62)	81.33	(8.76)	81.30	(24.26)	0.998



**Figure 1:-** showed that weight loss after gastric sleeve surgery was faster during the first 12 months, and then from the second year the rate of weight reduction decreased until the third year where the patients started to regain weight.

**Table 3:-** Long-term Results of Sleeve Gastrectomy for Obesity by age group

Weight	Age<25 y		Age 25 -34 y		Age 35 -44 y		Age≥45y		p value
	Mean(SD)		Mean(SD)		Mean(SD)		Mean(SD)		
Before surgery	131.17	(31.62)	129.42	(30.28)	114.39	(17.56)	117.25	(19.31)	<0.001
After 3 months	118.20	(29.18)	114.63	(31.83)	102.86	(17.03)	105.76	(17.74)	.003
After 6 months	110.21	(26.90)	98.13	(19.87)	96.59	(15.12)	98.89	(18.15)	.057
After 9 months	101.10	(34.34)	89.11	(16.49)	84.21	(8.62)	89.01	(14.69)	.103
After 12 months	87.89	(27.33)	91.56	(17.34)	79.11	(19.01)	86.14	(12.52)	.309
After 18 months	86.61	(26.80)	90.81	(32.34)	83.16	(13.30)	82.05	(13.05)	.610
After 24 months	83.63	(28.87)	81.33	(14.86)	83.24	(18.36)	82.53	(15.21)	.993
After 30 months	74.53	(12.69)	91.13	(19.16)	72.55	(13.87)	79.93	(12.24)	.022
After 36 months	88.56	(22.70)	79.29	(22.47)	85.05	(23.37)	85.56	(8.91)	.771
After 48 months	91.61	(26.24)	94.32	(38.23)	80.64	(16.89)	89.00	(8.23)	.784
After 60 months	75.31	(13.41)	91.04	(29.22)	72.83	(7.80)	78.98	(20.54)	.352

Table 3 described the Long-term Results of Sleeve Gastrectomy for Obesity by age group and showed that there is no a significant difference in the rate of weight loss among age group all time except before surgery, after 3 months, after 30 months.

### Results:-

The total number of subjects who underwent Sleeve Gastrectomy and included in this study was 306, with a mean age of 33 years old, and females were statistically significant older compared to males. The majority of them were females (67.32%), while males represented only 32.68%. The largest proportion (30.07%) of the participants was in the age group of <25 years old, when looking to male participants only the majority (40.00%) of them were in the age group of <25, while a different finding from female gender was observed where 56.00% of females who underwent sleeve gastrectomy were in the age group of 25-34 years old. The mean weight of the participants before surgery was 124.07, and males had statistically significant higher weight compared to females. The mean Body Mass Index (BMI) for the whole studied sample before surgery was 46.49 kg/m<sup>2</sup>, and males had a statistically significant higher BMI compared to females (49.77 kg/m<sup>2</sup> and 44.80 kg/m<sup>2</sup> respectively). 10.46% of participants had Diabetes Mellitus (DM) as comorbidity, 9.15% had hypertension and 3.27% had Dyslipidemia, all of these three comorbidities were higher in males compared to females but the difference was not statistically significant. (Table 1)

Table 2 showed the Long-term results of Sleeve Gastrectomy for obesity by gender, and it was found that, overall, there was a continuous decrease in body weight with increasing the time after surgery till 30 months. Postoperatively, the mean weight (kg) after 3 months, 6 months, 9 months, 1 year, 18 months, 2 years, and 30 months for all participants was as following: 110.82, 101.26, 92.32, 85.92, 85.76, 82.91, and 78.53 respectively. There was a significant difference in the rate of weight loss between the two genders in all times except after 18 and 30 months. After the third year from surgery, it was noticed that, for overall and male gender specifically, the weight started to increase. Where, it was found that the mean weight was increased by 32.07 kg in males compared to the mean weight in the period of 30 months after surgery. This weight regain continued in the fourth year after surgery. For females, the results were slightly different. The difference in the rate of weight regain was statistically significant between the two genders. Then the overall results showed that the weight started to decrease in the period of six years after surgery, where the mean weight was 81.31 compared to 89.66 in the period after four years. This was also clearly shown in Figure (1) where weight loss after gastric sleeve surgery was faster during the first year, and then from the second year the rate of weight loss decreased until the third year where the subjects started to regain weight.

Table 3 described the Long-term results of Sleeve Gastrectomy for Obesity by age group and showed that there was no statistically significant difference in the rate of weight loss among age groups in all times except the time before surgery, and the time of three and 30 months after surgery.

### Discussion:-

The results of the present study showed that body weight is affected by age and gender. Thus an individual rate of weight loss will depend on factors such as age, gender and the initial weight before surgery. The gender and age differences found in the current study support the findings of several previous studies (Paxton *et al.*, 1994; Rolls *et al.*, 1997; Thompson *et al.*, 1997; Middleman *et al.*, 1998; O'Dea, 1999) (O'Dea,1994; Abraham *et al.*, 2001), that

showed body weight dissatisfaction, weight concerns, attempt to lose or gain weight, attempt to skip meals are more common among females than male. In addition, age also affects body weight, for example during the age of 20 – 30 years old excess weight loss is faster because of minor changes to eating habits and increased activity levels to lose weight (Bosy-Westphal *et al*, 2003). On the contrary, losing weight requires more effort as the individual reaches middle age due to reduction of muscle mass. Although there is no exact mechanism explaining reduction in muscle tissue with age, it seems that wear and tear on the muscles, combined with hormonal changes, may make the body less efficient at replenishing damaged muscle cells (Elia, 1992). Clearly, when muscles cells are diminished, calories expenditure is decreased. However caloric expenditures depend on the metabolic rate. For example during activities metabolic rate is high, hence, the muscles require 60-70% of cardiac output, but at rest the muscles receive only 15% of cardiac output (Linde *et al.*, 1989; McCully KK *et al.*, 1995). At rest, the metabolic organs actually contribute heavily to metabolic rate and use a higher percentage of cardiac output (about 50%). Even bone receives more than 10% cardiac output at rest (Gallagher *et al.*, 1998). Therefore, it is the level and the duration of activities that determine the metabolic rate of muscular metabolic rate. Although representing only about 6% of bodyweight, the metabolic organs contribute much more dramatically to resting energy expenditure than the quantifiably heavier muscle and fat tissue (Elia, 1992). This new concept provides the basis of “specific energy expenditure” which has critical clinical applications, specific to changes in resting energy expenditure induced by diseases such as cancer, metabolic disease and diabetes, muscle dystrophy, heart diseases, lungs diseases, and spinal deformities.

The results of the present study showed that there were no significant differences among gender in terms of the presence of comorbidity for hypertension, diabetes and dislipdemia in both group being studied. Therefore the observed post-surgery changes in body weight might had been influenced by gender independent of the impact of “specific energy expenditure” to some extent.

It was also observed that the rate of post-surgical weight loss was faster during the first 12 months, as compared to the second 12 months period. These findings can be explained based on the structural remodeling of the gastric musculature. These findings were consistent with previously reported findings (Aarts *et al.*, 2011; Benaiges *et al.*, 2012). Clearly the amount of dietary intake induct stretching of the gastric wall which in turn becomes more effective during the second year after more tissue of gastric remodeling had been established. Further similar observations were noted on quarterly basis. The observations of the present study, regarding post-surgical weight loss, were lower than findings reported by others for patients with similar pre surgery BMI (Brethauer *et al.*, 2009). However the observed post-surgical weight reduction of the present study was comparable to the recommended level set by the World Health Organization (WHO,1997).

### **Conclusions:-**

Based on the results of the present study, it can be concluded that prior and post gastric sleeve surgery body weight is influenced by age and gender. As observed (not carefully statistically analyzed), the rate of weight reduction after gastric sleeve surgery is faster during the first 12 months, compared to the second 12 months. As observed, (not carefully statically analyzed) gastric sleeve affected body loss and that can be considered as effective treatment for obesity and obesity related diseases.

### **Limitations:-**

The present study is limited by some patients who did not complete all examinations after surgery and second, patients who did not report their dietary intake and that might had influenced actual energy intake.

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### RESEARCH ARTICLE

#### VAGINAL MALIGNANT MELANOMA IN TREATED PATIENT OF CARCINOMA CERVIX- AN UNUSUAL CLINICAL ENTITY.

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Vaginal malignant melanoma, possibly radiation-induced, rare.

#### Abstract

Vaginal melanoma is a rare gynecological malignancy, with no clearly defined risk factor. It presents mostly in postmenopausal women as a painless lump in lower vagina. Surgical excision with or without adjuvant radiotherapy is the treatment of choice. Despite all treatment modalities, it is characterized by its poor survival outcome. There isn't yet any conclusive evidence on the possibility of radiation induced carcinogenesis.

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#### Introduction:-

Vaginal malignant melanoma (VMM) is a rare entity with an estimated incidence of 0.026/100,000 women per year [1]. It has a very aggressive clinical course with poor survival outcomes [1]. No definite risk factor has yet been identified and prior therapeutic radiotherapy as an etiology is a matter of speculation right now [2]. We describe here a case of VMM which developed 6 years after radical radiotherapy for carcinoma cervix.

#### Case Presentation:-

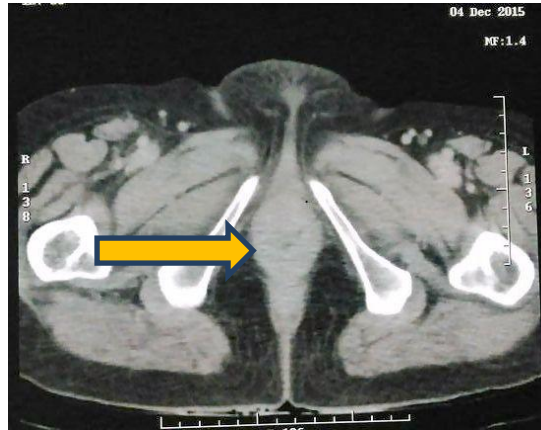
A 66 year post-menopausal female resident of Punjab, P 3+0, was referred to our clinic for cervical brachytherapy in early August 2009. She was a diagnosed case of squamous cell carcinoma of cervix, FIGO stage IIB and had received external beam radiotherapy by Cobalt-60 to a dose of 46Gy in 23 fractions, completed in July, 2009. On local examination, a 2 x 1cm residual was seen at cervix with thickened medial one-third of right parametrium; left parametrium and rectal mucosa were free. We treated her with 35 Gy Low Dose Rate (LDR) equivalents by Medium Dose Rate (MDR) Selectron applicator. Post treatment patient had clinically complete response. Hence, she was kept on periodic follow-up and was asymptomatic till December, 2015 when she developed swelling around her genitalia. Local examination revealed a 3.5 x 2.5 cm ulcerated growth over upper two-thirds of anterior vaginal wall which bled to touch. The cervix was completely flushed with no evidence of any disease recurrence and bilateral parametrium were fibrosed. Contrast enhanced computed tomography (CECT) chest, abdomen and pelvis showed a well-defined heterogeneous mass 3.5 x 3.5 cm involving upper two-thirds of vagina causing circumferential wall thickening [Fig 1]. Three well defined heterogeneously enhancing masses along right external and internal iliac vessels were also seen, suggestive of metastatic lymphadenopathy [Fig 2]. Biopsy of the lesion showed predominantly epitheloid tumor cells with large nuclei, vesicular chromatin, prominent nucleoli and scanty to moderate cytoplasm, arranged in sheets in dermis. The cells were extending to deep dermis. Few tumor cells showed intracytoplasmic

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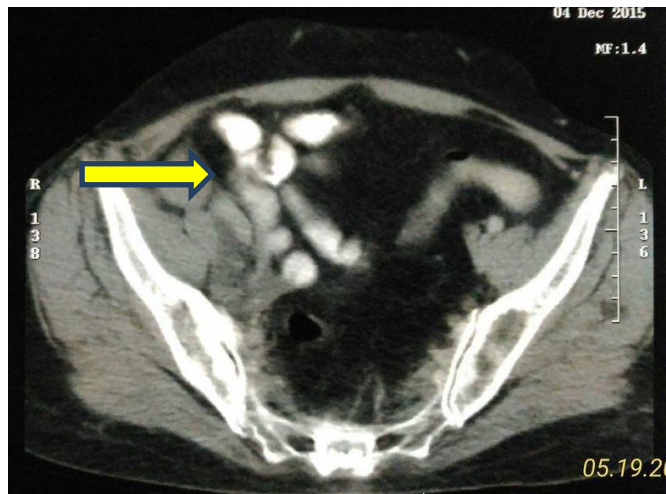
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pigmentation. The tumor cells stained positive for HMB-45 and S-100 while negative for pancytokeratin. A pathological diagnosis of nodular melanoma was reported<sup>[Fig 3]</sup>.

Her general condition was not considered fit for surgery hence palliative radiotherapy (30Gy in 10 fractions) to the primary and inguino-pelvic regions was planned. She tolerated radiotherapy well and vaginal bleeding stopped. Thereafter, she was started on three weekly palliative chemotherapy with cisplatin (30mg/m<sup>2</sup> Day 1-3) and dacarbazine(375mg/m<sup>2</sup> Day 1-3). She completed chemotherapy uneventfully. Her last clinical examination showed a marginal decrease in size of the vaginal mass post treatment.

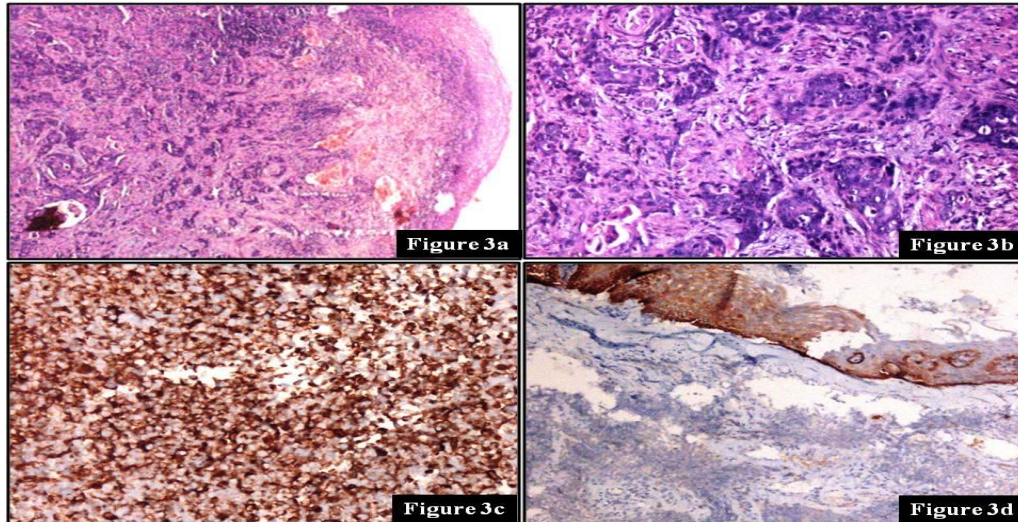


**Fig 1:-**Well-defined heterogeneous mass involving upper two-thirds of vagina.



**Fig 2:-** CECT showing metastatic lymphadenopathy.





**Figure 3a:-** Tumor cells in clusters in the dermis. H&E; 4x **Figure 3b:** Tumor cells are polygonal, moderately pleomorphic with conspicuous nucleoli. H&E; 40x **Figure 3c:** Tumor cells are positive for HMB-45 immunostain; 20x **Figure 3d:** Tumor cells are negative for pan-cytokeratin immunostain while epidermis is positive; 10x.

### Discussion:-

VMM accounts for less than 3% of all vaginal malignancies [1]. They occur mostly in post-menopausal women in their fifth and sixth decades and commonly present with vaginal bleeding and discharge or with lump in the lower third of vagina or its anterior wall [1,3,4]. Macroscopically, VMM are mostly polypoid and ulcerated with a pigmented appearance [3, 5]. The non-pigmented ones look like epithelial tumors of the vagina [3, 5]. The most common histopathological variants of VMM are epitheloid (55%), mixed (28%) and spindle (17%) [3,5]. In our case, the tumor was ulcerated with a pigmented appearance, located in upper two-thirds of vagina and pathologically it belonged to the mixed variant.

Vaginal melanomas are better staged surgically using the AJCC system, which incorporates Breslow and Clark micro staging [6]. Wide local excision (WLE) with negative margins is the standard surgical procedure for VMM [4]. Lymph node dissection is not recommended because of the low rate of lymph nodal metastases in such patients [4]. Hence, sentinel lymph node biopsy has gained popularity [7]. Pelvic exenteration has fallen out of place because of its accompanying morbidity and very modest survival benefit over WLE and adjuvant radiotherapy [4, 8]. Immunotherapy with interferon (IFN) or interleukin-2 (IL-2) has shown survival benefit in VMM, but toxicity of the therapy often excludes its application in elderly patients [9]. Combining immunotherapy with chemotherapy (known as 'biochemotherapy') has shown improved response rates over chemotherapy alone in cutaneous melanomas, but its role in VMM is yet to be proved and its toxicity is a major concern [9]. Our patient was 66 years old and her general condition was not fit for any surgery or immunotherapy. Hence we treated her with palliative radiotherapy to vagina and inguino-pelvic regions followed by palliative chemotherapy with reduced doses of cisplatin and dacarbazine, even knowing the little benefits these cytotoxic agents had in VMM [10].

Regardless of the treatment modality, the prognosis of VMM is very poor with a 5 year survival estimate of only 5-25%, because most of the cases are diagnosed at a late stage [1, 11 and 12]. The rich vascular and lymphatic network is thought to contribute to early tumor spread and metastases [4]. Tumor size less than 3 cm is supposedly the most important prognostic factor for survival, irrespective of the treatment delivered [13]. In our case the vault primary was more than 3 cm and the disease had already spread to external iliac nodes by the time it was detected. Hence palliative treatment was chosen keeping in mind the dismal prognosis of the patient.

The etiology of VMM is not clearly defined and there are no significant racial or ethnic differences in its incidence [2]. Exposure to Ultraviolet radiation has been clearly linked with cutaneous melanomas [14], however, whether therapeutic radiotherapy can be a risk factor for melanomas has not yet been documented clinically. With extensive search, we could find only one molecular medicine research article reporting that radiotherapy induced decrease in substance P may potentiate melanoma growth [15]. We are not sure whether radiotherapy induced changes in immune

environment in melanocytes of vaginal mucosa is implicated in the development of VMM in our case, but the link can't be rejected either.

### **Conclusion:-**

At this moment we can suggest that vaginal melanoma may be a possible clinical entity as a late sequelae of radiation therapy, which can only be substantiated with further case reports in future.

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### RESEARCH ARTICLE

#### PREVALENCE AND FACTORS ASSOCIATED WITH DEPRESSIVE SYMPTOMS AMONG POST-PARTUM MOTHERS IN JEDDAH.

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Postpartum depression ,risk factors.

#### Abstract

**Background:** Pregnancy and delivery are big events in a woman's life , it could associated with physiological and psychological problems lead to postpartum depression (PPD) , This study aimed to assess the prevalence rate of post-partum depression symptom among post-partum mother in Jeddah , Saudi Arabia

**Method:** This cross sectional study was carried out at five health care centers in Jeddah , Saudi Arabia during the period from January to December 2016, among post-partum mother who admitted to obstetrics & gynecology units , A semi structure questionnaire was used to collect the data.

**Result:** A total of 512 postpartum females were included in this study, (68.8%) were from group age 25-40 46.5% were housewives and 66.6% had a university education , 65.6% were from group monthly income more than 8000 SR, 25.0% reported medical problem, 43.9% planned for pregnancy. The EPDS mean score was  $12.7 \pm 5.8$  rang (0-30) , there was significant association between PPD and the following sociodemographic and medical characteristics ( maternal age, maternal education ,maternal occupation, monthly income , medical problems , planning pregnancy and previous psychological problems).

**Conclusion:** The current study showed that advanced age , lower educational level for both mother and father , medical problems were risk factors . Further studies need to be conduct to investigate the relation between PPD and other risk factors in Saudi community.

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#### Introduction:-

Pregnancy and delivery are big events in a woman's life , it is a blessing and joyful experience in normal situation, however the opposite can happen due to the fact that childbirth could associated with physiological and psychological problems lead to postpartum depression (PPD) , which is defined as " in the Diagnostic and Statistical Manual for Mental Disorders as major depression with postpartum onset with episodes of depression beginning within 4 weeks of giving birth" . (1) and also as "a non-psychotic depressive state that begins in the post-partum period, after the child birth , it is a mood disorder that can occur at any time during the first year after delivery " . (2)Mental health problem are major public health issue for women in reproductive age in both developing and developed countries ,(2)where several studies reported postpartum depression as the most common

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psychological complications among childbearing women , with prevalence rate between 10-20% , (1,3,4) this variety in the prevalence due to several factors : time of survey, population characteristics, culture issues. (1) in the first day after delivery mother will be concentrated on her baby and excited about it but after a few days her mood go down and she may feel sad ,depressed and had insomnia that what we called a baby blues and it begin from the early days after birth to two weeks later and it would may develop to a postpartum depression, (3,5) . The main characteristics of PPD are: tearfulness, anxiety, emotional stress , guilty feelings , loss of appetite, suicidal thoughts, sleep disorders, concentration and memory problems, exhaustion, and irritability, as well as feelings of weakness and incompetence to deal with the baby. (1,3,4).

the post-partum depression is a relatively common disorders with onset between one and six months after delivery and may last six month or longer, (4) and can affects the health of both the mother ( poor life quality and death) as well as the child (malnutrition , developmental delay, poor growth, and damaged mother-infant relation). (1,3,4,6) There are several risk factors associated with PPD: Family history of previous depressive illness or other psychiatric in the patient or her relatives, life stress , (4) ,labor pain (1) inadequate antenatal care, socio-economic status, (7) chronic illness, caesarian section, (post partum), nutritional deficiency (3), poor social support, (vigod) violence during pregnancy (7), in addition there are few risk factors seen only in developed countries : multiparity, baby gender and multiple births (2,3).

This study aimed to assess the prevalence rate of post-partum depression symptom among post-partum mother in Jeddah , Saudi Arabia and to identify the risk factors associate with PPD in order to help mothers avoiding them.

### Method:-

This cross sectional study was carried out at five health care centers in Jeddah , Saudi Arabia during the period from January to December 2016, among post-partum mother who admitted to obstetrics & gynecology units , A semi structure questionnaire was used to collect the data from the mothers, where it divided to three parts : first demographic data (age, education level, occupation and monthly income), second pregnancy and delivery characteristics (delivery place, postnatal care service level, delivery mode, planning pregnancy, labor duration, abortion, gravidity and parity, baby health, medical problem during pregnancy, complications, surgical history, depression history, family history) and the third part is the Edinburgh Postnatal Depression Scale which consists of 10 questions with 4 points scale , (8) The data collected was analyzed using SPSS version 20 statistical software. Mean and standard deviations (minimum and maximum) were used to presented parametric data while number (percentage) were used to presented non-parametric data. Comparison for categories variables ( sedation drugs and delirium presentation ) was done using Chi – square test . Statistically significance was considered at the 0.05 level and extreme significant at the 0.0001 level .

### Result:-

A total of 512 postpartum females who completed the demographic , obstetric variables section and the EPDS questionnaire were included in this study. The majority of them (68.8%) were from group age 25-40 and 19.9% were less than 25 years, 73.4% were Saudi. The females who participated in the study included housewives (238, 46.5 %), those employed outside the home (205, 40.0%), those with a university education or higher (341, 66.6%), and those who attend high school education (126, 33.6%). The majority of the participants (90.8%) were non-smokers and (65.6%) from group monthly income more than 8000 SR, more than two third reported that their husband were employed (68.8%) , with university degree or higher (69.9%). (Table 1)

Out of the 512 postpartum females 128 (25.0%) reported medical problem, 40 (7.8%) reported Previous psychological problems and 143 (27.9%) reported family history of PPD . ( Table 2)

Out of the 512 postpartum females 225 (43.9%) planned for pregnancy, 190 (37.1%) reported medical problems during pregnancy , those who had Marital problems numbered 99 (68.3%), those who suffered from depression during last pregnancy at least for one semesters numbered 314 (61.3%). Out of the 512 postpartum females 368 (71.9%) delivered in private hospital and 136 (26.6%) delivered in governmental hospital, those who spent Puerperal duration in her family house numbered 215 (42%), most of the female delivered Spontaneously and from them only 93 (25.8%) received epidural analgesia, 407 (79.5%) reported that baby gender not as they wish, 102 (19.9%) reported medical problems during delivery and 91 (17.8%) had complications after delivery. Half of the

women (253-50.4%) had baby girl ,252 (49.2%) had baby boy and 2 (0.4%) had both, only 15 (2.9%) baby reported medical problem, 46.1% reported both kind of feeding . **(Tables 3 ,4&5)**

The EPDS mean score was  $12.7 \pm 5.8$  rang (0-30) and was divided into two categories with cut off  $> 13$  , of the 512 mothers, 257 (50.5%) had depressive symptoms (EPDS score  $> 13$ ), and 255 (49.5%) did not have depressive symptoms (EPDS scores  $\leq 13$ ). **(Table 6)**

The results showed significant association between PPD and the following sociodemographic and medical characteristics ( maternal age, maternal education ,maternal occupation, monthly income , husband occupation and education level, medical problems , baby health, planning pregnancy , Medical problem during pregnancy and delivery , complication and semester depression , family history of PPD and previous psychological problems ) where advanced age , lower level of education, working mother , lower monthly income, husband level of education, working husband , positive medical problems before-during pregnancy and during and after delivery , positive family history of PPD and previous psychological problems and un planning pregnancy showed higher scores in EPDS (p=0.02, p<0.0001, p<0.0001, p<0.0001, p<0.0001, p<0.0001, p=0.04, p=0.03, p=0.04, p=0.03, p=0.04, p=0.01, p=0.04, p=0.01 and p=0.006) respectively. **(Table 7)**

### Discussion:-

Several studies were conducted about the prevalence of PPD and the associated risk factors, where PPD had big influence on the baby emotional and social development and this influence continues during teenage and adult years. **(3,9)** In industrial countries there is rapid screening for PPD so an early intervention can be done to decrease the negative effects of PPD on mothers and babies lives. **(3,10,11)** The current study showed that almost the half of participants mothers (49.5%) had depressive symptoms during post-partum period. Previous studies in Nepal and Saudi Arabia reported the prevalence of PPD 30-33% with cut off score  $\geq 10$ , **(2,3)** also the results from Pakistan and India studies the prevalence was between 11%-40% , while in other studies with cut off  $\geq 12$  the prevalence was 6%-12% , **(2,12,13)** and 15.4% in Turkish study with cut off  $\geq 13$ , **(7)** this variation in the prevalence rate could be due to the difference cut off, multi-cultural and multi-social factors, sample size and methods. **(2,3,7,12,14,15)**

The findings of current study showed that mother aged more than 40 years are more likely to develop PPD than younger mother , similar results were found in Singapore Nepal and Canada studies the authors reported high prevalence of PPD among women aged 35-40 , **(1,2,16)** in contrast in Turkey and Canada studies the authors reported high prevalence of PPD among young mother , **(2,7,17,18,19)** while in Saudi Arabia study the association was between older and younger age. **(3)**

Several studies investigated the association between PPD occurrence and sociodemographic data (mother's education and occupation , monthly income and father's education and occupation), **(6,20-26)** where the results showed contradictory evidence **(1,2,3,7)**, in Nepal ,Singapore, turkey and Saudi study there was no association between mother's education level, occupation and low monthly income and PPD , **(1,2,3,7)** while in other studies there was positive association between PPD and mother's lower education , being a housewife , and lower monthly income. **(2,3,7 27-32)** also in 2007 study the authors reported significant association between lower partner education and occupation and PPD , **(7,33)** the current study showed consistent with previous study regarding mother low educational level and controversy result regarding mother occupation and monthly income, where the high prevalence of PPD was between working mothers and high monthly income.

The current study findings showed that any medical problems in any time before or during pregnancy , during or after delivery had a strong effect on developing PPD (p=0.03p=0.004,p=0.03,p=0.01) ,this consistent with previous studies, **(1-7, 34-36)** in Saudi Arabia study the authors reported significant association between anemia during pregnancy and PPD **(3)**, in Singapore study there was significant association between medical problem during pregnancy such as GDM and hypertension and PPD. **(1,37,38)**

In addition to that the current studies confirmed previous studies findings that stressful life such as family problem , week relation with husband or his family , previous psychological problems specially anxiety , exhausts , pregnancy depression, tearful and lack of sleep , and family history of PPD either first degree relative or second degree relative , **(1-7)** in Nepal studies the authors reported that there is relation between PPD and early contractions during pregnancy and maternity blues after seven days from delivery, **(2,39)** in Turkey study the authors confirmed the relation between PPD and antepartum depressive symptoms which assessed by HADS-D , and they reported that thinking in committing suicidal during pregnancy is a high risk factors in developing PPD (odds ratio 6.99, CI 2.08-

23.49), (7,40,41) similar results were found in Singapore study where the authors reported high prevalence of PPD among women with previous psychological problems. (1,37,38)

Regarding planning pregnancy and baby gender, the results of the current study showed significant association between developing PPD and unplanned pregnancy ( $p=0.01$ ), this consistent with Turkey study. (7)

Pain during delivery considered as the most severe pain could be experience by some women during their entire life, it is not life-threatening, however it has association with the risk of development post-traumatic stress disorder, mood disorders, weakness of cognitive function and causing post-partum depression. Epidural analgesia was addressed in several studies as an effective way to reduce delivery pain and decreasing the incidence rate of PPD on the Edinburgh Postnatal Depression Scale (EPDS). The new guidelines recommended to use epidural analgesia when mothers ask if there is no medical contraindication, this use affected by several factors such as labor progress, mother condition and preferring. (1, 42-44) In Singapore study the authors reported significant association between the using of epidural analgesia and decreasing the score of Edinburgh Postnatal Depression Scale ( $P=0.0078$ ), (1) similar result was found in Hiltunen et al study (odds ratio [OR] 0.25, 95% confidence interval [CI] 0.09–0.72), (45) and Ding T et al study (OR 0.32, 95% CI, 0.11–0.89,  $P = 0.029$ ), (43) although the current study couldn't establish this relation.

There was no significant difference in the prevalence rate of PPD regarding mode of delivery, smoking and baby gender wishing.

**Table (1):-Demographic data:**

Variables	N	%
<b>Age</b>		
Less than 25	102	19.9
25-40	342	66.8
More than 40	68	13.3
<b>nationality</b>		
Saudi	376	73.4
Non Saudi	136	26.6
<b>Education level</b>		
Postgraduate	34	6.6
University degree	307	60.0
High school	126	33.6
Intermediate	29	5.7
Elementary or lower	16	3.1
<b>Occupation</b>		
Student	69	13.5
Employee	205	40.0
House wife	238	46.5
<b>Smoking</b>		
Yes	47	9.2
No	465	90.8
<b>Monthly income</b>		
Less than 5000	62	12.1
5000-8000	114	22.3
More than 8000	336	65.6
<b>Husband occupation</b>		
Employee	352	68.8
Business man	134	26.1
Retired	26	5.1
<b>Husband education level</b>		
University degree	336	65.6
Postgraduate	22	4.3
High school	109	21.3
Intermediate	29	5.7
Elementary or lower	16	3.1
Variables	Mean± SD	Rang (Min-Max)
Family members number	5.0±2.0	(3.0-9.0)

**Table (2):-Medical characteristics obstetrics (pregnancy and delivery) characteristics**

Variables	N	%
Medical problems		
Yes	128	25.0
No	385	75.0
Specify		
Diabetes	21	16.4
Hypertension	27	21.1
Hypothyroidism	28	21.9
Anemia	4	3.1
Others	48	37.5
Family history of PPD		
Yes	143	27.9
No	369	72.1
Who		
Sister	76	51.4
Mother	47	20.4
Aunt	20	28.2
Previous psychological problems		
Yes	40	7.8
No	472	92.2
Specify		
Depression	10	25
Tearful	1	2.5
Anxiety and uncomfortable	2	5
Un mention	27	67.5

**Table (3):-Obstetrics (pregnancy) characteristics**

Variables	N	%
Prenatal care level		
Excellent	166	32.4
Very good	184	36.0
Good	99	19.3
Average	52	10.2
Poor	11	2.1
Planning pregnancy		
Yes	225	43.9
No	276	53.9
Un mention	11	2.1
Medical problems during last pregnancy		
Yes	190	37.1
No	322	62.9
Personal problems		
Marital problems	99	68.3
Traffic accidents	12	8.2
Losing family member	34	23.5
Depression during current pregnancy		
First semester	172	33.5
Second semester	63	12.3
Third semester	64	12.5
Two semesters	9	1.8
All semesters	6	1.2
No	198	38.7
Variables	Median	quartile (25-75)
Gravidity	2.0	0.0-4.0
Abortion	1.0	0.0-2.0

**Table (4):-Obstetrics (delivery) characteristics**

Variables	N	%
<b>Birth place</b>		
Governmental hospital	136	26.6
Private hospital	368	71.9
Polyclinics	4	.8
Home	4	.8
<b>Puerperal duration place</b>		
My home	215	42.0
My husband family house	21	4.1
My family house	276	53.9
<b>Postnatal care level</b>		
Excellent	154	30.1
Very good	181	35.4
Good	110	21.5
Average	53	10.2
Poor	14	2.8
<b>Delivery mode</b>		
Spontaneous	360	70.3
Cesarean	152	29.7
<b>Epidural</b>		
Yes	93	25.8
No	267	74.2
<b>Gender baby did not consistent with the wishes of the family or you</b>		
Yes	95	18.6
No	407	79.5
Un mention	10	2.0
<b>Medical problems during last delivery</b>		
Yes	102	19.9
No	410	80.1
<b>Complication after last delivery</b>		
Yes	91	17.8
No	420	82.0
<b>Surgical history</b>		
Yes	41	8.0
No	471	92.0
<b>Variables</b>		
	Median	quartile (25-75)
Labor duration	5.0	2.0-11.0

**Table (5):-Neonatal section**

Variables	N	%
<b>Baby gender</b>		
Boy	252	49.2
Girl	253	50.4
Both	2	.4
<b>Baby health</b>		
Healthy	497	97.1
Sick	15	2.9
<b>Specify</b>		
Jaundice	2	14.3
Congenital anomalies	6	42.7
Others	7	43.0
<b>Feeding</b>		
Breastfeeding	186	36.3
Bottle	90	17.6
Both	236	46.1

**Table (6):-EDP scale:**

Variables	Mean± SD	Rang (Min-Max)
*I have been able to laugh and see the funny side of things	1.0±0.8	(0-3)
*I have looked forward with enjoyment to things	1.0±0.8	(0-3)
I have blamed myself unnecessarily when things went wrong	1.6±0.9	(0-3)
*I have been anxious or worried for no good reason	1.5±0.9	(0-3)
have felt scared or panicky for no very good reason	1.5±0.9	(0-3)
Things have been getting on top of me	1.8±0.9	(0-3)
I have been so unhappy that I have had difficulty sleeping	1.7±1.0	(0-3)
I have felt sad or miserable	1.3±1.0	(0-3)
I have been so unhappy that I have been crying	1.3±1.0	(0-3)
The thought of harming myself has occurred to me	1.0±0.7	(0-3)
Total	12.7±5.8	(0-30)

**Table (7):-The relation between PPD and demographic data and medical characteristics:**

Variables		Mean	±	SD	P value
Age	Less than 25	11.71	±	6.29	0.02*
	25-40	12.76	±	5.69	
	More than 40	13.91	±	5.50	
Education level	Postgraduate	12.64	±	5.63	0.0001*
	University degree	12.83	±	5.98	
	High school	14.00	±	5.38	
	Intermediate	9.89	±	5.32	
	Elementary or lower	14.81	±	4.44	
Occupation	Student	14.52	±	4.16	0.0001*
	Employee	13.260	±	5.46	
	House wife	11.70	±	6.29	
Monthly income	Less than 5000	9.85	±	7.52	0.0001*
	5000-8000	11.76	±	5.78	
	More than 8000	13.56	±	5.23	
Husband educational level	University degree	13.06	±	5.39	0.0001*
	Postgraduate	14.09	±	5.07	
	High school	11.86	±	6.41	
	Intermediate	9.31	±	6.00	
	Elementary or lower	9.56	±	7.30	
Husband occupation	Employee	13.14	±	5.40	0.04*
	Business man	11.17	±	6.23	
	Retired	11.95	±	7.64	
Medical problem	Yes	13.67	±	5.18	0.03*
	No	12.35	±	5.97	
Medical problem during pregnancy	Yes	13.68	±	5.02	0.004*
	No	12.15	±	6.16	
Medical problem during delivery	Yes	13.93	±	5.32	0.03*
	No	12.43	±	6.06	
Complications	Yes	14.13	±	5.03	0.01*
	No	12.41	±	5.92	
Baby health	Healthy	12.61	±	5.82	0.04*
	Sick	15.66	±	5.40	
Planning pregnancy	Yes	12.00	±	5.87	0.01*
	No	13.32	±	5.77	
Family history of PPD	Yes	13.89	±	5.16	0.004*
	No	12.24	±	6.00	
	Yes	15.10	±	4.41	0.006*
	No	12.48	±	5.88	
Semester depression	1 <sup>st</sup>	14.63	±	5.10	0.03*
	2 <sup>nd</sup>	13.96	±	4.52	

	3 <sup>rd</sup>	13.84	±	4.52
	1 <sup>st</sup> & 2 <sup>nd</sup>	18.66	±	5.00
	2 <sup>nd</sup> & 3 <sup>rd</sup>	6.50	±	4.19
	All	17.16	±	4.57

### Conclusion:-

This study highlighted the high prevalence rate of PPD symptoms. Whenever the early detection of the risk factors for PPD, the easier for the doctor to intervene to treat and remedy it and prevent it from getting worse. The current study showed that advanced age, lower educational level for both mother and father were risk factors, however there are many other risk factors couldn't be detected in the current study. Further studies need to be conducted to investigate the relation between PPD and other risk factors in Saudi community, more awareness campaigns need to be held to raise the awareness about PPD among mothers and community, also psychiatrist and social worker should attend a postnatal care unit on a regular base to talk with mothers, advise them and help them in facing their fear.

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### RESEARCH ARTICLE

#### THE DETERMINANT FACTORS OF WORKER'S SUBJECTIVE WELL-BEING.

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##### Key words:-

subjective well-being, sense of humor, personality type of the big five personality, gratitude, social support, work reward and working condition.

#### Abstract

The objective of this research is to trace effect of the individual factor (intrinsic) including sense of humor, personality type of the big five personality, gratitude, and situational factors (extrinsic) consist of social support, work reward, and work condition of subjective well-being, finally it will be known the determinant factors of subjective well-being for the worker in the organization in Indonesia. The research subjects are 139 workers and 56 supervisors in the PT. Y. The Collecting data method use closed and opened questionnaire, observation, interview and focus group discussion. To understand different between subjective well-being viewed from work level and gender is used statistic analysis, those are the regression analysis and t-test. Sense of humor and social support become determinant of high-low subjective well-being PT. Y's labors. At supervisor, predictor of subjective well-being are personality type variable of openness to experience, agreeableness, gratitude and work reward. The result show that labor's subjective well-being is higher than supervisor, because positive psychology centered to the meaning of life, that is, how persons give a meaning everything happen of their life. For supervisor, work reward is tool for self actualization, those are, prestigious, autonomy, safety, and protect, while for labors, work reward is used to fulfill basic needs. This matter makes labors more satisfied easily with work reward that is gotten because the work opportunity is also more limited.

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#### Background:-

In the midst of an increasingly tough environmental conditions like today, every man would want to live a happy life, not to mention the employees. Often people get frustrated, stressed, and even to suicide because they feel confident that he will not get the happiness he wants in life. Maybe that's the concept of subjective well-being owned by some individuals with low subjective wellbeing. Feeling happy indeed subjective nature, differing between individuals from one another, as well as employees will feel very happy when he first accepted to work in a company. Is feeling happy and satisfied will also be experienced after a long time in the world of work, both the worker and supervisor-level employees. Indonesia as a developing country, has always held a development in all fields. One of the priority areas of development is the industrial field. Along with the development of industrialization, found many companies that have sprung up in major cities. Field of industrialization is very concerned with the employment factor that can not be separated from the human factor as an asset that support industrial progress. This industry absorbs the most workers, both men and women. Research Herzog & Strevey

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(2007) states that a sense of humor can increase subjective well-being of individuals. Abel (2002); Lefcourt (2001); and Martin and Kuiper (2001) (in Herzog & Strevey, 2007) gives an example of that humor has a functioning network for immunity and reduce stress or any variable that can produce stress. A study shows that individuals who are closer to the gratitude showed a high level in terms of life satisfaction, self-esteem, and optimism. Results of a meta analysis of the relationship between subjective well-being of gratitude with  $r = 0.17$  (Emmons & Crumpler, 2000). Kennedy (1999) and Maltby (1999) wrote that the type of gratitude has a positive emotional valence. Allegedly gratitude is the root of the basic tendency to experience positive emotions and well-being. In the classification of the Big Five Personality, grateful people have high extraversion scores (positive effect) and neurotic low (negative effect) because both these personalities have relevance to the emotional experience. The experience of people who are grateful to have specific levels of positive emotions such as happiness, enthusiasm, optimism, hope, and satisfaction in life. Conditions lower subjective well-being can be influenced by the presence of social support. Individuals who receive social support will feel at ease in running their lives, activities, because the environment can encourage individuals, particularly in achieving life goals. Kaplan and Killilea (Sarason et al., 1990) says that a support system can help individuals in encouraging the sources of psychological, releasing pressure, sharing tasks, and obtain important information about solving problems.

Strauss and Sayles (1980) states that social support is a means to improve the subjective well-being. Social support can be obtained from family, co-workers, supervisors, and others (Miner, 1992). There are studies that show that when people get the least of someone who can provide social support, especially emotional support, then the experience of subjective well-being increased, with  $r = 0.49$  (Davis & Newstrom, 1993). This is in line with research Gademmann & Zumbo (2007) which showed that social support has a positive and significant correlation with subjective well-being,  $r = 0.63$ . Besides social support has a positive and significant correlation with positive affect,  $r = 0.52$ , with negative affective aspects of subjective well-being has a negative and significant correlation,  $r = -0.38$ , and with the satisfaction of having a positive and significant correlation with  $r = 0.57$ . The study of remuneration in the organization of work show that: 1). Well-being achieved if the consideration received appropriate or feasible perceived by employees; 2). The feeling of satisfaction is influenced by the comparison between the remuneration obtained, with what is obtained by other people; 3). Satisfaction is influenced by how satisfied employees by intrinsic and extrinsic rewards; 4). Preferred Rewards vary from different sides of a person's career, at the age levels and a variety of situations, and 5). Money is a reward that encourages something of prestige, autonomy, security, and protection. Rewards or awards may be given by the leader, groups or individuals themselves, either directly or indirectly increase the subjective well-being of employees (Gibson et al., 1994). Diener research results (in Eddington & Shuman, 2005) states that it is generally low but significant correlation between remuneration or income with subjective well-being found on a representative sample in the United States. Remuneration which is also consistently associated with subjective well-being in a country (Diener et al., 2005). One possibility is that the income only affects the subjective well-being at a lower level, where basic needs have not been met. However, if basic needs are met, an increase in income or wealth is only little effect on happiness.

#### **Research purposes:-**

This study aimed to explore the effect of individual factors (intrinsic) and situational factors (extrinsic) to the subjective well-being, which ultimately will be known contributing factors subjective well-being of workers in work organization PT. Y in the town of East Java. The general objective can be described more specifically below:

To determine the relationship between personality variables openness to experiences, conscientiousness, extraversion, agreeableness, neuroticism, humor, gratitude, social support, employee benefits, and working conditions to the subjective well-being, both individually and together. To find out the differences and factors that influence levels of subjective well-being among workers and supervisors.

#### **Hypothesis:-**

Personality openness to experiences, conscientiousness personality, personality extraversion, agreeableness personality, sense of humor, grateful, social support, working conditions and employee benefits is a supporting factor subjective well-being, whereas neuroticism personality is a factor inhibiting the subjective well-being.

#### **Material And Methods:-**

##### **Subject Research:-**

The population in this study were all employees and employee production supervisor at PT. Y Sidoarjo. Production employees at PT. Y amounted to 139 people, while the supervisors of employees amounted to 56 people consisting of a Section Head (Head of Section) and Group Team Leader (GTL). Making the subject of study is a Total

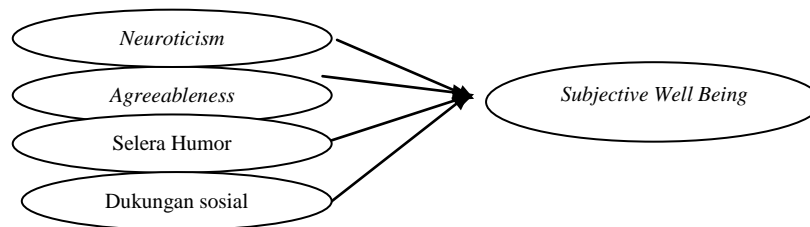
Population Study with consideration of the entire population is used as a research subject. Researchers took the subject to all members of the population due to the limited number of employees and production employees have the same characteristics ie at least high school educated and occupying grade I, whereas the employees supervisor entirely educated minimal S1 and scholars all have men between 2-15 people.

#### **Instrument and Data Collection Procedures:-**

To obtain data on the variables in this study used seven instruments in the form of scale of assessment, Summated scale rating, complemented by interviews, and focus group discussion. Summated rating method is popular with the name of the model Likert scaling is a method of scaling-oriented responses. In other words, in this method, the response category will be placed on a continuum. The entire instrument using five kinds of ordinal categories.

#### **Results And Discussion:-**

When depicted on the analysis of quantitative data on production employees, predictors that support the subjective well-being as follows:



**Figure 1.** Predictors of Subjective Well-being Employees Production

The results showed that the predictors that have a correlation with the criterion of subjective well-being of employees is the production of personality agreeableness, neuroticism, sense of humor, and social support. Thus the determining subjective well-being more influenced by internal factors, namely private high agreeableness, neuroticism personal low, and has a sense of humor. Subjective well-being of workers also increased when obtaining social support from outside. Results of regression analysis obtained by  $F = 5786$  and  $p < 0.01$ , respectively. These results indicate that personality agreeableness, neuroticism, sense of humor, and social support can be a significant predictor of subjective well-being of the production employees. Effective contribution obtained throughout the predictor is 31.1%, this shows that there are still 69.9% of other variables that affect the subjective well-being of production employees who have not taken into account in this study. When sorted, the fourth most powerful predictor of the effect is the personality of agreeableness, neuroticism, sense of humor, and social support have the smallest influence. Agreeableness personality can be a predictor of subjective well-being significantly with the production employees  $r = 0.379$ ,  $p < 0.01$  and  $\beta = 0.278$  and  $p < 0.01$ , respectively. These domains focus on how much people appreciate his relationship with others. Individuals who are agreeable to appreciate relationships with others. They are full of awards, friendly, generous, helpful, and willing to compromise their interests with others. People who are agreeable also have an optimistic view of man. This agreeable person who according to external demands in a corporate environment, so that it becomes easier to accept people who are not satisfied with the environment and conflict. Production employees who have never experienced the conflict will easily reach subjective wellbeing (Burke et al., 2006). This is in contrast with the disagreeable person who puts his interests above others. They tend to be less concerned with the well-being of others, and tend to keep a distance with others, this is what makes employees shunned and effect on subjective well-being is becoming weaker. There are two possibilities that could be the explanation could be the strongest predictor of agreeableness to subjective well-being of the employees of production, namely:

The first possibility is a rule that is already tight so it does not need self-discipline in managing the implementation of activities, so that although the type of characteristics do not fit the job, but the environment to force any employee to be able to adjust to external demands, so that subjective well-being can be realized because it does not make a conflict with a friend in the work environment or the company where she worked. The second possibility is typical of Indonesian people are affected strongly by culture Java and all Java production employees also have tribes. Javanese culture has a strict view of the importance of alignment. Deeply internalized feelings in the soul of the Javanese is the sensitivity to not be humiliated in public. Thus fostering a feeling of conformity, controlling behavior, and maintaining strict social harmony. The conflict was muted mightily. Normal reaction of everyone Java

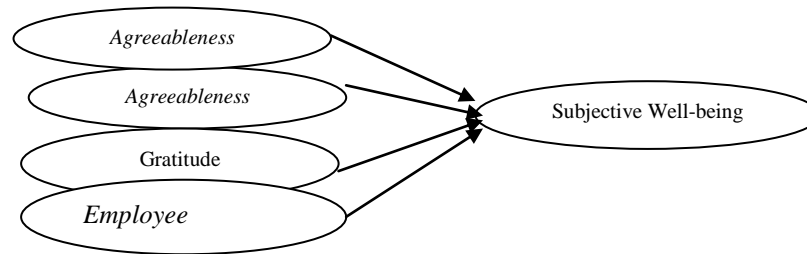
in response to conflicts is avoidance, "wegah crowded", and mediation by a third party (Henry Susetya, 2007). When the conflict erupted, particularly when taunted each other and mutual contempt case, then what emerges is a feeling of shame and loss of face. This agreeableness character according to the type of personality that is liked by the management of PT. Y the character a quiet, does not stand out, according to, and routine. With the suitability agreeableness personality types with external demands companies make his subjective well-being increased. Personal neuroticism can also be a significant predictor of the subjective well-being, with  $r = -0.354$ ,  $p < 0.01$  and  $\beta = -0.268$  and  $p = 0.001$ . This shows that the more neurotic person, the lower his subjective well-being, and vice versa less neurotic then the higher his subjective well-being. This domain is concerned with the tendency of someone who is experiencing negative emotions such as anxiety. People who have high levels of neuroticism tend to have a high emotional reaction. They respond to emotional events that could have an impact on others (Ho, 1995). Problems in setting these emotions can reduce people's ability to think clearly neurotic, make decisions, and cope with stressful problems. Individuals who have low scores on neuroticism tend to be quieter and emotions tend to be reactive. They tend to be more stable and free of negative feelings. The majority of production employees who also have private neuroticism that level quite as much as 97.84% (Table 33) and used to living hard, was still experiencing anxiety about the future, especially for the cost of living in the future. Personal neuroticism become anxious, irritable, prone to depression, sensitive, redundant, and vulnerable, so much dominated by negative emotions and lower positive emotions. This is what makes neuroticism negatively correlated with subjective well-being. Most production employees have enough personality neuroticism on the category (97.84%) so that his subjective well-being is also at the high category (68.34%) (Table 31 and 33). This study supports the results of the study Gaderman & Zumbo (2007); Burke, et al. (2006); and Gutierrez, et al. (2005) which showed that the higher a person's neuroticism, the lower his subjective well-being.

The correlation between the sense of humor with subjective well-being, the value of  $r = 0.199$ ,  $p = 0.009$  and  $\beta = 0.206$ ,  $p = 0.009$ , thus there is a significant relationship between the sense of humor with subjective well-being. This is consistent with research and Strevey Herzog (2007) which states that a sense of humor can increase subjective well on production employees. Abel (2002); Lefcourt (2001); and Martin and Kuiper (2001) (in Herzog and Strevey, 2007) gives an example of that humor has a functioning network for immunity and reduce stress or any variable that can produce stress. Subjective well-being and sense of humor are related because basically has the same single phenomenon that is self-objectivication, the ability to see yourself. Humor art aims to alleviate community in living her life (Kleverlaan et al., 2000). Individuals who have a sense of humor can reduce negative affect and increase positive affect and it will increase the satisfaction that ultimately subjective well-being will increase as well. It became apparent, after explained that humor is one of the factors that have an important contribution to the subjective well-being. Isen, Daubman and Nowichki (Herzog and Strevey, 2007) demonstrated the results of experiments that positive affective, can improve their skills in problem solving. Positive mood and thinking flexibly dealing with a good sense of humor. According to Martin and Kuiper (2001) mechanism that connects between humor and subjective well-being is a positive emotion that is where it accompanies the humor. A sense of humor has the power to produce the "pleasure" associated with positive emotion or mood (Herzog and Strevey, 2007). Other results that support is currently conducted interviews and focus group discussions, the production employees feel happy and at home working at PT. Y because of its pleasant atmosphere, between friends joking with each other and throws a "joke" making the morale be growing. Even the results of FGD 11 of 14 (78.57%) production employees say that the most important work is able to meet friends, be "joking" or "gojegan" and "teasing", and can "ngrumpi" than at home had no friends and no income, this will have an impact on positive affective or feeling happy that the production employees.

#### **Research on Employee Supervisor:-**

Predictors of high or low criterion that affects the subjective well-being between production employees and employee supervisors indicate a difference. Predictors equally be a determinant of subjective well-being of employees and employee production supervisor is agreeableness personality.

Other predictors that determine the level of subjective well-being of the employees supervisor is different, as follows:



**Figure 2:-** Predictors of Subjective Well-being Employee Supervisor

From the results of hypothesis testing on the correlation between the predictor with the criterion of the employees supervisor, only personality type openness to experience, agreeableness personality types, grateful, and employee benefits showed a significant association with subjective well-being (table 15). Thus the determinant of the high-low subjective well-being of employees supervisor is entirely internal factors that personality openness to experience and agreeableness), grateful, and employee benefits, especially the intrinsic rewards associated with the completion of tasks, achievement, autonomy, and personal development. Results of regression analysis obtained  $F = 8152$  and  $p < 0.01$ ,  $R^2 = 0.644$  means that donations predictors of sense of humor, personality openness to Experiences, Conscientiousness, Extraversion, Agreeableness, Neuroticism, grateful, social support, employee benefits, and working conditions on subjective wellbeing amounted to 64.4%, while the remaining 35.6% is influenced by other factors.

The relationship between personality openness to experience with subjective well-being of employees supervisor, obtained  $r = 0.362$  and  $p = 0.003$ . This shows that there is a significant relationship between personality openness to experience with subjective well-being of employees supervisor. Results were positive correlation indicates that the stronger the personality type openness to experience in employee supervisor, the higher the well-being of subjectivity. Openness to experience is a valid predictor, actually not surprising, since the research results Warr, Bartram and Martin (2005); Murphy and Davies (2006), found a positive effect openness to experience on the job performance and subjective well-being of the sales. This could be due to being able to move in advance, the necessary curiosity and willingness to learn (Barrick and Mount, 1991; Costa and McCrae, 1992; and Hogan and Holland, 2002). The results support the research Burke et al. (2006) and Gutierrez et al. (2005), which states that there is a significant correlation between personality type openness to experience with subjective well-being. Openness to experience refers to how a person is willing to make adjustments on an idea or a new situation. Openness to experience assume the character of easy tolerance, the capacity to absorb information, to be very focused, and able to be alert to the feelings, thoughts, and impulsivity. Employees supervisor who has the personality type openness to experience (87.50%) in the table 35 has a value of imagination, broadmindedness, and a world of beauty. Someone who has openness to experience higher levels will also have thoughts and insight, not conservative, and liked changes, so as to build personal growth. Achievement of creativity are more prevalent, so curious or open to the experience will be much easier to get a solution to a problem, so it will gain a sense of excitement as well as having the satisfaction that will improve the subjective well-being.

The relationship between personality agreeableness to subjective well-being of employees supervisor. obtained  $r = 0.509$  and  $p = 0.000$  (Table 16). This shows that there is a significant relationship between personality agreeableness to subjective well-being of employees supervisor. In the classification of the Big Five Personality, it is recommended that people who are grateful tend to score high on agreeableness which shows the social and behavioral oriented on others. Saucier and Goldberg (in Emmons and McCullough, 2003) also reported that two items contain properties measured personality grateful and thankful correlated with agreeableness ( $r = 0.31$ ). Agreeableness can be called social adaptability or likeability that indicate someone who is friendly, has a personality that always give in, avoid conflict, and has a tendency to follow others. Based on the value of the survey, someone who has a high agreeableness scores is described as someone who has values like helping, forgiving, and compassionate. This very personal agreeableness in accordance with the generic competency PT. Y one of which is self-control is an ability to control emotions and reactions are controlled display, so that interpersonal relationships can be maintained properly. With the core competency of individuals who have a high agreeableness scores will be adaptable, this is what makes his subjective well-being is increased.

The relationship between subjective well-being grateful to the employees supervisor, obtained  $r = 0.600$  and  $p < 0:01$  (Table 16). This shows that there is a significant relationship between subjective well-being grateful to the employees supervisor. It supports research Emmons and McCullough (2003) which states that a person who is grateful to have positive emotions and good well-being. Some experts and researchers write that type are grateful to have a positive emotional valence. Allegedly gratitude is the root of the basic tendency to experience positive emotions and well-being. Experiences of people grateful to have a specific level of positive emotions such as happiness, enthusiasm, optimism, and hope and satisfaction in life. Gratitude or grateful also be conceptualized as a virtue (Emmons and Crumpler, 2000). Klein (in Emmons and Crumpler, 2000) found that people experiencing gratitude protected from harmful impulse of jealousy and greed. Instead, jealousy is a fertile field for ingratitude. Practice gratitude as spiritual study (thank you therapy) has been suggested as a remedy for individuals materialist excessive and negative emotions that go with it, jealousy, resentment, disappointment, and bitterness. The core issue of jealousy (envy) is to be a blessing unconsciousness that surrounds a person consistently (Bonder, in Emmons and Crumpler, 2000). Mc. Cullough and colleagues expressing gratitude or gratitude as a moral emotion, something that drives a person to pay attention to others and support social ties supportive. The results also support previous research that there is a relationship between subjective well-being grateful. Another study by Koenig, Smiley and Gonzales (in Santrock, 2004) said that it was grateful related to subjective well-being. Survey of American adolescents and adults showed that more than 90% of respondents expressing gratitude, thus helping them to feel happy (Gallup, in Emmons and McCullough, 2003). The results also support previous research conducted by Arbiyah, et al. (2008) which states that there is a positive correlation between subjective well-being thankful to the poor. Results of the analysis of the above data show a positive correlation, ie the higher the level grateful that employees supervisor, the higher the well-being of subjectivity.

That is because the feeling of gratitude can cause positive emotions like peace of mind, interpersonal relationships are more comfortable and also happiness (Bono, Emmons and McCullough, in Seligman, 2005). In particular, McCullough et al. (in Bono et al., 2004) says that people who are grateful are likely to experience positive emotions more often, enjoy the satisfaction in life, and more hope, and less likely to experience depression, anxiety, and envy. Individuals who are grateful tend to be more empathetic, forgiving, helping, and showing support for others.

Emmons and Crumpler (2000) states that gratitude has three functions specific morals, namely: 1). Serves as a moral barometer that gratitude or grateful signifies generosity is felt, that someone had given him a gift, 2). As a moral motive is gratitude encourages a person to act in reciprocity to the other people who helped him directly (direct reciprocity) or something else (upstream reciprocity), and 3). As a moral booster (moral reinforce), as gratitude or grateful to increase the chances of generous behavior in the future. Thankful called an empathetic emotions (Lazarus and Lazarus, in Emmons and McCullough, 2003) because it was predictable as the capacity to recognize the benefits of the action in one's life. Thankful is also the root of the nature of the East Asia which has high sensitivity and attention to others. Some research suggests that there are many dimensions of time perspective, which consists of past-negative, past-positive, present-fatalistic, present-hedonistic, futures, and transcendental-future (Zimbardo and Boyd, 2010). The supervisor captures the attitude towards the past, not record the events good and bad objective. Positive attitudes towards the past reflects the positive events that actually people experiencing, or positive attitude that allows individuals to make the best of circumstances is very difficult. What people believe happened in the past affect the thoughts, feelings, and behavior in the present. People who experience severe events but if it is able to finish with positive ways will be resilient and optimistic. Results of this study was supported by research Zimbardo and Boyd (2010), which uses the first semester students in the United States show that students who are Muslim has the past-negative scores are low, the lower the present-fatalistic, as well as the future time perspective is high. This is because the followers of Islam had never been to prioritize pleasure, always controlled, focused on the routine of worship and always remember the result of the behavior in the future. It is this factor that makes Muslims who mendominasi subject of this study, namely 100% of production employees and 82.14% in employee supervisor has a high level of subjective well-being.

The relationship between employee benefits to the subjective well-being of employees supervisor obtained  $r = 0.427$  and  $p = 0.001$ . This shows that there is a significant relationship between employee benefits to the subjective well-being of employees supervisor. Creed et al. (2001) showed that certain groups can attain happiness when materialistic needs are met as well as the economic establishment (Cotton and Hart, 2003). The study of remuneration in the organization of work show that: 1). Well-being achieved if the consideration received appropriate or feasible perceived by employees; 2). The feeling of satisfaction is influenced by the comparison between the remuneration obtained, with what is obtained by other people; 3). Satisfaction is influenced by how

satisfied employees by intrinsic and extrinsic rewards; 4). Preferred Rewards vary from different sides of a person's career, at the age levels and a variety of situations, and 5). Money is a reward that encourages something of prestige, autonomy, security, and protection. Rewards or awards may be given by the leadership, groups, or individuals themselves, either directly or indirectly increase the subjective well-being of employees (Gibson et al., 1994). Research results Blanchflower (2001) stated that in general low but significant correlation between remuneration or income with subjective well-being found on a representative sample in Japan. Remuneration which is also consistently associated with subjective well-being in a country (Diener et al., 2005). Kingdon and Knight (2004) and Baker et al. (2005), the research results gained that employee benefits have a positive and significant correlation with subjective well-being. Diener et al. (2005) also states that at the individual level and the national level, changes in income over time have little effect on subjective well-being. The results showed that there is a correlation between fulfillment of expectations payroll or compensation with subjective well-being (Hubbard, 2005). One possibility is that the income only affects the subjective well-being at a lower level, where basic needs have not been met. When basic needs are met, an increase in income or wealth is only little effect on happiness. There are some who say that in terms of religiosity can also obtain happiness (Compton, 2005). But from the interviews although there has been a remaining finances, they have not been able to achieve a high subjective well-being. Thus further confirming that emotional factors play a Role in providing optimization of subjective well-being.

### Conclusion:-

1. Personality agreeableness, neuroticism, sense of humor, and social support determines the high-low subjective well on production employees at PT. Y, it is because of cultural kinship company has three functions such as family functions, ie functions of affection, the maintenance function, and the function of empowerment, so that among employees like family members would be easy joke / "gojekan", mockery, "ngrumpi" and give support especially emotional and informational support, and give considerable attention to the development and training of employees and increasing autonomy.
2. In the employee supervisor, who became a predictor or determinant of the high-low subjective well-being is a personality type variable openness to experience, agreeableness personality types, grateful, and employee benefits.
3. Personality agreeableness be a predictor of subjective well-being of employees and employee production supervisor. Javanese culture has a strict view of the importance of alignment. Deeply internalized feelings in the soul of the Javanese is the sensitivity to not be humiliated in public. Thus fostering a feeling of conformity, controlling behavior, and maintaining strict social harmony. The conflict was muted mightily.
4. The high-low Determinants of subjective well-being of workers are employees of internal factors that personality agreeableness, neuroticism, and a sense of humor. The workers will also increase the well-being of subjectivity when obtaining social support from outside.
5. That showed significant differences between production employees and the employees supervisor is the subjective well-being, personality type openness to experience, conscientiousness, agreeableness, neuroticism, humor, gratitude, social support, employee benefits, and working conditions. Subjective well-being of employees is higher than the production supervisors employees, because positive psychology centered on the meaning of life, how people interpret everything that happens within him. At the employee supervisor, employee benefits are a means to encourage something that is prestige, autonomy, security, and protection.
6. Predictors showed no difference between the employee and the employee production supervisor extraversion is the personality type, as well as subjective well-being in terms of gender.
7. Humor appreciation and humor tolerance has a significant correlation with subjective well-being in the production employees. This suggests that subjective well-being of employees will increase production even if just to appreciate the humor created by others, or respond to other people's jokes. Humor production and humor coping may not be a predictor of high and low subjective well-being, because not everyone is able to create humor and being able to use humor to resolve the issue. It thus shows that even though a person is able to create humor or being able to use humor to solve the problem, but if it is unable to appreciate the humor in the environment, then he will not be able to improve the well-being of subjectivity.
8. The correlation between social support and well-being aspects of subjective production employees, shows that emotional and informational aspects have a significant correlation with subjective well-being. Instrumental aspects and assessment has no relationship with subjective wellbeing Thus the size of the instrumental support or materialistic as well as support for assessment or giving feedback does not determine the level of subjective well-being, when the emotional support or informational support is not obtained.



9. Aspects grateful that correlated with subjective well-being is an aspect of good intentions, act positively, and grateful transpersonal, while aspects of the appreciation of someone or something and thank personally can not be a predictor of high and low subjective well-being of employees supervisor. Subjective well-being can be achieved not just good intentions, but it must be done with a real positive actions and with gratitude transpersonal. Through concrete actions, one will soon get feedback from their behavior, and through transpersonal grateful to be gained comfort and relief, so that subjective well-being can be increased.
10. Employee benefits are correlated with subjective well-being of employees employee benefits supervisor is intrinsic, whereas extrinsic employee benefits may not be a predictor of high and low subjective well-being of employees supervisor. These results indicate that the employee supervisors interpret the work as a career like characteristics always perform task completion, achievement, autonomy, and personal development. Employee benefits are correlated with subjective well-being of employees employee benefits supervisor is intrinsic, whereas extrinsic employee benefits may not be a predictor of high and low subjective well-being of employees supervisor. These results indicate that the employee supervisors interpret the work as a career like characteristics always perform task completion, achievement, autonomy, and personal development.
11. Familial culture is growing rampant in PT. Y, because of the socialization and perception of the way to work. The first is the perspective of socialization which employees assess that co-production becomes a very important thing, to social support had a significant correlation with subjective wellbeing production employees. In building that relationship which must be adhered to is the value of equality that all men are equal and therefore must be mutual respect between people. Another perspective is the perception of the way to work, have to balance between the achievement of social relationships. Therefore, salaries or employee benefits is not a measure or predictor for subjective well-being of workers, particularly the production employees.
12. A steady income through minimum wage has no effect on the high-low subjective wellbeing and effect only when the system of employee benefits following the performance.

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### RESEARCH ARTICLE

## CORRELATION OF PROLACTIN WITH THYROID-STIMULATING HORMONE AND FEMALE SEX HORMONES IN INFERTILE WOMEN.

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#### Abstract

Hormonal and biochemical disturbances play an important role in development of infertility cases. Therefore, this study was conducted to evaluate the prolactin level and to explore the association between prolactin and thyroid stimulating hormone (TSH) and other hormones in the diagnosed infertile women in Ma'an governorate. The study was performed on 151 women (age group 20–40 years) who visited the Gynecology and Obstetrics Department at Ma'an governmental hospital. The study sample was divided into three groups: fertile group (n= 27), primary infertile group (n= 82) and secondary infertile group (n= 42). The results showed high incidence of prolactin abnormalities in both primary and secondary infertile women (90% and 92%, respectively). Furthermore, TSH abnormalities were found in 90% of primary infertile and % 93 of secondary infertile women. In addition, the results revealed the positively significant correlation between TSH and the fertility. Positive correlations were found between the levels of prolactin and TSH in primary and secondary infertility. Also, there were positive correlations between the levels of prolactin and other hormones, including luteinizing hormone, follicle-stimulating hormone, testosterone, estradiol and progesterone. In conclusion, the present study revealed a significant correlation between prolactin and TSH and other hormones in infertile women. Therefore, assessment of serum TSH and prolactin levels are mandatory in the work up of all infertile women, especially those presenting with menstrual irregularities.

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#### Introduction:-

Infertility is defined as the inability of non-conceiving couple to achieve pregnancy in one year (Roupa *et al.*, 2009; Turchi, 2015). In the second decade of the new millennium, infertility remains a highly prevalent global condition. Infertility is estimated to affect between 8 and 12% of reproductive-aged couples worldwide (Inhorn and Patrizio, 2015). Primary infertility is diagnosed in couple who do not have any living children, while secondary infertility is diagnosed when female have been pregnant at least once but are unable to carry subsequent pregnancies (Whitehouse and Hollos, 2014). The female infertility can be a result of various conditions such as ovulation disorders, uterine or cervical abnormalities, fallopian tube damage or blockage, presence of endometriosis, primary ovarian insufficiency, pelvic adhesions and using of cytotoxic chemotherapy for cancer treatment (Abrao *et al.*, 2013).

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Furthermore, disturbances of several hormones can play a crucial role in development of infertility cases. These hormonal disturbances may involve one or more than sex related hormones including prolactin (PRL), thyroid stimulating hormone (TSH), follicle-stimulating hormone (FSH), luteinizing hormone (LH), estrogen, progesterone and testosterone (Veeresh et al., 2015). Besides, prevalence of hypothyroidism in the reproductive age group is 2–4% and it has been shown to be the cause of infertility and habitual abortion (Verma et al., 2012; Kameswaramma, 2017). Hypothyroidism can be easily detected by assessing TSH levels in the blood. Many infertile women with hypothyroidism had associated hyperprolactinemia due to increased production of thyrotropin releasing hormone (TRH) in ovulatory dysfunction (Goswami et al., 2009).

Moreover, there is a number of scientific studies that have revealed significant correlations between some biochemical alterations and the infertility. These biochemical disturbances involve glucose concentration, lipid profile such as triglyceride, total cholesterol, high density lipoproteins (HDL) and low density lipoproteins (LDL) levels (Allahbadia and Merchant, 2011; Szaboova and Devendra, 2015). This study was, therefore, performed to evaluate the prolactin level in selected females (age group 20-40 years old) from Ma'an governorate, and to explore the association between prolactin with TSH and other hormones, including sex hormones.

## **Material and Method:-**

### **Study population:-**

The study was conducted on 151 women (age group 20–40 years) who visited the Gynecology and Obstetrics Department at Ma'an governmental hospital during 1/4/2014 to 30/9/2014 for a period of six months. The study was achieved in Ma'an governmental hospital laboratory. This study was conducted after taking informed, written consent of all patients. Infertile women on treatment for thyroid disorders or hyperprolactinemia were excluded from the study. All females underwent a complete physical examination, with measurement of weight, height and body Mass Index (BMI). Patient were grouped into three categories according to the Asia-Pacific classification of obesity: overweight (BMI 23-24.9 kg/m<sup>2</sup>), class I obesity (BMI 25-29.9 kg/m<sup>2</sup>) and class II obesity (BMI > 30 kg/m<sup>2</sup>) (Flegal et al., 2012).

### **Blood sample collection:-**

Blood samples from fasting participants were collected at 8.00-10.00 am. Venous blood was collected in an evacuated tube with a gel and a clot activator. Blood samples for FSH, LH, prolactin, TSH, testosterone and estradiol analysis were taken in second day of the menstrual cycle. For progesterone determination, the blood was taken at day 21 of the menstrual cycle. The serum samples were rapidly separated by centrifugation for 3-5 minutes at room temperature at 3500 rpm and were separated into two tubes and stored at -20 C until analysis.

### **Biochemical analysis:-**

The glucose levels in serum were measured by glucose hexokinase method (Hitach-912, Germany). The lipid profile, including triglyceride, cholesterol and HDL, were assessed by automated enzymatic colorimetric method (Hitach-912). Low LDL level was calculated by using the Friedewald formula = (Total cholesterol – HDL) - Triglyceride /5 (Friedewald et al., 1972). The normal reference ranges for glucose, triglyceride, cholesterol and HDL and LDL are 4.20-6.80 mmol/L, 0.70-1.90 mmol/L, 3.90-6.70 mmol/L, 1.06-1.52 mmol/L and 2.80-4.80 mmol/L, respectively. TSH, LH, FSH, prolactin, testosterone, estradiol and progesterone were measured by electrochemiluminescence assay as per the instruction manual for Elecsys, 2010 (Roche Healthcare, Basel, Switzerland). The normal reference ranges for TSH, LH, FSH, prolactin, testosterone, estradiol and progesterone are 0.27-4.20 mIU/ml, 0.40-20 mIU/ml, 2.00-13.00 mIU/ml, 3.40-24.10 ng/ml, 0.025-15.00 ng/ml, 12.50-166.00 pg/ml, 4.90-71.90 nmol/l, respectively.

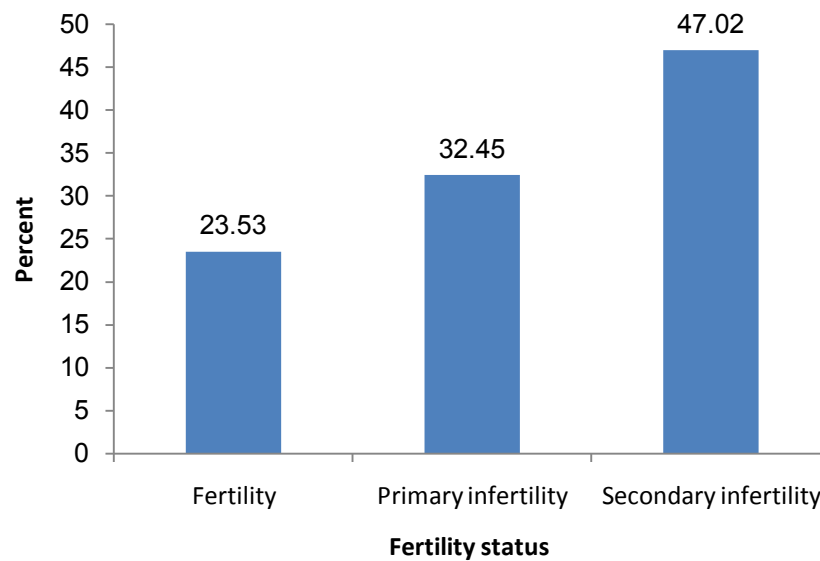
### **Statistical Analysis:-**

The data were presented as the mean ± standard deviation (S.D). Association between variables was assessed by pearson's bivariate coefficient of correlation. *t* -test for independent samples was also used to determine significant difference between means of two continuous variables. Simple linear regression was also employed to analyze the data. *P* ≤ 0.05 was considered significant. All statistical analyses were performed using the SPSS Statistics program, version 16.0 (IBM Corp., Armonk, NY, USA).

## Results and Discussion:-

### Patients' characteristics:-

The mean age of the women included in the present study was  $31.14 \pm 4.29$  years. Figure 1 illustrates the characteristics of the subjects according to infertility status. It was found that 20.53 % of subjects were fertile women, while 47.0 % of the subjects having primary infertility and 32.5 % with secondary infertility. Some characteristics of the subjects, including irritable breast, overweight, amenorrhea, secretion of prolactin from the breast, facial growth increase and obesity, are shown in table 1. Most women in this study were obese according to BMI values. The relationship between obesity and reproductive functions has been known for many years (Dağ and Dilbaz, 2015) and it is still being explored (Klenov and Jungheim, 2014). Several mechanisms are involved in the relationship of fertility and obesity. The insulin resistance and leptin levels are increased and hyperandrogenemia occurs in obese women. Similarly, anovulation, changes in adipokine levels and the hypothalamic–pituitary–gonadal axis (HPG axis), and steroidogenesis in obese women affects the reproductive system (Pasquali *et al.*, 2003; Chen *et al.*, 2013).



**Figure 1:-** Fertility status (%).

**Table 1:-** Distribution of the study population characteristics (n=151)

Characteristics	Status	Number, percentage (%)
Fertility status	Fertility	27 (17.88)
	Secondary infertility	42 (27.81)
	Primary Infertility	82 (54.3)
Hair loss		84 (55.6)
Weight increase		93 (61.6)
Irritable Breast		46 (30.5)
Amenorrhea		90 (59.6)
Secretion of prolactin from breast		73 (48.3)
Hair growth increase		86 (37.1)
Body mass index:	20-25	3 (2.0)
	25-30	51 (33.8)
	>30	97 (64.2)
	>30	

### Serum levels of glucose and lipid profile:-

The results were shown according to fertility status and were grouped into fertile, primary infertile and secondary infertile. Table 2 shows the levels of glucose and lipid profile in all groups. Glucose levels were significantly ( $P \leq 0.01$ ) higher in both secondary and primary groups than in fertile group. The high blood sugar is linked to polycystic ovarian syndrome, which in turn affects the balance of hormones in the body which affects the ovulation process thus negatively happen difficult pregnancy (Chamberlin *et al.*, 2013). The most important hormones is insulin to keep blood sugar at a normal level. Estrogen works to make the body more receptive to insulin (which helps the action of insulin) and therefore it tends to reduce blood sugar, while progesterone works on blocking the action of insulin, and therefore it tends to increase the proportion of sugar in the blood, and there are wondrous harmony between hormones to work (Moce *et al.*, 2005).

Some infertile women have a condition underlying their blood sugar problems. This condition is called polycystic ovarian syndrome (PCOS). In PCOS, too much testosterone is produced and this affects the ability of the eggs to mature within the ovaries (Wu *et al.*, 2012). In turn, this will affect the balance of hormones in the body which affects the ovulation process thus negatively happen difficult pregnancy (Chamberlin *et al.*, 2013).

Lipid profile, including cholesterol and LDL levels, were significantly ( $P \leq 0.01$ ) and ( $P \leq 0.05$ ), respectively, higher in both secondary and primary groups than in fertile group, while triglyceride and HDL showed insignificant changes compared to fertile group. High saturated fat raises LDL cholesterol in the body, which affects the body's sexual and reproductive ability. Cholesterol levels may be an important factor in healthy couples who do not have infertility problems. Cholesterol may be related in fertility because it is a building block of all hormones, male and female, such as estrogen and progesterone in women and testosterone in men, because they affect the sperm and semen of men quality, as well as the ovulation, in planting and maintaining a healthy pregnancy in women (Elis *et al.*, 2013).

**Table 2:-** Levels of glucose and lipid profile (cholesterol, triglycerides, HDL and LDL) in the serum of all groups.

Measurements	Fertility (n=27)	Secondary infertility (n=42)	P value *	Primary infertility (n=82)	P value *
Glucose(mmol/l)	5.48 ± 0.75	6.07 ± 0.97	≤ 0.01	6.02 ± 0.94	≤ 0.01
LDL(mmol/l)	3.49 ± 0.46	3.69 ± 0.8	≤ 0.01	3.68 ± 0.45	≤ 0.01
HDL(mmol/l)	1.31 ± 0.11	1.34 ± 0.09	NS	1.36 ± 0.09	NS
Triglyceride(mmol/l)	1.67 ± 0.46	2.16 ± 0.6	NS	2.12 ± 0.52	NS
Cholesterol(mmol/l)	4.99 ± 0.85	5.82 ± 0.85	≤ 0.01	5.64 ± 0.67	≤ 0.01

Results are expressed as the mean ± S.D. NS: not significant

\* Compared to the fertile group.

### Levels of hormones in serum:-

The hormonal levels in serum are illustrated in table 3. The prolactin levels were significantly ( $P \leq 0.001$ ) higher in both primary and secondary groups than in fertile group. Prolactin does not only work on body to increase the production of milk, but it also affects the ovulatory menstrual cycle. The high prolactin level in the blood is a common reason for the absence of ovulation cycle leading to infertility. This is why it is rare occurrence of pregnancy for women during the period of breast-feeding. Prolactin works on inhibition of two hormones needed for ovulation: FSH and gonadotropin releasing hormone (GnRH). In addition to the lack of ovulation, it also can cause irregular menstruation periods (Cousineau and Domar, 2007; Shafik, 2009; Rebar, 2014).

The pituitary hormones that are related to the process of ovulation and cycle, including FSH and LH, were analyzed in the three studied groups. FSH hormone was significantly ( $P \leq 0.01$ ) higher in both primary and secondary fertility groups than in the fertile group. Likewise, the levels of LH were significantly ( $P \leq 0.01$ ) higher in both primary and secondary groups as compared to the normal fertile group.

LH measurement is useful in the diagnosis of ovarian bagging and recurrent miscarriage. The normal level of LH indicates that the ovary is active, but high number indicates failure of the ovary or the menopause stage of the woman. On the other hand, the low level of LH indicates a lack of secretions by the pituitary gland in general (Pakarainen *et al.*, 2005; Berinder *et al.*, 2007). The FSH measurement gives an idea of the remaining stocks of eggs in a woman's body. In addition, FSH helps to distinguish between the primary and secondary ovarian failures.

The high levels of this hormone are consistent with the primary ovarian failure which is due to failure of ovarian development and chromosomal abnormalities such as Turner syndrome. Meaning while, the of secondary ovarian failure is caused by radiation and chemotherapy syndrome, PCOS and diseases of the thyroid and adrenal glands (Arachchige *et al.*, 2012).

**Table 3:-** Hormones levels in the serum of all groups.

Hormone level	Fertility (n=27)	Secondary infertility (n=42)	P value *	Primary infertility (n=82)	P value *
Prolactin (ng/ml)	16.26 ± 6.68	40.48 ± 12.6	≤ 0.001	35.9 ± 6.53	≤ 0.001
LH (mIU/ml)	11.19 ± 4.48	27.91 ± 9.57	≤ 0.01	21.76 ± 5.9	≤ 0.01
FSH (mIU/ml)	10.0 ± 3.65	25.08 ± 8.54	≤ 0.01	19.4 ± 5.58	≤ 0.01
TSH(mIU/ml)	3.24 ± 1.11	8.86 ± 4.1	≤ 0.01	6.19 ± 2.83	≤ 0.01
Progesterone (nmol/L)	39.8 ± 8.81	14.97 ± 9.72	≤ 0.01	19.14 ± 6.69	≤ 0.01
Testosterone (ng/ml)	5.71 ± 3.75	15.85 ± 4.46	≤ 0.01	14.77 ± 2.58	≤ 0.01
Estradiol (pg/ml)	48.2 ± 12.31	19.14 ± 16.4	≤ 0.01	20.11 ± 6.73	≤ 0.01

Results are expressed as the mean ± S.D.

\* Compared to the fertile group.

Furthermore, TSH levels were significantly ( $P \leq 0.01$ ) higher in both primary and secondary groups than in the fertile group. Thyroid hormones interact with reproductive hormones, estrogen and progesterone, to maintain the function of normal development of the egg and ovaries. The over secretion or hyposecretion of thyroid hormones could lead to the imbalance in these reproductive hormones, causing ovulation disorders, irregular menstrual cycle and reduced fertility (Crain *et al.*, 2008; Artini *et al.*, 2013).

Progesterone levels were significant ( $P \leq 0.01$ ) reduction in both primary and secondary groups as compared to the fertile group. Progesterone is considered of the most important hormones in a woman's body where it plays a major role in maintaining the regularity of menstrual cycle and thus is responsible for the pregnancy process. The shortage of this hormone in women is linked to some symptoms including delayed pregnancy, an increase in weight, especially over the abdominal area, disrupted menstrual cycle dates, low motivation and sexual coldness, fluctuation in mood and depression (Segar *et al.*, 2013).

Testosterone levels were significantly ( $P \leq 0.01$ ) higher in both primary and secondary groups than in fertile group. High proportion of the male sex hormone (Testosterone) causes disorder and irregular menstrual cycle and ovulation where the menstruation comes every two or three months and sometimes only with the help of reproductive medicine. It is often accompanied by blisters or grain in the face and increased hair growth on the face, abdomen and chest (Barry *et al.*, 2011).

Estradiol levels were significant ( $P \leq 0.01$ ) reduction in both primary and secondary groups when compared to the fertile group. Estrogen controls the thickness of uterine and the maturity of the egg when menstruation or pregnancy, reduces the pH in the vagina, and reduction of bacterial infection. Low estrogen levels may cause osteoporosis and menopause. Estrogen affects libido in women and controls the production of milk from the breasts (Stefanidou *et al.*, 2009; Yu *et al.*, 2014).

#### **Correlations between prolactin and different hormones:-**

Table 4 displays Pearson correlation coefficients between prolactin and TSH and sex hormones in primary and secondary infertility groups. The results in table 4 showed significant correlation between prolactin and TSH in both primary and secondary groups. In a previous study, Kumkum *et al.* (2006) showed a positive correlation of 1:4 was found between hypothyroidism and hyperprolactinemia. These findings are in accordance with the results of a study showed that there was a higher prevalence of hyperprolactinemia which positively correlated with thyroid disorder in infertile women (Goswami *et al.*, 2009). In a recent study, Bassey *et al.* (2015) concluded that hyperprolactinemia with thyroid dysfunction may be a major contributor hormonal factor in infertility among infertile women. In addition, both groups showed significant correlation between prolactin and other hormones, including LH, FSH, prolactin, testosterone, estradiol and progesterone (Table 4). These findings are in line with the results of a study

showed a positive correlation between estradiol and progesterone with hyperprolactinemia in infertile women (Isong *et al.*, 2016).

**Table 4:-** Pearson correlation coefficients between prolactin and different hormones in primary and secondary infertility groups.

Measurements	Secondary infertility		Primary infertility	
	<i>r</i>	<i>P</i> value	<i>r</i>	<i>P</i> value
LH(mIU/ml)	0.783	0.003*	0.745	0.003*
FSH(mIU/ml)	0.740	0.002*	0.684	0.002*
TSH(mIU/ml)	0.815	0.010*	0.677	0.010*
Progesterone (nmol/l)	-0.799	0.002*	-0.725	0.002*
Testosterone (ng/ml)	0.801	0.003*	0.681	0.003*
Estradiol(Pg/ml)	-0.803	0.004*	-0.703	0.004*

\* Indicates significant at  $P \leq 0.05$

### Conclusion:-

Hyperprolactinemia are mandatory in all infertile women especially those with amenorrhea. There was a significant high prevalence of hypothyroidism and hyperprolactinemia in the infertile women. A decrease in FSH level which could lead to the problems with the development of the follicle and infertility. There was a significant correlation between prolactin and TSH in both primary and secondary groups. Therefore, assessment of serum TSH and prolactin levels are mandatory in the work up of all infertile women, especially those presenting with menstrual irregularities.

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### RESEARCH ARTICLE

#### DIAGNOSIS MADE PRECISE AND PERFECT – CBCT IT'S APPLICATION IN DENTISTRY.

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#### Abstract

**Aim:** To summarise the application of CBCT in dentistry emphasising on its important in precise diagnosis.

**Background:** CBCT is the abbreviation for Cone Beam Computed Tomography. It is capable to project the dental imaging in three dimensions, which is better than the two dimensions radiographs. Generally, CBCT is a very useful tool for imaging the craniofacial region, by providing a detailed and sharp image under high resolution. The image produced can be used as a guidance for further diagnosis, treatment and even surgical procedures. In fact, CBCT also has low radiation exposure.

**Reasons:** To acknowledge the application of CBCT in of dentistry and its usefulness in diagnosis and treatment planning.

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#### Introduction:-

Generally, radiograph is the image produced on the radiographic film by the exposure of the X-ray radiations. There are lots of imaging techniques that are still available and used till now especially in dentistry, such as intraoral and extra-oral radiography, computed tomography and also tuned aperture computed tomography (TACT). Cone Beam Computed Tomography which is also known as CBCT is the advanced radiographs technology that enlightens the various field of dentistry, by giving a sharp three dimensional (3D) image.

CBCT creates a realistic and high resolution three dimensional image of the object on the oral and maxillofacial region, at a lower radiation dose [1]. The CBCT is also cheap and affordable when compared to conventional CT. Although its radiation dose is low when compare to other techniques, the radiation risk is almost similar to those intraoral radiographs, panoramic radiographs and also full mouth radiographic radiographs.

In addition, CBCT also provides a multiplanar image for the maxillofacial region and this process is known as multiplanar reformation (MPR), in which it produces image of a “real time” in axial plane as well as in two dimensional images in the coronal, sagittal, oblique and even in curved image planes [3]. In fact, CBCT also able to provide imaging in a single 360° rotation of a patient in a digital format, in relation to each rotation of the radiographic projection [4]. Then, the image is reconstructed by using an algorithm of volumetric tomography [5].

Hence, CBCT it is appropriate for the imaging of craniofacial area. Therefore, most of the dental practitioner tend to used CBCT, due to its various advantages in producing the radiographic image.

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**History:-**

Cone Beam Computed Tomography (CBCT) was established by the Japanese and Italian groups in late 1990s [6,7]. They were working independently in developing this new tomographic scanner which is also known as digital volume tomography (DVT), for specific function on maxillofacial and dental only.

In 2001, the first dental CBCT radiograph had become commercially accessible for the dentomaxillofacial imaging [5]. This was the beginning for the commercialized used of the CBCT. It had gain lots of attention from people especially from the dental practitioner, due to its various advantages like low dose, detailed image and also low cost. Along with its various functions in dentistry such as caries diagnosis, implantation, periodontal bone characterization and also its application in endodontics.



**Figure 1:-** Examples of hybrid CBCT. (a) KODAK Dental Imaging 9000 3D, (b) Veraviewepocs 3D, and (c) Picasso Trio [3].

**Advantages of CBCT:****Limitations of X-ray Beam:**

CBCT can be adjusted to scan small regions. This can be done by reducing the size of irradiated area by collimation of the primary X-ray beam to a particular area along with reducing the dose of the radiation [3].

**Image Accuracy:**

Voxels which is a 3D block of smaller cuboid structures is a volumetric data that display the degree of the X-ray absorption, and its size help in determining the resolution of the image. All CBCT systems have isotropic voxels resolutions, which mean it is equal for all of the three dimensions. Thus, this will result to formation of the sub-millimetre resolution from 0.125 mm to 0.4 mm [3].

**Shorten Time of Scanning:**

CBCT can be done in a single 360° rotation of a patient, in a short period of 10 to 70 seconds, to produce image [3].

**Lower Dose:**

The radiation dose used in CBCT is very low compare to conventional fan-beam CT up to 98%. This will result to decreased of the effective radiation dose to almost 4-15 times of a single panoramic radiograph [3].

**Decreased the Image Artifact:**

Through manufacturers artifact suppression algorithms, the CBCT will display the image on a low level of metal artifact, specifically in designed for the secondary reconstructions for observing the teeth and jaws of the patient [9].

**Applications of CBCT:****Caries Diagnosis ( General Dentistry):**

In general dentistry, CBCT imaging is very beneficial for assessing the detection of the caries and its depth in the approximal and occlusal lesions [1].

### Endodontic Applications:

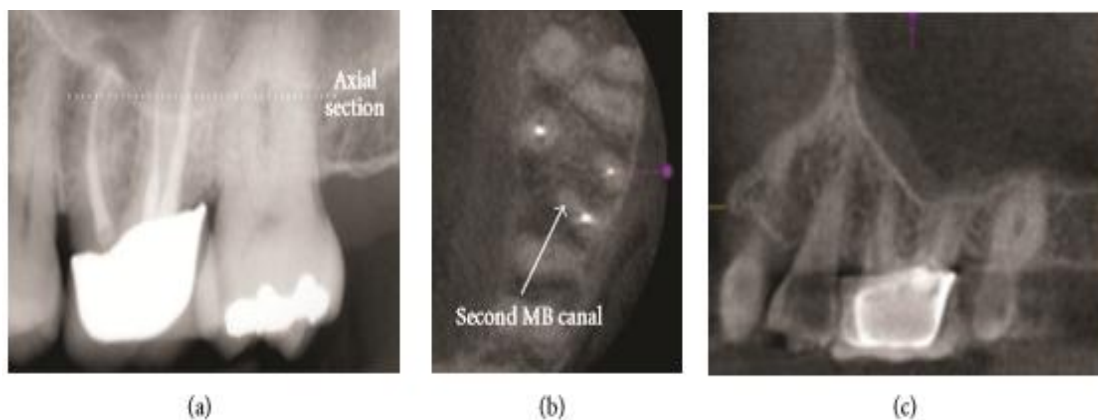
CBCT play a significant role in the endodontic applications because it provide a three dimensional image of the anatomical features of the structures inside of the mouth, that cannot be produced either by intraoral or panoramic radiographs. The CBCT is commonly used for diagnosis of the peri-apical lesions due to the pulpal inflammation, visualization of canals, clarification of internal and external resorption, and also recognition of root fracture [1].

Following are the beneficial used of CBCT in endodontic applications:

### Assessment Of Tooth Morphology:

All root canals can be demonstrated in three dimensional image by the CBCT technique. Through this, the root canals can be accessed, cleaned, shaped and also obturated [10].

The CBCT able to identify the second mesiobuccal canal (MB2) in maxillary first and second molars [12]. The accuracy of the identifications of the MB2 is differs, based on the investigation method used in a range of 69% to 93% accuracy [10]. On top of that, CBCT images also showed the existence of untreated or missed canals intraoperatively or in root filled teeth, including its complications [11].



**Figure 2:-** In (a) a periapical lesion can be seen through the periapical radiograph. The CBCT imaging accurately displayed the previous additional canal that was not treated (b) 0.076mm and (c) 0.076 parasagittal [3].

### Detection of Apical Periodontitis:

CBCT can identified the radiolucent finding beforehand. The peri-apical radiolucency is detected first before it is displayed on the conventional radiographs [11]. CBCT can detect any bone defect in the cancellous bone and cortical bone separately [11], although they cannot be detected conventional radiographically especially in the cancellous bone [13]. Thus, this shows that CBCT has high potential in detection of radiolucencis in apical periodontitis when compare to peri-apical radiography [14].

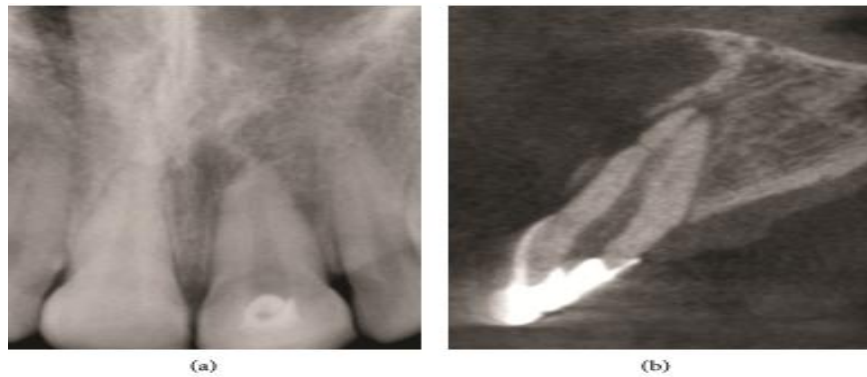
### Pre-surgical Assessment:

CBCT has a significant role in detection for palatal roots of maxillary first molars in planning for its peri-apical microsurgery [15]. The measurement of the gap between the cortical plate and apex of palatal roots can be established by the CBCT as well as the existence or absence of the maxillary air sinus in between the roots of the maxillary first molars. Thus, the thickness of the cortical plate, fenestration, pattern of the cancellous bone and also inclination of teeth's roots can be determined preoperatively by using CBCT for surgery planning [16].

### Traumatic Injuries and Sequelae Assessments:-

#### Assessments of Root Fractures:

The fractures of the crown is more common compare to the fractures of the roots, and it occur about 7% or lesser in dental injuries [17, 18]. CBCT can assessing the vertical roots fractures under the influence of the root canal filling. Potentially, it demonstrated a highly accurate image compare to periapical radiographs [19]. In fact, CBCT also can be used to detect the horizontal root fractures as we can see in figure 3 (b). This capability of CBCT has been reported and approved by the Kamburoğlu et al [20]. Hence, CBCT is an accurate technique that can be used to diagnose any root fractures.



**Figure 3:-** Horizontal root fracture on the anterior dentition due to traumatic injuries. (a) Image produced by using periapical radiographs and (b) image established using CBCT [3].

**Assessments of Roots Resorption:**

CBCT is an excellent system for assessment of the root resorption. It has been successfully used for the determining and confirmation of the internal root resorption (IRR) and differentiate it from the external root resorption (ERR) [21].

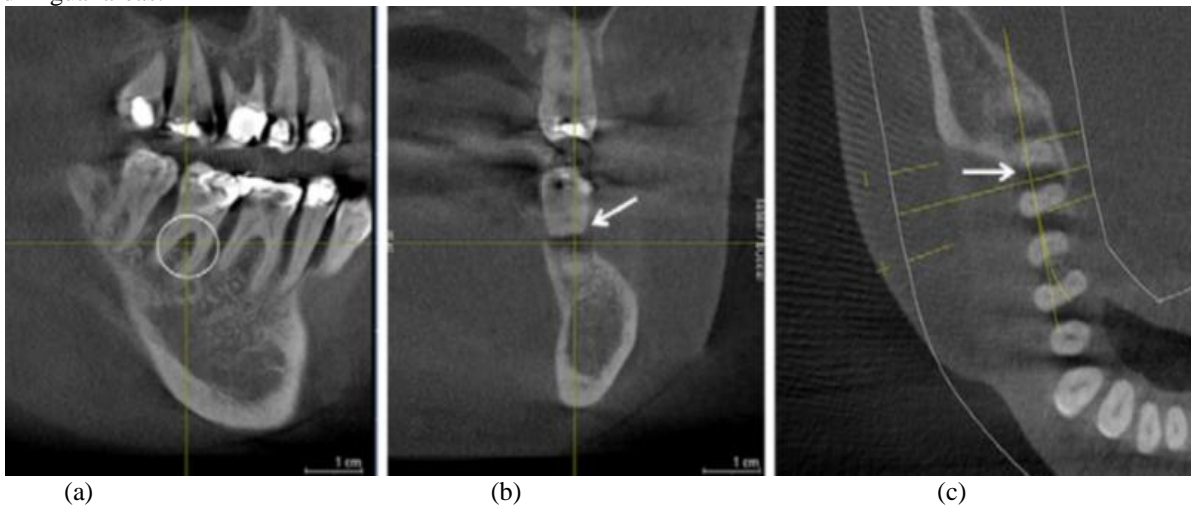
**Assessments of Post-operative:**

CBCT is used to monitor the success of the healing of the peri-apical lesions [10].

**Periodontal Applications:-**

In periodontal, CBCT help in displaying the image of the periodontal bone in an accurate description. Researchers Vandenberghe and colleagues [22] studied on the structure of the periodontal bone by using the 2-dimensions CCD and also full volume of the 3-dimensions CBCT000- based imaging modalities [1,22]. From their investigation, they found that the measurements of periodontal bone levels and defects of CBCT image were comparable to the intraoral radiographs. In fact, they also concluded that CBCT images have high capability in displaying the morphologic description of periodontal bone [1].

In a research conducted by Misch and team-mates [23], they found a similar result about CBCT as in the study of Vandenberghe. However, in their research they found a significant characteristics of image produced by the CBCT, in which the image produced by the CBCT is precise and similar to the used of periodontal probe in measuring the bony defects. This is along with providing a detailed morphologic description of the architecture of the bone [23, 24]. It also can be used for imaging the interproximal regions and also for the measurements of defects on buccal and lingual areas.





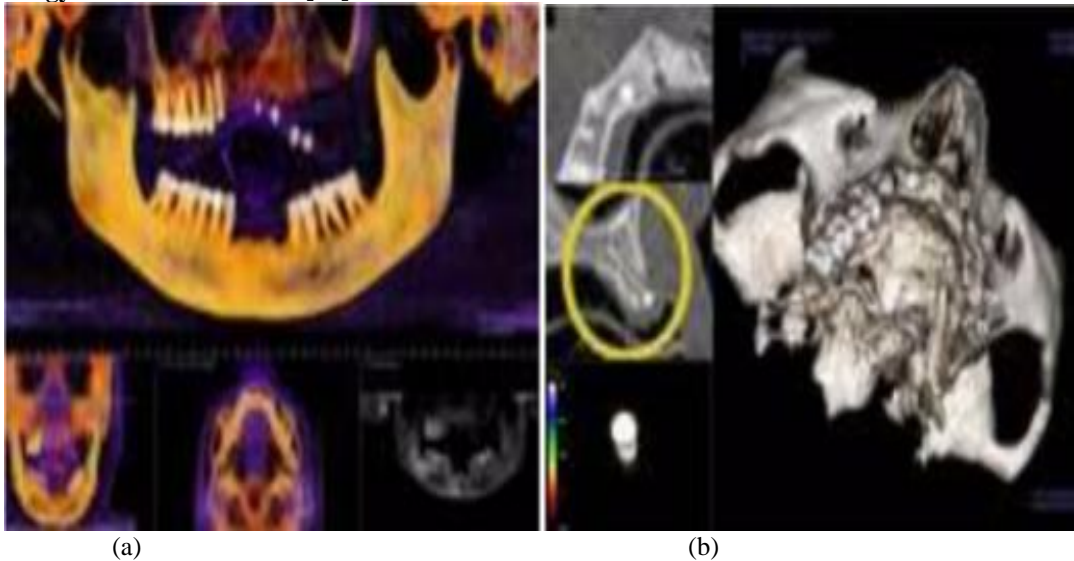
**Figure 4:-** The (a), (b) and (c) image demonstrated a complete periodontal furcation of second molar. (a) A furcation is highlight by the circle. (b) and (c) The arrow on the images show the extent of lesion from facial-lingual and axial views [1].

In an article of digital volume tomography (DVT) for diagnosis in periodontology written by Kasaj and Willershausen [25], they concluded that CBCT is a perfect techniques for periodontal application. Especially in the intrabony defects, dehiscence and fenestration defects regions, periodontal cysts as well as for the diagnosis of the furcation that involved molars teeth. This is due to its lower radiation dose and production of high resolution image [1,25].

#### **Applications in Oral Maxillofacial Surgery:**

CBCT helps to display the jaw pathology, pre and post surgical evaluation of fractures, impacted and super numerary teeth, assessment of bone graft, paranasal sinuses and etc [24] in a three-dimensional image that is important for oral maxillofacial surgery.

#### **Implantology and Prosthodontics [26]:**



**Figure 5:-** (a) The images displayed on the faulty implant planning. (b) The images shown on the implant planning [24].

CBCT is used for evaluation of the site of implant, accurate measurements and planning of implant that corresponds to vital structures, surgical guide and also for computerized prosthesis for any developmental disturbances [24].

#### **Plastic Surgery [27]:**

CBCT is used for estimation of the dental age and three-dimensional face reconstruction. It is useful for evaluating any ENT problems like DNS , paranasal sinuses, syndromes, pre and post evaluation after the plastic surgery [24].

#### **Orthodontics applications:**

The CBCT images can also be used in orthodontic assessment.

#### **Conclusion:-**

CBCT is an effective diagnostic aid in all field of dentistry. The advantages of CBCT outweigh the disadvantages. In fact, it is better compared to other radiographs in many aspects, like producing high resolution and sharp images, low dose of radiation and can be used widely in many areas as it able to demonstrate accurate and detailed image on the particular areas. In addition, the CBCT also available as a low cost technique.

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### RESEARCH ARTICLE

#### RARE PRESENTATION OF DUODENAL ADENOCARCINOMA IN A YOUNG ADULT - A CASE REPORT.

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##### Key words:-

Duodenum, Adenocarcinoma, Young adult

#### Abstract

The incidence of duodenal adenocarcinoma in general population is very rare. It may arise from duodenal polyps seen in familial polyposis or can be associated with celiac disease. Usually duodenal adenocarcinoma is seen in middle or elderly age group. It can occur in young age also when it is associated with polyposis syndromes or with any inflammatory diseases affecting small bowel. But when there is no such syndromes or diseases, duodenal adenocarcinoma in young age is very rare. We are reporting a case of 28 years old male who presented to us with history of recurrent abdominal pain. After evaluation it was diagnosed as adenocarcinoma arising from junction of first and second part of duodenum without any associated polyposis syndromes or inflammatory bowel diseases.

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#### Introduction:-

Duodenal adenocarcinoma is an aggressive malignancy though it is seen rarely<sup>1</sup>. Primary malignant tumors of the duodenum makes 0.3% of all gastrointestinal tract tumors and up to 50% of small bowel malignancies. Duodenal adenocarcinoma must be differentiated from malignant tumors of the ampulla, pancreas and common bile duct<sup>2</sup>. It may arise from duodenal polyps seen in familial polyposis or can be associated with celiac disease. The common location of the tumour is second part of duodenum. Usually duodenal adenocarcinoma is seen in middle or elderly age group. It can occur in young age also when it is associated with polyposis syndromes or with any inflammatory diseases affecting small bowel. But when there is no such syndromes or diseases, duodenal adenocarcinoma in young age is very rare. We are reporting a case of 28 years old male who presented to us with history of recurrent abdominal pain. After evaluation it was diagnosed as adenocarcinoma arising from junction of first and second part of duodenum without any associated polyposis syndromes or inflammatory bowel diseases.

#### Case Report:-

28 years old male ECOG performance status 1 with no co morbidities presented to us with upper abdominal pain and vomiting of one month duration. There was no history of any malignancy in family. Local and systemic examination was within normal limits. Routine blood investigations were normal. Upper gastrointestinal scopy done showed (Fig 1 & 2) ulcerating lesion present in D1 and D2 junction of

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duodenum with stenosis of that area. Endoscopic biopsy was suggestive of moderately differentiated adenocarcinoma of duodenum. Colonoscopy done was normal. Contrast enhanced CT scan showed (Fig 3) mild circumferential irregular wall thickening up to 1.3 cm in D1 part of duodenum with extension in to the D2 segment. There was a large node seen in the peripancreatic location superior and medial to the pancreatic head measuring 3.2 cm in size. Another node of size 2.8 cm present in the porta hepatis. No evidence of periduodenal fat stranding, para aortic or distal adenopathy or distant metastasis.

After completing evaluation Whipple's resection was done for this patient. Post operative period was uneventful. Histopathological report came as moderately differentiated adenocarcinoma duodenum with a tumour of size 3\*3 cms with 1.7 cms thickness, infiltrating through the muscularis propria in to the sub serosal connective tissue and invades adjacent pancreatic tissue with positive lymphovascular invasion. Metastatic carcinomatous deposits in four out of twenty two lymph nodes dissected seen. Extra capsular spread in one lymph node noted. Periportal lymph node dissected is negative for malignancy. All resected surgical margins are free of malignancy. pT4b pN2 (AJCC 7<sup>th</sup> edition).

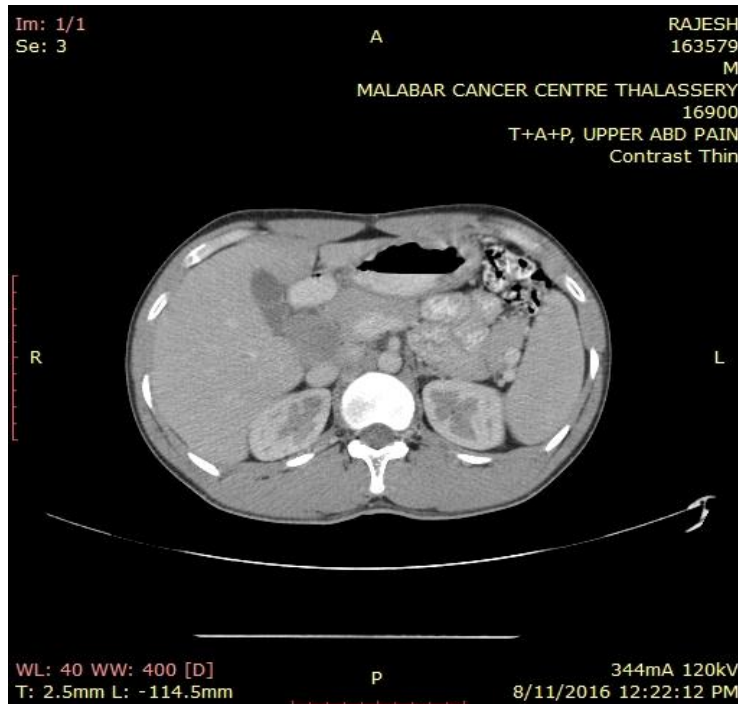
After discussing the case in institutional multi specialty board, it was decided to give 8 cycles of chemotherapy (CAPEOX). Now the patient has completed 5 cycles of chemotherapy and is doing well.



**Fig 1:-** Ulceroproliferative growth in D1 - D2 junction.



**Fig 2:-** Duodenal lesion causing D1 - D2 junction Stenosis



**Fig 3:-** CECT scan showing duodenal lesion with peripancreatic and periportal lymph nodes

### Discussion:-

The most common tumour of the duodenum is adenocarcinoma<sup>3</sup>. The other histological varieties seen are carcinoid tumors, lymphomas, stromal tumours, leiomyosarcomas and gastrinomas. Adenocarcinoma of the duodenum may arise from duodenal polyps observed in familial adenomatous polyposis, Gardner's syndrome, Lynch syndrome, Muir Torre syndrome, Puetz Jeghers syndrome, and are or it can be associated with Crohn's disease and Celiac disease<sup>4</sup>. Duodenal adenocarcinoma is usually seen in middle or elderly age group. But it is seen in young age also when it is associated with polyposis syndromes or inflammatory diseases. But occurrence of duodenal adenocarcinoma without such syndromes in young age is very rare.

The common symptoms of duodenal carcinoma is nausea and vomiting, mass in the abdomen, abdominal pain, acid reflux, unexplained weight loss, upper gastrointestinal bleeding and obstructive jaundice. The diagnostic investigations for duodenal carcinoma includes upper gastro intestinal endoscopy, contrast enhanced CT scan, barium study and routine blood investigations. Upper gastrointestinal endoscopy shows the exact location of the tumor and endoscopic biopsies can be taken to confirm the diagnosis. Contrast enhanced CT scan helps to confirm the anatomical location of the lesion, operability of the lesion and to rule out any metastasis. Barium study usually reveals an irregular stricture of the duodenum but it can be either benign or malignant stricture. If you are suspecting any syndromes like familial adenomatous polyposis colonoscopy should be done to rule out colonic polyps.

If the lesion is operable and non metastatic after evaluation the treatment is curative resection by Whipple's procedure. The 5 year survival rate varies widely according to different series published, but is generally reported to be >40% in case of curative resection<sup>5</sup>. The presence of lymph node metastases is not a bad prognostic factor in most series and is not a contraindication for curative resection<sup>6</sup>.

### **Conclusion:-**

Though rare, duodenal adenocarcinoma can occur in young age also. Primary malignant tumours of the duodenum must be differentiated from malignant tumours of the ampulla, pancreas and common bile duct. The prognosis of duodenal adenocarcinoma is better than peri ampullary, pancreatic or cholangiocarcinoma. Treatment of this condition is by curative resection.

### **Conflict of Interest:-**

None

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### RESEARCH ARTICLE

#### SOCIAL MEDIA FOSTERING THE REVOLUTIONS: CASE STUDY OF THE ARAB SPRING.

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##### Manuscript History

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#### Abstract

Globalization converted the world into a global village which is closely interconnected through Social Media. 2010 and 2011, were the years of large scale political uprisings in Middle East. The uprisings were mainly the result of the political mobilization that was generated by the Social Networking sites such as Face book, Twitter and YouTube Social media played an important role in awakening the people and mobilizing them to protest for their rights, and against the authoritarian regimes they were living under The research discusses the role of social media in bringing up the Arab spring.. The aim of research paper is to articulate how the revolution has been fostered by the Social Media and the role social media play in political mobilization. The research is both qualitative and quantitative in methodology in which the primary sources for qualitative data are the newspaper archives and books on empowerment of the social media while the secondary sources are the academic research papers. Quantitative analysis will be based on the survey conducted by the author himself. This paper concludes that social media has made an unequivocal contribution in fostering the revolutions and bringing up the revolution in Middle East during Arab Spring.

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#### Introduction:-

Arab Spring was set apart by the arrangement of progressive anti-government challenges and demonstrations that started from Tunisia and spread over the entire Middle East. It began when individuals started to be enraged by the Authoritative Regime. The Arab world have been battling long to change their legislatures gradually, however they were falling flat, until finally in 2010 oppositions began, the self-immolation of a vegetable merchant simply energized up the procedure of these demonstrations. None would have accepted that the challenge of a young vegetable merchant named Muhammad Bouazizi would have unleashed a stream of protests for democracy in the Arab world. Muhammad Bouazizi set himself ablaze before the organization of the Tunisian Government on December 17, 2010 in the wake of being embarrassed by a female officer. The rebellions for a popularity based government or democracy had started, which, later on extended across the whole of Middle East. To bring down or dissolve the dictatorial regime became the motto of the protestors.

The Arab Spring had many causes; however, the most obvious among them was Social Media. This notion was elegantly illustrated by a protestor that they utilized Facebook to plan the dissents; Twitter to synchronize the protests and finally YouTube was used to show the world the protests and riots going on in Middle Eastern world. Social networks and outlets made the persecuted individuals to express their thoughts, to see the ruthlessness they

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are long enduring and to make them to act and to stop this administration severity and the illegitimate control of government. Bouazizi's video of setting himself on fire was exclusively shown on the social sites like Facebook, Twitter and YouTube for getting attention of the population and to encourage them to come out and fight for their rights. This created his story to be told over and over. This drove the general population to condemn the legislature and urged them to remain firm against the savagery of the government. An influx of protests and riots begins that toppled the legislature of Tunisia, and after that the government of Egypt. Civil war started up in Libya and protests started in the boulevards of Morocco, Algeria, Yemen and Syria.

The Arab Springs in the Middle East was mainly fostered by the Social media which has played a role of mobilization towards pro-democracy movements. The goal of the study is to understand how social media helps in bringing up a revolution. The research paper is aimed to highlight how social media helped transfer information and mobilize the protestors. In addition, how social media promoted Arab Spring and helped protestors in their movement for a democratic government and, in doing so, how the revolutions were fostered resulting in the fall of Governments in Middle Eastern countries.

### **Methodology:-**

The research is mostly qualitative based on the rhetoric analysis of the primary and the secondary data. The primary data sources include the news archives, while the secondary data is collected from the academic research papers. The dependent variable in this case is the Revolution or the Arab Spring while the independent variable is social media. The research also includes a portion of quantitative analysis in which a survey is conducted in which the relationship of social media with political mobilization and social awareness has been examined on the basis of data collected through the surveys.

### **Literature Review:-**

The utilization of Social Media to achieve some desired objectives has turned into the most persuasive event of the present world. Individuals utilized Social Networking sites like Twitter, Facebook, YouTube and numerous other sites and applications for social association. They utilized them to make themselves watchful and aware of the things happening around the globe. Online networking and systems administration have come to characterize another era of correspondence and have molded a stage that has interminable capacities to associate, share, and investigate the world (Bhulyn, 2011). Online networking is a standout amongst the most critical worldwide jumps forward in mankind's history (Omidyar, 2014). It furnishes people with the methods of expression for themselves, what they feel and get them on mutual understanding. Social Media has transformed our world into a global village and has connected everyone around the globe.

Web-based social networking sites have been turned into devices or gadgets that associate individuals and their thoughts and philosophies. Prior to the Social Networking Sites, Middle East had government controlled media outlets where everything was blue-penciled and government was depicted to be the most ideal in all ways. No one was permitted to evaluate the validity of any event or incident and if someone would spoke the truth, he or she would be muted by the administration. The fear of death never allowed anybody to speak the truth. Media was completely controlled, while a limited access was provided to the facts and figures of any incident. What was in the interest of the government was displayed, and thus this became the rule of society. In those conditions the arrival of Social Media into the life of Middle Eastern folks assisted them overwhelmingly in the articulation of their thoughts on any issue. Frequent use of these sites by the individuals was compelling the governments to create majority based rules system, since web-based social networking destinations gave individuals a voice to express their sentiments about government (Bhulyn, 2011). The social networking sites including the Facebook, twitter, YouTube permitted individuals of Middle East to have the power they had longed for.

After the innovative progress of Internet in the locality of Middle East, the nations were loaded with internet cafes. A big population of people mainly comprising the youth and educated class rushed to these cafes and spent their time in making them politically aware. They acquired information about the political activities of the globe. People vastly equipped themselves with tools of technological advancement and started to use these tools to make a keen observation over the political incidents of their state and political happenings around the world. The year 2009 vested cell phones to half of the population of Egypt. In the end of 2010, three forth of the population had one and a substantial number of new associations were emerging every month (Cole, 9). However, in Tunisia everyone had cell phone by 2009. The youth encountered by Cole felt that it was imperative for them to have these cell phones for

their politicking (Cole, 11). Youth utilized the social networking sites to display the discontent and disappointment towards their legislature. Furthermore, Cole interprets how young generation invested a large proportion of its time surfing the web and perusing the news on their phones as they did not trust the printed daily papers and magazines due to political pressure of the state on media houses, resulting 2010 to be the year of social and political awareness. By the end of 2010, there were tens of millions of Arabs on the social networking sites and had access to the internet. 15 million of the Arab population was using social networking sites like Facebook, twitter etc. Youth between the ages of 15 to 29 encompassed seventy-five percent of Facebook clients (Cole, 11).

The internet has furnished the general population with a significant access to the data. It has provided the people with the accurate, unbiased and most importantly most up to date information of the political incidents. During the Arab Spring a large amount of evidence and information of the political scenario was spread over Twitter. Prior to the condition of Arab Spring, there were about hundred million clients in Egypt, but as the upheaval finished the number expanded to 1.1 Million clients of Twitter (Amer, 2011). Local Google supervisory Wael Ghonim terrifically indicated the reason for the liberation of a society. He proposed that to liberate a society, the society should be bombarded with internet. The internet and the products of internet that include the social networking sites are proved to be effective weapon of the feeble, and have stifled individuals against their tyrant oppressors.

#### **Assumptions:-**

1. Social Media played a very important role in encouraging the revolution in the Arab Spring.
2. Social media made people aware of the ongoing political change and led to political mobilization which was the root cause of the Arab Spring.
3. Social Media and networking sites have yielded a Pro Democratic environment.

#### **Descriptive Analysis:-**

Social media has now evolved to be the basic source of information, news, and a source to read criticism and political analysis. Almost every living soul has its hand on Social media and, can easily access social media and its usage has evolved as the most influential occurrence in the present society. People from all age groups use these social networking sites like Facebook, YouTube, twitter, WhatsApp, Snapchat, Instagram and many other social media outlets for communication and interaction. The use of social networking sites is not only restricted to social interaction and communication but these are also used by the online gaming applications and YouTube has become the main source of entertainment for entire population. It is providing the world with a platform to share and express their thoughts and ideas, entertain them and also make them aware of the global happenings.

Middle East has long been ruled by the dictators and monarchs. Under their rule, if any media outlet would broadcast or publish news that was against the government that media outlet would face severe consequences. All the media was censored by the government. But with the invention of Social Media Middle East underwent much digital advancement. Social media enabled people to share their feelings and thoughts. Social Media became the voice of the people. People made themselves aware of the world politics and how people in a democracy enjoyed their rights. The Middle Eastern People realized how less they were given the rights and how their rulers were exploiting them. The pro democratic feelings aroused in the people and they started thinking of having a government of their own choice. Thus, they became frustrated by their rulers, and expressed their frustrations via these Social networking sites. These social networking sites and applications persuaded the masses to have the power they were always fancied for.

Before the start of Arab Spring, few of the countries had already had the online public groups where political thoughts and views were shared, and these were free from the censorship of Government. The videos of the lavish lifestyles of the rulers were shared on Facebook and YouTube. People became aware of the corruption of their rulers and also showed to international communities how they have been living under these corrupt ruler ships. Once the protests erupted, the Middle Eastern countries started a wide shut down on the social activists and the bloggers and also the human rights activists. A huge number of social activists faced the brutality and excesses committed by the government. But the Social media and social networking sites became the tools for public to support pro democratic movement and protest for a democratic government, and also to highlight the corruption and brutality of the Authoritarian regimes.

A detailed impact of Social Media and Social Networking sites on the Revolutions in different states during Arab Spring is given below:



**Tunisian Revolution:-**

Social Networking sites, mainly facebook, are considered to be the catalysts that ignited the Tunisian Revolution. One of the activists of the revolt, Rochdi Horchani, who was also a relative of Bouazizi, said that the activists grabbed a stone in one hand and a phone in the other (Ryan, 2011). The greater part of the activists was young fellows that could be seen holding their phone cameras and archiving the scenes. Footage of the tranquil activists and terrible scenes that contained the brutality of the police were uploaded on Facebook, YouTube, and Twitter where people could be exposed to the truth. Horchani indicated that they could have protested for two years or more, but without the videos and recordings, no one would have noticed (Ryan, 2011). Bouazizi was not the first man to set himself on fire, there had been numerous men before him, however, none knew about them. The only reason that Bouazizi's self-immolation created such hype was the eminent presence and the usage of Social networking sites that displayed and shared his story on the Social sites and that's what drove individuals to know reality.

Tunisian government consistently had attempted to stop the general population from selecting the social destinations by web restriction. Tunisian authorities started regular assaults on activists using Gmail and Facebook accounts by infusing distinctive kind of viruses. Ben Ali's monitors could acquire passwords of the records, bolting out the activists and gathering email arrangements of asserted protestors (Zuckerman, 2011). Government began to capture the conspicuous activists. Zine El Abidine was so anxious of losing the power that he did everything conceivable to stop the protestors, including the utilization of live ammo. All the interpersonal communication sites were hindered aside from Facebook. But quick interaction of people on Facebook and twitter gave information to the protestors how to counter the security forces. Maps demonstrating areas for the protestors and rational aides for what to do when exposed to tear gas was utilized and assisted a number of the protestors to save their lives. The severity and brutality of the security powers was viewed by the general population with extreme anguish and wrath. And finally, as a result of these protests, the revolt became successful and on 16<sup>th</sup> January 2011 Zain el Abidin surrendered.

**Egyptian Revolution:-**

Another product of the Social Media is the Egyptian Revolution that started on January 25, 2011. Social Networking sites, mainly twitter, was exclusively used that made "Egypt" and "Jan25" to be the most tweeted hash tags of the following year. Everybody was equipped with phone during the Egyptian Revolution. Like Tunisia, Egypt also had a huge population that used social media outlets. These Social Media outlets were the destinations where major fundamentalists, analytical columnists, and isolated citizens connected with each other (Howard & Hussain, 21). These social media outlets became the only source of expressing views and without utilization of these outlets there was no medium that could help in the elevation of the expression against the legislature. These destinations enabled them to voice their worries and political perspectives about the nation.

Wael Ghonim, regional executive at Google, started a page on Facebook, in the memory of a young blogger from whom Egyptian Police violently pounded the life out in 2010 in Alexandria for exposure of their vicious extortion, entitled as "*We Are All Khalid Saeed*". Ghonim posted on the Facebook page that today they killed Khalid, on the off chance that I don't represent his purpose tomorrow they will kill me as well (Vargas, 2012). Pictures of his battered face were taken and passed around from one phone to another. Those were seen by a great number of individuals who initiated their own pages on Facebook looking for equity for Khalid Saeed, and consolidating protests on the Social Media sites and outlets. The web pages created to remember Saeed turned into an entrance for aggregate sensitivity (Howard and Hussain, p.21). During the dissent, Ghonim was captured and locked up behind the bars. Ghonim was discharged following two weeks, and it was then that he turned into the voice of the Arab Spring in Egypt. Be that as it may, Ghonim rejected this thought, pronouncing that he was not a saint, and that he was only participating through the web, wasn't revealing his life into risk, but the actual legends are those people who were fighting and protesting in the streets of Egypt (Smith, 2011). Ghonim was called upon for an interview by CNN in 2010 in which he projected that Social Media was in charge of the Arab Spring. He also commented that he was indebted to Mark Zuckerberg, the founder of Facebook. This change began on the social networking site mainly Facebook. This upheaval began in 2010, when a large number of Egyptians began working together in the digital space. They would post a video on Facebook that would be shared by 600,000 individuals on their Facebook walls within few hours (Smith, 2011).

Through the peak times of the revolutions, the Tahrir Square was occupied by the protestors who were protesting against the brutality of governmental institutions. They messaged from their cell to persuade each other to turn out to roads and show dissent. Countless reacted to the catch and poured out to show solidarity with the protestors. The government felt it didn't have any other option except to block all Internet access in the nation (Abdulla, 2012).



Be that as it may, this minute was thought to be the water shed moment in the political Scenario of Egypt. The Mubarak's rule came to an end because of this progression of government, as even those individuals who were not among the protestors, the individuals who were watching the dissent from home , also went to Tahrir Square to expanded the weight on the administration, and eventually ,Mubarak's Government fell.

### **Libyan Revolution:-**

Arab spring also knocked the doors of Libya. The revolution in Libya started on February 15, 2011. However, before it began in Libya, its ruler, dictator, Muammar Gaddafi in his speech, severely condemned Tunisian people for bringing down the government of Ben Ali. He audaciously and sarcastically expressed his feelings by depicting that Social media had created problems for the people in knowing the truth, as any deranged individual or a personal who was under the influence of any drug or mental illness could write anything and people would believe in whatever he wrote (Lynch, 2001). But unluckily, Gaddafi himself was assassinated, and his government was toppled over by his own people with the help of the social networking sites.

Social Networking sites, mainly Facebook, played a vital role in bringing up the uprising in Libya. A Facebook page was created like in the case of Egyptian revolution on January 2011. The page made people aware of the brutality and hardship they have been living under along with portraying the lavish lifestyle of their rulers. Through this page, the activists asked the Libyan individuals to follow in the strides of the Tunisians and Egyptians and strive for democracy in their political system. The page also reinforced people to end Gaddafi's regime and broadcasted him as a deceptive and vindictive killer. The page also demonstrated, how Qaddafi's children were burning cash on extravagant events and private yacht trips, and gave proof of the corruption of the government and its institutions.

Finally, the struggle for democratic government started. On February 15, 2011 a small population of the youth of Libya reacted against the government and rebelled in the city of Albyeda. These protests got reinforced as the government executed two of the rebels and caught the others and put them into the prisons. Gaddafi felt threatened by the ongoing Social Media role in the protests, and to tackle which he called a meeting with all the renowned Libyan activists accompanied by the bloggers and threatened them of the critical results if they kept blogging on informal sites, but , it was of no use to cry over the spilt milk. By the time the warning came, it was already too late, and many of the Libyan citizens had already started using Facebook pages to criticize the government and its institutions.

Through mid-February 2011, countless Libyans revolted in the streets of second largest City of Libya, Benghazi, to end the ruler ship of Gaddafi (El Mahjub, 2013). At the point when the rebellion started Gaddafi was being ignorant and attempted to control his peoples by manipulations. All the media outlets were taken under control of the government and every TV or News channel showed pro-state songs and documentaries. The news of the fatal conflicts between the protestors and the security forces and murdering of individuals were nowhere to be shown. But in this scenario, Social Media became the voice of the people. The general people, who were on the roads fighting with the state forces, procured pictures and recordings of the riots as they were happening, and posted them on YouTube and Facebook. The communication of protestors on social networking sites also attracted the attention of the International World and whole of the international community soon started to condemn the Gaddafi government (El Mahjub, 2013). Due to these social networking sites whole world saw the uprising of Libyan people and supported them in their urge for democracy.

Gaddafi attempted to counter that movement by posting the videos of people loyal to him on social networking sites believing that people would see him as a good man. But all his efforts went in vain, as the protests and riots heated up more. The final option for Gaddafi was the use of his military. He used heavy ammunition, rocket launchers and the tanks to regain the power. About 600 of the protestors were killed and their killing by the military forces was shown on social media. These were so brutal and dreadful that even international community acted against it as a result of which United Nations imposed no-fly zone. After that, the protestors were titled as the freedom fighters, and they succeeded in taking the control of the government. Gaddafi was caught and killed.

Social Media ad networking sites without any doubt played a noteworthy part in the Libyan turmoil. In the event without Social Media, the general population of Libya could never have possessed the capacity to expel Gaddafi from power.

**Syrian Revolution:-**

The success of the toppling of the governments of Tunisia and Egypt aroused the general population in Syria to begin their own revolution. Social media also proved to be a helpful medium of expressing views. Gradually, people and the revolutionists group began to voice their thoughts on Facebook and other online networking sites. People were afraid of being monitored by the government so the expression of public opinion was kept under secret chat groups.

On 5<sup>th</sup> March, 2011 some school boys painted the mainstream progressive slogans and included that the general public need to topple the government. They aggravated matters for themselves by including their names to the painting. The Syrian law enforcers caught these young men, and for quite a long time, their whereabouts were unknown to the families. In reaction to it, the general population of Daraa protested against the government unlawful act and demanded the children back. Syrian aggressively acted on the protests and they started shooting at the protestors, murdering many individuals and harming others. In solidarity with the Daraa killings, a rush of challenges spread to different urban areas in Syria (Shehbat, 2012).

It is to be noted that Syrian revolutionists were not given complete access to social media because of the fear that government may be monitoring and keeping tabs on all the social networking activities of individuals. Hence, Social Media's part in Syrian revolution was limited. Still the activists knew that social media and networking sites were their only choice to get their exploiters out of the nation, and also for the world to know, how the Bashar administration worked. The protests were organized by the Facebook groups that gave the location of the protest at eleventh hour of the protests. Syrian government was doing everything to stop the riots and protests; they were also making the use of arms. While the only ammunition the protestors had was YouTube, where they would show videos of brutality of the government and let the world know about viciousness of the Bashar's regime. In the end of May, 2011, a video that demonstrated the abused, and plainly tormented dead body of 13-year-old kid was uploaded to YouTube. This video proved to be a spark, and whole world witnessed the viciousness of the Bashar's government (Shehabat, 2012). After this event, numerous protestors started to express themselves on twitter, Facebook and YouTube. Additionally, Skype was used that would provide live broadcasting of the news. The Bashar's government now started censoring the media content on the social networking sites by cutting off the cell phones and Internet links in Daraa and Homs (Shehabat, 2012). To counter this act of government, people started to use the smuggled Sims from neighboring states. They used the Jordanian and Turkish Sim cards. The internet connection was cut down so people started to use 3G services on their phones.

The ruling government was tired of these events and finally came on air to express its anger. It condemned the social networking sites and told that the people might be the winners on the social media but on actual grounds the winner would be the government. Syrians used YouTube as the main tool for expressing their views and brutality of the government. Facebook was also used by the protestors and helped to make the international community aware of the hardships being endured by the people of Syria. Skype also played an important role in this revolution. People and famous analysts would communicate on skype. But unfortunately, the Syrian people did not achieve the results in their favors but the civil war broke out in the country that is continued till now.

Social Media started a chain of revolutions that affected the whole Middle Eastern World. The revolts not only ended on Syria but continued to all the Middle Eastern states. Yemen was also struck by the revolts that were started right after the Tunisian revolutions. Protests also broke out in the Jordan and Bahrain. The result of the revolution was different in Syria, but still Social networking sites played an important role in mobilizing the people, and made them vigilant and politically active. Pro democratic expressions were born in the individuals for which they fought and toppled the regimes. Syrian's had controlled and monitored social media which made it difficult for the people to organize their revolt effectively against the government. Strict monitoring and quick actions of the government against the activists hindered the Syrian revolution, causing them not to topple the government. To what an extent the social networking sites made the revolutions successful, is debatable but their role in bringing up the revolutions cannot be dismissed altogether.. Social media gives the oppressed and depressed people a medium to voice their thoughts and to develop democratic thoughts. So we can say that the Social Media was an effective tool in bringing up the revolutions and forming pro democratic expressions in the general public.

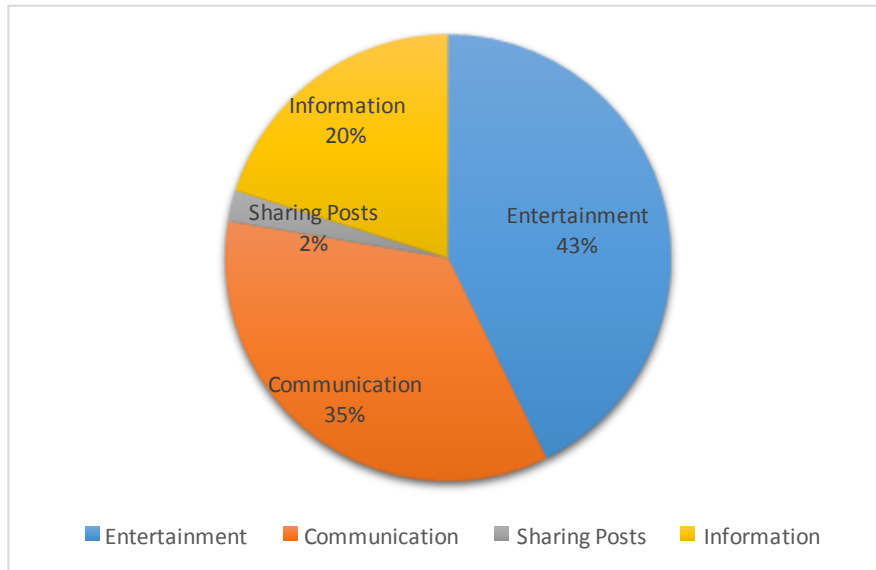
**Statistical Analysis:-**

The statistical analysis is based on the survey that was conducted from 22<sup>nd</sup> November 2016 to 2<sup>nd</sup> December 2016 at Forman Christian College, Lahore in which 100 participants were involved. Different Questions were asked from

the participants that allowed us to explain the role that social media played in revolutions during Arab spring. The analysis is given below

- **What does Social Media mean to you the most?**

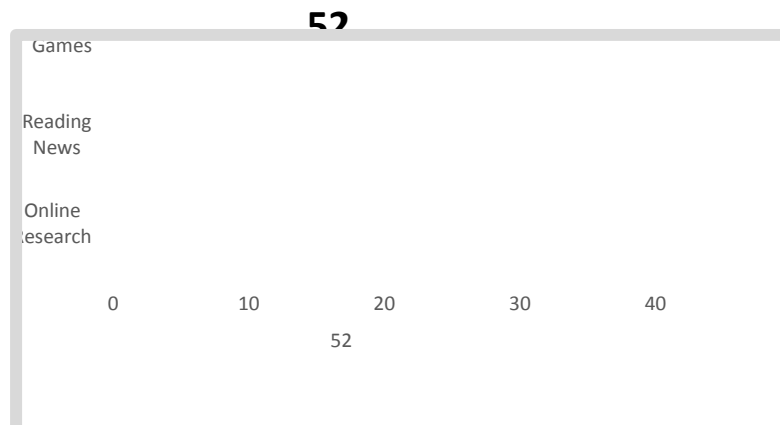
For this question the participants were given four options whose percentage is shown in the pie chart.



It is evident from the table that a large proportion of students use these social networking sites for Entertainment purpose, and after entertainment they use it for communication.

**Most time spent on Internet is utilized in?**

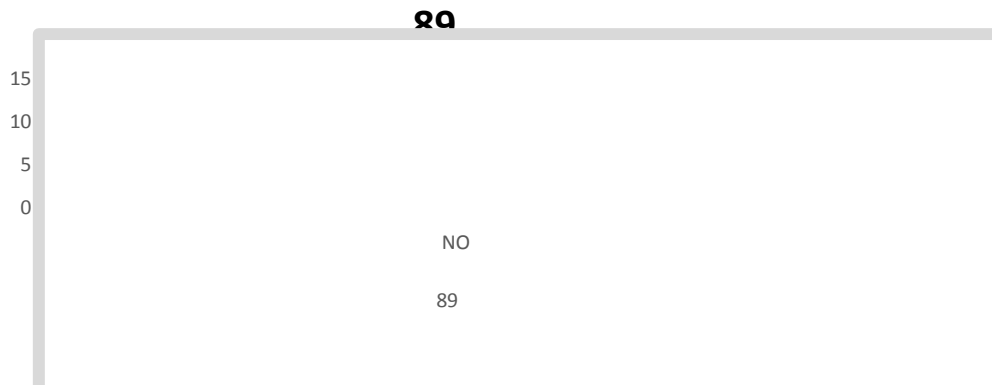
For this question the participants were given four options whose percentage is shown in the below pie chart.



The results showed that a large number of the population of the participants utilized internet for social networking sites, and then secondly, reading the news.

**Does Social Media help you to stay in touch with current affairs:-**

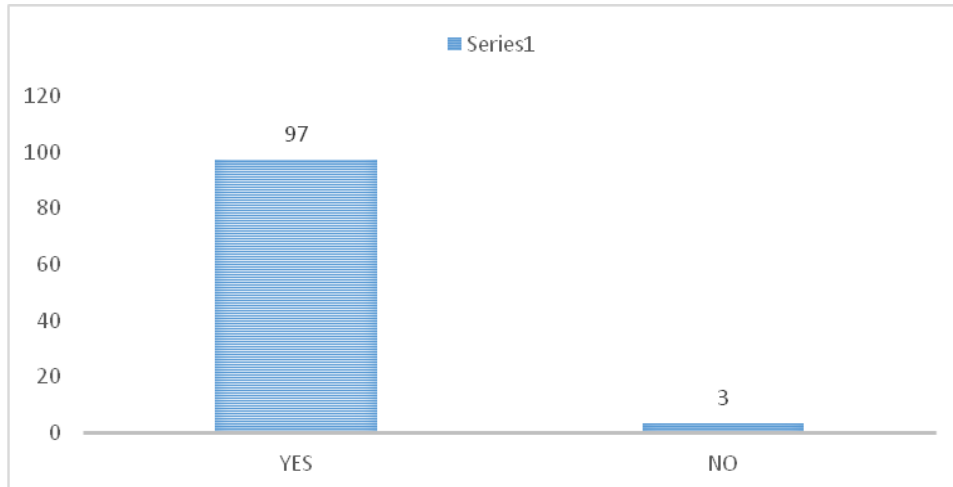
To answer this particular question, the participants were given two options of YES or NO. Following is the data obtained.



The above chart clearly shows that social media and the networking sites greatly help people to stay in touch with the current affairs; thus, making them more politically active and aware of the surroundings.

**Do you use social media to follow news and political events?**

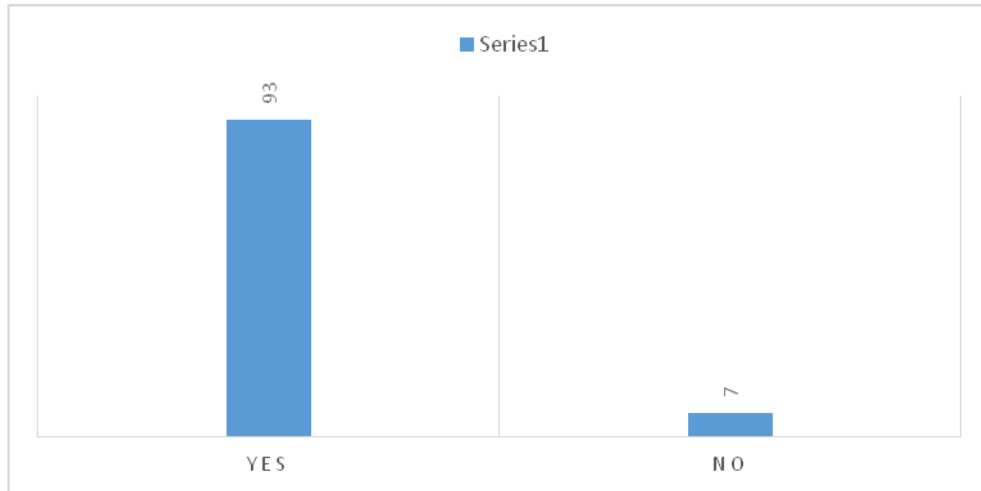
To answer this question on the survey, the participants were provided with two options of either YES or NO. Following are the results.



The above chart indicates that a large number of participants use social media to become aware of the political events.

**Do political news from social networking sites made you aware?**

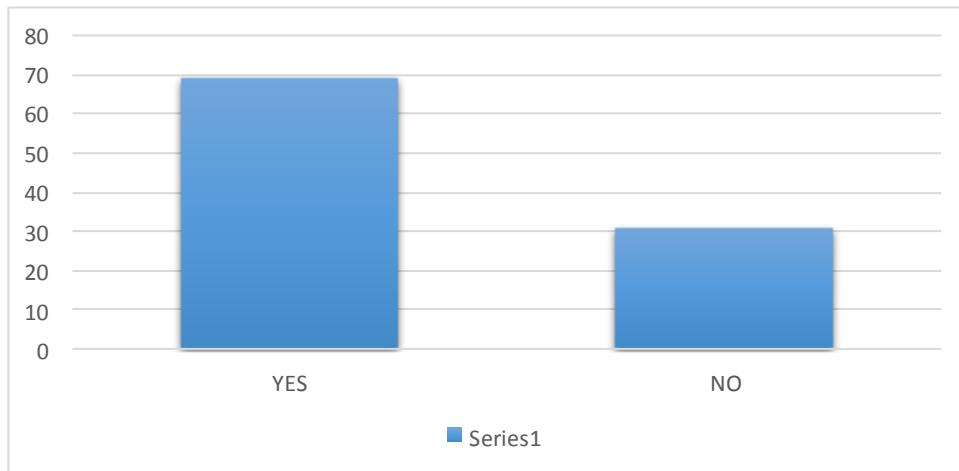
To answer this particular question, the participants were given two options of yes or no. following is the data obtained.



The above diagram shows that political news that the participants obtained from the Social networking sites made them socially and politically aware.

**Have you ever been a part of any social media oriented political demonstration or protest?**

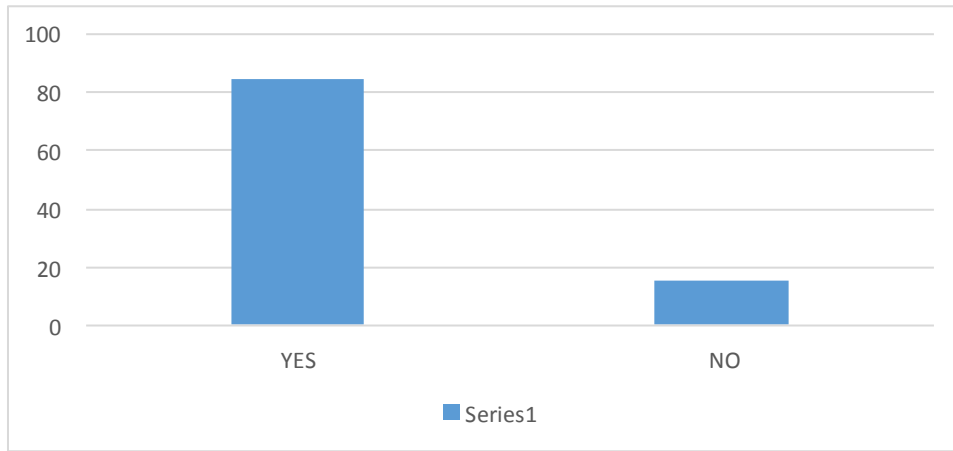
In this question the participants were asked about a personal experience in which they were asked about taking part in any political event or protest that was oriented in social media. Following is the data collected on question.



It is evident that people actually did go to the political events that were oriented by the social media. A large proportion of participants participated in social media oriented political events.

**Criticism on Social media is effective in building up political awareness?**

In this question the participants were asked about whether the criticism on the social media has impact on them or not. Following is the data collected.

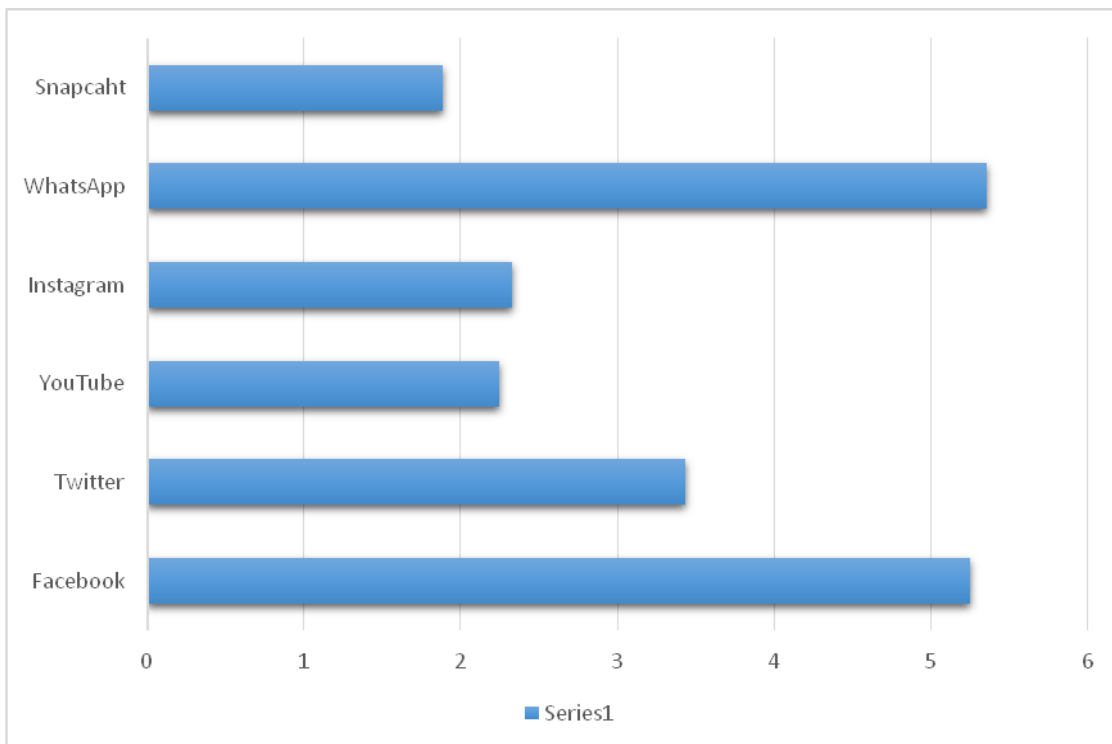


It is illustrated by the chart that high number of participants actually were affected by the criticism they read on the social networking sites. And this reading of the criticism actually benefited them to become politically aware.

**Time Spent on Social Networking Applications:-**

For this activity each participant was asked to give time they spend on the social networking applications. Following is the average data collected

Social Media Applications	Hours Spent
1) Facebook	5.25 Hours
2) Twitter	3.43 Hours
3) YouTube	2.25 Hours
4) Instagram	2.33 Hours
5) WhatsApp	5.36 Hours
6) Snapchat	1.89 Hours



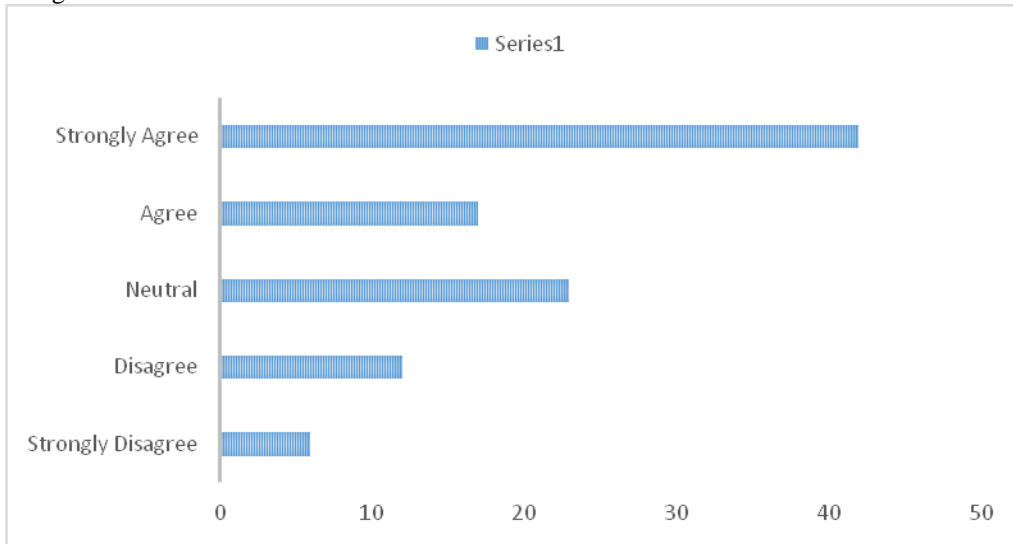
The Chart shows that the participants spent a lot of time on the social networking sites making them aware or socially connected.

**Final Table:-**

In the last step of the survey the participants were given to fill a table, in which they were asked to tick the level of agreement or disagreement for the lines given to them. Following is the data collected.

**Has social Media proved to be free and objective?**

Following is the data collected for this account:

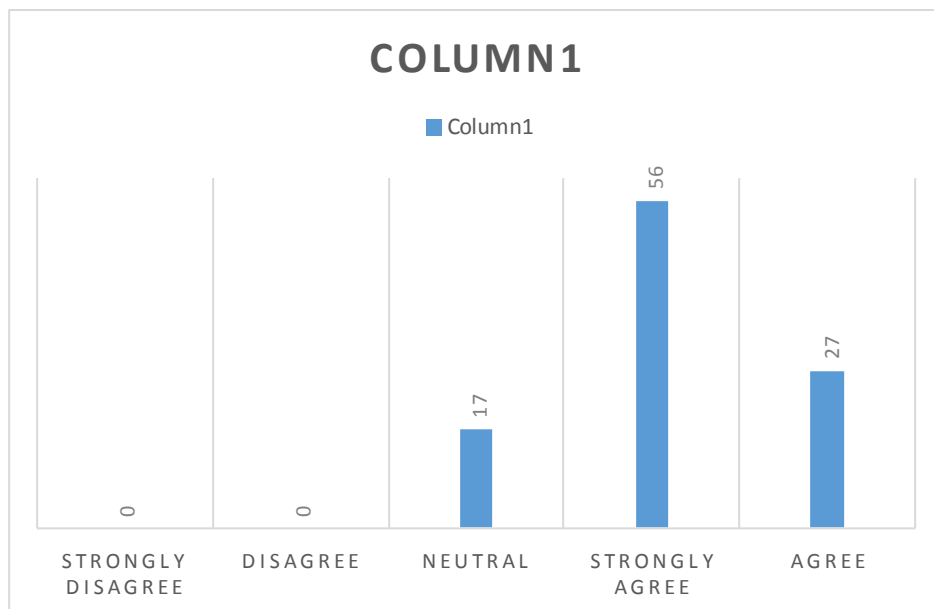


As the chart shows, a large number of participant strongly agreed with the statement that social media has proved to be free and objective, so, one can say that Social media is objective and free.

**Is Social media a tool for bringing up revolution?**

Following collected:-

is the data



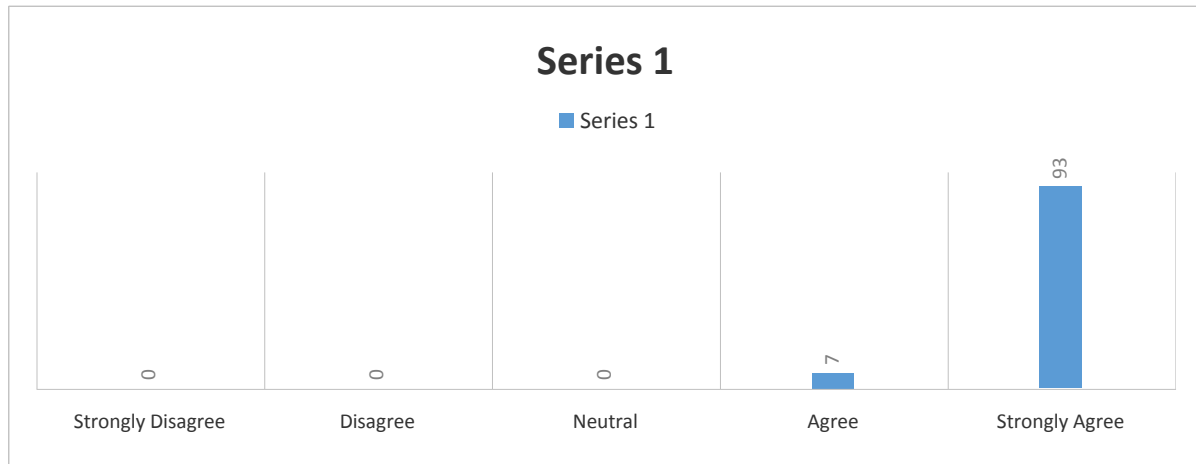
As the chart indicates that most of the participants think that the social media is the tool for bringing up the revolutions and revolts across the world.

### Arab Spring was a product of Social Media?

The data given below illustrates this:

It is evident from the chart that almost all the participants consider the Arab spring to be the product of Social Media and social networking sites

We can conclude, on the basis of data, that Social media plays a vital part in making the people aware both socially



and politically and also persuade them to take part in the social media oriented protests and demonstrations. So, we can say that social media has become an integral part of the society not only to interact socially on these networking sites and applications but also to make us politically more aware. Social media, by making us politically aware, also enables us to actively express our feelings and thoughts on the ongoing political activities. The social media is fostering the revolutions by making us to express our opinion on any issue and also to react against any unlawful act of the Government. The revolts and protests included in Arab Spring were all fostered by the Social Media.

### Conclusion:-

This paper has examined the role of social media and social networking sites including Facebook, twitter and YouTube by utilizing both the qualitative and the quantitative analysis. There is a fluctuation of opinion on how much part social media had played in fostering the revolutions during the Arab Spring, but there is no denying to the fact that Arab spring was the product of Social Media and social networking sites. The availability of advanced media including the online networking sites like Facebook, YouTube and Twitter has given individuals a chance to promote their voices, their political thoughts and send their demands the high structures of Legislatures. Social media has also provided a way through which the voice of general public reaches the other structures of the government, making the government and institutions to listen and react favorably, and if they ignore, the same voice strikes them like a big flood and takes away with it their governance. Before social media, people of Middle East were living under the Authoritarian regimes, and were also deprived of many basic rights, while the rulers lived their lavish lives without the fear of losing the power. But Social media became the savior for these oppressed people and made them able to voice their feelings and thinking. Before social media, the people were not allowed to take part in active politics, but after these Social networking sites every individual became socially and politically active. They started to keep keen observations on the political activities, and if any incident was found to be against their wishes, they posted it online, criticized it and protested against it.

For the same reason, we can now see every political person on these social sites, and social media cells of every political party working to promote its mandate and propositions to come to power. Social Media is also used by them to give updates of the projects and other happenings, and their thinking or defense to a particular event. Thus by this analysis we can conclude that social media has made us more active and respondent and the government to be more vigilante, and have also promoted the pro democratic views and thoughts among the general public.

The internet and its major component, the social media, assumed a central part in the Arab spring. The Arab spring would have not been achieved if there was no social media. Social Media gave voice to the people's opinion and







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### RESEARCH ARTICLE

#### AWARENESS OF SAUDI POPULATION IN MADINA REGION ABOUT ATTENTION DEFICIT HYPER-ACTIVE DISORDER (ADHD) IN CHILDREN.

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#### Abstract

**Introduction:** Attention Deficit Hyper-Active Disorder (ADHD) is one of the most common neurobehavioral developmental disorders among children. The prevalence of ADHD in all Arabic countries in general was ranging from 1.3% to 16% compared to 4-8% in US. While in Korea it was between 7.6% to 9.5%. However, the prevalence was reached 20 % in India.

**Methodology:** A cross sectional study has been set in Saudi Arabia, Madina Region. The study population included both genders from 15 years and above, people living outside Madina and those whom are in the medical field have been excluded. Data were analyzed by the SPSS version 20.

**Results:** . 25.1 % knew the disease through their experience with an ADHD patient known to them. 14.7% read about ADHD through medical websites, 7.3% and 7.6% knew about it from newspapers and social media, respectively. 71.3%, believed that ADHD is a real disease, 22 % believe that it is a behavioral disorder, 16 % consider it as a neurological disease while 18 % considered it as a psychiatric disorder. On the other hand, 31 .8 % believe that ADHD is a mixed disorder and only 11 % did not know anything about the nature of the disease. , 32.2 % believe that it is a genetic disease, 23.1% blame nutritional habits, 19.3% believe that preservatives and dye contents of certain types of the food are the main cause, 4.9 % considered insecticides the main cause ,1.1% connected it to smoking and the rest believe that it is multi-cause disease. 5.6% of respondents believe that medical management is the main modality of treatment, 27.1% think that behavioral therapy is main treatment option and 59.8% suggested both modalities and the rest considered it as not a treatable disease.

**Conclusion and Recommendations:** Madina society is in a tremendous need to increase their awareness about ADHD in a simple layman language.

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**Introduction:-**

Attention Deficit Hyper-Active Disorder (ADHD) is one of the most common neurobehavioral developmental disorders among children. It has a special prevalence in preschool and early school years<sup>(1)</sup>. It is characterized by three main symptoms which are: persistent and debilitating inattention, over activity and impulsivity<sup>(2), (3)</sup>. Presently, there are three main subtypes of ADHD which are classified to: primarily inattentive (50–75%), primarily hyperactive/impulsive (20–30%) and a combined subtype (less than 15%).<sup>(4)</sup>

ADHD may associate with a different psychiatric comorbidities as disruptive behavior disorders, anxiety and/or mood disorders.<sup>(5)</sup> Additionally, to psychiatric, ADHD could be compound with difficulty in learning and social-emotional development<sup>(6)</sup>.

Epidemiological knowledge of ADHD was estimated in different countries by several studies on children between the ages of 6 and 12 years<sup>(7)</sup>. The prevalence of ADHD in the US was 4-8%<sup>(8), (9)</sup>. While in Korea it was between 7.6% to 9.5%<sup>(10)</sup>. However, the prevalence was reached 20 % in India<sup>(11)</sup>.

On the other hand, the prevalence rate of ADHD in all Arabic countries in general was ranging from 1.3% to 16% in one study<sup>(12)</sup>.

However, the prevalence in other studies like the one conducted in Qatar it showed that incidence of ADHD 9.4% to 18% in Qatar. While, a similar study in the United Arab Emirates, showed the prevalence as 14.9%<sup>(13)</sup>. According to a local study which was conducted in Saudi Arabia, 11.6% is the prevalence rate of ADHD<sup>(14)</sup>.

The underlining etiology of ADHD includes several factors like genetic, dietary, and environmental. Nutritional factors in particular, such as color agents which have been determined to raise the risk of ADHD<sup>(15)</sup>.

It is still argumentative whether or not there is a relation between ADHD and sugar consumption. As in Wolraich et al's study, where they found that dietary food with high sucrose had no significant effects on behavior and cognitive performance in children<sup>(16)</sup>.

The diagnosis of ADHD is usually controversial as concerns are expressed by parents, teachers, healthcare professionals and the public as well. The diagnosis and treatment of ADHD in children will be dependent mainly on the knowledge and perspectives of every person around the child. The diagnosis and treatment of children with ADHD require a good participation and cooperation among the family and educational and health professionals to achieve a common goal<sup>(17), (18)</sup>.

There are two definitive treatment lines for those children; medications, behavioral therapy or even both<sup>(19)</sup>.

Many global studies involving different professionals (teachers, teacher trainees and general physicians) have displayed that the misconception about ADHD and its treatment is persistent<sup>(20)</sup>.

We plan to determine the awareness of the Saudi population about such a complex disease in order to improve the current practice and to contribute to the management of ADHD as the society is in need to play its role as well.

**Methodology:-**

A multi-items cross sectional survey was conducted. The study population and sampling included both genders from 15 years and above as we don't aim to determine the incidence of the disease but we would like to assess the general knowledge about it. We chose our sample using random sampling method. We excluded people living outside Madina region, and who did not match our target age. We chose the questionnaire as a collecting tool (electronic and paper based questionnaire). This questionnaire reached to our target group through social media as well as, in the public places, secondary school students, and finally university students.

The variables we have been considered were age, gender, specialty, and occupation. Those whom are in the medical field were excluded. Before starting with our observation process, we explained the purpose of our study. Validity and reliability has been taken into account. Pilot study and pre-test has been done to clarify any ambiguous question.

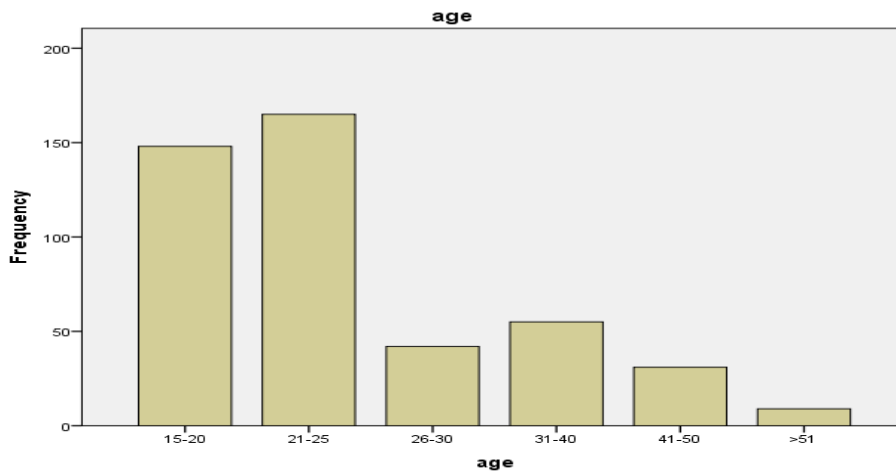
Data were analyzed by the Statistical Package for the Social Sciences (SPSS) version 20 acquired by IBM for statistical analysis.

Frequency tables were used to present the distribution of nominal variables. Results were expressed in numbers and percentages of respondents to each question and presented in tables. Their responses to 9 different related question which were: "have you heard of ADHD?", "where did you get information about ADHD", their believes about whether ADHD is a real disease and its underlying etiology, their knowledge about underlying causes and their treatment preferences.

**Results:-**

			Percent
	Male (%)	63.1	
	Female (%)	36.9	
	Age (range),(mode)*	15-50	21-25
	Level of education (mode),n 421.		Secondary School

**Table 1:-** Sociodemographic data n (450),\* graph 1.



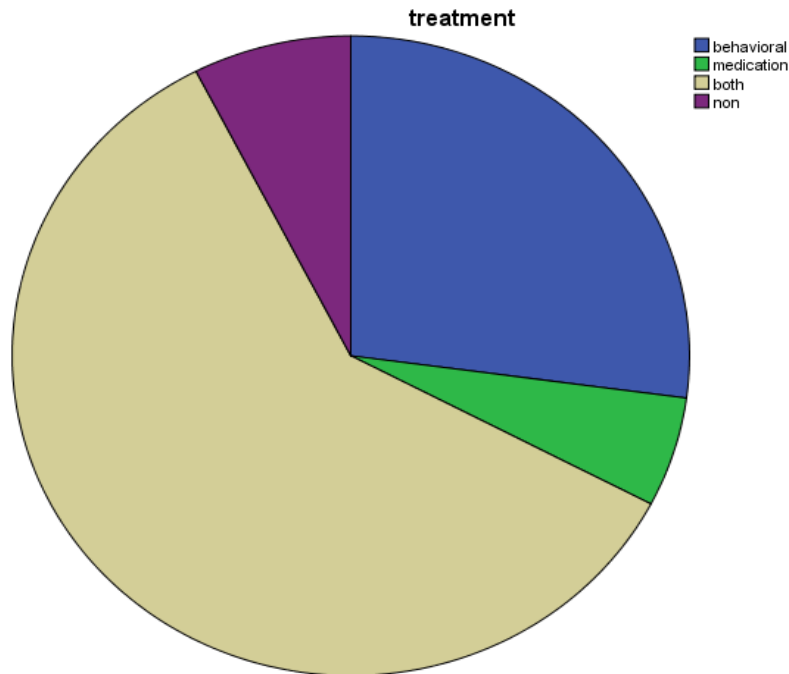
**Graph 1: Age of the respondents.**

Interestingly, approximately three-quarters of respondents had heard of ADHD, 373(71.8%) and they were able to provide information about sources of their information. 25.1 % knew the disease through their experience with an ADHD patient known to them. 14.7% read about ADHD through medical websites, 7,3% and 7.6% knew about it from newspapers and social media, respectively, 9% didn't recall the source of their knowledge about it.

In addition, the majority of the sample, 71.3%, believed that ADHD is a real disease, 22 % believe that it is a behavioral disorder, 16 % consider it as a neurological disease while 18 % considered it as a psychiatric disorder. On the other hand, 31 .8 % believe that ADHD is a mixed disorder and only 11 % did not know anything about the nature of the disease.

When asking the respondents about the underlying causes, 32.2 % believe that it is a genetic disease, 23.1% blame nutritional habits, 19.3% believe that preservatives and dye contents of certain types of the food are the main cause, 4.9 % considered insecticides the main cause ,1.1% connected it to smoking and the rest believe that it is multi-cause disease.

5.6% of respondents believe that medical management is the main modality of treatment, 27.1% think that behavioral therapy is main treatment option and 59.8% suggested both modalities and the rest considered it as not a treatable disease.



**Graph 1: Beliefs of respondents about treatment options.**

### **Discussion:-**

Although a high percentage of participants in the study are young population and had a knowledge about ADHD, the vast majority of them didn't get the information from the ideal source as they get them through sharing experiences with others. This might reflect two things, first is how common is the problem second thing is the need to increase the awareness of how to seek more concise medical knowledge.

The good thing is that most of the participants are believing that ADHD is a disease and they believe in the importance of treatment.

### **Recommendations:-**

Based on the results we have we believe that Madina society is in a tremendous need to increase their awareness about ADHD in a simple layman language.

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### RESEARCH ARTICLE

#### CERVICAL CERCLAGE: SILK Vs NYLON SUTURE.

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#### Abstract

**Introduction:** The term 'cervical incompetence' is used to describe a disorder in which painless cervical dilatation led to recurrent second trimester pregnancy losses. Structural weakness of cervical tissue was thought to cause or contribute to these adverse outcomes. Cervical cerclage is used for the treatment of cervical incompetence. The relatively muscular and elastic internal Os is responsible for retaining the pregnancy in utero and a cerclage represents an attempt to physically support a weakened cervix. Though various studies have proven the efficacy of cerclage procedure, a number of questions still exist. What is the effect of the type of suture on the cervix? Is there any difference in the outcome following cervical cerclage with a multifilament suture, compared to a monofilament suture? The present study was thus conducted with the objective of comparing difference in cervical cerclage by silk and nylon as a suture material in terms of operability and outcome. The intention is to know the difference between monofilament and multifilament suture.

**Materials & Methods:** A Randomized control study was conducted in the Department of Obstetrics and Gynecology of a Tertiary Care Hospital and Medical college. After fulfilling the inclusion and exclusion criteria, total 50 cases of cervical length less than 3cms were selected and divided into two groups randomly using table of random numbers: **Nylon Group:** McDonald cerclage procedure using nylon sutures (25 patients) and; **Silk group:** McDonald cerclage procedure using silk sutures (25 patients). The patients were compared with respect to time taken for procedure, intra-op complications, ease of operability and ease of stitch removal. All the patients were followed up till delivery as per routine ANC schedule and development of fibrosis and outcome were compared. Data was analyzed using SPSS software ver. 21.

**Results:** The mean age and weeks of gestation in nylon group was 23.80±2.71 years and 20.66 weeks whereas in the silk group was 23.24±3.19 years and 21.41 weeks (p=0.507, 0.051). The mean time taken for the procedure in nylon group was 21.20±5.26 min whereas the mean time taken in silk group was 17.20±4.35min (p<0.01). No difference was observed between the study groups with respect to

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difficulty in operability and ease of suture removal ( $p > 0.05$ ). Intra operative bleeding was significant in 24% women from nylon group and in 12% women in silk group ( $p = 0.46$ ) while Discharge and leakage was reported by 20% of cases each in nylon group and 12% and 20% cases in silk group ( $p = 0.78$ ). No difference was observed between the study groups with respect to development of fibrosis and outcome i.e. type of delivery ( $p > 0.05$ ).

**Conclusion:** The average time taken for the procedure was lesser with silk sutures while significant fibrosis was associated with nylon sutures. Both the suture materials were comparable in terms of operability, complication rate and ease of removal and outcome.

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### **Introduction:-**

Cervical incompetence is defined as the weakness of the sphincter mechanism of the internal cervical os leading to painless effacement and dilatation of the cervix. This results in either mid-trimester pregnancy loss or pre term rupture of membranes or preterm labor and pregnancy failure.<sup>1</sup>

Despite major research efforts, more than 10 million births before 37 weeks of gestation occur annually worldwide, and more than 1 million infants die from this common complication of pregnancy (5–12% incidence)<sup>2</sup>.

Cervical cerclage (tracheloplasty), also known as a cervical stitch, is used for the treatment of cervical incompetence (or insufficiency). The treatment consists of a strong suture being inserted into and around the cervix early in the pregnancy, usually between weeks 14 to 16, and then removed towards the end of the pregnancy when the greatest risk of miscarriage has passed.

Shirodkar introduced the application of transvaginal cervical cerclage as treatment of cervical incompetence in 1951.<sup>3</sup> Initially, the operation was performed during pregnancy after the detection of a gradually yielding cervix seen in a woman who had entered seventh month of pregnancy. McDonald introduced his transvaginal cervical cerclage in 1957.<sup>4</sup> McDonald cervical cerclage was performed when dilatation of cervix and bulging fetal membranes were present during the second trimester of pregnancy.

Several observational studies into the efficacy of cervical cerclage have claimed high rate of successful pregnancy outcome in women with a poor obstetric history attributed to cervical incompetence.<sup>5,6</sup> Cervical cerclage is probably effective in the prevention of mid-trimester miscarriage. Many case series quote a viable delivery rate of 70 to 90 percent after cerclage, compared with 10 to 30 percent prior to the procedure.<sup>7</sup>

The relatively muscular and elastic internal os is responsible for retaining the pregnancy in utero and a cerclage represents an attempt to physically support a weakened cervix. Though the intention is good in providing mechanical support to a weakened cervix, a number of questions still exist. What is the effect of the type of suture on the cervix? Is there any difference in the outcome following cervical cerclage with a multifilament suture, compared to a monofilament suture?

Different surgical suture materials used are: silk, nylon, polyester, polypropylene and polybutester. They are basically divided as monofilament and multifilament (braided/ unbraided). The Royal College Obstetricians and Gynaecologists in a most recent guideline in 2011 advised that the choice of suture material should be at the discretion of the surgeon.<sup>8</sup>

Silk suture is a multifilament, non-absorbable, sterile, surgical suture composed of an organic protein called fibroin. Its advantage is that it is best in handling and tying, however it has least tensile strength, high tissue reactivity, increases risk of infection due to high capillarity.<sup>9</sup> Nylon sutures are synthetic non absorbable suture (monofilament). They have high tensile strength, minimal tissue reactivity and low cost.<sup>9</sup>



The present study was conducted with the objective of comparing difference in cervical cerclage by silk and nylon as a suture material in terms of operability and outcome. The intention is to know the difference between monofilament and multifilament suture.

### **Material & Methods:-**

A Randomized control study was conducted in the Department of Obstetrics and Gynecology of a Tertiary Care Hospital and Medical college. The study population included patients attending Antenatal clinic of the tertiary care Hospital with following inclusion and exclusion criteria:

#### **Inclusion Criteria:-**

After ruling out the contraindications of cervical cerclage, the pregnant patients attending antenatal clinic were selected with cervical length less than 3 cms on ultrasound.

#### **Exclusion Criteria:-**

1. Emergency cervical cerclage
2. Patient with history of previous cervical cerclage
3. Any associated medical disorder of pregnancy
4. Active vaginal infection

#### **Sampling Technique:-**

After fulfilling the inclusion and exclusion criteria total 50 cases of cervical length less than 3cms were selected and divided into two groups randomly using table of random numbers.

- **Nylon Group:** McDonald cerclage procedure using nylon sutures (25 patients).
- **Silk group:** McDonald cerclage procedure using silk sutures (25 patients).

#### **Methodology:-**

Detail demographic history along with previous gynaecological and obstetrical history, physical examination and digital assessment of portiovaginalis of cervix was recorded on a pre-structured and pretested proforma. Base line investigations as for ANC were done mainly to rule out underlying medical disorders if detected. The McDonald cerclage procedure using nylon/ silk sutures was performed as per standard technique under general anaesthesia.

Patients were observed for 1 hour in the post-operative room. After shifting the patients to the ward, they were observed for FHS, Uterine contractions, voiding of urine/urinary retention and lower abdominal pain and leaking. Patients were advised bed rest with minimal mobilization i.e. allowed to be ambulated for their toileting and for meals. No tocolysis was given to any patients. Patients were advised to follow up after 8 days or to report immediately if any of the complaints like leaking, bleeding, contractions occur and were asked to follow up as per routine ANC schedule thereafter.

Primary outcome was the term delivery rate, preterm delivery rate before 37 weeks of gestation and percentage of cesarean section.

#### **Follow-up:-**

- Patients were followed up till delivery as per routine ANC schedule.
- Suture removal was done as follows:
  - At 37 completed weeks after confirmation of maturity.
  - If she has complains of leaking.
  - If she has gone into frank preterm labour.
- Associated complications, ease of removal of sutures and fibrosis at suture site if any was recorded. The amount of fibrosis was noted as follows:
  - Grade I – upto 25 %
  - Grade II – upto 50 %
  - Grade III – upto 75 %
  - Grade IV – whole cervical rim

**Data Analysis:-**

Data was analyzed using SPSS 21.0 (SPSS Inc., Chicago, IL, USA) using appropriate statistical tests.

**Results:-**

The mean age and weeks of gestation in nylon group was  $23.80 \pm 2.71$  years and 20.66 weeks whereas in the silk group was  $23.24 \pm 3.19$  years and 21.41 weeks ( $p=0.507$ ,  $0.051$ ). It was observed that 68% women in nylon group were primi-gravida whereas 52% women in silk group were primi-gravida ( $p=0.387$ ). The mean cervical length in nylon group was  $2.15 \pm 0.42$  cm and in silk group was  $2.12 \pm 0.44$  cm ( $p=0.794$ ) (Table 1).

The mean time taken for the procedure in nylon group was  $21.20 \pm 5.26$  min whereas the mean time taken in silk group was  $17.20 \pm 4.35$  min ( $p < 0.01$ ). Stitch was removed at  $37.12 \pm 0.73$  weeks and  $37.12 \pm 0.53$  weeks of gestation in nylon and silk group respectively ( $p=0.99$ ) (Table 2).

No difference was observed between the study groups with respect to difficulty in operability and ease of suture removal ( $p > 0.05$ ) (Table 3 & 7).

Intra operative bleeding was significant in 24% women from nylon group and in 12% women in silk group ( $p=0.46$ ) while Discharge and leakage was reported by 20% of cases each in nylon group and 12% and 20% cases in silk group ( $p=0.78$ ) (Table 4 & 5).

Significant fibrosis at the site of suture site was observed in 8% cases in nylon group whereas in 4% cases with fibrosis at the site of suture site were observed in silk group (Table 6).

Full term normal delivery occurred in 46% of nylon group and silk group each. LSCS was required in 24% of cases in nylon group and 20% of silk group ( $p=0.60$ ) (Table 8).

**Table 1:-** Distribution of subjects based on baseline characteristics

Variables	Group	Mean/ N	SD/ %	p- value
Age (yrs)	Nylon	23.80	2.71	<b>0.507</b>
	Silk	23.24	3.19	
Gestation Age (weeks)	Nylon	20.66	1.29	<b>0.051</b>
	Silk	21.41	1.28	
Primi-gravida	Nylon	17	68%	<b>0.387</b>
	Silk	13	52%	
Cervical Length (cm)	Nylon	2.15	0.42	<b>0.794</b>
	Silk	2.12	0.44	

**Table 2:-** Distribution of subjects based on mean time for procedure and stitch removal

Variables	Group	Mean	SD	p- value
Time taken for procedure	Nylon	21.2	5.26	<b>&lt;0.01</b>
	Silk	17.2	4.35	
Week of Stitch Removal	Nylon	37.12	0.73	<b>0.99</b>
	Silk	37.12	0.53	

**Table 3:-** Distribution of subjects based on Ease of operability.

Operability	Group		Total	p- value
	Nylon	Silk		
Easy	19(76%)	19(76%)	38	<b>0.99</b>
Moderate	4(16%)	5(20%)	9	
Difficult	2 (8%)	1(4%)	3	
Total	25(100%)	25(100%)	50	

**Table 4:-** Distribution of subjects based on Intra-op Bleeding.

Intra-op Bleeding	Group		Total	p- value
	Nylon	Silk		
Significant	6 (24%)	3 (12%)	9	<b>0.463</b>
Minimal	19 (76%)	22 (88%)	41	
Total	25 (100%)	25 (100%)	50	

**Table 5:-** Distribution of subjects based on post-op Complaints

Complaints	Group		Total	p- value
	Nylon	Silk		
Discharge	5 (20%)	3 (12%)	8	<b>0.78</b>
Leaking	5 (20%)	5 (20%)	10	
Nil	15 (60%)	17 (68%)	32	
Total	25 (100%)	25 (100%)	50	

**Table 6:-** Distribution of subjects based on Incidence of Fibrosis.

Fibrosis at suture Site	Group		Total	p- value
	Nylon	Silk		
75-100%	2 (8%)	1(4%)	3	<b>0.99</b>
50%	8 (32%)	10 (40%)	18	
< 25%	15 (60%)	14 (56%)	29	
Total	25 (100%)	25 (100%)	50	

**Table 7:-** Distribution of subjects based on Ease of stitch removal

Ease of Removal	Group		Total	p- value
	Nylon	Silk		
Easy	21 (84%)	23 (92%)	44	<b>0.67</b>
Difficult	4 (16%)	2 (8%)	6	
Total	25 (100%)	25 (100%)	50	

**Table 8:-** Distribution of subjects based on Outcome.

Outcome	Group		Total	p- value
	Nylon	Silk		
FTVD	15 (60%)	18 (72%)	33	<b>0.606</b>
PTVD	4 (16%)	2 (8%)	6	
LSCS	6 (24%)	5 (20%)	11	
Total	25 (100%)	25 (100%)	50	

**Discussion:-**

There are many surgeries that can be performed for cervical cerclage operation. The two main techniques of transvaginal cerclage are the McDonald method and the Shirodkar method. The McDonald's method is the most popular method in modern obstetrics.<sup>10</sup> It is because of the ease with which it can be performed. In the present study, we performed all the cases by McDonald's method. Out of 50 cases, 25 surgeries were performed with silk and 25 with nylon.

In the study population, the mean age in nylon group was 23.80±2.71 years whereas in the silk group was 23.24±3.19 years (p=0.507). Kaukab Naheed et al.<sup>11</sup> studied the cases of cervical incompetence in their study and observed the mean age of presentation of 26 years.

Out of all chosen patients, overall percentage of Primi-gravida patients was 60% and multigravida was 40%. The lower percentage of multigravida can be attributed to the exclusion criteria i.e. patients with previous history of cervical cerclage. Also the other reason for more number of primi-gravida is incompetent os due to decrease muscular content (less than 10 %).<sup>12</sup> Less number of multigravida required encirclage because of the cervical changes related to age or previous injuries leading to fibrosis.<sup>13</sup>

The mean time taken for performing the procedure in nylon group was  $21.20 \pm 5.26$  min. and the mean time taken in silk group was  $17.20 \pm 4.35$  min. The average time was possible to calculate as a single surgeon has performed all the cases to remove operator bias. On an average, the time taken for performing the procedure in nylon group was 4 minutes more which was statistically significant. Therefore it can be concluded that the suturing time is less for silk easier knotting and gripping of the cervix with suture material.

The operability was easy in 76% cases in both nylon group and silk group. In 8% cases from nylon group and 4% cases in silk group the operability was reported to be difficult. However, the figures are insignificant as the difficult procedure was not because of the material used but because of the excessive shortening of cervix. Also, no significant intraoperative bleeding was seen in 82% of cases. We have considered bleeding to be significant when there was soaking of more than 2 swabs (4 layered). Patients in whom there was significant bleeding, 2/3rd cases were with nylon but it can be attributed to the trochar point needle which was used for nylon. Hence, it was not related to the suture material used per se. So, the difference was statistically insignificant.

The complications reported with cerclage include sepsis, premature rupture of membranes, premature labour, cervical dystocia, cervical laceration at delivery (11% to 14%) and haemorrhage<sup>14-21</sup>. Discharge and leaking were the common complaints reported by patients in the present study. Discharge was reported by 20% of cases in nylon group and 12% cases in silk group. Discharge which was found in our case was not there with the infection because it was not foul smelling. There were limitations to our study that we could not send swab culture. The vaginal discharge which was present was because of diffuse tissue reaction of vaginal mucosa to suture material but the difference which was found in the present study is 20% with nylon and 12% in silk which was insignificant. Leaking was reported by 20% cases in both the groups showing that there is no difference.

Stitch removal was planned after confirming the maturity of the foetus. Average gestational age for stitch removal in both the groups was  $37.12 \pm 0.73$  weeks (nylon) and  $37.12 \pm 0.53$  weeks (silk) ( $p > 0.05$ ). Stitch removal in 6 patients who went in spontaneous preterm labour (PPROM) was not related with the amount of intraoperative bleeding or infection or type of suture material used. We removed the stitch in procedure room in all cases but in these 6 cases of leaking we removed suture in pre-labour room.

Significant fibrosis was present more in cases of nylon group (8% vs 4%), but with respect to overall fibrosis, it was not significant ( $p > 0.05$ ). According to some authors threaded silk in superficial and deep sutures has demonstrated some advantages over cotton suture. This is also a twisted multifilament suture, producing a less severe inflammatory reaction around the stitches,<sup>22-24</sup> as compared with cotton. Among the synthetic suture materials, nylon undoubtedly produces the mildest tissue reaction.<sup>24,25</sup> This is also a non-resorbable monofilament suture, and is widely used in sites where aesthetics is important. Fibroblastic and capillary proliferation related to this type of material occurs earlier in comparison with the other kinds.

It was easier to remove the silk stitch because there was only one thread. The amount of embedding of the silk suture was not evident in our study which was contrary to the assumption that suture material is embedded in mucus membrane. Nylon sutures were also easy to be removed but in 4% of the cases, only 1 string was cut, then there was more difficulty in removal of other string (we did cervical cerclage with nylon with double strings). The difference observed in both groups was not statistically significant.

Caesarean section was done in 11 cases. Majority of these were due to other obstetrical indications. Out of 11, only 3 were done for cervical dystocia that had occurred because of severe fibrosis due to cervical cerclage. Full term normal delivery occurred in 46% of nylon group and silk group each. LSCS was required in 24% of cases in nylon group and 20% of silk group. Among the total 24% cases undergone LSCS in nylon group, cervical dystocia was the most common indication for LSCS (12%) followed by twin pregnancy, breech pregnancy and android pelvis in 4% each. In silk group total 20% of cases were delivered by LSCS with fetal distress (8%) as common indication followed by CPD and breech presentation. Intra operative bleeding was seen in 24% women from nylon group whereas in 12% women in silk group. The difference observed in nylon and silk group was statistically insignificant.

It may be suggested that in cervical incompetence the mechanical or biochemical properties of the cervix vary from those of the normal cervix, making possible a different pattern of labor. A recent study tested the connective tissue changes of the cervixes of normal pregnant women and those of women with cervical incompetence. It was shown

that, although the cervixes of patients with cervical incompetence contained normal collagen concentrations, there was a high collagenolytic activity in these cervixes, indicating a high turnover of collagen. This newly formed collagen had low strength and high distensibility properties.<sup>26</sup> It has been shown further that women with a classic history of cervical incompetence have reduced elasticity as measured by intracervical balloons. Other authors have stated that the cervix does not dilate normally after a cerclage, presumably because of the foreign body reaction to the suture material and the formation of scar tissue. The scar tissue does not efface or dilate normally, but rather ruptures and "gives off" at the point at which the tensile forces of the uterine contractions overcome those of the tissue.<sup>27-29</sup> We could not confirm these claims; similar labor patterns were found in women with cervical cerclage and the comparison group. Cervical dystocia is commonly cited as a complication of cervical cerclage, causing faulty progression of labour and a higher caesarean rate.<sup>30-32</sup>

Takashi Yorifuji et al.<sup>33</sup> conducted a retrospective study to determine the sustained effects of emergency cerclage using slowly absorbable monofilament sutures, changes in cervical length after cerclage. They concluded that absorbable monofilament suture appears useful for emergency cerclage. Vincenzo Berghella<sup>34</sup> conducted a study to assess whether type of suture material affects cerclage efficacy for preterm birth prevention and they concluded that type of suture material may not affect ultrasound-indicated cerclage efficacy in high-risk women with short CL, but further study is needed. Y. E. Abdelhak<sup>35</sup> compared the efficacy of traditional non absorbable suture to delayed absorbable suture for used in McDonald cervical cerclage. They conducted a retrospective analysis of all cerclage procedures over a one year interval and stratified by the type of suture material. They reported that delayed absorbable suture material may be a reasonable alternative during cerclage placement, with the added benefit of spontaneous degradation versus surgical removal.

### **Conclusion:-**

We thus conclude that average time taken for the procedure was significantly less with silk sutures while more intra-op bleeding (24% vs 12%) and complaint of discharge (20% vs 12%) was seen with nylon sutures. Both the suture materials were comparable in terms of operability, fibrosis, ease of removal and outcome.

### **Recommendations:-**

We thus recommend that silk suture should be preferred in McDonald cerclage procedure, as significantly lesser time was required for the procedure and it also has a lower complication rate.

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### **Conflict of Interest:-**

None declared

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### RESEARCH ARTICLE

## WEYL FRACTIONAL DERIVATIVE OF THE PRODUCT MULTIVARIABLES POLYNOMIALS AND I –FUNCTION.

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### Abstract

In this research work, we establish a theorem on Weyl fractional derivative of the product multivariable polynomials and I –function. Certain special cases of our theorem have been discussed.

**Mathematics Subject classification** - 26A33, 33C 60, 44A15.

### Key words:-

Weyl fractional derivative operator, multivariable polynomials and I-function

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### Introduction:-

The I- function of the one variable is defined by Saxena (1982) and we will represent here in the following manner:

$$(1.1) \quad I[z] = I_{p_i, q_i; r}^{m, n} [z] = I_{p_i, q_i; r}^{m, n} \left[ z \left| \begin{matrix} \dots, \dots \\ \dots, \dots \end{matrix} \right. \right] = I_{p_i, q_i; r}^{m, n} \left[ z \left| \begin{matrix} (a_j, e_j)_{1, n}; & (a_{ji}, e_{ji})_{n+1, p_i} \\ (b_j, f_j)_{1, m}; & (b_{ji}, f_{ji})_{m+1, q_i} \end{matrix} \right. \right]$$

$$(1.2) \quad = \frac{1}{2\pi i} \int_L \theta(s) z^s ds,$$

where  $i = \sqrt{-1}$ ,  $z (\neq 0)$  is a complex variable and (1.2)  $z^s = \exp[s \{ \log |z| + i \arg z \}]$ . In which  $\log |z|$  represent the natural logarithm of  $|z|$  and  $\arg |z|$  is not necessarily the principle value. An empty product is interpreted as unity. Also,

$$(1.3) \quad \theta(s) = \frac{\prod_{j=1}^m \Gamma(b_j - f_j s) \prod_{j=1}^n \Gamma(1 - a_j + e_j s)}{\sum_{i=1}^r \left[ \prod_{j=m+1}^{q_i} \Gamma(1 - b_{ji} + f_{ji} s) \prod_{j=n+1}^{p_i} \Gamma(a_{ji} - e_{ji} s) \right]}, \quad m, n, p_i \text{ and } q_i \forall i \in (1, \dots, r) \text{ are non-negative}$$

integers satisfying  $0 \leq n \leq p_i$ ,  $0 \leq m \leq q_i$ ;  $\forall i \in \{1, \dots, r\}$ ,  $e_{ji}, (j = 1, \dots, p_i; i = 1, \dots, r)$  and  $f_{ji}, (j = 1, \dots, q_i; i = 1, \dots, r)$  are assumed to be positive quantities for standardization purpose. Also  $a_{ji}, (j = 1, \dots, p_i; i = 1, \dots, r)$  and  $b_{ji}, (j = 1, \dots, q_i; i = 1, \dots, r)$  are complex numbers such that none of the points.

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$$(1.4) \quad S = \{(b_n + v) | f_h\}, h = 1, \dots, m; v = 0, 1, 2, \dots,$$

which are the poles of  $\Gamma(b_h - f_h s), h = 1, \dots, m$  and the points

$$(1.5) \quad S = \{(a_l - n - 1) | e_l\} l = 1, \dots, n; \eta = 0, 1, 2, \dots,$$

Which poles are of  $\Gamma(1 - a_l + e_l s)$  coincide with one another, i.e. with

$$(1.6) \quad e_l (b_n + v) \neq b_n (a_l - \eta - 1),$$

for  $v, \eta = 0, 1, 2, \dots; h = 1, \dots, m; l = 1, \dots, n$ .

Further, the contour L runs from  $-i_\infty$  to  $+i_\infty$ . Such that the poles of  $\Gamma(b_n - s), h = 1, \dots, m$ ; lie to the right

of L and the poles  $\Gamma(1 - a_l + e_l s), l = 1, \dots, n$  lie to the left of L. The integral converges, if  $|argz|$

$< \frac{1}{2} B\pi, B > 0, A \leq 0$ , where

$$(1.7) \quad A = \sum_{j=1}^{p_i} e_{ji} - \sum_{j=1}^{q_i} f_{ji} \text{ and}$$

$$(1.8) \quad B = \sum_{j=1}^n e_j - \sum_{j=n+1}^{p_i} e_{ji} + \sum_{j=1}^m f_j - \sum_{j=m+1}^{q_i} f_{ji} \quad \forall i \in (1, \dots, r)$$

Let A denote a class of good functions. By good function f, we mean Miller [1975, p.82] a function which is everywhere differentiable any number of times and if all of its derivatives are  $O(x^{-\nu})$ , for all  $\nu$  as  $x$  increases without limit. We define the Weyl fractional derivatives of a function  $g(z)$  as follows:-

Let  $g \in A$ , then for  $q < 0$ ,

$$(1.9) \quad {}_z W_\infty^q g(z) = \frac{(-1)^q}{\Gamma(-q)} \int_z^\infty (u - z)^{-q-1} g(u) du.$$

For  $q \geq 0$

$$(1.10) \quad {}_z W_\infty^q g(z) = \frac{d^n}{dz^n} ({}_z W_\infty^{q-n} g(z)),$$

$n$  being positive integer, such that  $n > q$ .

The general class of multivariable polynomials is defined by Srivastava and Garg [1987]:

$$(1.11) \quad S_L^{h_1, \dots, h_r} [x_1, \dots, x_r] = \sum_{k_1, \dots, k_r=0}^{h_1 k_1 + \dots + h_r k_r \leq L} (-L)_{h_1 k_1 + \dots + h_r k_r} A(L; k_1, \dots, k_r) \frac{x_1^{k_1}}{k_1!} \dots \frac{x_r^{k_r}}{k_r!},$$

where  $h_1, \dots, h_r$  are positive integers and the co-efficient  $A(L; k_1, \dots, k_r), (L; h_i \in \mathbb{N}; i = 1, \dots, r)$  are arbitrary constant, real or complex.

Evidently the case  $r = 1$  of the polynomials (1.11).

Would correspond the polynomials given by Shrivastava [1972]

$$(3.1.2) \quad S_L^h [x] = \sum_{k=0}^{[L, h]} \frac{(-L)_{hk}}{k!} A_{L,k} x^k \{L \in \mathbb{N} = (0, 1, 2, \dots)\},$$

where  $h$  is arbitrary positive integers and the co-efficient  $A_{L,k} (L, k \geq 0)$  are arbitrary constant, real or complex.

**Mathematical pre-requisites:-**

To establish the main result, we need the following integral of the H-function by SaigÖ[1992]:



$$(2.1) \quad \int_x^\infty t^{\rho-1} (t-x)^{\sigma-1} I_{p_i, q_i; r}^{m, n} \left[ zt^\mu (t-x)^\nu \left| \begin{matrix} (a_j, e_j)_{1, n}; (a_{ji}, e_{ji})_{n+1, p_i} \\ (b_j, f_j)_{1, m}; (b_{ji}, f_{ji})_{m+1, q_i} \end{matrix} \right. \right] dt$$

$$= x^{\rho+\sigma-1} I_{p_i+2, q_i+1; r}^{m+1, n+1} \left[ zx^{\mu+\nu} \left| \begin{matrix} (1-\sigma, \nu), (a_j, e_j)_{1, n}; (a_{ji}, e_{ji})_{n+1, p_i}, (1-\rho, \mu) \\ (1-\rho-\sigma, \mu+\nu), (b_j, f_j)_{1, m}; (b_{ji}, f_{ji})_{m+1, q_i} \end{matrix} \right. \right],$$

where

(i)  $\rho, \sigma$  are complex numbers and  $\mu, \nu$  are positive real numbers,

(ii)  $|\arg z| < \frac{1}{2} A\pi$ ,  $A$  defined as

$$A = \sum_{j=1}^{p_i} e_{ji} - \sum_{j=1}^{q_i} f_{ji},$$

(iii)  $\min \left[ \operatorname{Re} \left( \frac{1-\rho-\sigma}{\mu-\nu} \right), \min_{1 \leq j \leq m} \left[ \operatorname{Re} \left( \frac{b_j}{f_j} \right) \right] \right] >$   
 $\max \left[ -\operatorname{Re} \left( \frac{\sigma}{\nu} \right), \max_{1 \leq j \leq N} \left[ \operatorname{Re} \left( \frac{a_j-1}{e_j} \right) \right] \right].$

**Weyl Fractional Derivatives Of The Product Of Multivariable Polynomials And I-Function.**

**Theorem.**

Let  $m, n, p_i$  and  $q_i$  be non-negative integers such that  $0 \leq n \leq p_i, 0 \leq m \leq q_i$  and

$$\sum_{j=1}^n e_j - \sum_{j=n+1}^{p_i} e_{ji} + \sum_{j=1}^m f_j - \sum_{j=m+1}^{q_i} f_{ji} > 0$$

together with the set of conditions (i) – (iii) given with equation (2.1). Then, for all value of  $q$ ,

$$(3.1) \quad {}_z W_\infty^q \left\{ x^{\rho-1} (z-x)^{\sigma-1} S_L^{h_1, \dots, h_r} \left[ c_1 x^{\delta_1}, \dots, c_r x^{\delta_r} \right] \right.$$

$$\left. \times I_{p_i, q_i; r}^{m, n} \left[ yx^\mu (x-z)^\nu \left| \begin{matrix} (a_j, e_j)_{1, n}; (a_{ji}, e_{ji})_{n+1, p_i} \\ (b_j, f_j)_{1, m}; (b_{ji}, f_{ji})_{m+1, q_i} \end{matrix} \right. \right] \right\}$$

$$= \frac{(-1)^{q+\sigma-1}}{\Gamma(-q)} z^{\rho+\sigma-q-\sum_{i=1}^r k_i \delta_i - 2} \sum_{\substack{k_1, \dots, k_r=0 \\ h_1 k_1 + \dots + h_r k_r \leq L}} (-L)_{h_1 k_1 + \dots + h_r k_r} A(L; k_1, \dots, k_r) \frac{c_1^{k_1}}{k_1!} \dots \frac{c_r^{k_r}}{k_r!}$$

$$\times I_{p_i+2, q_i+1; r}^{m+1, n+1} \left[ yz^{\mu+\nu} \left| \begin{matrix} (2-\sigma+q, \nu), (a_j, e_j)_{1, n}; (a_{ji}, e_{ji})_{n+1, p_i}, (1-\rho-\sum_{i=1}^r k_i \delta_i, \mu) \\ (2+q-\rho-\sigma-\sum_{i=1}^r k_i \delta_i, \mu+\nu), (b_j, f_j)_{1, m}; (b_{ji}, f_{ji})_{m+1, q_i} \end{matrix} \right. \right].$$

**Proof :** Taking left hand side of equation (3.1) and using equation (1.11), we get

$$(3.2) \quad {}_z W_\infty^q \left\{ x^{\rho+\sum_{i=1}^r k_i \delta_i - 1} (z-x)^{\sigma-1} \sum_{\substack{k_1, \dots, k_r=0 \\ h_1 k_1 + \dots + h_r k_r \leq L}} (-L)_{h_1 k_1 + \dots + h_r k_r} A(L; k_1, \dots, k_r) \frac{c_1^{k_1}}{k_1!} \dots \frac{c_r^{k_r}}{k_r!} \right.$$

$$\left. \times I_{p_i, q_i; r}^{m, n} \left[ yx^\mu (x-z)^\nu \left| \begin{matrix} (a_j, e_j)_{1, n}; (a_{ji}, e_{ji})_{n+1, p_i} \\ (b_j, f_j)_{1, m}; (b_{ji}, f_{ji})_{m+1, q_i} \end{matrix} \right. \right] \right\},$$

Now using equation (1.9) and definition of I – function, easily we can find the proof of equation (3.1).

For  $q \geq 0$  invoking the definition (1.10) the relation (3.2) further reduces to

$$= \sum_{\substack{h_1 k_1 + \dots + h_r k_r \leq L \\ k_1, \dots, k_r = 0}} (-L) A(L; k_1, \dots, k_r) \frac{c_1^{k_1}}{k_1!} \dots \frac{c_r^{k_r}}{k_r!} \frac{(-1)^{q+r+\sigma-1}}{\Gamma(r-q)} \frac{d^r}{dz^r} \left\{ z^{\rho+\sigma-q+r-\sum_{i=1}^r k_i \delta_i - 2} \right. \\ \times I_{p_i+2, q_i+1; r}^{m+1, n+1} \left[ yz^{\mu+\nu} \left| \begin{array}{l} (2-\sigma-h_1 k_1 - \dots - h_r k_r + q, \nu), (a_j, e_j)_{1, n}; (a_{j_i}, e_{j_i})_{n+1, p_i}, (1-\rho-\sum_{i=1}^r k_i \delta_i, \mu) \\ (2+q-\rho-\sigma-\sum_{i=1}^r k_i \delta_i, \mu+\nu), (b_j, f_j)_{1, m}; (b_{j_i}, f_{j_i})_{m+1, q_i} \end{array} \right. \right] \right\}$$

In replacing of  $(q - r)$  by  $q$ , we may obtain again

$$= \frac{(-1)^{q+\sigma-1}}{\Gamma(-q)} z^{\rho+\sigma-q-\sum_{i=1}^r k_i \delta_i - 2} \sum_{\substack{h_1 k_1 + \dots + h_r k_r \leq L \\ k_1, \dots, k_r = 0}} (-L) A(L; k_1, \dots, k_r) \frac{c_1^{k_1}}{k_1!} \dots \frac{c_r^{k_r}}{k_r!} \\ \times I_{p_i+2, q_i+1; r}^{m+1, n+1} \left[ yz^{\mu+\nu} \left| \begin{array}{l} (2-\sigma+q, \nu), (a_j, e_j)_{1, n}; (a_{j_i}, e_{j_i})_{n+1, p_i}, (1-\rho-\sum_{i=1}^r k_i \delta_i, \mu) \\ (2+q-\rho-\sigma-\sum_{i=1}^r k_i \delta_i, \mu+\nu), (b_j, f_j)_{1, m}; (b_{j_i}, f_{j_i})_{m+1, q_i} \end{array} \right. \right]$$

**Special Case :** If we put  $r=1$  in the general call of multivariable polynomials given by Srivastava and Garg [1987] reduces to the polynomials given by Srivastava [1972] and I- function reduces into Fax’s H – function as follows :

$$(4.1) \quad {}_z W_\infty^q \left\{ {}_z W_\infty^q \left\{ x^{\rho-1} (z-x)^{\sigma-1} S_L^h [x^k] \times H_{p, q}^{m, n} \left[ yx^\mu (x-z)^\nu \left| \begin{array}{l} (a_1, e_1)_{1, p} \\ (b_1, f_1)_{1, q} \end{array} \right. \right] \right\} \right\} \\ = \frac{(-1)^{q+\sigma-1}}{\Gamma(-q)} z^{\rho+\sigma-q-k-2} \sum_{k=0}^{[L, k]} \frac{(-L)_{hk}}{k!} A_{L, k} \times H_{p+2, q+1}^{m+1, n+1} \left[ yz^{\mu+\nu} \left| \begin{array}{l} (2-\sigma+q, \nu), (a_j, e_j)_{1, p}, (1-\rho-k, \mu) \\ (2+q-\rho-\sigma-k, \mu+\nu), (b_j, f_j)_{1, q} \end{array} \right. \right]$$

Replacing  $\nu$  by  $-\nu$  equation (3.3) correspond to the following result according as  $\mu > \nu$ ,  $\mu < \nu$  and  $\mu = \nu$ , i.e. for  $\mu > \nu$

$$(4.2) \quad {}_z W_\infty^q \left\{ {}_z W_\infty^q \left\{ x^{\rho-1} (z-x)^{\sigma-1} S_L^h [x^k] \times H_{p, q}^{m, n} \left[ yx^\mu (x-z)^{-\nu} \left| \begin{array}{l} (a_1, e_1)_{1, p} \\ (b_1, f_1)_{1, q} \end{array} \right. \right] \right\} \right\} \\ = \frac{(-1)^{q+\sigma-1}}{\Gamma(-q)} z^{\rho+\sigma-q-k-2} \sum_{k=0}^{[L, h]} \frac{(-L)_{hk}}{k!} A_{L, k} \\ \times H_{p+1, q+2}^{m+2, n} \left[ yz^{\mu-\nu} \left| \begin{array}{l} (a_j, e_j)_{1, p}, (1-\rho-k, \mu) \\ (2+q-\rho-\sigma-k, \mu-\nu), (\sigma-q-1, \nu), (b_j, f_j)_{1, q} \end{array} \right. \right]$$

For  $\mu < \nu$

$$(4.3) \quad {}_z W_\infty^q \left\{ {}_z W_\infty^q \left\{ x^{\rho-1} (z-x)^{\sigma-1} S_L^h [x^k] \times H_{p, q}^{m, n} \left[ yx^\mu (x-z)^{-\nu} \left| \begin{array}{l} (a_1, e_1)_{1, p} \\ (b_1, f_1)_{1, q} \end{array} \right. \right] \right\} \right\} \\ = \frac{(-1)^{q+\sigma-1}}{\Gamma(-q)} z^{\rho+\sigma-q-k-2} \sum_{k=0}^{[L, h]} \frac{(-L)_{hk}}{k!} A_{L, k} \\ \times H_{p+2, q+1}^{m+1, n+1} \left[ yz^{\mu-\nu} \left| \begin{array}{l} (\rho+\sigma-q+k-1, \nu-\mu), (a_j, e_j)_{1, p}, (1-\rho-k, \mu) \\ (\sigma-q-1, \nu), (b_j, f_j)_{1, q} \end{array} \right. \right]$$

and  $\mu = \nu$

$$\begin{aligned}
 (4.5) \quad & {}_zW_\infty^q \left\{ {}_zW_\infty^q \left\{ x^{\rho-1} (z-x)^{\sigma-1} S_L^h [x^k] \times H_{p,q}^{m,n} \left[ yx^\mu (x-z)^{-\nu} \left| \begin{matrix} (a_1, e_1)_{1,p} \\ (b_1, f_1)_{1,q} \end{matrix} \right. \right] \right\} \right. \\
 &= \frac{(-1)^{q+\sigma-1} \Gamma(2-q-\rho-k)}{\Gamma(-q)} z^{\rho+\sigma-q-k-2} \sum_{k=0}^{[L,h]} \frac{(-L)_{hk}}{k!} A_{L,k} \\
 &\times H_{p+1,q+1}^{m+1,n} \left[ y \left| \begin{matrix} (a_j, e_j)_{1,p}, (1-\rho-k, \mu) \\ (\sigma-q-1, \nu), (b_j, f_j)_{1,q} \end{matrix} \right. \right].
 \end{aligned}$$

Finally writing  $-\mu$  instead of  $\mu$ , equation (3.3) yields the following results according as  $\mu > \nu$ ,  $\mu < \nu$  and  $\mu = \nu$  respectively.

For  $\mu > \nu$

$$\begin{aligned}
 (4.6) \quad & {}_zW_\infty^q \left\{ x^{\rho-1} (z-x)^{\sigma-1} S_L^h [x^k] \times H_{p,q}^{m,n} \left[ yx^{-\mu} (x-z)^\nu \left| \begin{matrix} (a_1, e_1)_{1,p} \\ (b_1, f_1)_{1,q} \end{matrix} \right. \right] \right\} \\
 &= \frac{(-1)^{q+\sigma-1}}{\Gamma(-q)} z^{\rho+\sigma-q-k-2} \sum_{k=0}^{[L,h]} \frac{(-L)_{hk}}{k!} A_{L,k} \\
 &\times H_{p+2,q+1}^{m,n+2} \left[ yz^{-\mu+\nu} \left| \begin{matrix} (q-\rho-\sigma-k+1, \mu-\nu), (2+q-\sigma, \nu), (a_j, e_j)_{1,p} \\ (b_j, f_j)_{1,q}, (\rho+k, \mu) \end{matrix} \right. \right]
 \end{aligned}$$

for  $\mu < \nu$

$$\begin{aligned}
 (4.7) \quad & {}_zW_\infty^q \left\{ {}_zW_\infty^q \left\{ x^{\rho-1} (z-x)^{\sigma-1} S_L^h [x^k] \times H_{p,q}^{m,n} \left[ yx^{-\mu} (x-z)^\nu \left| \begin{matrix} (a_1, e_1)_{1,p} \\ (b_1, f_1)_{1,q} \end{matrix} \right. \right] \right\} \right. \\
 &= \frac{(-1)^{q+\sigma-1}}{\Gamma(-q)} z^{\rho+\sigma-q-k-2} \sum_{k=0}^{[L,h]} \frac{(-L)_{hk}}{k!} A_{L,k} \\
 &\times H_{p+1,q+1}^{m+1,n+1} \left[ yz^{-\mu+\nu} \left| \begin{matrix} (2-\sigma+q, \nu), (a_j, e_j)_{1,p} \\ (2+q-\rho-\sigma-k, \nu-\mu), (b_j, f_j)_{1,q}, (\rho+k, \mu) \end{matrix} \right. \right]
 \end{aligned}$$

and for  $\mu = \nu$

$$\begin{aligned}
 (4.8) \quad & {}_zW_\infty^q \left\{ {}_zW_\infty^q \left\{ x^{\rho-1} (z-x)^{\sigma-1} S_L^h [x^k] \times H_{p,q}^{m,n} \left[ yx^{-\mu} (x-z)^\nu \left| \begin{matrix} (a_1, e_1)_{1,p} \\ (b_1, f_1)_{1,q} \end{matrix} \right. \right] \right\} \right. \\
 &= \frac{\Gamma(2-\rho-k-\sigma+q)}{\Gamma(-q)} \frac{(-1)^{q+\sigma-1}}{z^{\rho+\sigma-q-k-2}} \sum_{k=0}^{[L,h]} \frac{(-L)_{hk}}{k!} A_{L,k} \\
 &\times H_{p+2,q+1}^{m+1,n+1} \left[ yz^{\mu+\nu} \left| \begin{matrix} (2-\sigma+q, \nu), (a_j, e_j)_{1,p}, (1-\rho-k, \mu) \\ (2+q-\rho-\sigma-k, \mu+\nu), (b_j, f_j)_{1,q} \end{matrix} \right. \right].
 \end{aligned}$$

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### RESEARCH ARTICLE

#### CAN WE STILL RELY ON ABDOMINAL X-RAY IN DIAGNOSING BOWEL OBSTRUCTION?

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#### Abstract

**Background:** Bowel obstruction (BO) describes as "failure of passage of intestinal contents", it's common surgical emergency and a major cause of morbidity , during last twenty years there was a huge development in radiological techniques used to diagnose bowel obstruction . This study aimed to compare reliability between abdominal plain radiography and CT for detection of suspected cases.

**Method:**A retrospective study including 261 patients suspected SBO who underwent CT scan and abdominal x-ray in king Abdulaziz University hospital, during the period from May 2016 to November 2016.

**Results:**From 261 patients suspected BO,119 (45.6%) were male and 142 (54.4%) female, with mean age score  $56.3 \pm 17.7$ , 132 (50.8%) were presented as abdominal distension , follow by 129 (49.6%) abdominal pain, 69 (26.5%) as vomiting , 61 (23.4%) as constipation, and 11(4.2%) as diarrhea ,from the total number 78 (29.9%) cases reported as positive intestinal obstruction by CT , where 154 (59.4%) cases reported as suspected intestinal obstruction by x-ray .

**Conclusion:**The early precise diagnosis of bowel obstruction helps in decreasing the morbidity and mortality rate. Plain abdomen radiography is suitable technique in the emergency cases and follow up tool after operation , however CT scan is the more accurate technique.

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#### Introduction:-

Bowel obstruction (BO) describes as "failure of passage of intestinal contents", (1)it's common surgical emergency and a major cause of morbidity which requires a correct diagnosis and rapid management . (2)It could be mechanical or paralytic in origin, it is classified in to two types; large and small intestinal obstruction where 60-80% of the cases had small bowel which is mechanical in nature in the majority of the cases. (3 , 4)

A multidisciplinary approach includes; familiarity of pathophysiology, clinical skills and the accurate imaging of choice are needed to reach the correct diagnosis, (5)majority of bowel obstruction cases diagnosed based on plain radiography and it has been the initial diagnostic test since it characterized by fast accessibility, easily to perform and low priced more over it has specific key features of BO. Although plain X-ray is the initial test, CT scan is the gold standard in diagnosing BO and added the advantage of detect the site and the cause of obstruction. Since imaging has a crucial role in management plan, the purpose of the study is to compare the reliability between

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abdominal plain radiography and CT for detection the suspected cases clinically with obstruction, and to evaluate optimal radiological modality or identifying new criteria for early assessment, hence allow fast intervention. (1,3,4,5,6).

### Material and Methods:-

A retrospective study including 261 patients suspected SBO who underwent CT scan and abdominal x-ray in King Abdulaziz University hospital. Comparing CT scan and abdominal x-ray with a maximum time of 72 hours between each one for the accuracy of diagnosis. We reviewed the electronic files from hospital medical record. Data sheet items included personal data (age, gender, MRN), X-ray images had been reviewed for detection of 3 specific signs for each radiograph which were; air fluid number, paucity of gases and diameter of the largest bowel, where diameters guided by 3/6/9 rule. Each CT scan reviewed and confirmed by reports with focusing on: contrast administration route, the presence of obstruction, its sites and complications if present. The most important question was if there is an obstruction by CT, all specific signs of both CT and radiograph were taken. If the CT was non-diagnostic for intestinal obstruction, only x-ray specific signs were recorded.

### Result:-

This study included 261 patients suspected SBO, of which 119 (45.6%) were male and 142 (54.4%) female, with mean age score  $56.3 \pm 17.7$ . (Table 1)

**Table 1:-**Demographic data.

Variables	N	%
<b>Gender</b>		
Male	119	45.6
Female	142	54.4
Variables	Mean $\pm$ SD	Rang (min-max)
Age	56.3 $\pm$	(17-90)

The clinical presentation and radiology findings, 132 (50.8%) were presented as abdominal distension, followed by 129 (49.6%) abdominal pain, 69 (26.5%) as vomiting, 61 (23.4%) as constipation, 45 (17.3%) as intestinal obstruction, and 11 (4.2%) as diarrhea, from the total number 78 (29.9%) cases reported as positive intestinal obstruction by CT, where 154 (59.4%) cases reported as suspected intestinal obstruction by x-ray (Table 2)

**Table 2:-**Type of presentation:

Variables	N	%
<b>Type</b>		
Abdominal pain	129	49.6
Abdominal distension	132	50.8
Vomiting	69	26.5
Diarrhea	11	4.2
Constipation	61	23.4
Fever	2	0.8
<b>CT findings ( intestinal obstruction on CT)</b>		
Negative	182	69.7
Positive	78	29.9
<b>X-ray performing ( there is x-ray for this patient or not)</b>		
No	106	40.6
Yes	154	59.4

CT findings includes, 71 (27.2%) cases received oral contrast, while 67 (25.7%) received IV contrast, and only 11 (3.4%) cases received rectal. More than third (29 patients 37.2 %) reported Ileum as the site of obstruction, followed by Jejunum (21 patients -26.9%) and colon (21 patients-26.9%), also more than third (28 patients -35.9%) reported mechanical obstruction as the main cause and on the other hand 70 patients (89.9%) cases reported no complication. (Table 3).

**Table 3:-** CT findings.

Variables	N	%
<b>Oral contrast</b>		
No	7	2.7
Yes	71	27.2
<b>IV contrast</b>		
No	11	4.2
Yes	67	25.7
<b>Rectal contrast</b>		
No	67	25.7
Yes	11	3.4
<b>Site of obstruction</b>		
Jejunum	21	26.9
Ilium	29	37.2
COLON	21	26.9
Jejunum, Ilium	2	2.6
Jejunum , colon	1	1.3
Ilium , colon	2	2.6
All	2	<b>2.6</b>
<b>Cause of obstruction</b>		
Neoplasm	21	26.9
Inflammation	5	6.4
Mechanical	28	35.9
Idiopathic	24	30.8
<b>Complication due to obstruction</b>		
No	70	89.9
Ischemia	2	2.5
Perforation	6	7.6

The x-ray findings showed the mean score of diameters was  $4.9 \pm 1.7$  rang (2.4-10.0) where 44.8% of the cases reported diameters measurement between 4.0-6.0 , the median score of air/fluid levels was 4 (0-6) where 19 (28.4%) cases reported air fluid level between 5.0-9.0 and 10 (13.9%) between 3.0-4.0 . More than two third of the patients (107 cases -69 %) reported no paucity bowel gases followed by 25 patients (16.1%) cases in all over the abdomen. (Table 4).

**Table 4:-**X-ray findings.

Variables	N (67)	%
<b>Paucity</b>		
No	42	61.0
RUQ	3	5.0
RS	4	6.0
MS	1	1.5
LS	1	1.5
RLQ	1	1.5
LLQ	2	3.0
All over	12	16.0
RUQ, MS, RLQ	2	3.0
RLQ,MLQ,LLQ	1	1.5
<b>Diameters</b>		
2.5-3.9	20	29.9
4.0-4.9	15	22.4
5.0-5.9	15	22.4
6.0-6.9	9	13.4
7.0-10.0	8	11.9
Mean $\pm$ SD	<b>4.9<math>\pm</math>1.7</b>	

Rang (min-mx)	2.4-10	
	Air/fluid	
≤ 2.0	29	43.3
3.0-4.0	10	14.9
5.0-9.0	19	28.4
10.0-14.0	9	13.4
Median	4	
Quartile (25-75)	(0-6)	

The results showed significant difference between CT findings and x-ray findings , where from the 154 cases suspected by obstruction 68(44.1%) cases were positive in CT , while from the 106 cases negative in x-ray 10 cases were positive in CT (p<0.0001) . (Table 5)

**Table 5:-** Comparing between CT scan and X-ray findings:

Variables		CT findings		P value
		Positive	Negative	
X-ray	Yes	68 (87.0%)	86 (47.3%)	0.0001*
	No	10 (13.0%)	96 (52.7%)	

## Discussion:-

### Bowel obstruction:-

Bowel obstruction is a critical clinical condition and responsible of 20% of surgical intervention due to acute abdominal condition. (4)

The current study results showed that the most common symptoms was abdominal pain , abdomen distension and constipation , this consistent with the results of previous study , ( 1,4,7)The diagnosis of BO is a real challenging where it has variety in symptoms and signs regarding the nature of presentation (acute or subacute) , complete obstruction or partial , and if it is simple or there is complication such as strangulation or perforation. (3,5)

### Radiology modalities:-

During last twenty years , there was a huge development in radiological techniques used to diagnose BO , where the most important step is to choose the most suitable method to detect the medical condition and provide the correct diagnosis, (3,5) The current study focused on comparing between abdominal plain radiography and CT for detection BO, where from 260 patients suspected patients with BO, only 68 patients diagnosed with BO and confirmed by CT & abdominal plain radiography , 86 cases were suspected by radiograph and negative in CT, while 10 cases showed normal finding in radiograph but they were diagnosed as BO by CT , similar results were found in others studies where the authors reported that CT scan comparing with has higher sensitivity (93%) , specificity (100%) & accuracy (93%)while plain abdominal radiography could misdiagnosis 20% of the cases.(1,2,3,4)

### Abdominal plain radiography:-

Plain abdominal radiography was the first radiology technique used with physical examination to diagnose BO since 1920 , (5) with reliability level between 46-86 % , (1,5,6) this disparity in reliability between studies was due to several factors such as study design, picking participants , use of the term “non-specific bowel gas pattern,” , involved patients with recent abdomen surgery,(6)the result of current study consistent with previous study where 44% of the cases were diagnose by plain abdominal radiography.

Several studies conduct to evaluate the use of plain abdominal radiography as diagnostic tool of BO. These studies demonstrated the use of plain abdominal radiography as the primary evaluation tool in detecting BO among suspicion cases presented to ER ,(1,6,8)where the advantages of this technique are :lower cost, availability , easy access, high sensitivity in detecting high grade obstruction and the ability of using it to follow the progress after surgical intervention. (1,4,6,9,10),The main signs of BO in on abdominal radiographs were " distended small bowel loops of greater than 3 cm , paucity of air in the large bowel, collapsed colon, differential air-fluid levels, and thickened bowel wall", (1,5), the results of the current study agreed with previous study where more than tow third showed dilated more than 3 cm , more than half showed air fluid level longer than 2.5 cm and all 67 suspected cases with BO and performed plain abdominal radiography showed paucity abdomen ,



On the other hand several studies reported that performed plain abdominal is confusing & uncertain in detecting BO (5) where a few limitations were recorded on this tool: unable to detect cause unless in inguinal hernias, and gallstone ileus (5,11), the imagine could be normal in early obstruction and in low grade obstruction, (1,4,12) these limitations made researchers emphasize on the need to perform CT scan in the cases of high suspicion of BO even with negativradiography imagine. (1)

### **Computed tomography (CT):-**

In1979 CT scan was invention , since then it became one of the important radiology technique in diagnosis of BO.(5)CT scan could be categorized toroutine abdominal CT, CT enteroclysis (CTEc), and CT enterography (CTE). (6), Routine abdominal CT is the most commonmethod using in diagnosis of BO because it is fast and could be run without oral contrast where "the retained intraluminal fluid serves as a natural negative contrast agent"this mean it could be used with patients suffered from nausea and vomiting without fearing from contrast's aspiration . (3,6) however in the cases of partial obstruction oral contrast need to be given and in low grade partial obstruction CTE is preferred more than routine CT because it is provide better evaluation to BO . (3,6,13)

There are five major questions in BO cases where CT provide doctors with the answer of them which make it a valuable tool in diagnosis of BO: (Is there an obstruction in the bowel?, Where is the transition point (TP)?What is the cause?, What is the severity degree ?,Is it simple or complicated?). (2,4)

Bowel obstruction diagnosed by CT when "the small bowel is dilated to a caliber of more than 2.5 cm with a distinct point of transition and normal caliber bowel beyond". (5,14)

Regarding the question of transition point (TP) , it is look like a beak and specified by "identifying a caliber change between the dilated proximal and collapsed distal small bowel loops".(4,5,11,15)

Concerning the question of the cause of obstruction , The main causes of BO in this study were mechanical, neoplasm, and idiopathic , where the evaluation of transition point is essential to identify the real cause , (3)similar results were found in India study the main cause were Intestinal adhesion and tumor (1269), and in Pakistan study were adhesions 29 (40%), neoplasm 12 (17 %) and hernias 7 (10%). (2970), where adhesions reported mostly in patients with history of previous abdomen surgery and it responsible of 60-80% from small BO cases. (1,16)

Determination of severity degree of BO either it is complete or partial rely on 3 factors: " distal collapse, proximal bowel dilatation, and the transit of contrast", (4)If the oral contrast material pass through TP to the collapsed distal bowel this mean partial obstruction, if there was minimal contrast in the distal loops this mean high grade, while if there was adequate contrast flows across the transition point this mean low grade. (2,3,17)

In the case of simple BO the blood flow continue in order, (4)on the other hand there are several serious complications of BO(perforation, ischemia, closed loop obstruction and Strangulation) threaten life in the case of delay diagnosis , (1,3,4), in the current study only 8 cases reported complication 2 as ischemia and 6 as perforation . Each of this complication has different presentation in CT image which helped in diagnosing and differentiate between these medical condition, CT signs of strangulations are " poor or no contrast enhancement of bowel walls , target sign , mesenteric vasculature engorgement, and mesenteric congestion ", (5,18)while in closed-loop obstruction the signs are " distended bowel with radial mesenteric vessels with medial conversion ", in ischemia cases CT signs are "thickened intestinal walls and poor flow of contrast material into a section of bowel ",(1)and in necrosis and perforation, the main signs are " pneumatosis intestinalis, free intraperitoneal air, and mesenteric fat stranding ". (1)

However as all other radiology modalities there are few limitations of CT scan , (3,5)superficial lesions cannot precisely be seen, which make the diagnosis of low-grade or sub-acute obstructions difficult and need to be combine with contrast study particularenteroclysis(5,19).Also the high dose of radiation is consider a big limitation in using CT scan specially between children, pregnant women and patients inflammatory bowel diseases (IBD) who need for recurrent imaging examination , however the new generation of multidetector CT (MDCT) scan combining with pediatric protocols showed significant influence in decreasing the radiation dose.(19,20,21,22,23)All of these limitations led the researcher to emphasize on the fact that CT scan is not a first line method to diagnose BO and it

should use only in equivocal cases where there is no previous history of surgery or hernias and there is a high suspicion of complication. (1,3)

### Conclusion:-

The early precise diagnosis of bowel obstruction helps in decreasing the morbidity and mortality rate. There are many radiology modalities help in the diagnosis where each modality has advantages and limitations . Plain abdomen radiography is suitable technique in the emergency cases and following after operation , however CT scan is the more accurate technique . Further studies need to be conducted to compare between these two technique and other modalities to provide more information to help doctors and radiologist in choosing the appropriate technique regarding the situation.

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### RESEARCH ARTICLE

## NITRITE OXIDE DETECTION UTILIZING THE GRIESS ASSAY: ELUCIDATING INTERFERING FACTORS FOR IN VITRO APPLICATION.

Turki Alsharekh and Faisal Albaqami.

#### Manuscript Info

##### Manuscript History

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#### Abstract

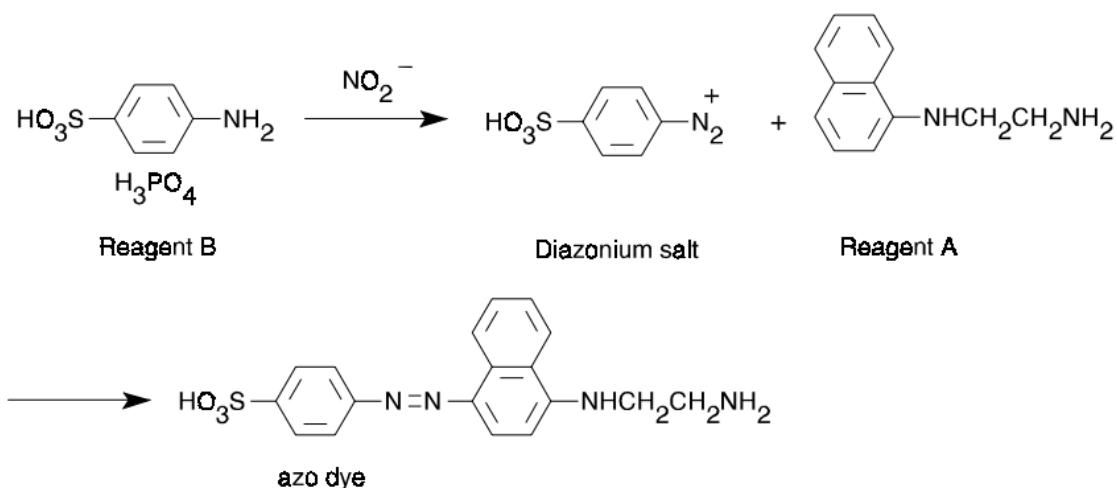
Nitrite Oxide (NO) is a molecular mediator of many physiological processes including: Vasodilation, Inflammation, Immunity & Neurotransmission. But we can't measure Nitrite Oxide formation Directly by Griess assay so we use one of its stable non-volatile breakdown products: the Nitrite (NO<sub>2</sub><sup>-</sup>). In our paper we look into different factors that may change the Nitrite Oxide Quantification in Griess Assay reaction for in-vitro application including: Culture Media (DMEM, RPMI, MEM and RPMI-F12) & Anticoagulants (Heparin and Enoxaparin). This is done by comparing the results from a control Griess Assay against a Griess Assay with either Culture media or Anticoagulant. From the results we conclude that a) Culture Media produce similar results to Calibration curve. B) Griess assay is effected by Heparin and Enoxaparin.

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#### Introduction:-

Nitrite Oxide (NO) is a molecular mediator of many physiological processes including: Vasodilation, Inflammation, Immunity & Neurotransmission. A number of methods exist for measuring Nitrite Oxide in biological systems; one of these is Griess Assay. But we can't measure Nitrite Oxide formation Directly by Griess assay so we use one of its stable non-volatile breakdown products: the Nitrite (NO<sub>2</sub><sup>-</sup>). [1]

The Griess assay is a chemical analytical test that is used to measure the levels of Nitrite. The Assay based on a chemical reaction which uses sulfanilamide and N-1-naphthylethylenediamine dihydrochloride under acidic conditions. Sulfanilic acid is quantitatively converted to a diazonium salt by reaction with nitrite in acid solution. The diazonium salt is then coupled to NED, forming an azo dye that can be spectrophotometrically quantitated based on its absorbance at 540 nm. Thus it detects NO<sub>2</sub><sup>-</sup> in a several biological and experimental liquids such as plasma, serum, urine and tissue culture medium. [2]



**Figure.1:-** Principle of Nitrite Quantitation using Griess reaction. [1]

#### Objective:-

In our paper we shall look into different factors that may change the Nitrite Oxide Quantification in Griess Assay reaction for in-vitro application including:

1. Culture Media:DMEM , RPMI , MEM and RPMI-F12.
2. Anticoagulants including Heparin And Enoxaparin.

#### Method:-

Heparin and Enoxaparin (Low Molecular Weight Heparin ) will be used to determine if these have any effect on Griess assay.

#### To do our projects first we need to make a couple of solutions:-

Stock solution A ( 50 ml ) which is composed of :

1. 0.4 % NED.(200mg in 50ml).
2. 4% Sulphanilamide.(2g in 50ml).
3. 10% Phosphoric acid ( 6ml of 85% stock )

#### Solution B ( 15ml ) which is composed of:-

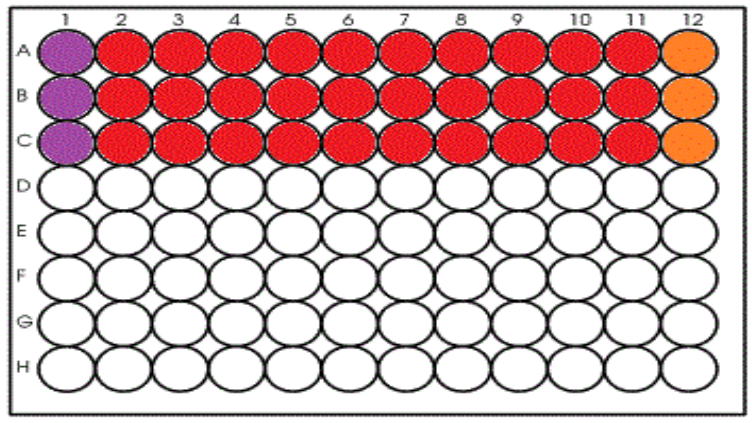
4. 3ml Stock Solution A.
5. 12ml MilliQ water.

#### Method for Traditional Griess Assay Curve:-

1. We Added 100  $\mu\text{l}$  of 5mM Sodium Nitrite to all wells of column 1 of a 96 well-plate.
2. Then we Added 100  $\mu\text{l}$  of MilliQ water media to each of all remaining wells.
3. After that we serially dilute (1:2) sodium Nitrite across the plate.
4. Add 100  $\mu\text{l}$  Solution B to all wells on the 96-well plate.
5. Finally we measured the absorbance at  $\lambda_{\text{abs}}=540\text{nm}$  ( or 570nm ) by using a plate reader .

#### Variations:-

Replace MilliQ water and add Culture Media / Heparin solution / Low Molecular weight Heparin in its place to detect changes.



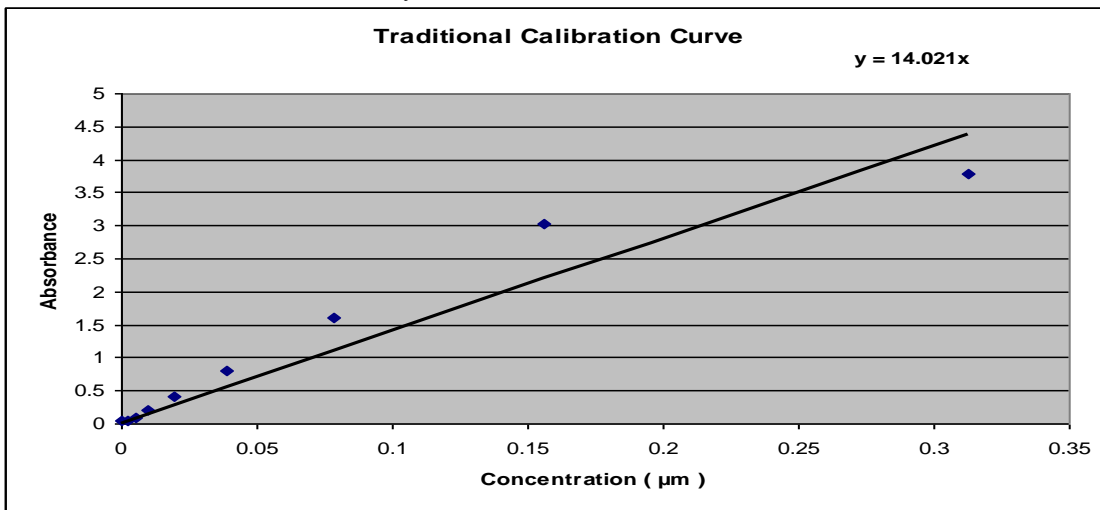
**Figure 2:-** Representation of the 96 well-plate. Left is the highest concentration of Nitrate serially diluted to the right. Three rows were used and averaged to maintain lower chance error.[3]

For the results we shall compare culture media, heparin solution and enoxaparin solution to the Traditional Curve which is used as control.

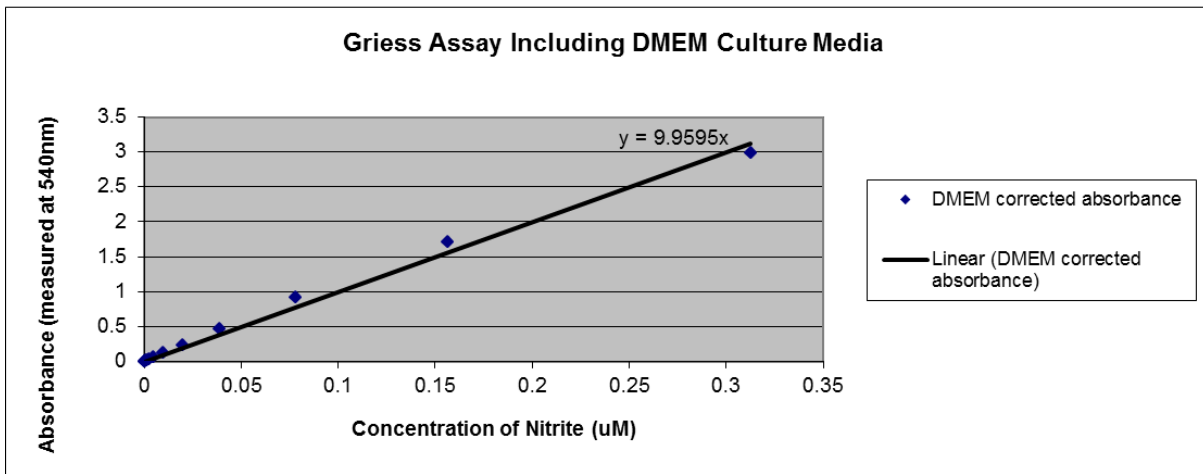
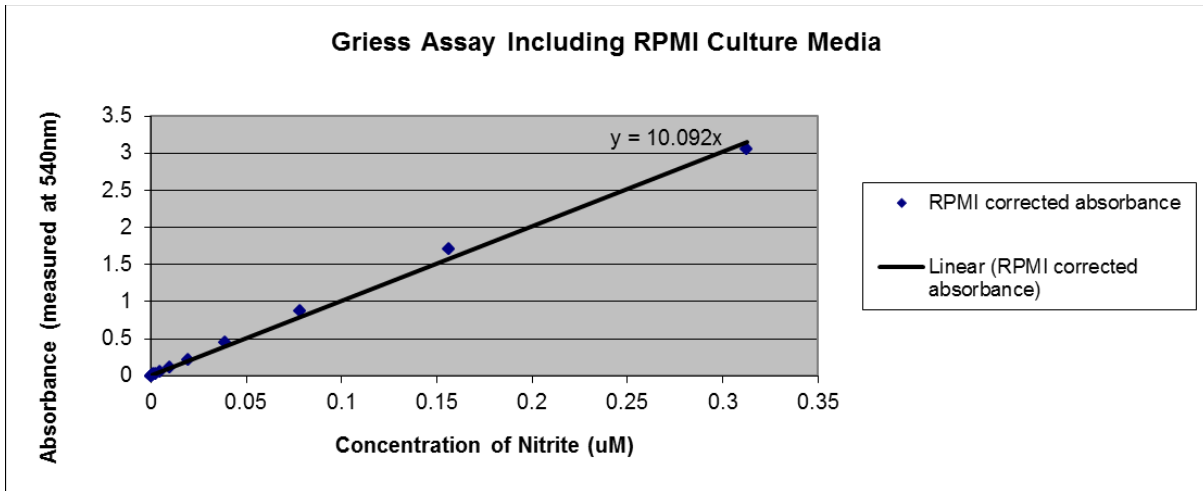
**Results:-**

We will use graphs & Linear equations to represent the results. First, we will look at Traditional Curve which will be compared to the rest of the results. Then we will look at culture media & heparin results.

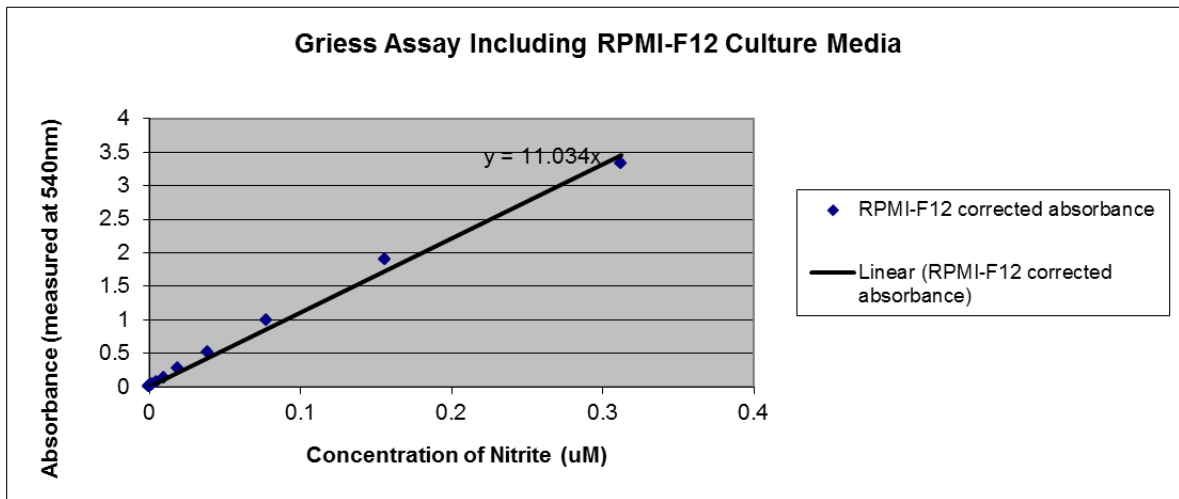
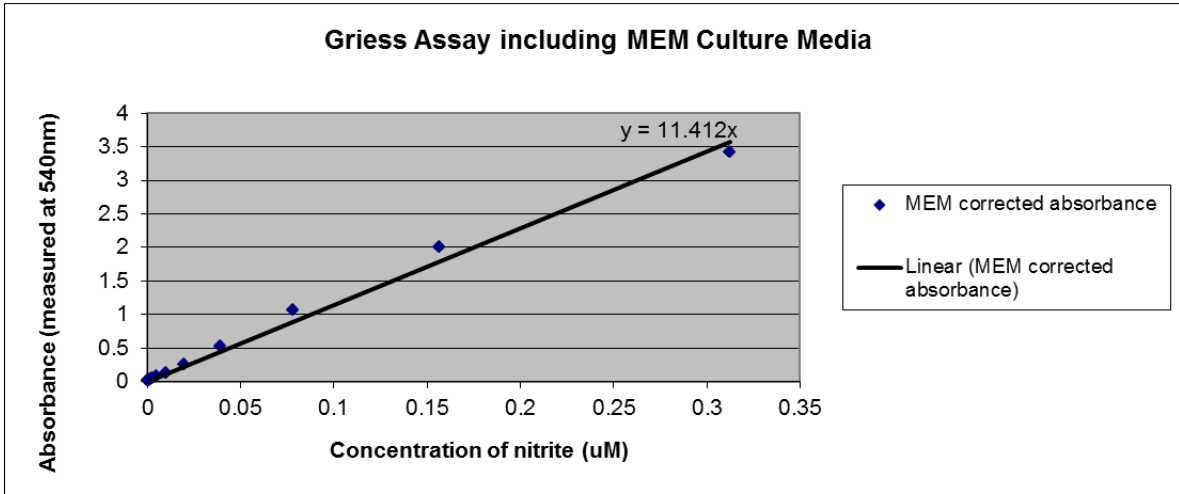
Initial results on Traditional curve showed that the absorbance on the spectrophotometer is not accurate at higher concentrations (1.5uM to be specific) and thus we have lowered the Concentration to 0.3125 to be the highest concentration of Nitrate to maintain accuracy.



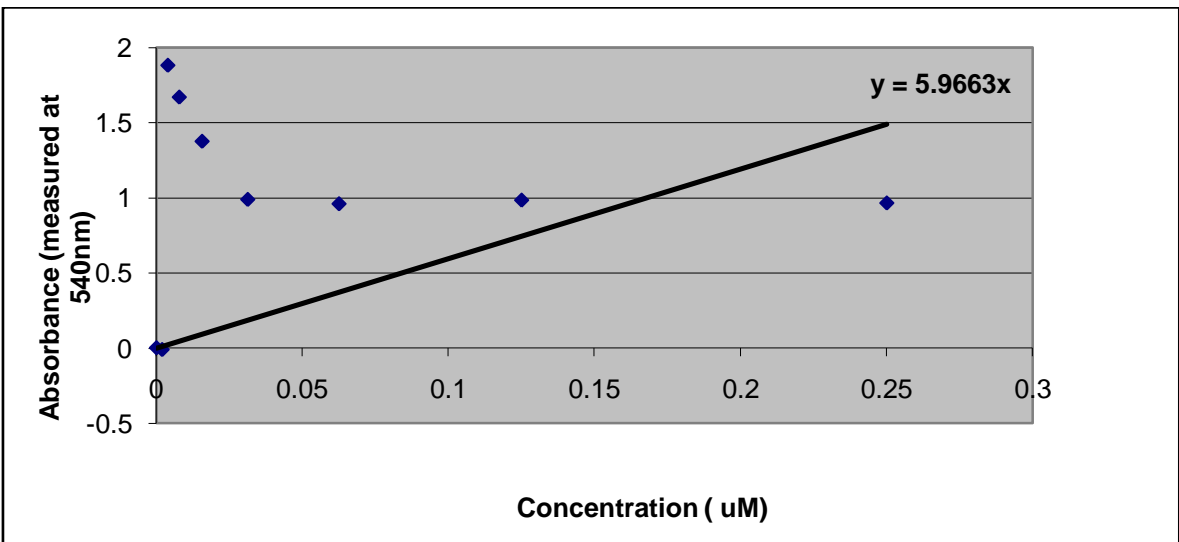
**Graph.1:-** Traditional Calibration Curve, which will be used as control.

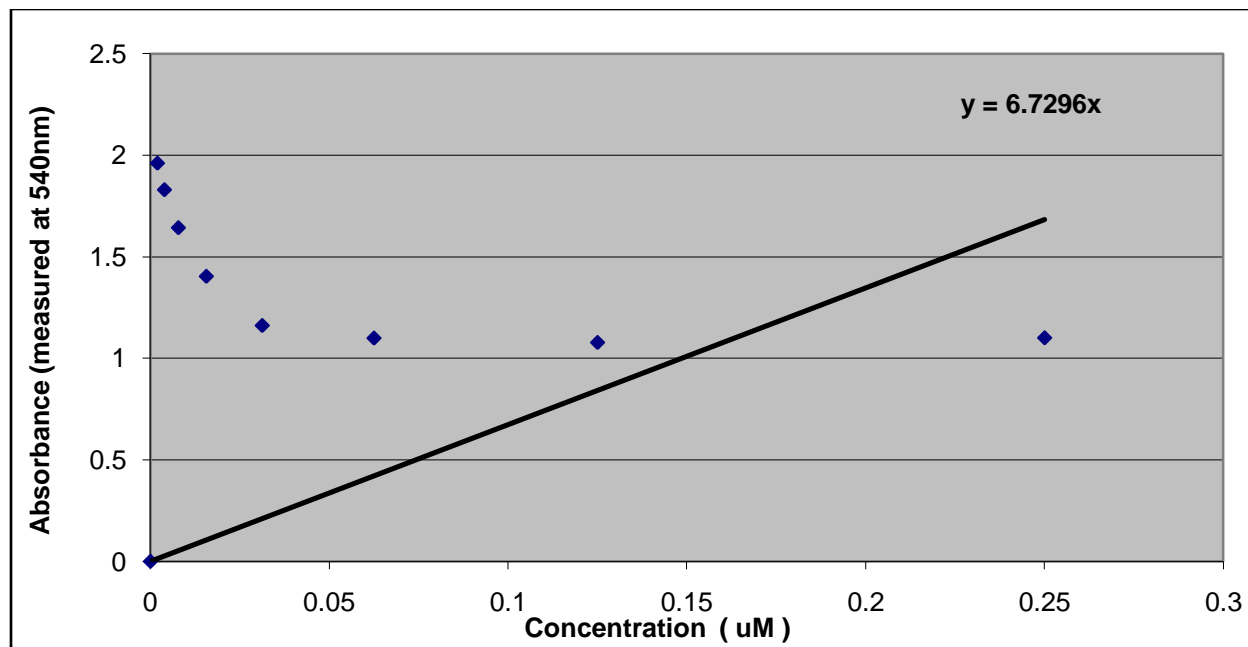


Graph. 2 & 3:- RPMI and DMEM Culture Media, There is small difference between them and Calibration Curve.



Graph 4 & 5:- RPMI-F12 and MEM Culture Media, still similar to previous results.





**Graph. 6 & 7:0-** Heparin and Enoxaparin, from analysing the graphs and trendlines we found that Griess Assay is prone to interferences with Heparin and Enoxaparin and gives altered results.

#### **Conclusion:-**

From the results we conclude that a) Culture Media produce similar results to Calibration curve. B) Griess assay is effected by Heparin and Enoxaparin and gives altered results.

#### **Sources:-**

1. Griess Reagent Kit for Nitrite Determination (G-7921) – Molecular Probes.
2. Griess Reagent System INSTRUCTIONS FOR USE OF PRODUCT G2930.
3. Figure is made by Authors.





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### RESEARCH ARTICLE

#### TYPE 1 DIABETES MELLITUS AMONG PEDIATRICS AND ADOLESCENTS IN SAUDI ARABIA: A SYSTEMATIC REVIEW.

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Type 1DM, Pediatric, Adolescents,  
 Saudi Arabia, Systematic Review

#### Abstract

**Introduction:** Saudi Arabia is ranked the 7th globally in number of children with T1DM and the 5th regarding the incidence. T1DM sequelae in children and adolescents involve both acute complications such as hypoglycemia attacks, and diabetes ketoacidosis (DKA). Long-term complications microangiopathies in the retina and kidney as well as dyslipidemia were reported.

**Objective:** we aimed to shed more lights on T1DM among Pediatrics and Adolescent patients in Saudi Arabia in a systematic way.

**Methodology:** A systematic search of published literature that has addressed T1DM in pediatrics and adolescents was carried out via the internet, using the medical database MEDLINE/PubMed, supported by the US National Library of Medicine. All published articles containing the words "Type 1 Diabetes", "IDDM", "adolescents", "children", "pediatric", in combination with "Saudi Arabia" as part of their title, as a keyword or as a reference in their abstract have been collected. Only full publications and original articles were included in the review process

**Results:** out of 54 articles, 27 were selected for this review. The number of children with T1DM in KSA is 16,100 cases. The incidence rate is growing by 3% yearly and Saudi Arabia ranked as 5th in incidence rate. The growth in incidence is driven by environmental factors rather than genetics. The clinical presentation at diagnosis includes polydipsia, polyuria and weight loss with high incidence of DKA. T1DM is commonly associated with autoimmune thyroiditis and coeliac disease. Glycemic control is an area for improvement to reduce both the acute and long term complications. T1DM is associated also with disturbance of lung function, hepatopathy and vitamin D deficiency among T1DM population. Overall, the quality of life for patients and their families were impacted negatively.

**Conclusion:** in such a devastating disease, more epidemiological studies are needed to screen the environmental factors that trigger the autoimmune response. Awareness campaigns and continuous medical

education is of utmost importance to detect the disease earlier before development of DKA. Multidisciplinary approach by highly trained diabetes management team should be enforced to improve patients' outcomes.

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### **Introduction:-**

Type 1 diabetes mellitus (T1DM) is caused by insulin shortage because of autoimmune disease destroying the  $\beta$  beta cells of the pancreas. Globally, there is a worrying growth of T1DM in pediatrics. The trend toward more children developing T1DM has continued and as of 2015, more than half a million children are estimated to be living with type 1 diabetes. Whilst T1DM is much less common compared to type 2, it is still increasing by around 3% every year, particularly among children. The reasons for this are still unclear, but may be due to variations in ecological risk factors or pattern of viral infections. Around 86,000 children develop T1DM yearly and when insulin is not available, the life expectancy for diseased children is very short. [1]

Saudi Arabia, a country of almost 30 million population of which 26% are under 14 years old, ranked the 7th globally in number of children with T1DM.[1] In 2008, Al-Herbish AS et al. reported 109.5/100000 prevalence rate in pediatrics and teenagers.[2] Other forms of autoimmune disorders, such as celiac disease (CD) and thyroiditis (AIT), may increasingly affects T1DM patients.[3,4] Moreover, T1DM sequelae in children and adolescents involve acute complications such as hypoglycemia attacks, and diabetes ketoacidosis (DKA). Long-term complications microangiopathies in the retina and kidney as well as dyslipidemia were reported. [5] In this review, we aimed to shed more lights on T1DM among Pediatrics and Adolescent patients in Saudi Arabia.

### **Material and Method:-**

A systematic search of published literature that has addressed T1DM in pediatrics and adolescents was carried out via the internet, using the medical database MEDLINE/PubMed, supported by the US National Library of Medicine. The review was conducted to the time of January 2017. The methodology followed by the researcher for the process of selection of articles is presented in. The researchers conducted a review process and the discordances were resolved by consensus. At a first stage, all published articles containing the words "Type 1 Diabetes", "IDDM", "adolescents", "children", "pediatric", in combination with "Saudi Arabia" as part of their title, as a keyword or as a reference in their abstract have been collected. The initial search retrieved 54 articles. A group of filtering conditions was adopted to confine the search results, excluding case reports studies or not original papers. Finally, at the end selection process, the remaining 27 articles were examined in details.

### **Results:-**

#### **Epidemiology of Type 1 Diabetes Mellitus in Saudi Arabia:-**

As per diabetes atlas 7th edition, 16100 children suffer from T1DM in Saudi Arabia. Such number ranks Saudi Arabia as 7th globally in terms of numbers and 5th in terms of incidence rate. [1] In 2008, results of nationwide epidemiological survey was published showing that out of 45,682 children and adolescents surveyed, 50 has been identified as having T1DM which brings the prevalence rate to 109.5/100,000. The distribution of prevalence as per region and age group was variable with almost equal gender distribution. [2] The incidence rate showed dramatic increase of numbers over 18 years' study (1990-2007) of children <15 years old in Saudi Aramco Medical Services Organization. In the 1st 9 years of the study the incidence was 18.05/100,000 and got doubled in the 2nd 9 years to reach 36.99/100,000. [6]

#### **Etiopathogenesis:-**

The exact etiology of type 1 diabetes is unknown. However, it is suggested that it develops in individuals who are genetically susceptible, who come in contact with certain environmental factors, which trigger immune mediated destruction of the  $\beta$ -cell mass. The interplay between genetics, environmental triggers and immunological response involve a balance between susceptibility and protective factors in each category. [7,8] Among Saudi population, Human Leucocytic Antigen class II DQB1\*0201/0202-DRB1\*04 genotype was recognized as inclining to T1DM (P = 0.0002; odds ratio = 0.67; 95% CI = 0.009-0.381). On the other hand, high frequency of the DPB1\*0401 may designate a protecting effect of this combination of HLA alleles against T1DM in Saudis. [9]

Despite genetics as a contributing factor to the incidence of Type 1DM, yet it cannot explain the alarming increase in the incidence. Perhaps the environmental factors or triggers like viral infections are changing and leading to this

leap in incidence. [6] In a community based cross sectional study involving 11552 mothers answering a survey about consanguinity, 6470 (56%) ladies had consanguineous marriage with no significant relation to T1DM (P=.92). [10]

Autoantibodies are responsible for the pathogenesis of T1DM namely islet cell antibodies (ICA), insulin autoantibodies (IAA) and glutamic acid decarboxylase antibodies (GAD). In a study involved 98 children with T1DM in Riyadh between 2000-2007 to identify the prevalence of autoantibodies per age group and correlate between their occurrence and the severity of presenting symptoms. Results showed that among the study population (age range 1-12 years, mean: 6.6 years, equal sex distribution) 49% presented with diabetic ketoacidosis (DKA). ICA, IAA and GAD were identified in 67%, 36% and 84.4% respectively. ICA was predominant in preschool children. Children who showed positivity for GAD and ICA but not IAA had more severe clinical presentation. [11]

#### Clinical Presentation of Type 1 Diabetes Mellitus in Saudi Arabia:-

Few regional studies reported the clinical presentation of T1DM in Saudi Arabia including patients from Riyadh region in 1991. [12] Eastern provinces in 2001. [13] Al-Medina region in 2004. [14] North West region in 2011,[15] and Riyadh region 2011. [16] The table below summarizes the key presenting symptoms and signs:

**Table 1:-Clinical presentation of Type 1 Diabetes Mellitus in Saudi Children and adolescents**

Region	Mean Age in years	Male : Female	Polydipsia	Polyuria	Weight loss	Abdominal Pain	DKA	Vomiting
			N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Riyadh 110 pts	5.9	51:59					74 67.0%	
Eastern 46 pts.	9	1:1.5	36 78.3%	31 67.4%	28 60.9%	10 21.7%	35 77%	10 21.7%
Al-Madina 230 pts	6.9	111:119	221 96.0%	222 96.0%	176 76.6%	118 63.4%	127 55.2%	42 35.3%
NorthWest 311 pts	6.7	152:159	304 98.0%	305 98.0%	108 34.7%		172 55.3%	
Riyadh 369 pts	12.4	175:194	310 88.8%	321 92.0%	292 83.9%	172 49.3%	174 49.9%	52 14.9%

pts = patients, DKA = Diabetic ketoacidosis

Over all, the cardinal signs and symptoms are polyuria, polydipsia and weight loss whereas diabetic ketoacidosis seems to be less frequent than it is used to be. The time elapsed from the onset of symptoms till presenting to the clinic was few weeks if not days.

#### Autoimmune diseases Associated with T1DM in Saudi Arabia:-

Autoimmune thyroiditis whether overt or subclinical was recognized in 14% of patients.5 Celiac disease was described in 5 publications with varying incidence among T1DM children ranging from 4.9% -21.2% depending on the screening test used and confirmatory biopsy done. [5,17-20]

#### Management of Type 1 Diabetes Mellitus in Saudi Arabia:-

Two studies from King Abdul Aziz University (KAAU) hospital described the glycemic control of T1DM in pediatrics and adolescents. [5,21] The protocol for management of T1DM in children at KAAU hospital was outline by the author below. [21]

#### Insulin Regimens and Self-Monitoring Blood Glucose (SMBG):-

T1DM children were stratified by age to either conventional insulin regimen for patients <6 years or intensive insulin regimen for children >6 years and all adolescents. Conventional insulin therapy refers to utilizing 2 injections of premixed insulin /day before meals and guided with SMBG, insulin dosage was adapted per the glycemic control attained. Intensive insulin therapy refers to receiving 3 injections of rapid or short acting insulin /day prior to meals combined with either basal insulin bolus, or insulin pump to compensate for basal insulin.

#### Diabetes Education and Physical Exercise:-

Appropriate diabetes education means participation in  $\geq 1$  educational session /month. Proper physical exercise should last for  $\geq 30$  minutes/day whether indoors and outdoors 3-4 times/week.

The first study, published in 2011, was retrospective single visit that evaluated the glycemic control among T1DM children and adolescents at KAAU hospital from 2006 to 2010. A total of 484 subjects (male=213, female= 271),

mean age was 12.5±4.1 years. 38.6% of the patients were pre-pubertal and 61.4% pubertal. The overall mean A1c was 9.4±2.4% and 31.4% achieved satisfactory A1c as per American Diabetes Association (ADA) guidelines. The glycemic control of T1DM children in this cohort was less satisfactory because of physical inactivity and patients' educational. The following table depict the main factors contributed to better glycemic control. [21]

**Table 2:-**Comparison of well and poorly controlled T1DM children and adolescents according to the ADA guidelines [21]

	Well controlled	Poorly controlled	p value
	(n=152)	(n=332)	
Age (years)	10.3±4.1	13.4±3.6	< 0.001†
Gender (female)	89 (58.6)	182 (54.8)	NS
A1c (%)	7.2±0.5	10.4±2.3	< 0.001
Duration of T1DM (years)	2.4±1.2	3±1.3	< 0.05
Insulin regimen (intensive insulin therapy)	120 (79)	314 (94.6)	< 0.05
Compliance to educational activities	128 (84.2)	10 (3)	< 0.001
SMBG≥4 times/day	102 (67.1)	85 (25.6)	< 0.05
No physical exercise	61 (40.1)	264 (79.5)	< 0.001
Exercise (1 to 2/week)	67 (44.1)	57 (17.2)	< 0.001
Exercise (3 to 4/week)	24 (15.8)	11 (3.3)	< 0.001
Values are expressed as patients count and percentages (%) or as mean ±SD; NS: non-significant			

Later in 2015, a published cross-sectional study had included 228 T1DM subjects attending at the KAAU Hospital, Jeddah, Saudi Arabia from Jan. 2013 to Jan. 2014. Subjects mean age was 10.99 years, and the A1c level was 8.8%. pre-pubertal age groups had significantly better glycemic control (p=0.01) compare to pubertal age group. Within this study cohort, acute sequelae included DKA in 65.4% of patients, and hypoglycemia in 68.9%. Long-term complications were detected in patients including macroangiopathic changes in the retina (4.4%), microalbuminuria (16.2%), and dyslipidemia (8.3%). [5]

#### Complications of T1DM in Children and adolescents:-

Microalbuminuria is a surrogate marker for diabetic nephropathy in T1 DM pediatric patients. Among 409 T1DM children and adolescents the prevalence of microalbuminuria was 11.3%. in patients with T1DM duration ≥2 years, post-pubertal, elevated blood pressure and overweight Microalbuminuria was significantly higher. [22]

#### Other associated conditions:-

##### Pulmonary function:-

Lung function was evaluated in a group of 52 (26 male and 26 female) volunteer T1DM children within age range from 8-14 years (mean 12.05 ± 1.42 years), mean duration of disease of 5.25 ± 0.47 years, and mean glycosylated hemoglobin of 11.27 ± 0.31%. Pulmonary function in children with diabetes showed significant lower mean values of actual lung function parameters forced vital capacity (FVC), peak expiratory flow (PEF), and maximum mid expiratory flow rate (MMEF) compared to their projected standards. [23]

##### Hepatopathy:-

In adults, liver disease among diabetics ranges from 17% to 100%. A pediatric study performed over one year starting Nov. 2008 to evaluate liver diseases among T1DM pediatric subjects. 22 patients (21%) out of 106 had positive signs of liver affection either hepatomegaly in 10 patients or hyperechogenic liver in 12 patients. Patients with hyperechogenic liver had poorer glycemic control. Upon achieving better glycemic control, hepatopathy was reversible in 60% of patients at 6 months' follow-up. [24]

##### Vitamin D Deficiency:-

In a prospective cross-sectional study evaluating vitamin D deficiency had included 100 Saudi children with T1DM and 100 healthy controls from the pediatrics' department of, Security Forces Hospital, Riyadh, KSA from Jun. to Sept. 2010. 25OHD mean levels were meaningfully lower in the T1DM children compared to the controls (36.7 ± 14.3 nmol/l versus 44.8 ± 14.1 nmol/l). Overall, 84% of the T1DM children, and 59% of the control children were vitamin D deficient. [25]

Another study investigated whether deficiency of vitamin D can impact glycemic control or cardiometabolic complications in T1DM patients KSA. 301 young patients with T1DM in Jeddah during 2010-2013 were enrolled. Only 26.2% of subjects had a satisfactory A1c level. 25-hydroxyvitamin D [25(OH)D] mean level was 35.15. In males, it was inversely associated with frequency of hypoglycemia ( $p < 0.01$ ), BMI ( $p < 0.05$ ), diastolic blood pressure ( $p < 0.05$ ), and triglyceride levels ( $p < 0.01$ ), while in females, it was inversely associated with current age ( $p < 0.05$ ), age at diagnosis ( $p < 0.01$ ), and triglyceride levels ( $p < 0.01$ ). [26]

#### **Health-Related Quality of Life (HRQoL) in T1DM adolescents and their families:-**

In a study involving 315 adolescent patients (12–18 years old) and their caregivers, HRQoL of T1DM and its effect on the caregivers were evaluated. Patients reported a collective mean HRQoL score of 64.8, while caregivers reported significantly lower scores of 60.3 ( $p = 0.003$ ). “Worry” subscale had the lowest scores reported by both adolescents and parents. [27]

In another group, 214 adolescents (13-18 years) with T1DM were surveyed to assess HRQoL at Diabetes Treatment Center, Prince Sultan Military Medical City, Riyadh, KSA from Jun. to Sep. 2013. Factors associated with at least one poor HRQoL parameter were Female gender, repeated daily injection, T1DM >7 years, DKA and adolescents with poor glycemic control. [28]

#### **Discussion:-**

This is the first review on T1DM children and adolescents in Saudi Arabia. Based on the data we have reviewed regarding the prevalence and incidence of T1DM in KSA we can notice a tremendous increase in the incidence year after year that cannot be explained by genetic factors or high prevalence of consanguinity only and most probably environmental factors and triggers have a principal role in the pathogenesis of T1DM. In comparison to other Arab countries the variability in incidence can be explained by, in addition to infections, other environmental factors particularly change in nutritional habits, including high meat consumption, vitamin D deficiency, low breast-feeding and high intake of nitrites in processed meat might be playing a role as the highest incidence is mainly seen among rich countries. [29]

The cardinal signs and symptoms for T1DM were polydipsia, polyuria and weight loss. There is a trend towards decreased presentation with DKA however in comparison to data from United Kingdom showing DKA among newly diagnosed T1DM is almost 26%. [30] More effort is needed to diagnose T1DM earlier before development of DKA perhaps in the form of awareness campaigns and continuous medical education.

Several factors are affecting metabolic control among pediatric and adolescent age groups including age of patients, duration of the disease, compliance to SMBG physical exercise and educational activities. Hence a multidisciplinary approach is mandated to improve outcome in our patients. The interaction between poor diabetic control, prevalence of acute and long term diabetes complications, associated autoimmune diseases, associated conditions as well as insulin treatment impact the quality of life not only the patients but also their families and caregivers.

#### **Conclusion:-**

In conclusion, T1DM in pediatrics and adolescents is a devastating disease and more epidemiological studies are needed to screen the environmental factors that trigger the autoimmune response. Awareness campaigns and continuous medical education is of utmost importance to detect the disease earlier before development of DKA. Multidisciplinary approach by highly trained diabetes management team should be enforced to improve the outcome and prevent long term complications.

#### **Author Contributions:-**

All authors have equally contributed to the development and review of the manuscript.

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### RESEARCH ARTICLE

#### GREEN SYNTHESIS, CYTOTOXICITY AND UTILIZATION OF CARBOXYMETHYLCHITOSAN-STABILIZED GOLD NANOPARTICLES.

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#### Abstract

Gold nanoparticles (AuNPs) was prepared via simple and green method by using polysaccharides as reducing and stabilizing agents at the same time. Hiren we used carboxymethylchitosan (CMCS) as a reducing agent for gold nanoparticle as well as capping agent. CMCS prepared based on our previous method by reacting chitosan with monochloroacetic acid in alkaline medium. AuNPs were prepared by using different concentrations of carboxymethylchitosan (0.2% w/v, 0.5% w/v and 1% w/v) at 100 °C for 1 hour. CMCS was characterized by using nitrogen content, carboxyl content and FTIR spectra. AuNPswas characterized by using UV spectrophotometry and TEM images. Finally, the cytotoxicity of the prepared AuNPs were evaluated using cell viability assay from MMT and IC<sub>50</sub> values compared with AuNPs prepared by chemical methods. The results shows that AuNPs have normal distributed with 15-25 nm particle size and its cytotoxicity was lowered when prepared by this green method and can use GNPs safely in contact medical treatment with skin.

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#### Introduction:-

Metal nanoparticles preparation represents major area in nanoscale science and engineering to give unusual physical and chemical properties specially its catalytic activity, novel electronic and magnetic properties and their potential applications in bio nanotechnology[1, 2].

Metal nanoparticles generally prepared by chemical reduction of metal salts with chemical reducing agents such as citric acids, borohydrides, or other organic compounds[1, 3-5].These reducing agents cause cytotoxicity towards biological hazards. Green chemistry used to minimize or eliminate the waste and implement sustainable process [6].So that biological method used for prepare AuNPs.

Raveendran et al was the first team work used the green concept to prepare silver nanoparticles by using glucose as reducing agent and starch as capping agent [7]. Nanoparticles preparation via green method was evaluated from three aspects: solvent, reducing agent and capping agent[8].

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Chitosan as inexpensive material with renewable sources used in several applications especially in cosmetics, pharmaceuticals, food and biotechnology [9, 10]. In the preparation of gold nanoparticles by using chitosan biopolymer, the  $\text{NH}_2$  groups used to stabilize gold nanoparticles [11, 12]. However precise control needed to avoid nanoparticles aggregations [11, 13]. Due to poor solubility of chitosan. Few papers found in the literature dealing with the direct application of chitosan and AuNPs nanocomposites.

Water-soluble chitosan derivative, O-carboxymethylchitosan (CMCS), not only has good solubility in water but also has unique properties (chemical, physical and biological) e.g. high viscosity, biodegradability, biocompatibility and low cytotoxicity. Herein chemical modification perform only on OH groups to form  $\text{OCH}_2\text{COOH}$ , which retain  $\text{NH}_2$  groups accessible for reaction i.e., O-CMCS has both COOH and  $\text{NH}_2$  groups used to stabilize AuNPs so that O-CMCS used as capping agent as well as reducing agent [14].

In the present study, we used simple and green method for gold nanoparticles preparation using carboxymethylchitosan as reducing agent and capping agent at the same time. No other chemical substances needed for the reduction process. We used aqueous solution in this process to avoid environmental hazards. UV spectrophotometry and TEM imaging used to characterize the prepared AuNPs. Finally, we evaluated the cytotoxicity of these nanoparticles compared with the AUGPs prepared by common chemical reduction.

## Experimental:-

### Materials:-

Chitosan (CS) (Aldrich, viscosity 1860cps, degree of deacetylation 79.0%). Sodium hydroxide (Modern Lab chemicals), monochloroacetic (Fluka), are used without further purification. Auric-chloride ( $\text{HAuCl}_4$ ) purchased from Aldrich and used without further purification, USA. All other chemicals and reagents were of analytical grade, and were used without further purification.

### Methods:-

#### Preparation of Carboxymethylchitosan:-

The carboxymethylation of chitosan (CMCS) was prepared as reported in our previous work [15, 16].

#### Preparation of Gold Nanoparticles (AuNPs):-

Gold nanoparticles were prepared by reduction of sodium citrate method as mentioned where [17, 18] with some slight modifications as follow: gold (III) chloride stock solution (1%) used to prepare 15mM, 20mM and 25mM respectively, followed by heating to  $95^\circ\text{C}$  under stirring on magnetic stirrer with heater. To this boiling solution add tri sodium citrate (1.5% w/v), and continue stirring until give red colour. Then we stored this solution at  $4^\circ\text{C}$  to be ready for use.

#### Finishing of Fabrics with Gold nanoparticles:-

The prepared gold nanoparticles (AuNPs) were applied on washed and dried fabrics using pad-dry-cure method.  $30 \times 30$  cm of fabrics were immersed in the gold nanoparticles (AuNPs) (0.005 -0.5 g/ml) solution containing acrylate binder (1%) for 30 min., and then it was passed through a padding mangle with 100% wet pick-up for all of the treatments. Then the fabrics were dried at  $80^\circ\text{C}$  for 5 min., followed by thermo-fixation for at  $140^\circ\text{C}$  for 3 min. Finally, samples washed and dried to be ready for characterization and antibacterial evaluation.

#### Characterizations of Gold Nanoparticles (AuNPs):-

- Fourier transform infrared (FT-IR) spectra of the samples were recorded by using an FT-IR spectrophotometer (Nexus 670, Nicolet, USA) in the region of  $4000\text{--}400\text{cm}^{-1}$  with spectra resolution of  $4\text{ cm}^{-1}$ .
- UV-vis spectroscopy of AuNPs were record on Shimadzu (UV-2450) to confirm the presence of AuNPs in the reaction medium at range 510–560 nm.
- Shape and size of gold nanoparticles (AuNPs) were investigated using JEOL, JXA-840 electron probe microanalyzer, Japan.
- The UV-protection factor (UPF) demonstrates the ratio of sunburn-causing UV measured without and with the protection of the fabric. The UPF of untreated and finished fabric samples (size  $3\text{ cm} \times 3\text{ cm}$ ) was determined according to the Australian/New Zealand standard (AS/NZS 4399-1996: Sun protective clothing-Evaluation and classification) using UV-Shimadzu 3101 PC spectrophotometer at wavelength of 280–390 nm, which includes the UVB (280–320 nm) and the UVA (320–400 nm) according to the following equation:

$$UPF_i = \frac{\sum_{\lambda=280}^{400} E_{\lambda} \times S_{\lambda} \times \Delta\lambda}{\sum_{\lambda=280}^{400} E_{\lambda} \times S_{\lambda} \times T_{\lambda} \times \Delta\lambda}$$

where:  $E_{\lambda}$  = relative erythemal spectral effectiveness,  $S_{\lambda}$  = solar spectral irradiance,  $T_{\lambda}$  = average spectral transmission of the specimen, and  $\Delta\lambda$  = measured wavelength interval (nm). Regarding UV-protection categories, fabrics are classified to good, very good, and excellent if their UPF values range from 15 to 24, 25 to 39, and above 40 (40+) respectively.

- SEM and EDX of the treated fabrics was studied using a scanning electron probe micro analyzer (type JXA 840A)–Japan. Surface morphologies were imaged at different magnifications, using 30kV accelerating voltage.

The tests were carried out at the Central unit for analysis and scientific services at National Research Center.

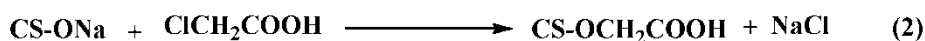
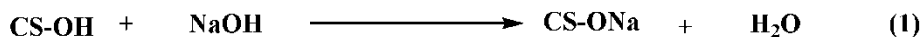
### Evaluation of cytotoxicity of AuNPs:

Cytotoxicity of the prepared AuNPs on A-549 cells were evaluated via cell viability test using MMT method (3-(4, 5-dimethylthiazol-2-yl)-2, 5-diphenyltetrazolium bromide) and determination of values of  $IC_{50}$  [19, 20].

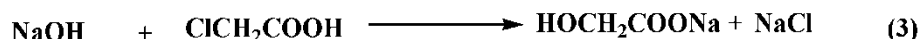
### Results and Discussion:-

#### Preparation of Carboxymethylchitosan:-

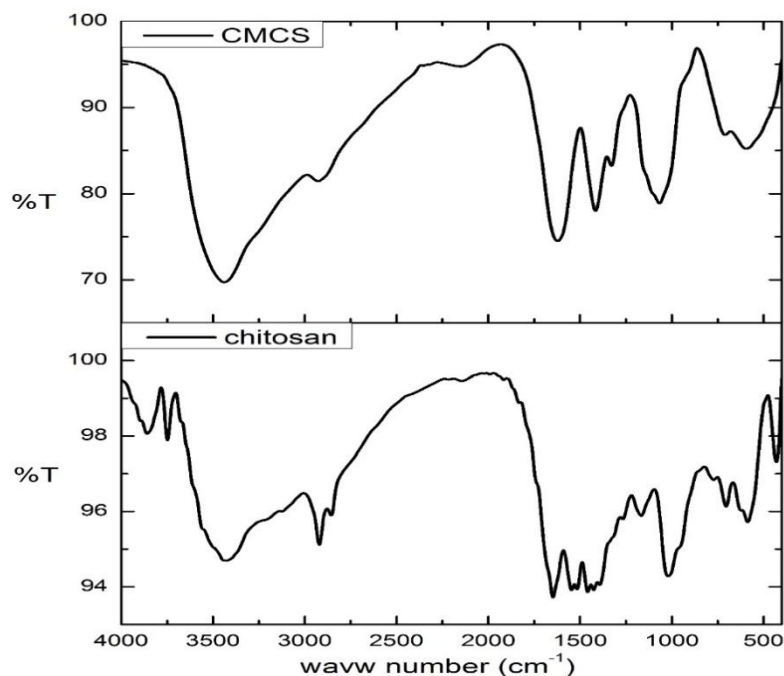
The carboxymethylation of chitosan proceeds by two step consecutive reaction and is accompanied by an undesired side reaction. In the main reaction, the sodium hydroxide reacts first with the hydroxyl groups of chitosan to give alkali chitosan. The carboxymethyl groups are then formed in a SN2 reaction between the alkali chitosan and monochloroacetic acid (MCAA). The main reaction is given by:



The side reaction takes place and results in the formation of sodium glycolate from MCAA and sodium hydroxide.



The FTIR spectra of the prepared CMCSs is shown in Figure 1. In IR spectrum, the wide band at  $3420\text{ cm}^{-1}$  corresponds to the axial stretching of the O–H and N–H bonds. The peaks at  $2927\text{ cm}^{-1}$  and  $1639\text{ cm}^{-1}$  are attributed to the axial stretching of the C–H bonds and the symmetric stretching vibration of C=O in the –COOH groups, respectively. The latter peak, together with the peak at  $1420\text{ cm}^{-1}$ , which arose from the asymmetric stretching vibration of the –COO<sup>−</sup> group, confirm the substitution of carboxymethyl groups onto the chitosan chain. Two bands at  $1528$  and  $1513\text{ cm}^{-1}$  assigned to  $NH_3^+$ , indicate that the carboxymethylation occurred at OH positions. The peaks at  $1413$  and  $1377\text{ cm}^{-1}$  are related to the symmetric angular deformation of C–H bonds and C–N stretching vibrations (amide III band), respectively. The peak at  $1377\text{ cm}^{-1}$  did not increase significantly in the spectra of the CMCS, compared to the chitosan spectrum, which indicates that a significant amount of N-carboxymethylation did not take place. The stretching vibration of C–O in the CH<sub>2</sub>COOH group gives rise to the peak at  $1207\text{ cm}^{-1}$ . Peaks located in the range of  $1175$ – $878\text{ cm}^{-1}$  are the result of vibrations of C–O and C–O–C and some other bonds that comprise the polysaccharide chain [21].

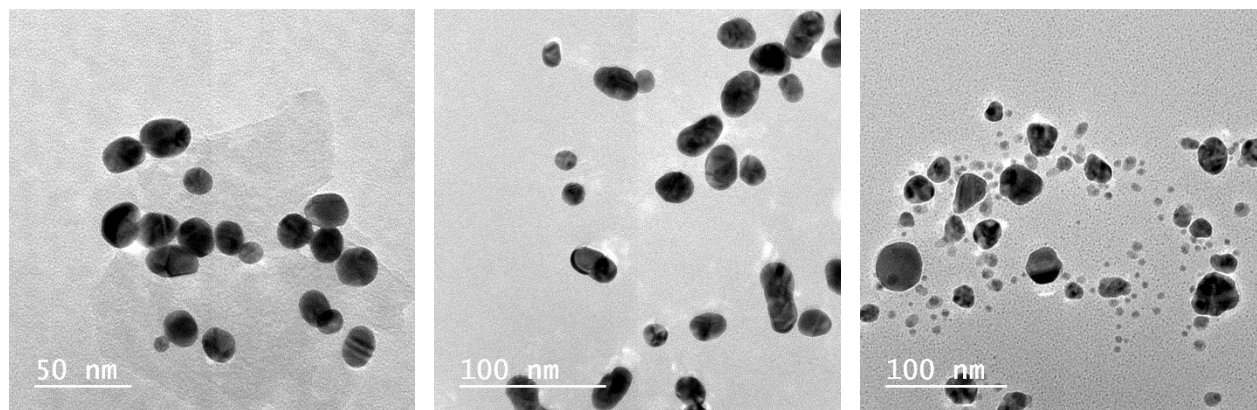


**Figure 1:**-FTIR spectrum of chitosan (CS) and CMCS prepared by reaction of 5gmchitosan with 2.5M MCAA in the presence of 50% NaOH within 3hrs at60°C.

#### Characterization of the CMCS–AuNPs nanocomposite:-

Carboxymethylchitosan play an important role in the preparation of nanoparticles. Amino groups have been used as metal nanoparticles stabilizer [14, 22]. So that we suggest that free amino groups in O-CMCS could bind with gold nanoparticles to stabilize it. When chitosan used instead of O-CMCS to stabilize AuNPs aggregation of nanoparticles occurs due to chitosan insoluble in both neutral and alkaline medium [11, 14].

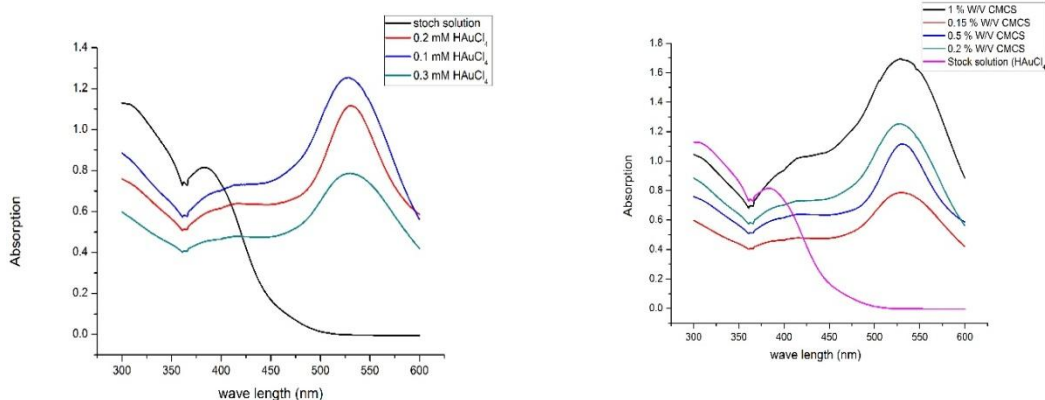
Figure 2 shows TEM images of the O-CMCS-AuNPs nanocomposites. It was observed that the AuNPs were encapsulated by O-CMCS and their size ranged from 15-25 nm. Unlike most gold colloid, few amount of non-spherical particles beside most spherical one was observed. These non-spherical particles seemed to be fabricated by gathered interference of two or three spherical particles during the nucleation process[14, 23].



**Figure 2:-**TEM images of O-CMCS-AuNPs nanocomposites.

Spectrophotometry is another important aspect for characterization of gold nanoparticles. With increase in particle size, the absorption peak shifts to longer wavelength and the width of absorption spectra is related to the size distribution range (Figure 2). Generally, gold nanospheres display a single absorption peak in the visible range between 510-550 nm, because of surface Plasmon resonance and show heavy absorption of visible light at 520 nm. This gives brilliant red color to Gold Nanoparticle (AuNPs), which varies according to their size. In present study

the absorption of gold nanoparticle was measured in single beam spectrophotometer and absorption maxima was noted at different wavelength (390-630 nm).



**Figure 3:-** UV/visible spectrum of gold nanoparticles

Figure 3 shows that the UV/visible spectrum of gold nanoparticles prepared by using carboxymethylchitosan as reducing agent as well as capping (stabilizing) agent with different gold salt concentrations (0.1, 0.2, 0.3 mM) and different O-CMCS concentration (0.15%, 0.2%, 0.5% and 1% W/V) to obtain the optimum condition and these results show that the optimum condition for preparing uniform AuNPs from O-CMCS at 0.2% CMCS and 0.2 mM HAuCl<sub>4</sub>.

#### Finishing of Fabrics with Gold Nanoparticles:-

We used 100% cotton (Sample 1) and 65:35 cotton: polyester (Sample 2) blend fabrics finished with the prepared gold nanoparticles (AuNPs) to be fabrics with new properties such as ultra violet protection (UPF). The results of the anti-UV efficacy of the untreated and AuNPs loaded substrates are shown in Table 1. It demonstrates that after treatment of fabrics with AuNPs results in a significant increase in their UV-protection function. The UV-protection property of the untreated cotton and Cotton/polyester substrates showed that they afforded poor protection, UPF < 20, against UV-radiation. The variation in protection value, expressed as UPF, between the cotton and Cotton/polyester, before and after post-treatment with AuNPs, is attributed to their differences in fabric construction [24].

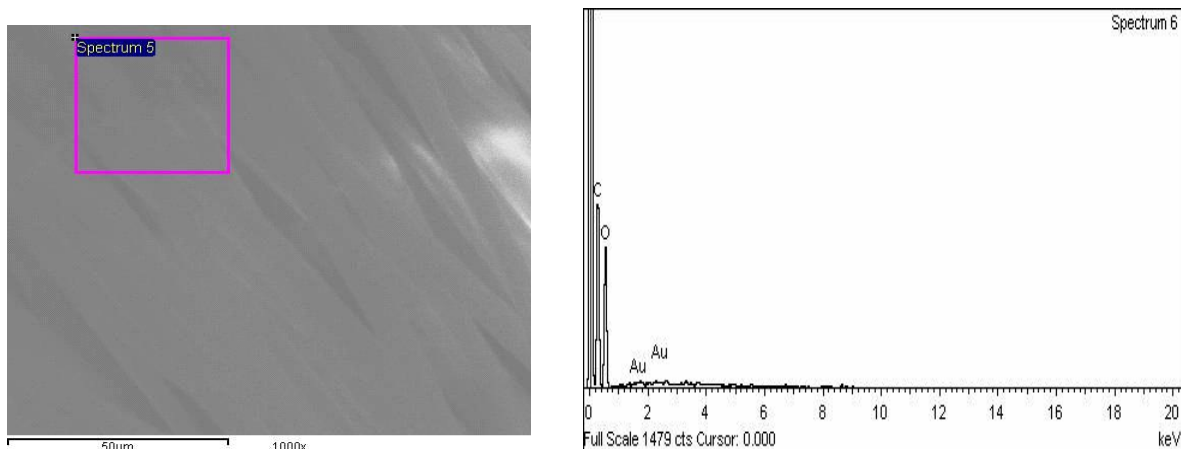
**Table 1:-** Atomic absorption and UPF values of the fabrics treated with AuNPs

Description	Atomic Absorption (mg/dl)	UPF
(Sample 1) untreated	0.000	8.211
(Sample 2) untreated	0.000	10.281
(Sample 1) treated with 15 mM AuNPs	1.203	20.54
(Sample 1) treated with 15 mM AuNPs	0.970	31.35
(Sample 1) treated with 20 mM AuNPs	1.493	36.12
(Sample 2) treated with 20 mM AuNPs	3.841	48.31
(Sample 2) treated with 25 mM AuNPs	3.841	50.65
(Sample 2) treated with 25 mM AuNPs	3.630	61.23

Scanning electron microscope (SEM/EDX) analysis were shown in Figures (4), which shows the presence of Au nanoparticles in the fabrics. The surface morphology of the treated fabric with Au nanoparticles appears as smooth surface with deposit of the nanoparticles. It is clear that the prepared Au nanoparticles are more homogeneous and regular distribution on the surface and has higher intensity peaks, on the other hand the Au nanoparticles EDX analysis indicate that the content of Au (0.49, 0.29) (Au weight 0.91) and has lower intensity peaks [25].

The observation of the Au nanoparticles coating shows that the surface texture appears to have dense and low porosity (The choice samples were interlock). In case of ripe fabrics the nanoparticles coated the fibers and appears to be uniform in size.

The coated fabric with Au nanoparticles film was formed and firmed on the surface of the sample. It is evident that experimental and reaction conditions did not alter the morphology surface on using Au nanoparticles. The Au nanoparticles was strongly attached to the fibers due to very strong electrostatic or chemical interactions between the Au nanoparticles and the fabric [25].



**Figure 4:-SEM and EDX spectra cotton treated with AuNPs**

#### Cytotoxicity of GNPs suspensions:-

To study the effect of gold ions concentration present in AuNPs suspensions on their toxicity, A549 cells were treated for 24 h with three different batches of AuNPs suspension, which contained the same concentration of GNPs (1mM) in three GNP types. As shown in Table. Epiderm cell line selected for cytotoxicity test for Au NPs prepared from  $\text{HAuCl}_4$  solution.

#### Cytotoxicity evaluated using two protocols: EC50 and MTT:-

Table 2 shows that the  $\text{IC}_{50}$  of  $\text{HAuCl}_4$  (1 mM), gold nanoparticles prepared by citrate reduction and third with our method using carboxymethylchitosan (CMCS). However, its toxicity reduces in AuNPs treated with CMCS. In this study,  $\text{Au}^+$  decreased mitochondrial activity more than AuNPs with almost two fold difference in  $\text{IC}_{50}$  values as shown in Table 2, which agreed with previous studies of many researcher[25-28]

**Table 2:-** $\text{IC}_{50}$  A549 cell line after exposing to  $\text{HAuCl}_4$ , Au NPs (citrate reduction), Au NPs (CMCS reduction) (for 24 h)

Material	EC50,
$\text{HAuCl}_4$ (1 mM)	0.32µg/ml
Au NPs (citrate reduction)	0.21 µg/ml
Au NPs (CMCS reduction)	5.61 µg/ml

MTT assay used to measure the cell viability expressed in the decrease in mitochondrial activity (Table3). A reduction in mitochondrial function of A549 cells exposed to the three GNPs types prepared.

**Table 3:-**MTT Test (metabolic Activity of the Mitochondria):

Material	MTT expressed in viable cells	
	After 3hrs.	After 24 hrs.
$\text{HAuCl}_4$ (1 mM)	18.6	2.8
Au NPs (citrate reduction)	14.2	1.9
Au NPs (CMCS reduction)	84.5	76.2

#### Conclusion:-

- Gold nanoparticles (AuNPs) was prepared via simple and green method by using CMCS as reducing and stabilizing agents at the same time.
- CMCS prepared based on our previous method by reacting chitosan with monochloroacetic acid in alkaline medium.

- AuNPs were prepared by using different concentrations of carboxymethylchitosan (0.2% w/v, 0.5% w/v and 1% w/v) at 100 °C for 1 hour.
- CMCS was characterized by using nitrogen content, carboxyl content and FTIR spectra. AuNPs was characterized by using UV spectrophotometry and TEM images.
- The cytotoxicity of the prepared AuNPs were evaluated using cell viability assay from MMT and IC<sub>50</sub> values compared with AuNPs prepared by chemical methods. The results shows that AuNPs have normal distributed with 15-25 nm particle size and its cytotoxicity was lowered when prepared by this green method and can use GNPs safely in contact medical treatment with skin.

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### RESEARCH ARTICLE

#### MEDICAL STUDENTS ATTITUDE TOWARD PSYCHIATRY IN UMM AL-QURA UNIVERSITY: A CROSS-SECTIONAL STUDY

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Attitude toward psychiatry, interns,  
 medical students,

#### Abstract

**Background:** Several studies worldwide reported negative attitude toward psychiatry from medical students and interns. Despite the increasing demand for psychiatry and mental health services, psychiatrists' numbers are still low, and the field of psychiatry is still attracting a lower number of medical students.

**Objective:** This study aims to measure the attitude of medical students and interns toward psychiatry in Umm Al-Qura University medical college, Makkah, Saudi Arabia.

**Method:** A Cross-sectional study. A web-based Attitude Toward Psychiatry (ATP-30) questionnaire was distributed among randomly chosen interns and 6th-year medical students, who had completed their psychiatry course and rotation, and to fourth and 5th-year medical students, who did not have any previous exposure to psychiatry.

**Results:** A total of 335 participants completed the survey, of which 168 were males, and 167 were females. Among them, only 53 are considering psychiatry as a career, while 193 did not, and 89 are not sure. The participants showed an overall positive attitude with the mean scoring of  $98.09 \pm 12.22$  on the ATP-30 questionnaire, with male participants showing more positive attitude ( $99.65 \pm 11.48$ ) than female participants ( $96.44 \pm 12.79$ ). The most neutral responses were about how facts in psychiatry are just vague speculations, how their undergraduate training in psychiatry was valuable, and that psychiatry cannot be taught effectively because it is so amorphous. Negative attitude was observed in the areas concerning the choice of psychiatry as a future career and viewing psychiatric hospitals as little more than prisons. Positive attitude toward areas on the validity of psychotherapy, viewing psychiatry as a respected branch of medicine, attention toward mental illness, and the humanity of the mentally ill. Significant differences based on gender were observed in the areas measuring attitude toward psychiatric patients, psychiatric illness, psychiatry, and psychiatrists. The prior exposure to psychiatry teaching and practice did not seem to affect the attitude.

**Conclusions:** Interns and students overall showed neutral to positive ATP. Proper evaluation and subsequent modification to the current



medical curriculum, with more clinical exposure and engagement with psychiatrists working in the field, may be needed to improve the attitude of interns and students toward psychiatry and mental illness.

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### **Previous publication:-**

The abstract for this study was published on the website of the Journal of Psychology & Psychotherapy as it was presented in the 3rd International Conference on Psychiatry & Psychosomatic Medicine held on December 05-06, 2016 Dubai, UAE.

### **Introduction:-**

Mental health is an important parameter in measuring the wellbeing and quality of life of human beings, and the World Health Organization (WHO) defines it as a "state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community"[1]. It's a common concern that psychiatry, psychiatrists, psychiatric illness and psychiatric patients are under a negative prejudice despite several facts including the increasing prevalence of mental illnesses in adult and pediatrics population which is estimated to be around 10% [1], it will be the leading cause of disability by 2020 (exceeding AIDS and heart attack) [2], it will also be among the top causes of economic burden (especially depressive disorders) [3], as patients with mental health problems represent around 20% of all visits to primary health care centers [4].

Psychiatry is attracting fewer medical graduates, with an associated shortage of qualified doctors in some high-income countries [8,34]. Attitudes toward psychiatry and mental illness among undergraduate medical students seemed to be key factors in determining their choice of psychiatry as a career and willingness to treat psychiatric disorders in clinical practice. The traditional beliefs toward psychiatry and mental illness tend to be deeply imprinted and are therefore not easily erased by modern education [6].

In Saudi Arabia, even though psychiatry and mental health have experienced a significant development in the past decades, the number of psychiatrists is still low (3.0 per 100,000) [5], and amongst them, the number of Saudi psychiatrists is even lower [6]. Also, a scarce number of newly qualified physicians intend to choose psychiatry as a future career [6].

Several articles explored the attitude of undergraduate medical students toward psychiatry, psychiatrists, and mental illness. In a systematic review done in 2013 by Lyons, in which 32 studies were selected and analyzed, only one of them is from Saudi Arabia; the results showed that overall medical students have a positive attitude toward psychiatry, but interest in psychiatry as a career is still low. Also, it revealed that the stigma toward mental illness had been raised as an influential factor in negative views that students have toward psychiatry [7].

The last published study from Saudi Arabia regarding this topic was by El-Gilany *et al.* in 2010 at Al-Hassa Medical College, where 56 of the fifth year male students during the 2007-2008 academic year were surveyed before and after psychiatry training. The study showed a favorable attitude expressed by students after they had some experience in the discipline. Also, the findings revealed that the common myths about psychiatry have significantly changed after the participants completed their training. This study was limited by a small sample size (54 medical students), and their focus on male students only.

The importance of conducting such studies that measure the attitude of medical students and interns toward psychiatry is that it well reflects, directly or indirectly, upon the quality of future health care as their beliefs and misconceptions will have an impact not only on future medical students but also on society as a whole.

### **The primary objectives of this study are to:-**

- Understand the attitude of medical students and interns toward psychiatry in general.
- To identify their attitude in major areas of psychiatry including psychiatric patients and illness, psychiatry as a career, psychiatric treatment and hospitals, and psychiatric knowledge and teaching.

**The secondary objective is to:-**

- Investigate gender differences, and to compare them if any.

**Material and Method:-**

This is a cross-sectional study, conducted at Umm Al-Qura University, college of medicine, Makkah, Saudi Arabia. A web-based Attitude Toward Psychiatry (ATP-30) questionnaire with basic sociodemographic information was distributed among randomly selected students. The randomization was insured by contacting the students whose serial numbers were obtained with the help of a web-based program at <https://www.randomizer.org>. A number of 418 medical students and interns were contacted. The population consisted of interns and 6<sup>th</sup>-year medical students, who had completed their psychiatry course and rotation, and 4<sup>th</sup> and 5<sup>th</sup>-year medical students, who did not have any previous exposure to psychiatry, from them a total of 335 completed the questionnaire (response rate 80.14 %). The ethical approval was sought from the Research Ethics Committee of the Faculty of Medicine, Umm Al-Qura University.

The ATP-30 is a five points Likert scale that records the responses of the subject (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree). The scale was originally designed and validated by Burra *et al.* [8], on a sample of Canadian medical students. Since that time, the scale has been used in multiple international studies to measure the attitude of medical students toward psychiatry worldwide, and it has proven to be a valid measure. Since the entire medical curriculum in Umm Al-Qura University was designed in English, and it's delivered to the students in English, it was safe to assume that there won't be a language barrier when we use the scale in its original English language as the students have had at least studied three years in English. The scale consisted of 30 statements, 15 of them were negatively stated with the other 15 were positively stated. The positively stated items (i.e., questions 4, 5, 9, 12, 14, 15, 18, 20, 23, 25, 27-29) were reversed by subtracting the score from 6. The instrument showed good internal consistency for this study (Cronbach's alpha = 0.810).

**Results:-**

The total responses received included 335 students and interns, from them 168 (50.14 %) were males, and 167 (49.85 %) were females. Among the respondents, 85 were interns, 84 were 6<sup>th</sup>-year medical students, 75 were 5<sup>th</sup>-years medical students, and 91 were 4<sup>th</sup>-year medical students.

The scores of the total sample are shown in Table 1, which are categorized based on subgroups and gender. The results show a significant difference when comparing males and females in the areas concerning psychiatric patient, psychiatric illness, and the areas measuring attitude towards psychiatrist and psychiatry. Overall, both males and females showed a positive attitude toward psychiatry; however, males showed a more positive attitude when compared to females. Although not shown in the table, no significant differences were found when the attitude of students from different years was compared ( $p$ -value = 0.122).

The responses to the statements that depict the ATP patients, psychiatric illness, psychiatrists, and psychiatry are shown in Table 2, in part 1: the first and third statements are indicative of a positive attitude, while the second and fourth statements are indicative of a neutral to a negative attitude. However, in part 2: all the statements are suggestive of a neutral to a negative attitude except statement number 6 and 11 which showed a positive attitude.

Table 3 statements are representing the responses of the ATP treatment, hospitals, psychiatric knowledge, and teaching, all of which showing a neutral to negative attitude, except statement number 3 and 8 in part 1 of this table. Table 4 shows the eleven statements having a significant difference based on gender, on which  $X^2$  with  $P < 0.05$  was applied for a statement to be significant.

**Table 1:-** Scores on ATP 30, its subgroups and its association with gender

	Total Sample			Male			Female			Significance	
	Mean	SD	Range	Mean	SD	Range	Mean	SD	Range	<i>t</i>	<i>p-value</i>
<b>Total</b>	98.09	12.22	67-129	99.65	11.48	71-129	96.44	12.79	67-125	2.393	0.017
<b>Subgroup1</b>	14.09	9.92	6-20	14.87	2.70	6-20	13.30	2.92	6-19	5.087	<0.001
<b>Subgroup2</b>	36.09	5.60	21-50	36.81	5.53	21-50	35.36	5.59	23-49	2.376	0.018
<b>Subgroup3</b>	25.40	3.58	15-36	26.69	3.35	19-34	25.10	3.79	15-36	1.508	0.132
<b>Subgroup4</b>	22.26	3.39	13-32	22.26	3.37	13-34	22.25	3.41	16-32	0.036	0.971

**Table 2:-**Scores in statements depicting ATP patients, psychiatric illness; psychiatrists and psychiatry of ATP 30 (Subgroup 1 and 2)

Statement	Total		Mean	SD
	Positive	Rest (neutral+negative)		
<i>Part 1: Statements toward psychiatric patients and psychiatric illness (subgroup 1)</i>				
Psychiatric illness deserves at least as much attention as physical illness.	221	114 (60+54)	2.14	1.216
It is interesting to try and unravel the cause of psychiatric illness	164	169 (124+45)	2.44	1.065
If we listen to them, psychiatric patients are just as human as other people.	202	133 (74+59)	2.27	1.190
Psychiatric patients are often more interesting to work with than other patients.	94	241 (132+109)	3.07	1.089
<i>Part 2: Statements toward psychiatrists and psychiatry (Subgroup 2)</i>				
Psychiatry is unappealing because it makes little use of medical training.	116	219 (159+60)	3.25	1.016
Psychiatrists talk a lot but do very little.	134	200 (113+87)	3.25	1.145
I would like to be a psychiatrist.	61	273 (91+182)	3.63	1.266
On the whole, people taking up psychiatric training are running away from participation in real medicine.	73	262 (130+132)	3.27	1.064
Psychiatrists seem to talk about nothing but sex.	132	203 (130+73)	4.06	1.115
Psychiatry is a respected branch of medicine.	203	131 (70+61)	2.28	1.234
Psychiatrists tend to be at least as stable as the average doctor.	100	235 (178+57)	2.80	0.830
Psychiatrists get less satisfaction from their work than other specialists.	102	233 (143+90)	3.06	0.987
If I were asked what I considered to be the three most exciting medical specialties, psychiatry would be excluded.	123	212 (79+133)	2.95	1.317
At times it is hard to think of psychiatrists as equal to other doctors.	135	200 (115+85)	3.28	0.930
The practice of psychiatry allows the development of really rewarding relationships with people.	192	143 (96+47)	2.36	1.093

**Table 3:-**Scores in statements depicting ATP treatment, hospitals; psychiatric knowledge and teaching of ATP 30 (Subgroup 3 and 4)

Statement	Total		Mean	SD
	Positive	Rest (neutral+negative)		
<i>Part 1: Statements toward psychiatric treatment and hospitals (Subgroup 3)</i>				
Psychiatric Hospitals are little more than prisons.	94	240 (107+133)	2.82	1.162
It is quite easy for me to accept the efficacy of psychotherapy	134	200 (132+68)	2.72	1.017
The practice of psychotherapy is fraudulent since there is no strong evidence that it is effective.	237	97 (66+31)	3.37	1.040
With the forms of therapy now available, most psychiatric patients improve.	130	205 (149+56)	2.75	0.868
Psychiatric treatment causes patients to worry too much about their symptoms.	81	254 (132+122)	2.85	0.990
There is very little that psychiatrists can do for their patients.	158	177 (95+82)	3.30	1.010
Psychiatric Hospitals have a specific contribution to make to the treatment of the mentally ill.	101	234 (177+57)	2.84	0.852
In recent years psychiatric treatment has become quite effective.	158	177 (117+60)	2.63	0.912

<i>Part 2: Statements toward psychiatry knowledge and teaching (Subgroup 4)</i>				
Psychiatric teaching increases our understanding of medical and surgical patients.	147	188 (109+79)	2.69	1.119
The majority of students report that their psychiatric undergraduate training has been valuable.	57	278 (184+94)	3.14	0.844
Psychiatry has very little scientific information to go on.	126	209 (125+84)	3.21	1.013
favorable	162	173 (99+74)	2.59	1.099
Psychiatry is so unscientific that even psychiatrists can't agree as to what it's basic applied sciences are.	119	216 (161+55)	3.28	0.930
Most of the so called facts in psychiatry are really just vague speculations.	55	279 (205+74)	3.07	0.738
Psychiatry is so amorphous (unstructured) that it cannot really be taught effectively.	84	250 (180+70)	3.09	0.819

**Table 4:-**Statements of ATP 30, depicting significant difference in responses of male and female interns

Statement	Total			Male			Female			t	p-value
	Agree	Neutral	Disagree	Agree	Neutral	Disagree	Agree	Neutral	Disagree		
I would like to be a psychiatrist.	61	91	182	27	41	100	34	50	82	2.294	.026
Psychiatrists seem to talk about nothing but sex.	73	130	132	1	34	133	30	32	104	5.137	<.001
Psychiatry is a respected branch of medicine.	203	70	61	114	40	14	89	30	47	-3.967-	.001
Psychiatric illness deserves at least as much attention as physical illness.	221	60	54	119	30	19	102	30	35	-2.914-	.006
Psychiatric treatment causes patients to worry too much about their symptoms.	122	132	81	70	67	31	52	65	50	-2.723-	.007
It is interesting to try and unravel the cause of psychiatric illness	164	124	45	96	59	13	68	65	32	-3.634-	<.001
These days psychiatry is one of the most important parts of the curriculum in medical schools.	162	99	74	89	49	30	73	50	44	-1.825-	.047
In recent years psychiatric treatment has become quite effective.	158	117	60	88	62	18	70	55	42	-3.322-	.002
If we listen to them, psychiatric patients are just as human as other people.	202	74	59	117	33	18	85	41	41	-4.297-	<.001
The practice of psychiatry allows the development of really rewarding relationships with people.	192	96	47	107	50	11	85	46	36	-2.898-	.011
Psychiatric patients are often more interesting to work with than other patients.	94	132	109	54	68	46	40	64	63	-2.121-	.030

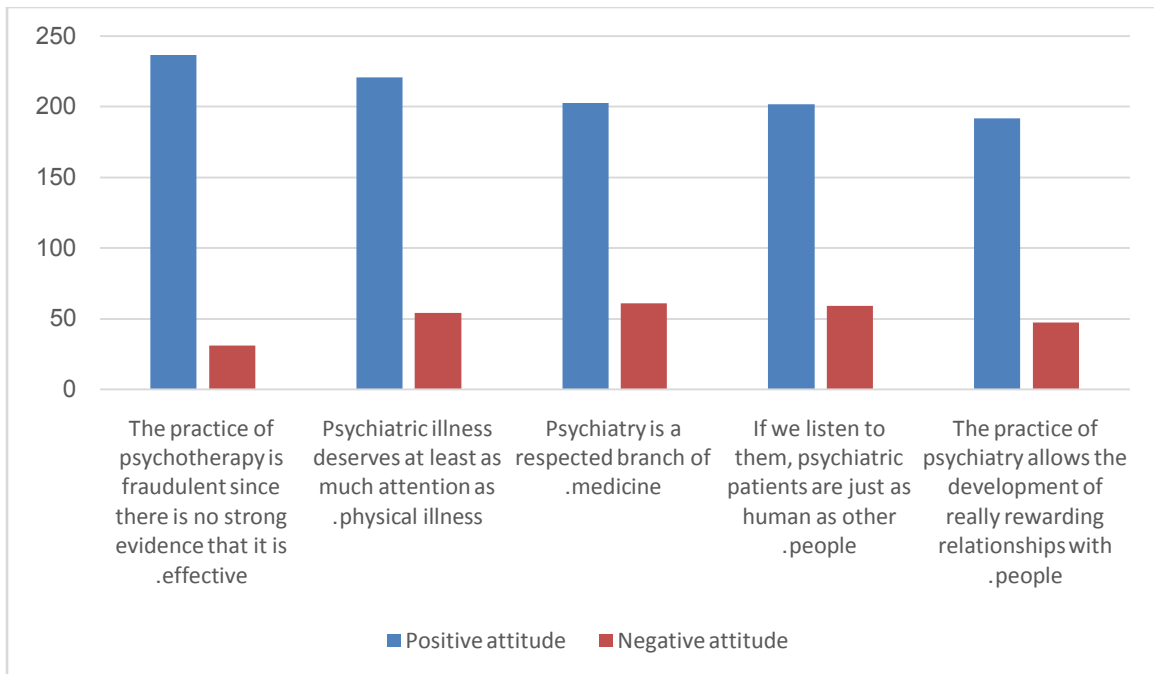


Figure 1:- Statements having most negative responses.

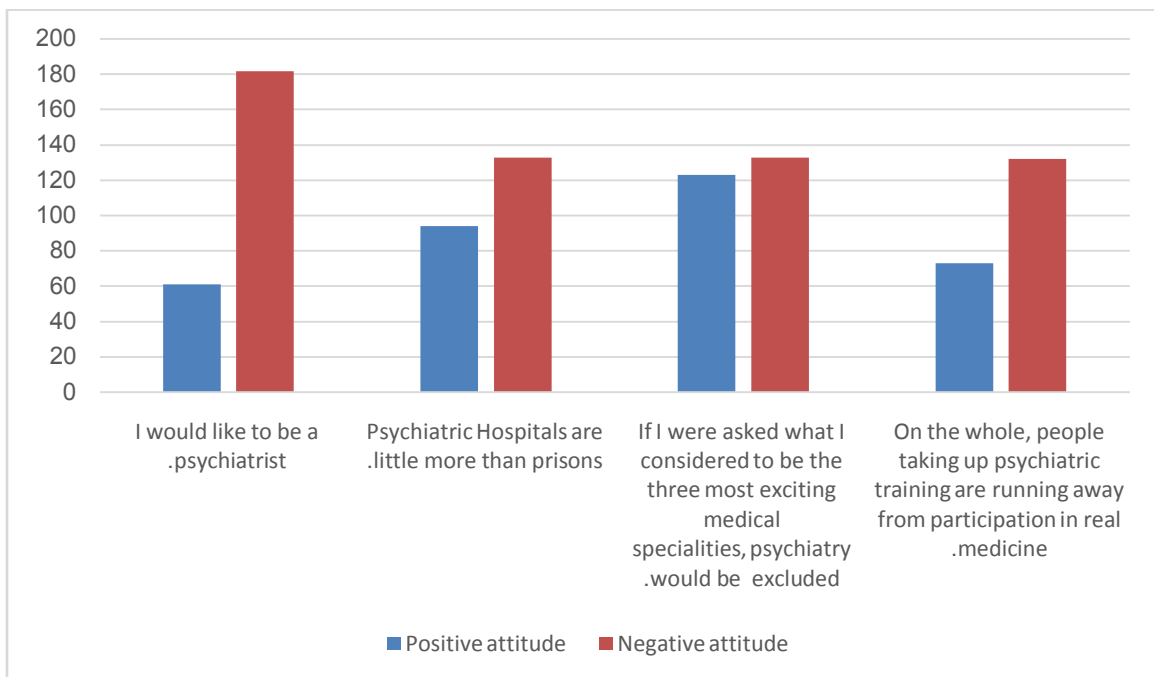


Figure 2:- Statments having most negative responses.

**Discussion:-**

The medical education in Saudi Arabia consist of 6 years of academic and clinical education, with the 1<sup>st</sup> year being part of the preparatory year of all health colleges, and 1-year mandatory medical internship after graduation. In Umm Al-Qura University, the exposure to psychiatry during this 6-years period is limited to only three weeks course in the 5<sup>th</sup> year, of which two weeks are devoted to classical teaching and one week only of clinical exposure for both inpatients and outpatients at psychiatric hospitals in the region. Regarding behavioral sciences, it has not been introduced formally as a separate subject -in contrast to other universities in Saudi Arabia- during the pre-

clinical years [6]. This lack of exposure to psychiatry and behavioral sciences may in part be a contributing factor to the low interest of medical students toward psychiatry as a career [10,7].

Table 1 shows the mean, SD, and range of scores, categorized based on subgroups and gender, which has shown a significant difference when comparing males and females in the areas concerning psychiatric patient, psychiatric illness, and the areas measuring attitude towards psychiatrist and psychiatry. Overall, both males and females showed a positive attitude toward psychiatry; however, males were more positive. In a systematic review done by Lyons published in 2013 [7], where 32 studies from 22 countries were reviewed, the majority of the studies found an overall positive students' attitude toward psychiatry; these results were comparable with ours, this was also noted in other studies conducted in other Arab countries. In two studies one done in Egypt by Shalaby in 2015 [9] and the other one in Bahrain by Al-Ansari and Al-Sadadi in 2002 [11], females showed more positive attitude than males, which is similar to the results found by Khan *et al.* in Pakistan in 2008 [12]. This is different from the results of this study, in which females were lagging behind males; Parikh *et al.* reported similar results in research done in India in 2014 [13].

Table 2 shows the responses to the statements that depict the ATP patients, psychiatric illness, psychiatrists, and psychiatry. In part 1: the first and third statements are indicative of a positive attitude (65.97 % feel that psychiatric illness deserves at least as much attention as physical illness, and 60.29 % feel that psychiatric patients are just as human as other people), while the second and fourth statements are indicative of a neutral to negative attitude (49.56 % feel that it is interesting to try and unravel the cause of psychiatric illness, and only 28.06 % feel that psychiatric patients are often more interesting to work with than other patients). Similar results were reported by some studies [13,14,15].

However, in part 2: 9 out of 11 statements showed neutral to negative attitude (65.37 % had neutral to negative attitude about the use of medical training in psychiatric practice, 81.49 % don't consider psychiatry as a future career (Figure 2), 69.55 % believe that psychiatry is less satisfactory than other branches of medicine, 63.28 % don't consider psychiatry to be an exciting speciality, 70.14 % think that psychiatrists are not as stable as other doctors, 78.20 % believe that psychiatrists are running away from real medicine, 59.70 % felt that psychiatrists talk too much and do little, and 59.70 % don't always think of psychiatrists as equal doctors), only two statements had positive attitude (60.59 % believe that psychiatry is a respected branch of medicine, and 57.31 % believe that practice psychiatry allows a rewarding relationship with people). These results point out toward a clear inconsistency between the overall positive attitude toward psychiatry and the possible choice of psychiatry as a future career. This pattern of disharmony has also been reported by other studies from different countries [16,17,18], while Shalaby's study has reported fewer inconsistencies among the Egyptian students' sample [9]. This indicates that students and interns do not view psychiatry as an intellectually challenging specialty and that psychiatrists are having low fulfillment rates and less rewarding and satisfactory outcomes since they are not able to provide a big help to the mentally ill as compared to the other medical specialties [18]. A number of possibilities could point to the reason behind this attitude; some studies have raised the stigma toward mental illness to be an influential factor in these negative views [19,20,21,22,23]. Other studies are pinning it on the poor-quality teaching of psychiatric curriculum and the limited exposure to clinical psychiatric settings [10,17].

Table 3 statements are representing the responses of the ATP treatment and hospitals in part 1, while psychiatric knowledge and teaching are in part 2. In part 1; the students and interns showed a neutral-to-negative attitude toward psychiatric hospitals (71.64%), with the majority (39.70%) agreeing that psychiatric hospitals are little more than prisons, while 31.94% were indecisive and only 28.05% disagreeing with this statement. On the other hand, the majority (52.80) were undetermined when it came to the psychiatric hospitals' specific contribution to the treatment of the mentally ill, while 30.15% had a favorable attitude in this matter and 17.05% did not think positively about it. In the statements that are concerned with psychiatric treatment, a generally-positive attitude (47.16%) was observed regarding the psychiatrists' ability to help their patients. When asked about psychotherapy, the majority (70.74%) looked at psychotherapy as an evidence-based practice rather than a fraudulent one (Figure 1), but only 40% felt that it is easy for them to accept the efficacy of psychotherapy. When it came to the other forms of psychiatric treatments, most of the students and interns (44.47%) were not determined about psychiatric patients' improvement with the now available forms of therapy, while 38.80% thought positively about it, and the majority (75.82%) had a neutral to negative attitude about psychiatric treatment causing the patients to worry more about their symptoms. However, the majority (47.16%) thought that psychiatric treatment had become more efficient in recent years. Two other studies by Melhiet *et al.* have reported similar results [25,26]. In part 2: The majority of students and intern had a

neutral attitude toward psychiatric knowledge, 62.38%, and 83.28% showed a neutral to negative attitude toward the scientific knowledge of psychiatry, and that most facts in psychiatry are just vague speculations, respectively. These results show that medical students and interns have a negative perception of psychiatry as an unscientific discipline and somehow different from other medical disciplines in terms of training and outcome [24], similar results were reported in an Australian study [25]. The emphasis on the biological aspects of psychiatric disorders has been proposed to play a positive role to enhance the attitude toward psychiatry [9,32], as well as the integration of psychiatry into the general hospital settings [33]. Similarly, the attitude toward psychiatric teaching was neutral to negative as well, 56.11 % do not think that psychiatric teaching increases their understanding of medical or surgical patients. Only 48.35 % acknowledged psychiatry as an important part of the curriculum, with the majority (62.38 %) didn't consider their undergraduate psychiatric training to be valuable, which may be due to the fact that 74.62 % believe that psychiatry is so amorphous that it cannot be taught effectively. Although not examined in this study, several studies have pointed to the positive effect of psychiatric clerkship or attachment among medical students and interns [27,28,29]. In a study done in Saudi Arabia [6], the students showed a favorable attitude after they have had some experience in psychiatry. A recent study conducted by Reddy *et al.* [30] in India, to investigate the effect of increasing the duration of psychiatry posting by 15 days, the students showed more favorable attitude when they had more exposure to psychiatric posting. However, psychiatry rotations influence on medical students might be limited when it comes to choosing psychiatry as a future career as evident by Shen *et al.* study [31].

Table 4 shows the eleven statements having a significant difference based on gender. Males had a more positive attitude in most of the statements especially considering psychiatry as a respected branch of medicine, the growing efficacy of psychiatric treatment in recent years, and with their attitude toward psychiatric patient and illness. However, females expressed a more positive attitude regarding choosing psychiatry as a future career, and that psychiatric treatment causes patients to worry too much about their symptoms.

Many studies have been conducted worldwide investigating the attitude of medical students and interns toward psychiatry. The results of these studies showed a lacuna in the knowledge and attitude toward the main psychiatric areas. However, this issue has not been addressed properly in Saudi Arabia with only limited number of studies. Therefore, it is suggested that a nationwide study with a larger sample size from different medical colleges and regions be conducted with the primary focus being the influencing factors for such attitude, with more elaborate and open-ended questions. Furthermore, more studies of the efficacy of the current psychiatric curriculum should be implemented to improve the existing teaching structure and subsequently the attitude toward psychiatry.

### **Conclusion:-**

Overall interns and students showed a neutral to a positive attitude toward psychiatry. However, a general lack of interest in psychiatry as a future career was observed. This lack of interest may be attributed to many factors, but a potential culprit is the poor-quality teaching of psychiatric curriculum and the lack of exposure to clinical psychiatric settings, in addition to the already existing stigma toward mental illness. Thus, undergraduate programs should focus on re-evaluating and subsequently modifying the current medical curricula, with more clinical exposure and engagement with psychiatrists and psychiatric patients to improve the attitude of interns and students toward psychiatry and mental illnesses.

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### **Conflict of interest:-**

The authors have no conflict of interest to declare.

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### RESEARCH ARTICLE

## CORRELATION OF TIRADS [THYROID IMAGING REPORTING AND DATA SYSTEM] AND HISTOPATHOLOGICAL FINDINGS IN EVALUATION OF THYROID NODULES.

Simmi Bhatnagar, Jaswinder Kaur Mohi, Navkiran Kaur, Amarjeet Kaur and Lovepreet Singh.

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##### Key words:-

Echogenicity, TIRADS,  
Microcalcification, Irregular contours.

#### Abstract

**Purpose:** Ultrasound [US] is an excellent noninvasive modality to evaluate thyroid nodules. Aim of our study was to characterize the thyroid nodules according to grey scale sonographic features into high suspicious, probably benign, benign aspects and normal thyroid using TIRADS scoring system and to characterize the thyroid nodule according to the sonographic features into a specific TIRADS stage and correlate the results with the histopathological examination findings wherever possible.

**Material And Methods:** The prospective study was carried out on 60 patients referred to Department of Radiodiagnosis, Rajindra Hospital, Patiala. All the patients were subjected to detailed history taking, clinical examination and routine laboratory investigations. All thyroid nodules were characterized according to the internal component [solid, mixed or cystic], the margins, echogenicity [hyperechoic, Isoechoic, hypoechoic, marked hypoechoic], evidence of calcification [microcalcification if less than 3mm and macrocalcification if more than 3mm with acoustic shadowing] and the shape [taller than wide if greater in anteroposterior dimension than in its transverse dimension and wider than tall]. Using the Modified Russ Classification, each nodule was classified into TIRADS categories [1, 2, 3, 4A, 4B and 5] based on ultrasound features. The patients were referred to Department of Pathology, Government Medical College Patiala and FNAC was done. The US findings were correlated with FNAC and data was analyzed statistically.

**Results:** Based on various ultrasound characteristics of thyroid nodules, TIRADS score was given to each thyroid nodule and then FNAC was done. The results of histopathology were correlated with ultrasound features and statistical analysis was done calculating sensitivity, specificity, positive predictive value and negative predictive value for each feature. The sensitivity and specificity for Irregular contours were 44.4% and 94.12%, for taller than wide were 22.22% and 100%, for microcalcification were 33.33% and 94.12%, for marked hypoechoic was 78 and 70.89% and for solid consistency were 89 and 70.5%. The risk of malignancy was found to increase from TIRADS 3 to TIRADS 5 in this study. All the cases [100%] of TIRADS 5 turned out to be malignant on histopathology.

**Conclusion:** Radiologists should be aware of usefulness of specific ultrasound features of thyroid nodules like Irregular contours, taller

than wide configuration, microcalcification, marked hypoechogenicity and solid consistency collectively taken as TIRADS for better differentiation of benign from malignant or potentially malignant lesions that warrant further diagnostic evaluation. The risk of malignancy was found to increase from TIRADS 3 to TIRADS 5 when different TIRADS categories were confronted with results of pathology and risk of malignancy was calculated.

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### **Introduction:-**

Thyroid nodules are a commonly encountered clinical problem in daily practice. With the increased use of high resolution ultrasound during last two decades, the detection rate has gone up [1]. This is in parallel to increased incidence of thyroid cancer worldwide since malignancy comprises approximately 5% of all Thyroid nodules irrespective of size [2]. The initial evaluation of thyroid nodules should always focus on exclusion of malignancy [4]. The prevalence of non-palpable nodules has increased recently as a consequence of the increasing application of ultrasound [5]. Nowadays, the use of high technology US equipment may detect nodules as small as 2 to 3 mm, which raises the question of which thyroid nodules are clinically relevant for further evaluation [3]. Various ultrasound characteristics of thyroid nodules have proven to have predictive diagnostic value in suspicion of malignancy, with particular focus on which nodules should be subjected to US guided fine needle aspiration [FNA]. Thyroid US should always include evaluation of neck for abnormal lymph nodes. When abnormal lymph nodes are present, biopsy for cytology and thyroglobulin washout should be performed at the same time as the nodule biopsy [6]. Fine Needle Aspiration Cytology [FNAC] is considered the most reliable test for diagnosis of thyroid nodules. FNAC is recommended for palpable nodules, but the indication for this procedure in non-palpable nodules is a matter of controversy. Some clinicians recommend ultrasound guided FNAC while others consider that a clinical follow up [neck palpation] is sufficient in absence of history of familial thyroid cancer or head/neck irradiation [5]. Neck US has long been used to evaluate the size, character and location of thyroid nodules, monitor nodule growth and identify loco-regional lymphadenopathy. Many studies have classified specific US characteristics predictive of malignant nodules. For instance, current US characteristics that are strongly correlated with malignancy include intranodular vascularity, the presence of microcalcifications, a taller than wider pattern, hypoechogenicity and spiculated margins [7]. Although controversial, the current guidelines state that if any one of the above findings is observed, with the exception of increased intranodular vascularity, the nodule should be defined as suspicious for malignancy.

### **Materials And Methods:-**

In this prospective study, we considered 60 patients referred to Department of Radiodiagnosis, Rajindra Hospital Patiala. Prior permission regarding this study was taken from hospital authorities. The Thyroid was imaged with high frequency linear array transducer with the patient in supine position with neck extended by placement of a pillow beneath the shoulders. The number, location, size in three dimensions and characteristics of nodules were documented along with examination of neck adenopathy. Ultrasound was performed with Philips Envisor with a 5.5MHz probe. All the patients were subjected to detailed history taking, clinical examination, routine laboratory investigations and high resolution ultrasonography. All Thyroid nodules were characterized according to the internal components [solid, cystic, mixed], the margins, echogenicity, type of calcification if present [micro less than 3mm and macro if more than 3mm], the shape of the nodule [characterised as "taller than wider" [greater in anteroposterior dimension than in its transverse diameter and "wider than taller"]. Using the Modified Russ classification, each nodule was classified into TIRADS category [1,2,3,4A,4B,5] based on ultrasound features. The findings were correlated with FNAC. Then data was analyzed statistically.

### **Tirads Classification Algorithm:-**

The terminology of TIRADS was first used by Hogarth et al. They described 10 ultrasound patterns of thyroid nodules and related the rate of malignancy according to the pattern. The following categories were established:

TIRADS 1: Normal Thyroid gland

TIRADS 2: Benign conditions [0% malignancy]

TIRADS 3: Probably benign nodules [5% malignancy]

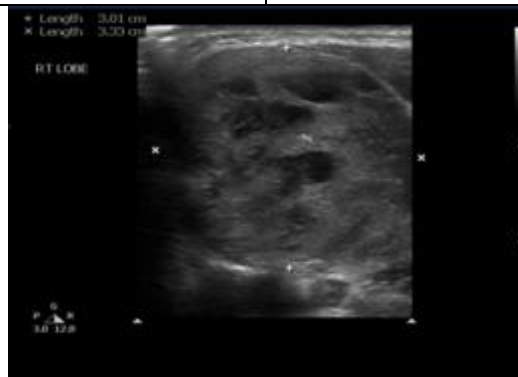
TIRADS 4: Suspicious nodules [5-80% malignancy]. A subdivision into 4a [malignancy between 5 and 10%] and 4b [malignancy between 10 and 80%] was optional.

TIRADS 5: Probably malignant nodules [malignancy 80%]

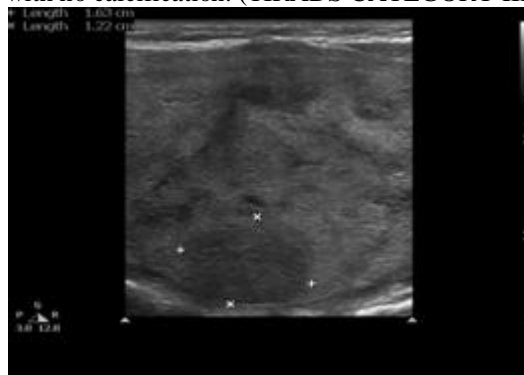
TIRADS 6: Category included biopsy proven malignant nodules.

**Tirads Classification Alogrithm**

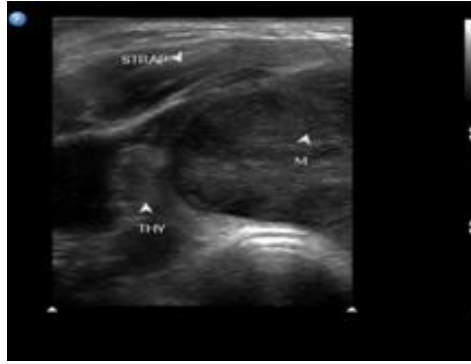
<p><b>HIGH SUSPICIOUS ASPECTS</b></p> <ul style="list-style-type: none"> <li>• Taller than wide shape</li> <li>• Irregular or microlobulated margins</li> <li>• Microcalcifications</li> <li>• Marked hypoechogenicity</li> </ul>	<p>≥3 signs and /or adenopathy  <b>TIRADS 5</b>                  1 or 2 signs and no adenopathy  <b>TIRADS 4B</b></p>
<p><b>LOW SUSPICIOUS ASPECTS</b></p> <ul style="list-style-type: none"> <li>• None of the high suspicious aspects</li> <li>• Moderately hypoechogenic</li> </ul>	<p><b>TIRADS 4A</b></p>
<p><b>PROBABLY BENIGN ASPECTS</b></p> <ul style="list-style-type: none"> <li>• None of the high suspicious aspects</li> <li>• Isoechogenicity</li> <li>• Hyperechogenic</li> </ul>	<p><b>TIRADS 3</b></p>
<p><b>BENIGN ASPECTS</b></p> <ul style="list-style-type: none"> <li>• Simple cyst</li> <li>• Spongiform nodule</li> <li>• “White knight” aspect</li> <li>• Isolated microcalcification</li> <li>• Typical subacute thyroiditis</li> </ul>	<p><b>TIRADS 2</b></p>
<p>Normal                  Thyroid USG</p>	<p><b>TIRADS 1</b></p>



**Figure 1:-** A well defined wider than tall hyperechoic nodule seen in the right lobe of thyroid with few cystic areas with no calcification. (TIRADS CATEGORY III)



**Figure 2:-** A well defined moderately hypoechoic area is seen in the thyroid with no calcification. (TIRADS CATEGORY IV A)



**Figure 3:-** An ill defined markedly hypoechoic nodule as compared to strap muscles



**Figure 4:-** An ill defined taller than wide markedly hypoechoic nodule with micro calcifications.(TIRADS CATEGORY V)

### Results:-

Our study consisted of 60 patients with male to female ratio of 1:5.1. 16.67% were males and 83.33% were females. Purely solid nodules were seen in 23 [38.3%] cases. Solid nodules with cystic components were seen in 12 [20%] cases. Purely cystic nodules were seen in 25 [41.7%] cases out of 60. Hyperechoic nodules were seen in 14 [23.33%] cases whereas Isoechoic nodules were seen in 18 [30%] cases. Hypoechoic nodules were seen in 06 [10%] cases and marked hypoechoic nodules were seen in 22 [36.7%] cases. Sharp well defined margins were seen in 53 [88.3%] of cases. Poorly defined margins were seen in 07 [11.7%] of cases. Microcalcification was seen in 06 [10%] cases and macrocalcification was seen in 20 [33.3%] cases. No calcification was seen in 34 [33.3%] cases. Taller than wide shape of the nodules was seen in 02 [3.33%] of cases and wider than tall shape was seen in 58 [96.7%] cases. In our study on US, we diagnosed 52 nodules as benign and 8 nodules as malignant nodules. 15 [28.84%] of the benign nodules were solid and 08 [100%] of the malignant nodules were solid. 12 [23.07%] of the benign nodules were mixed while none of the malignant nodules was mixed. 25 [48%] of the benign nodules were cystic and none of the malignant nodules was cystic. On correlation of echogenicity of nodules on ultrasound with histopathological findings, 15 [28.3%] nodules were markedly hypoechoic and 07 of them turned out to be malignant while 14 [26.4%] were hyperechoic and none of them turned out to be malignant. On correlation of margins of nodules with histopathological findings 53 [94.64%] cases with well defined margins turned out benign on histopathology and 04 [100%] of cases having ill defined margins were found to be malignant. None of the malignant nodules showed well defined margins. On correlation of pattern of calcification and histopathology, microcalcification was seen in 03 [13%] of the benign nodules and 03 [100%] of malignant nodules. Macrocalcification was seen in 20 [87%] of benign nodules. None of the malignant nodules showed macrocalcification. Taller than wide configuration was seen in 02 [100%] of the malignant nodules and wider than taller configuration was seen in 58 [100%] of the benign nodules. Major ultrasound features suggestive of malignancy were analyzed with respect to TIRADS category. Sensitivity, specificity, positive predictive value and negative predictive value were calculated for each feature (Table 1). Diagnostic index of individual grey scale sonographic criteria for predicting malignancy in Thyroid nodules was calculated.

**Table 1:-** Ultrasound features and their statistical parameters

Ultrasound feature	True positive	False positive	True negative	False negative
IRREGULAR CONTOURS	04	03	48	05
TALLER THAN WIDE	02	00	51	07
MICROCALCIFICATION	03	03	48	06
MARKED HYPOECHOGENICITY	07	15	36	02
SOLID CONSISTENCY	08	15	36	01

The sensitivity and specificity for Irregular contours were 44.4% and 94.12%, for taller than wide was 22.22% and 100%, for microcalcification were 33.3% and 94.12%, for marked hypoechogenicity were 78 and 70.89% and for solid consistency were 89 and 70.5%.

**Table 2:-** Tirads Categories Of Various Nodules

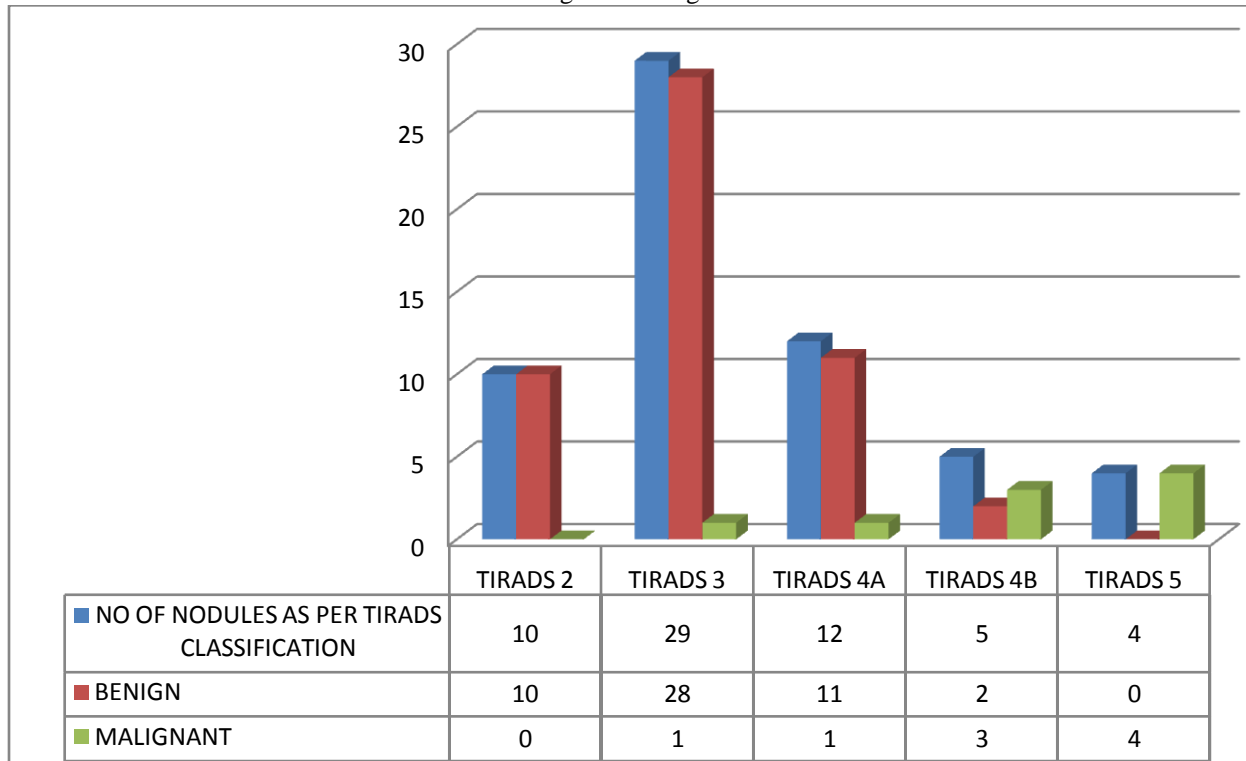
TIRADS CATEGORY	NO OF NODULES AS PER TIRADS CLASSIFICATION
TIRADS 2	10
TIRADS 3	29
TIRADS 4A	12
TIRADS 4B	05
TIRADS 5	04

The different TIRADS categories were compared with the results of pathology and risk of malignancy was calculated. The risk of malignancy was found to increase from TIRADS 3 to TIRADS 5 (Table 3).

**Table 3:-** Tirads Categories And Risk Of Malignancy

TIRADS CATEGORY	PATHOLOGY		TOTAL	RISK OF MALIGNANCY [%]
	BENIGN	MALIGNANT		
TIRADS 2	10	00	10	00
TIRADS 3	28	01	29	3.4
TIRADS 4A	11	01	12	8.3
TIRADS 4B	02	03	05	60
TIRADS 5	00	04	04	100

**Table 4:-** Bar diagram shows number of nodules according to TIRADS categories and their characterization into benign and malignant.



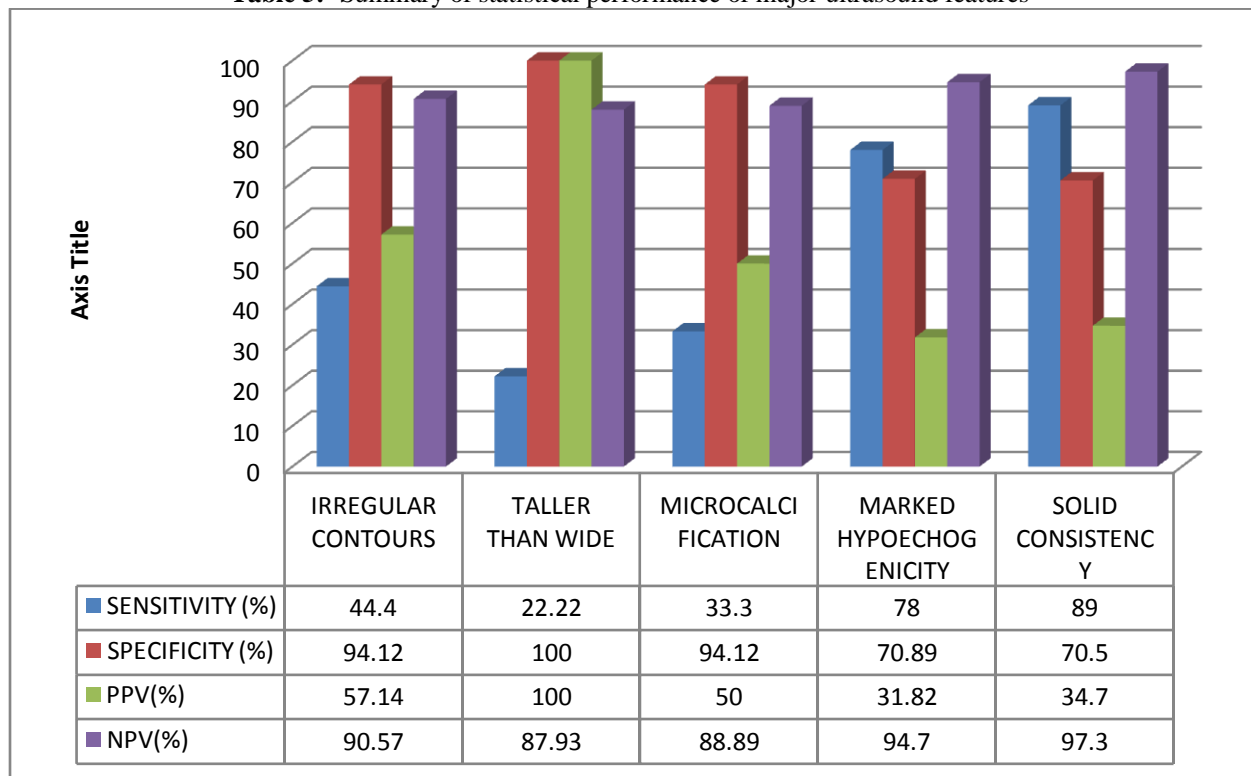
TIRADS categories and diagnostic performance of ultrasound was analysed. Total cases of TIRADS 2,3,4A were 51 out of which 49 were benign and 2 were malignant. Total cases of TIRADS 4B and 5 were 9 out of which 7 were malignant. Out of 51 cases, 9 cases were malignant.

**Discussion:-**

In present study, 60 cases of nodular thyroid disease were studied by grey scale ultrasonography. We differentiated Thyroid nodules into highly suspicious, low suspicious, probably benign, benign nodules and normal thyroid as per TIRADS scoring system using grey scale scoring sonographic features viz internal components [solid, mixed or cystic], the margins, echogenicity, evidence of calcification and shape. Grey scale ultrasonography was the first investigation to be requested in all cases of thyroid swelling in our study because of it being noninvasive, simple and without radiation exposure. In our study, solid consistency as a predictor for malignancy had sensitivity of 70.5%, positive predictive value of 34.7% and negative predictive value of 97.3%. Study conducted by Aggarwal et al [11] showed that solid echotexture had sensitivity of 54.5% and specificity of 64.3%. Koike et al [12] got sensitivity of 83.4% and specificity of 81.8% of solid echotexture of malignant nodules. In our study hypoechoogenicity as criteria for predicting malignancy had sensitivity of 78%, specificity of 70.89%, positive predictive value of 31.82% and negative predictive value of 94.7%. Koike et al [12] got sensitivity of 95% and specificity of 51.4%. Raho et al [10] reported that hypoechoogenicity had specificity of 48.6% and sensitivity of 66.6%, positive predictive value of 34.4% and negative predictive value of 78.2%. Papini et al [10] could predict malignancy in thyroid nodules using hypoechoogenicity as criteria with sensitivity of 87.1%, specificity of 43.4% and positive predictive value of 11.4%. In our study, poorly defined Irregular margins had sensitivity of 44.4%, specificity of 94.12% and positive predictive value of 57.14%. Papini et al [10] reported Irregular margins as independent risk factor of malignancy with sensitivity of 77.5%, specificity of 85% and positive predictive value of 30%. Kim et al [9] had sensitivity of 55.51%, specificity of 83%, positive predictive value of 60% and negative predictive value of 80%. Sajjadih et al [15] had sensitivity of 42%, specificity of 71%, positive predictive value of 20%, negative predictive value of 87%, when irregular margins were considered. Moifo et al [16] showed sensitivity of 34.78% and specificity of 99.51%. In present study, microcalcification for predicting malignancy had sensitivity of 33.3%, specificity of 94.12%, positive predictive value of 50% and negative predictive value of 88.89%. In study conducted by Papini et al [10], sensitivity of microcalcification as a predictor of malignancy was 29% and Jason et al [13] showed specificity of 94.45%. Moifo et al [16] showed sensitivity of 30.4% and specificity of 98.8%. In present study, taller than wide for predicting

malignancy had sensitivity of 22.2%, specificity of 100%, positive predictive value of 100% and negative predictive value of 87.93%. In study conducted by Moifo et al[16] taller than wide for predicting malignancy had sensitivity of 4.35%, specificity of 100%, positive predictive value of 100% and negative predictive value of 94.87%. In our study probably benign US findings were seen in 51 patients and probably malignant US findings in 9 patients. Howarth suggested a malignant risk of less than 5% for TIRADS 3, 5% to 10% for TIRADS 4b and greater than 80% for TIRADS 5. Our findings were within this range suggested by Hogarth[8], Russ et al[17] and Moifo et al[16]. Another study conducted by Hong et al[18] concluded that the three sonographic features that are meaningful findings in the diagnosis of thyroid malignancy were the presence of microcalcifications, marked hypogeneity and a taller than wide shape. In a multimeter Korean retrospective study, the ultrasound features that were statistically significant for malignancy were hypoechogenicity, marked hypoechogenicity, nonparametric orientation, microlobulated or spiculated margin, an ill defined margins and the presence of microcalcifications.

**Table 5:-** Summary of statistical performance of major ultrasound features



**Table 6:-** Comparison of risk of malignancy in different TIRADS categories in present study with that of previous published studies

TIRADS CATEGORY	Risk Of Malignancy (%)	Risk Of Malignancy (%)	Risk Of Malignancy (%)
	Moifo et al (43)	Horvath et al (8)	Present study
TIRADS 2	0	0	00
TIRADS 3	2.2	<5	3.4
TIRADS 4A	5.9	5-10	8.3
TIRADS 4B	57.9	10-80	60
TIRADS 5	100	>80	100

**Conclusion:-**

Radiologists should be aware of usefulness of specific ultrasound features of thyroid nodules like Irregular contours, taller than wide configuration, microcalcifications, marked hypoechogenicity and solid consistency collectively taken as TIRADS for better differentiation of benign lesions from malignant or potentially malignant lesions that warrant further diagnostic evaluation. The sensitivity and specificity for Irregular contours were 44.4% and 94.12%, for taller than wide were 22.22% and 100%, for microcalcification were 33.3% and 94.12%, for marked



hypoechoogenicity were 78% and 70.89% and for solid consistency were 89 and 70.5%. The risk of malignancy was found to increase from TIRADS 3 to TIRADS 5 when the different TIRADS categories were confronted with the results of pathology and risk of malignancy was calculated.

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### RESEARCH ARTICLE

#### THE DUCTILE CHARACTERISTICS OF HYBRID FERRO CEMENT SLAB.

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Gfrp(glass fiber reinforced polymer),  
 HybridFerro cement, reinforcement  
 content, ductility factors, crock pattern

#### Abstract

This Paper Presents The Ductile Characteristics Of Hybrid Ferro Cement Slab Incorporating Polypropylene Fibers And Gfrp Sheet. A Total Of 9 Slabs Have Been Tested Under Two Point Flexural Loading. The Size Of The Slab Is 1000 Mm (Length) X1000 Mm (Width) X 60 Mm (Thickness). The Parameters Studied in This Investigation Includes the Number of Weld Mesh Layers, Polypropylene Fibers i.e. (0.3%) And Gfrp Sheet. Two Point Loading Test Was Conducted On Slabs And Parameters Such As Ultimate Moment Capacity, Ductility Ratio And Crack Pattern Were Observed.

To Extend The Principles Of Reinforced Concrete Design By Using Continuous Steel Reinforcement As The Main Reinforcement To Satisfy Ultimate Stress Limit State And Fibers As A Secondary Reinforcement To Control Cracking And Satisfy The Crack Width Limit State In Service. To Use Polypropylene Fibers Instead Of Steel Fibers, Differently From Most Prior Investigations Were Used. To Study the Influence of Self-compactingconcrete Mixture Used Instead Of Conventionally Vibrated Concrete.

From The Test Results It Is Observed That The Compressive Strength At 28 Days Curing Of Hybrid Ferro cement Slab With Polypropylene Fibers Content Of 0.3% Is Increased By 6.34% With Compressive Strength Of Conventional Concrete Plain.

From The Studies It Is Observed That the Deformation at Ultimate Load Are High In Case Of Ferro cements With Polypropylene Fibers. The Stiffness Of The Specimens With Zero Layer Weld Mesh Is Lower Than That Of The Specimens With Two Layers And Three Layers Bundled. Further, There Is Reduction In Number Of Cracks With Increase In Fiber Content.

From The Test Results It Is Observed That The Ultimate Load Carrying Capacity In Three Layer Weld Mesh Hfs With 0.3% Fiber Content Is Increased By 25% In Comparison With Double Layer Weld Mesh Of Ferro cement Slab Without Gfrp Layer.

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**Chapter1:-****Introduction:-****General:-**

Modern Structural Engineering tends to progress towards more economical structures through gradually improved methods of design and use of higher strength materials, such developments are particularly important in the field of reinforced concrete. The limiting features of ordinary reinforced concrete have been largely overcome by the development of Ferro cement, Ferro cement is a type of thin reinforced concrete section commonly constructed with hydraulic cement mortar reinforced with closely spaced layers of continuous and relatively small size weld mesh. In its role as a thin reinforced concrete product and as a laminated cement-based composite, the ferro cement has found its place in numerous applications both in new structures and in repair and rehabilitation of existing structures.

Compared with the conventional reinforced concrete, ferro cement is reinforced in two directions; therefore, it has homogenous-isotropic properties in two directions. Benefiting from its usual high reinforcement ratio, ferro cement generally has a high tensile strength and a high modulus of rupture. In addition, since the specific surface of reinforcement in ferro cement is one to two orders of magnitude higher than that of reinforced concrete, larger bond forces develop with the matrix resulting in average crack spacing and width more than one order of magnitude smaller than in conventional reinforced concrete (Shah and Naaman 1997, Guerra et al 1978). Other appealing features of ferro cement include ease of prefabrication and low cost in maintenance and repair. Based on the abovementioned advantages, the typical applications of ferro cement are water tanks, boats, housing wall panel, roof, formwork and sunscreen (Nimityongskul et al 1980 and Kadir 1997). The renaissance of ferro cement in recent two decades has led to the ACI design guideline "Guide for the Design, Construction, and Repair of Ferro cement" (ACI Committee 549-1R-88 1993) and publications such as "Ferro-cement Design, Techniques, and Application" (Bingham 1974) and "Ferro cement and Laminated Cementations Composites" (Naaman 2000), which provide comprehensive understanding and detailed design method of contemporary ferro cement.

However, the rapid development in reinforcing meshes and matrix design requires continuous research to characterize the new material and improve the overall performance of ferro cement. Instead of cement mortar, self-compacting micro - concrete is used in this study in order to eliminate the external vibration and to overcome the difficulties and problems in the construction process. As a laminated composite, Ferro cement often suffers from severe spilling of matrix cover and delimitation of extreme tensile layer even at high reinforcement ratio, resulting in premature failure. Therefore, consideration of serviceability rather than strength limit would dominate composite design. Thus far, steel meshes have been the primary mesh reinforcement for ferro cement, but recently adding discontinuous short fibre to cementitious matrix has become in use (Sivakumar and Manu Santhanam 2007), which could bring significant improvement in ductility and shear capacity as well as moderate increase in tensile strength turns to be a logical and reasonable solution to solve serviceability problems. When concrete cracks, the randomly oriented fibres arrest the micro cracking, thus improving the strength, ductility and convert its brittle characteristics to a ductile one. In this study, the addition of polypropylene fibres also enhances the flexural strength and Impact resistance of HF slabs.

The development of new technology in the material science is progressing rapidly. In recent two or three decades, a lot of research was carried out throughout globe for how to improve the performance of concrete in terms of strength and durability qualities. Consequently concrete has no longer remained a construction material consisting of cement, aggregate, and water only, but it has become an engineered custom tailored material with several new constituents to meet the specific need of construction industry. The growing use of concrete in special architectural configurations and closely spaced reinforcing bars have made it very important to produce concrete that ensure proper filling ability, good structural performance, and adequate durability. In recent years a lot of research was carried out throughout the world for how to improve the performance of concrete in terms of its most important properties that is strength and durability. Concrete technology has undergone from macro to micro level study in the enhancement in strength and durability properties from 1980's onwards. However till 1980's the research study related to flow ability of concrete to strength and durability did not draw lot of attention of the concrete technologists.

This type of study has resulted in the development of Self Compacting Concrete (SCC), a much-needed revolution in concrete industry. Self-Compacting concrete is highly engineered concrete with much higher fluidity without segregation and is capable of filling every corner of formwork under its self weight only. This SCC eliminates the need of vibration either external or internal for the compaction of concrete without compromising its engineering properties. Nowadays it is well known that the benefits of adding fibres to concrete.

Reduce cracks during plastic and hardening stage, reduce water seepage and protects steel in concrete from corroding and walls from dampening, Protects corner in precast slabs and concrete flooring. Increases abrasion resistance by over 40% there by increasing lift of roads, walkways, floors. Also reduces pitting of the floor.

A large number of civil infrastructures around the world are in a state of serious deterioration today due to carbonation, chloride attack, etc. Moreover many civil structures are no longer considered safe due to increase load specifications in the design codes or due to overloading or due to under design of existing structures or due to lack of quality control. In order to maintain efficient serviceability, older structures must be repaired or strengthened so that they meet the same requirements demanded of the structures built today and in future. Ferro cement over the years have gained respect in terms of its superior performance and versatility. Ferro cement is a form of reinforced concrete using closely spaced multiple layers of mesh and/or small diameter rods completely infiltrated with, or encapsulated in, mortar. In 1940 Pier Luigi Nervi, an Italian engineer, architect and contractor, used ferro cement first for the construction of aircraft hangars, boats and buildings and a variety of other structures. It is a very durable, cheap and versatile material.

#### **Hybrid Ferro Cement Slab:-**

Research efforts to improve materials and production processes used in ferro cement follow a number of parallel paths that deal with increasing strength, improving toughness, improving durability, increasing mechanical efficiency and decreasing material usage and production cost.

Ferro cement could be seen as a scaled down system of reinforced concrete construction with reinforcement distributed throughout the depth of the member. Improved elasticity, cracking, extensibility and impact characteristics are achieved by proper control of reinforcement parameters. While ferro cement can benefit from being considered an extreme boundary of reinforced concrete, it has and is still taking advantage from the rapid development in the field of composite materials including advanced laminated and hybrid composites and thus it must also continue to establish its own identity.

By concrete standards, ferro cement can be thought of a thin reinforced concrete construction with very high performance characteristic such as high tensile strength to weight ratio, ductility and impact resistance, these characteristics are required for earthquake prone area applications. For instance, a factory produced ferro cement element using self-compacting concrete .

Square weld mesh instead of woven wire mesh cost two to three times less than conventional ferro cement elements of equivalent performance. The increasing availability of fiber reinforced polymer is likely to lead further cost reduction. Applications of ferro cement in small size structures and structural elements have mushroomed in developing countries. In a way, Ferro cement is becoming an all-purpose material and its potential combinations with other materials is a testimony to its versatility. This may take the form of mechanized production of small size elements such as cement sheets and pipes to replace asbestos cement

The investigations by Naaman and Gurrero (1996) shows the addition of discontinuous fibres to the matrix of ferro cement can effectively increase its moment of resistance and significantly reduce the average crack spacing and width at ultimate loading and it also prevent the spalling of concrete. To improve the structural performance and reduce total cost of construction, a new ferro cement system performance is enhanced with polypropylene fibers, FRP laminates and which is termed as Hybrid Ferro cement system. Most of the past research work has focused on the potential use of ferro cement in structural applications as permanent formwork (Kadir 1997) secondary roofing elements, etc.

Very little research has been done on altering the inherent character and material properties of the ferro cement. This research work aims at to study the flexural response, deformation characteristics, ductile performance and energy absorption capacity under impact load of ferro cement slabs made up of self-compacting concrete and wrapped with GFRP sheets at the bottom face.

**Chapter2:-****Literature Review:-****History Of Development:-****Joseph-Louis Lambot of France, in 1852:-**

The initial definition of ferro cement can be drawn from a patent application submitted by Joseph-Louis Lambot of France, in 1852. The patent for “Ferro-cement”, which translates into “iron-cement”. His invention shows a new product which helps to replace timber where it is endangered by wetness, as in wood flooring, water containers, plant pots etc.,. The new substance consists of a metal net of wire or sticks which are connected or formed like flexible woven mat. He gave this net a form which looks in the best possible way, similar to the article he wants to create. Then he put in hydraulic cement or similar bitumen tar or mix, to fill up the joints.



**Fig 1:-**Lambot's first boat at Brignoles museum France (Source :Google images)

Lambot built two rowboats in 1848 and 1849, in length respectively about 3.6m and 3m (12 and 9 feet), 1.3m (4ft) wide and 38mm (1.5in.) thick, and disclosed his patent at the Paris exhibition in 1855 by showing one of the boats. The first boat is now at Brignoles museum in France as shown in Fig[1].

**Joseph Monier in 1867:-**

He is working independently of Lambot, started building for the city of Paris, France, flower pots and garden tubs made out of cement iron rods. Monier took a patent in July 1867, for “a system of movable casing and bowls made of iron and cement, applicable to horticulture”, Monier's work also can be considered as the origin of reinforced concrete.

**Dutch man, Mr. Boon in 1887:-**

He built a small craft of ferro cement, the Zeemeuw (or seagull) and several barges of reinforced mortar to carry ashes and refuse on water canals. The Zeemeuw was reported to be still operating at the Amsterdam zoo in 1968. It is currently displayed in the lounge of the Vereeniging Nederland Cement Industries office in Amsterdam. During the first world war, ships and barges were built with reinforced concrete, and this was again attempted during the second world war due to shortages of materials, particularly steel. In effect, ferro cement was forgotten and replaced by reinforced and prestressed concrete.

**Pier Luigi Nervi in 1940:-**

A noted Italian engineer – architect, revived the original concept of “ferro cement” by proposing that Ferro cement be utilized to build fish boats. He pointed out the distribution of reinforcing meshes in concrete produces a material with approximately homogeneous mechanical properties, capable of resting high impacts. Following some preliminary test on slabs, he showed that ferro cement possesses exceptional elasticity, flexibility, strength, and resistance to cracking. In 1943 ferro cement received the acceptance by the Italian Navy. Shortly after the second world war, Nervi demonstrated the potential of ferro cement by building a 165 ton motor-sailor Irene using a ferro cement hull of thickness 35mm(1.4 in.) which is slightly less than that of the wood hull The Irene entirely satisfactory.

Nervi continued his pioneering by using ferro cement in some architectural work applications, such as a storage warehouse and the roof the exhibition hall of Turin(1948). Most of these structures are still standing today. The boats and structures built by Nervi were appreciated only two decades later, time at which the durability and serviceability of ferro cement could ascertained by the profession.

Ferro cement finally achieved wide acceptance in the early 1960's for boat building the united kingdom, New Zealand, Canada and Australia. In 1968, the Fisheries Department of the Food and Agriculture Organization(FAO) of the United Nations started ferro cement boat building projects in Asia, Africa, and Latin America. Other countries followed, including the soviet union, China, and several countries in south-east Asia. In 1972, the US National academy of science formed a panel to report on the application of ferro cement in developing countries. One of the recommendation of the panel was to establish a worldwide centre to collect, process, and disseminate information on ferro cement. Subsequently, in 1976, the International Ferro cement Information centre was established at the Asian institute of Technology (AIT) in Bangkok, Thailand. In 1975, the American concrete institute formed committee 549, Ferro cement. In 1991, the International Ferro cement Society was established (under the leadership of R. Pama) with headquarters at AIT in Bangkok.

**Chapter 3:-****Experimental Programme:-****Objectives:-**

1. To extend the principles of reinforced concrete design by using continuous steel reinforcement as the main reinforcement to satisfy ultimate stress limit state and fibres as a secondary reinforcement to control cracking and satisfy the crack width limit state in service.
2. To use polypropylene fibers instead of steel fibers, differently from most prior investigations were used.
3. To study the influence of SCC mixture used instead of conventionally vibrated concrete.
4. To study the experimental tests on simply supported HF slabs, in order to determine the ductility factor under the two point loading.
5. To analyze the nonlinear behavior of HF slabs by determining the load deflection response for the slabs tested.
6. To arrive at the analytical equations for moment of resistance, load deflection profile up to serviceability limit. Ductility factor of HF slabs from the experimental investigations carried out.

**Advantages Of Ferro Cement Slabs:-**

The construction of Ferro cement slabs has been found attractive in many developing countries because:

- Ferro cement is made of materials that are readily available in most countries.
- Ferro cement is suitable for a wide range of construction techniques, ranging from self-help construction for housing and agricultural structures to highly prefabricated industrial processes.
- At the low end, ferro cement requires a low level of technology and common labor skill, because of its light weight, it does not require heavy construction equipment or plants.
- Ferro cement can be fabricated in any desired shape, it is particularly suitable for shells and free form shapes.
- Ferro cement is durable and resistant to the environment like concrete and masonry, it is non-flammable, it is less prone to corrosion than steel, it is not sensitive to humidity and unlike wood, does not rot, and has longer life than fiber reinforced plastics.
- Ferro cement can be easily maintained and repaired after damage.
- Ferro cement is cost effective.
- The skills for ferro cement construction can be easily acquired.
- Ferro cement construction is less capital-intensive but more labour intensive.

- Ferro cement qualifies in terms of using fewer resources and less energy, in being less polluting, and in generating less waste.

#### Disadvantages Ferro Cement Slabs:-

- It is difficult to fasten to ferro cement with bolts, screws, welding and nail etc.
- Large no of labors required.
- Cost of semi-skilled and unskilled labors is high.

### Chapter 4

#### Preliminary Tests:-

##### Tests on Cement:-

Ordinary Portland cement 53 grade conforming to IS 12269-1987 is used and there properties are as follows:-

Table 1:- Test on cement

SL.NO	Characteristics	53 grade	As per IS 12269-1987 for 53 grade
1	Consistency of cement	35%	-
2	Specific gravity	3.09	3.15
3	Initial setting time	56 minutes	>30 minutes
4	Final setting time	268 minutes	<600
5	Fineness of cement	2.3%	<10%
6	Compressive strength 3 days	28.2 N/mm <sup>2</sup>	27 N/mm <sup>2</sup>
7	Compressive strength 7 days	38.6 N/mm <sup>2</sup>	37 N/mm <sup>2</sup>

#### Sieve Analysis of fine aggregates:-

The aggregate consists of well graded fine aggregate (sand) that passes a 4.75 mm sieve.

Table 2: sieve analysis of fine aggregate

IS Sieve Size	Wt. Retained On sieve(gm)	Cumulative Weight retained	Cumulative % retained	Cumulative % passing	Requirement IS 383-1970
4.75mm	66	3.32	3.32	96.68	90-100
2.36mm	176	8.84	12.16	87.84	75-100
1.18mm	330	16.58	28.74	71.26	55-90
600µm	226	11.36	40.10	59.90	35-50
300µm	1144	57.49	97.59	2.41	8-30
150µm	40	2.01	99.60	0.4	0-10
Pan	8	0.4	100.00	0.00	
TOTAL	1990		281.20		

#### Quantity Calculation:-

Mix design is defined as quantity of material per cubic metre of mortar (cement, fine aggregates) as shown in below

- Calculate the dry volume of materials required for 1m<sup>3</sup> cement mortar. Considering voids in sands, we assume that materials consist of 60% voids. That is, for 1m<sup>3</sup> of wet cement mortar, 1.6m<sup>3</sup> of materials are required.
- Now we calculate the volume of materials used in cement mortar based on its proportions. Let's say, the proportion of cement and sand in mortar is 1:2. Then, the volume of sand required for 1:2 proportion of 1m<sup>3</sup> cement mortar will be  $1.6 \times 2 / (1+2) = 1.067 \text{ m}^3$ .
- Volume of cement will be calculated as  $1 \times 1.6 / (1+2) = 0.53 \text{ m}^3$
- Since the volume of 1 bag of cement is 0.0347 m<sup>3</sup>, so the number of bag of cement will be calculated as:  $0.53 / 0.0347 = 15.27$  bag

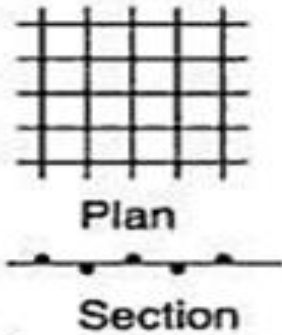


**Chapter 5:-****Materials:-****Constituents Of Ferro Cement:-**

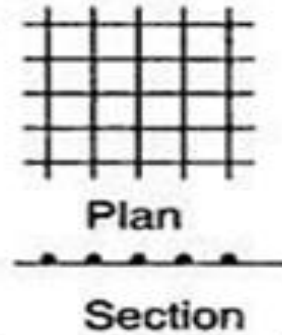
Ferro cement is a composite thin element which is constructed of building materials wire mesh, cement, fine aggregate (sand) water, polypropylene fibre.

**Wire mesh:-**

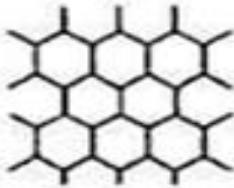
One of the important constituents of ferro cement is wire mesh reinforcement. These generally consist of thin wires, (galvanized or un-galvanized) either woven or welded at their intersections. The mechanical properties of ferro cement depends on the type, quantity, Orientation and strength properties of mesh reinforcement. Different type of mesh reinforcement are available in the market, which are suitable of ferro cement construction. Some of them are listed below



(a) Square woven wire mesh



(b) Square welded wire mesh

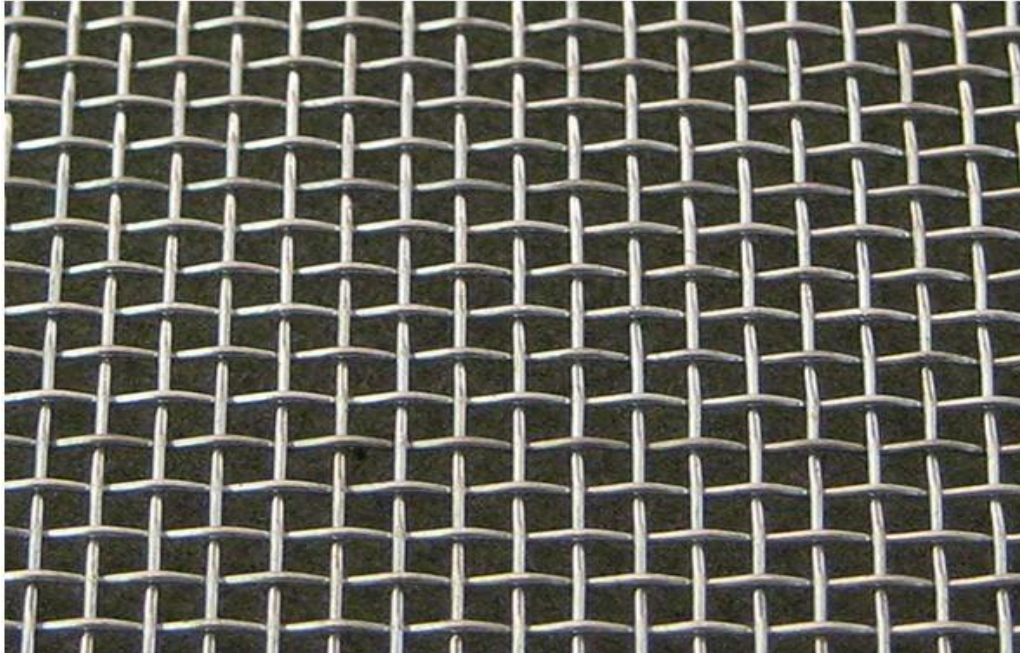


(c) Hexagonal wire

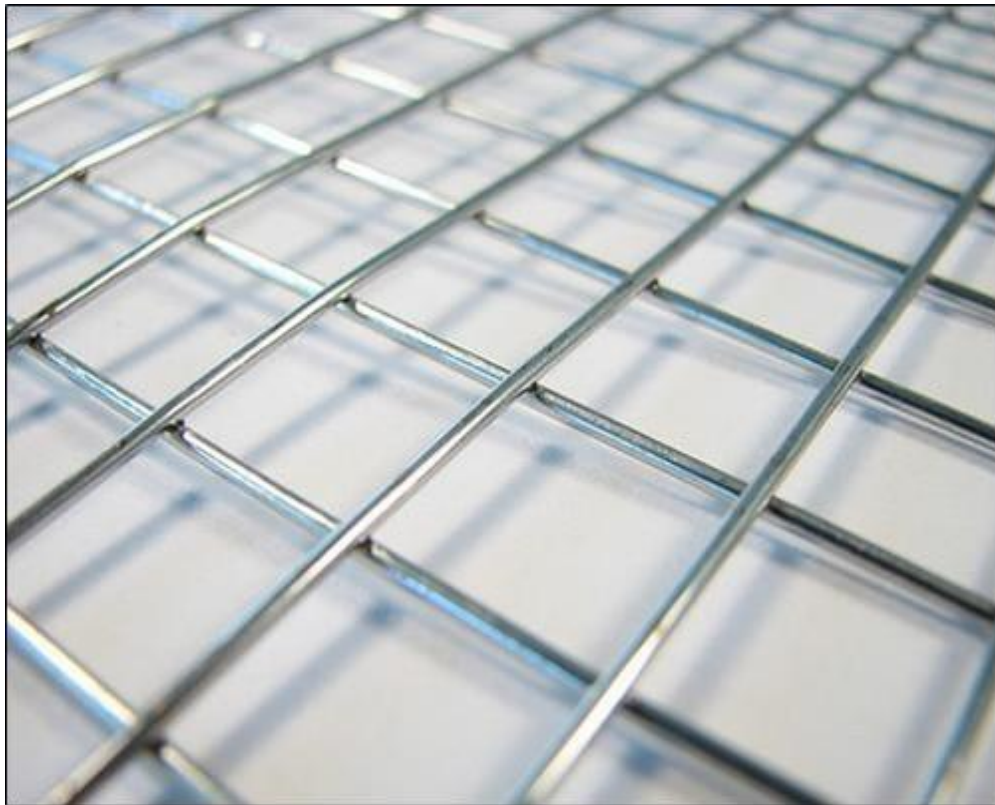


(d) Expanded metal





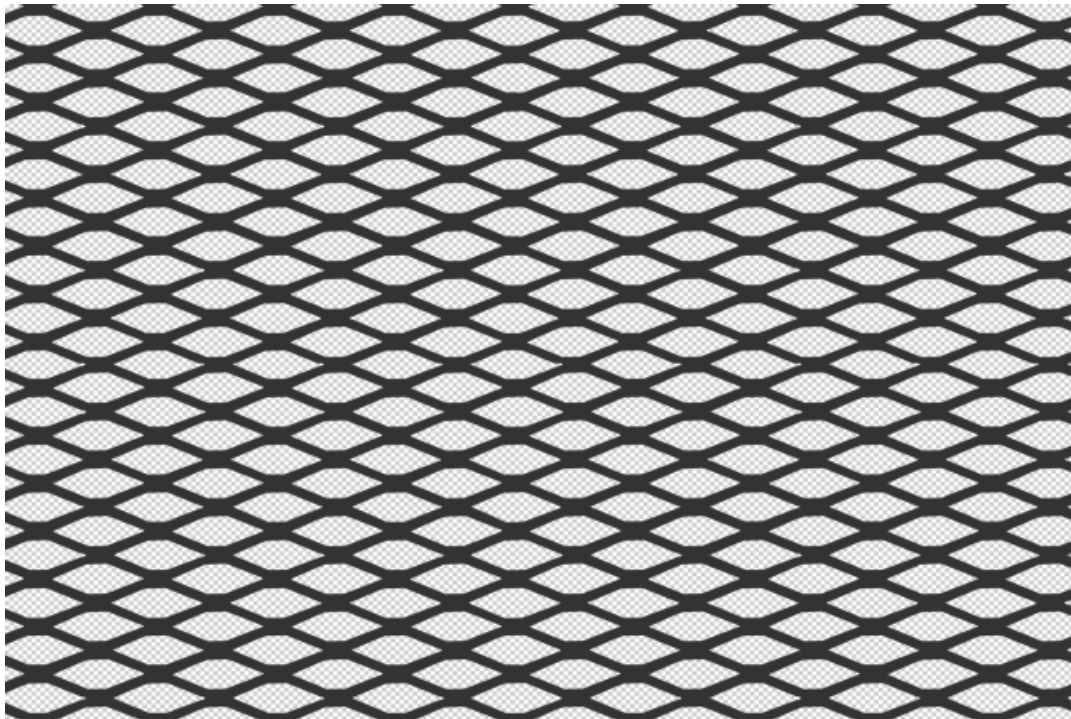
1.Squarewoven mesh



2.Square welded mesh



3.Hexagonal wire mesh.



4. Expanded metal mesh

**Fig 2:-** Types of wire mesh(Source: Google images)

1. **Woven wire mesh** is fabricated simply weaving the galvanized wires into desired grid sizes without welding them at the intersection. The grids are generally square. The mesh wires are not perfectly straight and some amount of waviness exists.
2. **Hexagonal wire mesh** also commonly known as chicken wire mesh is fabricated from cold drawn wires of diameter varying from 22-26 gauges and woven into hexagonal patterns with mesh opening varying from 10mm to 25mm. This is the cheapest, easiest to handle and most commonly used in ferro cement construction.
3. **Expanded metal mesh** which is sometimes used in ferro cement construction, is formed by slitting thin gauge sheets and expanding them in a direction perpendicular to the slits to produce diamond shape openings. This mesh has inherent advantages like good mechanical bond and ease of placing.
4. **Welded wire mesh** is fabricated in rectangular or square pattern by perpendicular intersecting wires (generally 2-3mm diameter) made of low to medium
5. **Tensile strength** steel (which are much stiffer than hexagon or woven wire mesh) and welded together at the intersections. Now we are using this kind of meshes in preparing ferro cement slabs.

#### **Cement:-**

Ordinary Portland cement of 53 grade that is commercially available in the market is satisfactory for ferro cement construction. But the type of cement should be selected according to the need or environment in which the structure is built. However other type of Portland cement can be used like sulphate resisting cement for ferro cement construction in marine environment.

Portland pozzolana cement has also been recommended for ferro cement as it provides good resistance to sulphate attack also competitive in price compared with ordinary Portland cement.

#### **Sand:-**

Only fine aggregate is used in ferro cement, Coarse aggregate is not used in ferro cement. Normally, the aggregate consists of well graded fine aggregate (sand) that passes a 4.75 mm sieve; and since salt-free source is recommended, sand should preferably be selected from river-beds and be free from organic or other deleterious matter. Good amount of consistency and compatibility is achieved by using a well-graded, rounded, natural sand having a maximum top size about one-third of the small opening in the reinforcing mesh to ensure proper penetration. The moisture content of the aggregate should be considered in the calculation of required water.

#### **Water:-**

In ferro cement, the water used for mixing cement mortar should be fresh, clinched fit for construction purposes; the water of pH equal or greater than 7 and free from organic matter—silt, oil, sugar, chloride and acidic material.

#### **Admixtures:-**

In numerous admixtures available, chemical admixtures is best suitable for ferro cement because it reduces the reaction between matrix and galvanized reinforcement. Chemical admixtures used in ferro cement cement serve one of the following purposes like water reduction, improvement in impermeability, air entrainment, which increases resistance to freezing and thawing. Here we are using Polycarboxylate Ether (PCE 811).

Polycarboxylate Ether (PCE 811). 'Polycarboxylate Ether' this liquid is commonly used for the purpose of enhancing the fluidity of concrete it also plays a vital role in boosting the strength it exalt the plasticity as well. Polycarboxylate ether increases the strength of concrete in a drastic manner. This chemical gives construction industry innovation solutions and totally new opportunities which are completely related to the field of concrete manufacturing. This chemical provides high fluidity to concrete at less levels of water. It also retains slump for the long time period. With water reducing property it also gives very remarkable strength and high workability to concrete.

#### **Polypropylene fiber:-**

##### **Specific Gravity:-**

0.90 – 0.91 gm/cm<sup>3</sup>, Because of its low specific gravity, polypropylene yields the greatest volume of fibre for a given weight. This high yield means that polypropylene fibre provides good bulk and cover, while being lighter in weight. Polypropylene is the lightest of all fibres and is lighter than water. It is 34% lighter than polyester and 20% lighter than nylon. It provides more bulk and warmth for less weight.



**Applications:-**

- Rcc&Pcc like lintel ,beam, slab, column, flooring and wall plastering
- Foundation, tanks, manholes, cover and tiles.
- Roads and pavement
- Hollow block and precast

**Advantages:-**

- ❖ Reduce cracks during plastic and hardening stage.
- ❖ Reduce water seepages and protect steel in concrete from corroding and walls from dampening.
- ❖ Rebound loss reduced by 50-70%. Result in saving of expensive mortar, cement and sand.
- ❖ Time taken for plastering is reduced and work is completed faster.
- ❖ Protect corners in precast slabs and concrete flooring.
- ❖ Increase abrasion resistance by over 40% there by increasing life of roads, walkways, floors. Also reduces pitting of the floor.

**Properties of ferro cement composites (as per aci committee 549r-97):-**

- Wire diameter 0.5 to 1.5 millimeters
- Size of mesh opening 6 to 35 millimeters
- Maximum use of 12 layers of mesh per inch of thickness
- Thickness 6 to 50 millimeters
- Ultimate tensile strength up to 34 MPa
- Allowable tensile stress up to 10 MPa
- Modulus of rupture up to 55MPa
- Compressive strength up to 28 to 69Mpa

**Chapter6:-****Methodology:-**

The experimental program includes preparing and testing of hybrid ferro cement slabs using point load method.

**The variable parameters are as follows:-**

1. Number
2. Percentage of welded square mesh reinforcement.
3. Percentage of polypropylene fibres in mortar.
4. Number of FRP layer wrapping.

**Mix Proportion:-****Table 3:-** Mix proportions

Cement sand Proportion	1: 2
Water cement ratio	0.45
Polypropylene fibres	0.3% by weight of cement
super plasticizer	0.5% by weight of cement

**Variable Parameters:-****Table 4:-** Variable parameters.

S.I no.	specimens	Thickness in mm	Wire mesh	FRP layers	Polypro-pyline fibers
1	A0	60	0	0	0
2	A2	60	2	0	0
3	A3	60	3	0	0
4	B0	60	0	0	0.30%
5	B2	60	2	0	0.30%
6	B3	60	3	0	0.30%
7	C0	60	0	1	0.30%
8	C2	60	2	1	0.30%
9	C3	60	3	1	0.30%

**Test Specimens:-**

A total of 9 specimens of Ferro cement slabs were cast and are tested. All the specimens have a dimensions of 1000mm\*1000mm with a thickness of 60mm each. The thickness of slabs were kept constant and by varying numbers of layers of meshes, numbers of FRP layers and the slabs with and without polypropylene fibre totally accounts for 9 slab specimen. The specimens were designated as A0, A2,A3,B0,B2,B3,C0,C2,C3. Table4 shows the details of varying parameters used in ferro cement slabs in the present investigation work.

The supplementary specimens such as six numbers out of which three are with and another three without polypropylene fibres of size 70mm\*70mm cubes were cast along with the ferro cement slab and are tested for compressive strength.

The slabs were cast using self compacting micro concrete, which gets compacted due to its own weight any external vibration. This concept is used for the construction of ferro cement slabs in order to overcome the problems and difficulties in the construction process.

The use of SCC in the construction of ferro cement slabs facilitates the easy placing of mortar without requirement of skilled labors, vibrators and improving the quality and speed of manufacturing ferro cement products.

**Preparation Of Mortar:-**

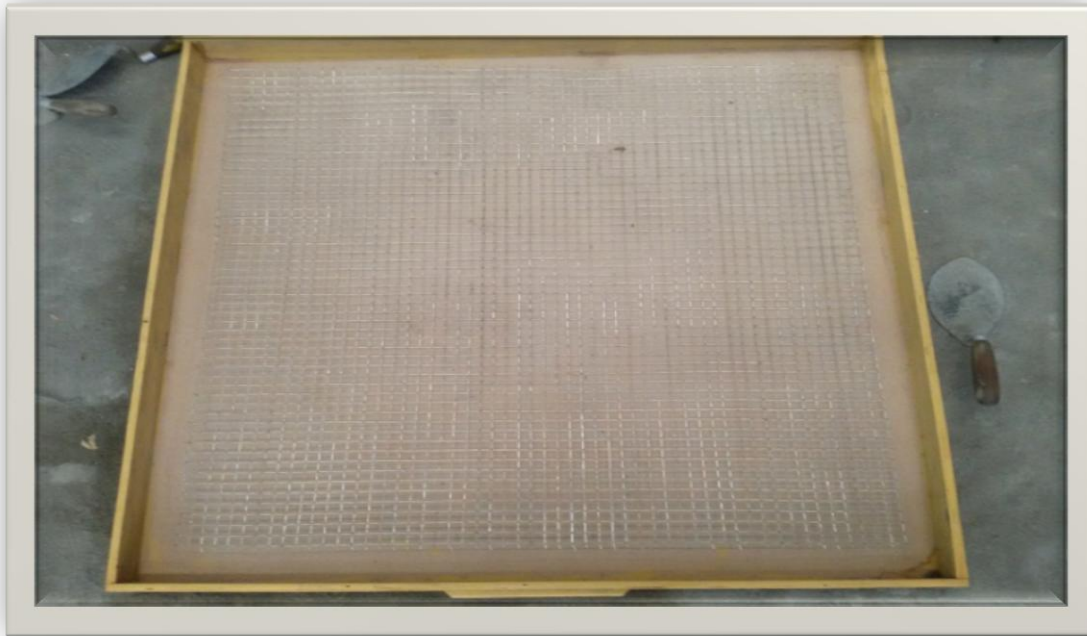
Mortar was prepared by calculating the exact amount of cement sand and water. At the first the cement sand were dry mixed. For addition of water, initially 75% of water is added to the dry mix and mixed thoroughly.

Admixture such as super plasticizer with dosage of 0.5% by weight of cement is added with remaining 25% of water and its added to the mixer and is mixed thoroughly for about ten minutes and polypropylene fibre with dosage of 0.3% by weight of cement is added to the mixture and mixed properly, Finally the mortar is prepared.



**Fig 3:-** Morter mix

The mesh pieces were cut down according to the size of panel leaving a cover of 50mm on both side of mesh of size (900\*900mm) as shown in figure below



**Fig 4:-** Pieces of welded square mesh (spacing 20\*20mm, 1.2mm diameter)

#### **Properties Of Self Compacting Concrete:-**

The SCC flows alone under its dead weight up to leveling, airs out and consolidates itself thereby without any entry of additional compaction energy and without a nameable segregation. The SCC owns over three key characteristics which are listed below. These characteristics were made possible by the development of highly effective water reducing agents (super plasticizers), those usually based on Polycarp boxy late ethers. The mixture composition of SCC deviates from conventional concrete. The powder contents of SCC are normally lying (in some cases even considerably) above those of conventional concrete.

1. **Filling Ability:** Ability of to fill a formwork completely under its own weight.
2. **Passing Ability:** Ability to overcome obstacles under its own weight without hindrance. Obstacles are e.g. reinforcement and small openings etc.
3. **Segregation resistance:** Homogeneous composition of concrete during and after the process of transport and placing.

An idea of SCC is a material that flows into formwork and compacted under the influence of its own self-weight without vibration and additional processing. Realization of self-compacting as the key feature of fresh concrete enabled at the same time application of technologically higher quality material with improvement of economic building conditions.

#### **Uses And Advantages Of Self Compacting Concrete:-**

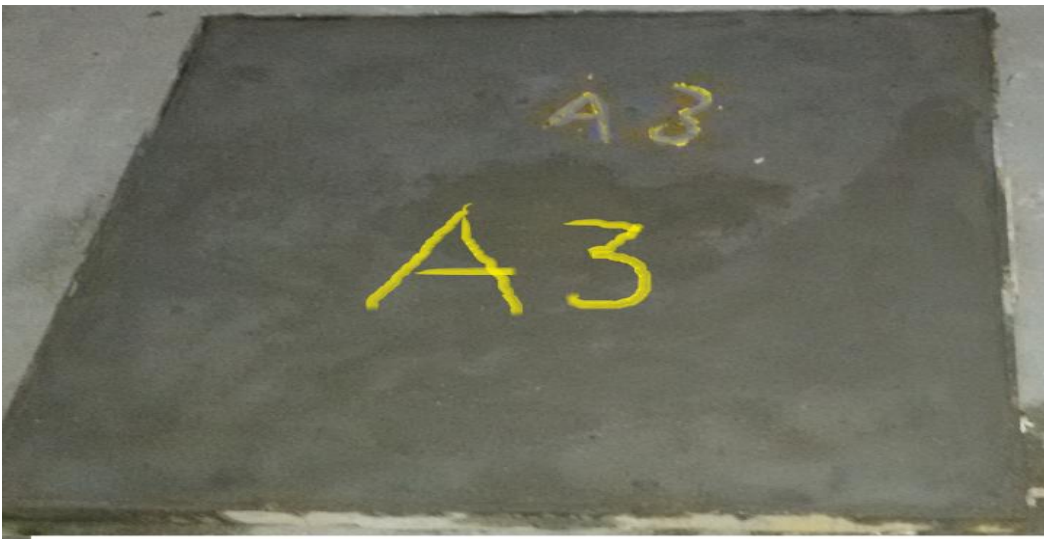
The main advantages of application of self-compacting concrete on site are as follows:

- No vibration of fresh concrete is necessary during placement into forms.
- Placement of concrete is easier.
- Faster and more efficient placement of fresh concrete is achieved. Total concreting time is reduced.
- Noise level on construction site is reduced.
- The number of working hours on the construction site can be increased and the night shift in urban zones is enabled.
- Energy consumption is reduced.
- Required number of workers on construction site is reduced.
- Safer and healthier working environment is obtained. Upon self-compacting concrete hardening in structures:
- High quality of placed concrete is achieved, regardless of the skill of the workers.

- Good bond between concrete and reinforcement is obtained, even in congested reinforcement.
- High quality of concrete surface finish is obtained with no need for any subsequent repair.
- With a better final appearance of concrete surface, smooth wall surfaces and flat floor surfaces that need no further finishing are obtained.
- Improved durability of structures is achieved.

**Casting:-**

A wooden mould of size 1000mm\*1000mm\*60mm were oiled before casting to avoid sticking of mortar. Firstly at bottom mortar is placed for about 6mm thickness and above this the wire mesh of size 900mm\*900mm to ensure minimum clear cover of 50mm on each side of the reinforcement is placed inside the mould care should be taken that the wire mesh should be strengthened to a plane surface by pressing with fingers and above this mortar is placed and another wire mesh is placed the procedure is continued for a three layer, two layer, and zero layer finally, the surface are being levelled to get a uniform surface finishes following fig 6 .shows casting slabs.

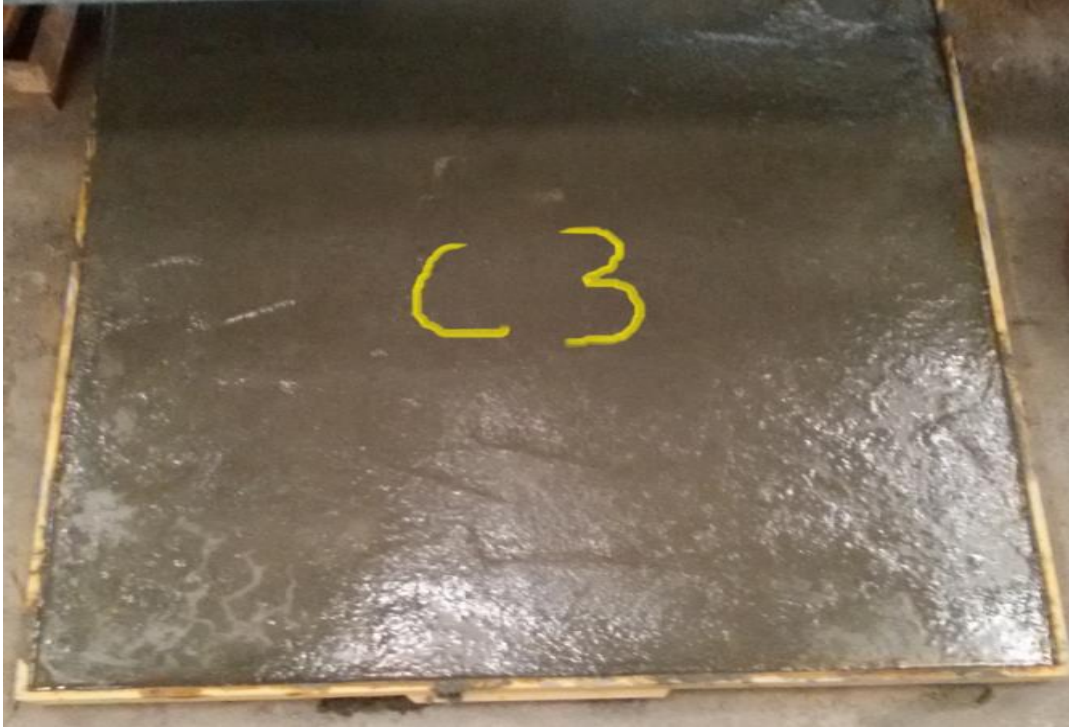












**Fig 5:-** casting slabs

#### **Design Parameters:-**

The arrangements of weld mesh used in this investigation were offive categories. Those are:

1. Placing a layer weld mesh across the cross section of slab attention zone with a clear cover of 3mm shown in Figure.
2. Placing the two layers of weld mesh across the cross section of slab at tension zone with a clear cover of 3mm and a spacing of 3mm between the layers shown in Figure.
3. Placing the three layers of weld mesh across the cross section of slab at tension zone with a clear cover of 3mm and a spacing of 3mm between the layers shown in Figure.
4. Bundling the two layers of weld mesh with binding wire and placing near bottom with a clear cover of 3mm shown in Figure.
5. Bundling the three layers of weld mesh with binding wire and placing near bottom with a clear cover of 3mm shown in Figure.

These specimens are designed to study the influence of arrangements of weld mesh on the flexural behavior of the ferro cement slabs.

The thickness of the slab also plays a major role in the flexural strength and in the ductility. Hence, for the proposed experimental study and 60 mm thickness were chosen. HF slabs polypropylene fibers (Ronald 1996) were added as secondary reinforcing elements to control cracking in the compression face. Two different number of GFRP layers were considered to wrap at the bottom face of the slab. They are: 1.Specimens with single layer of GFRP wrapping at tension zone 2. Specimens with two layers of GFRP wrapping at the tension zone.

#### **Curing And Application Of Gfrp Layers:-**

The specimens cast were left in the moulds for a period of 24 hours. After 24 hours Specimens were demoulded from the mould carefully and immediately placed under water in a curing tank and were allowed to cure under water for a period of 28 days.

After the period of 28 days, the ferro cement slabs were taken out of the curing tank, dried and out of nine slabs for three slabs such as C0, C2&C3 at the bottom surface of the slab is made rough using of wire brush. GP resin twice by weight of the FRP sheets is being applied using the brush on the bottom surface of the slab and the sheets are

pasted and are pressed along the edges of the slabs. FRP wrapped slabs are being kept for a period of 2 days and are allowed to get dried before the testing of slabs.

All the slabs were tested under monotonic loading in two point flexure to evaluate the following:

1. Deformation characteristics.
2. Ductility of Hybrid Ferro cement slabs
3. Modes of failure



**Fig 6:-** Application of GFRP layer.

#### **Chapter7:-**

##### **Instrumentation And Loading Procedures:-**

All the specimens were tested in a loading frame, which is fixed over a strong floor. The slabs were simply supported with an effective span of 800mm c/c. Two point loads were applied transversely at one third distances from support using a steel plate. Along with it, capacity proving ring was used for the load application. Dial gauge of sensitivity 0.01mm were used to measure the deflection of the slabs. The dial gauge were kept at mid span of the slab deflector meter to measure the deflection of the slab.





**Fig 7:-** Testing of slab specimens (structural lab)

The behavior of the slab was keenly observed from the beginning till collapse. The propagation of initial cracks due to the increase of load was also recorded. The loading was continued till the verge of collapse.

#### **Measurement Of Deflections:-**

The slabs were suitably instrumented for measuring deflection using dial gauge. Deflections under the loads of the central deflections were measured using One dial gauge. The dial gauge have a least count of 0.01 mm, it was held in position by stands fit with magnetic base. The readings were taken at closer intervals. Figure9 shows the deflector meter attached to the slab. The load was gradually applied by screw gauge with a proving ring of capacity 25 kN. As the applied load was increased, each test slab was carefully inspected visually for the first crack formation to estimate first crack strength. The value obtained was confirmed using the load-deflection plot, where the first - crack strength would correspond to a sudden (but small) drop in the load readings. After the determination of the first-crack strength, the specimen was tested to failure to obtain its ultimate strength.

#### **Ductility Performance:-**

The ability of a member to deform without a significant loss of its strength is known as ductility. One method of quantifying ductility is by using the ductility factor as defined by the ratio of ultimate deflection to the deflection at yielding of tensile reinforcement and Ductility Index, based on the failure state, where the failure load may be considered as equal to 85% of the ultimate load in the descending part of the load- deflection curve, is also of interest in some cases, especially in seismic design.

The displacement factor based on yielding of steel and ultimate stage are shown in Table: 9. it can be seen that displacement ductility factor varied from 0.38 to 2.15 for ferro cement slabs. From the test results, the slabs without the gfrp wrapping and fibre reinforcement exhibits lower ductility ratios. The gfrp wrapped slabs with 3 bundled layered reinforcement exhibits a higher displacement ductility ratio than those of fibre reinforced and conventional ferro cement slabs due to the fact that strengthening of tension zone on the slabs has better confinement which affect the ductility ratios.

The provision of gfrp layers in the tension zone and also the reinforcing of polypropylene fibres in the concrete has better confinement capacity than the conventional ferro cement slabs preventing the disintegration of concrete in the compression zone even after the concrete reaches failure thereby improving failure ductility. The number of bundleness reinforcement of wire mesh also has effect on the ductility ratios due to increase in the volume

#### Chapter8:-

#### Results And Discussions:-

##### Test Results Of Cubes:-

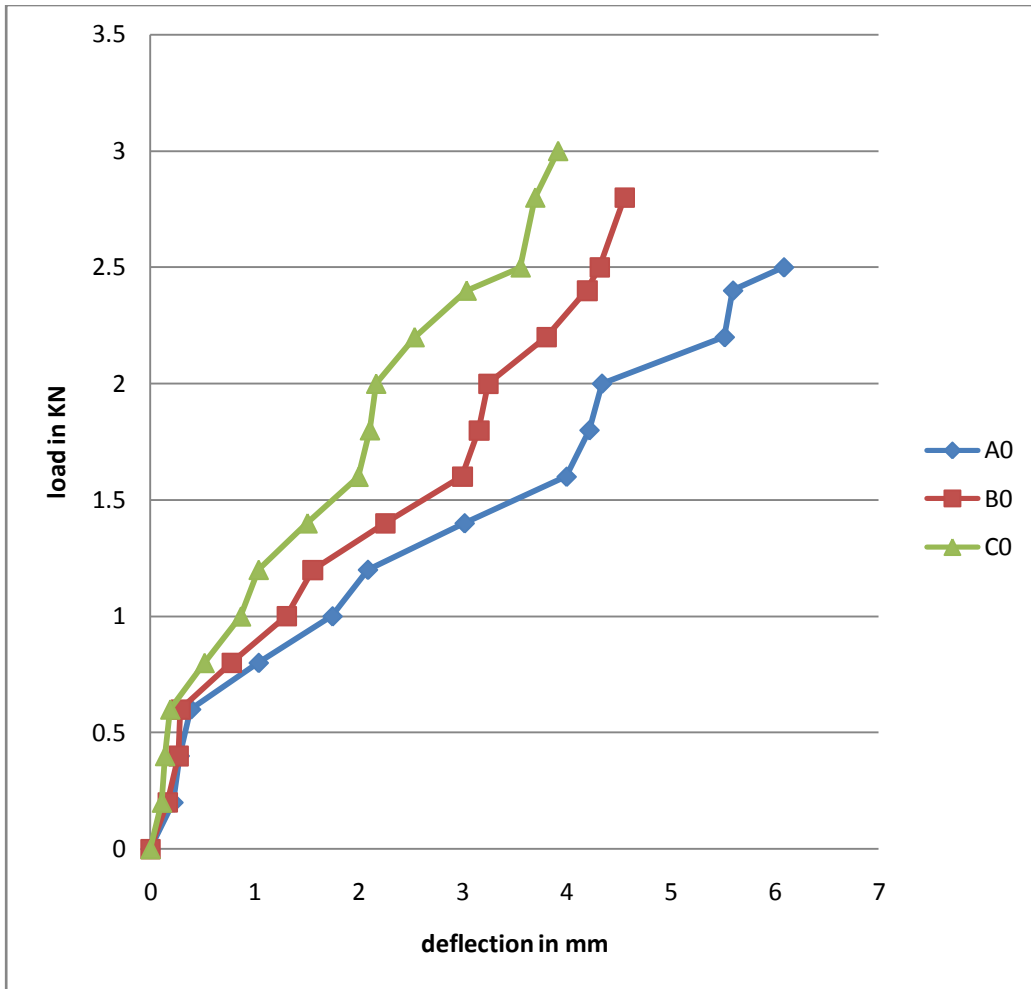
**Table 5:-** Test results on cubes

<b>WITHOUT POLYPROPYLENE FIBRES</b>				
Sl.NO	SIZE in mm	Load At failure (kg)	Compressive Strength(N/mm <sup>2</sup> )	Average
1	70*70	20,000	40.04	40.84
2	70*70	20,000	40.04	
3	70*70	21,200	42.44	
<b>WITH POLYPROPYLENE FIBRES (0.3%)</b>				
4	70*70	18,800	37.63	43.43
5	70*70	24,300	48.64	
6	70*70	22,000	44.04	

##### Test Results Of Slab Specimens:-

**Table 6:-** Slab thickness 60mm with zero layer of wire mesh.

Load (KN)	Deflection (mm) A0	Deflection (mm) B0	Deflection (mm) C0
0	0	0	0
0.2	0.22	0.165	0.11
0.4	0.28	0.27	0.14
0.6	0.39	0.29	0.19
0.8	1.04	0.78	0.52
1	1.75	1.31	0.87
1.2	2.09	1.56	1.04
1.4	3.02	2.26	1.51
1.6	4	3.0	2.0
1.8	4.22	3.16	2.11
2	4.34	3.25	2.17
2.2	5.52	3.81	2.54
2.4	5.60	4.2	3.04
2.5	6.09	4.32	3.56
2.8	6.30	4.56	3.70
3.0	6.40	4.66	3.92
1 <sup>st</sup> crack	5.52	4.2	3.56
Max.load	3000	2800	3000



Graph 1:- Load v/s deflection (60mm zero layer)

A0: Slab specimen with zero layer wire mesh in the absence of polypropylene and Frp sheet.

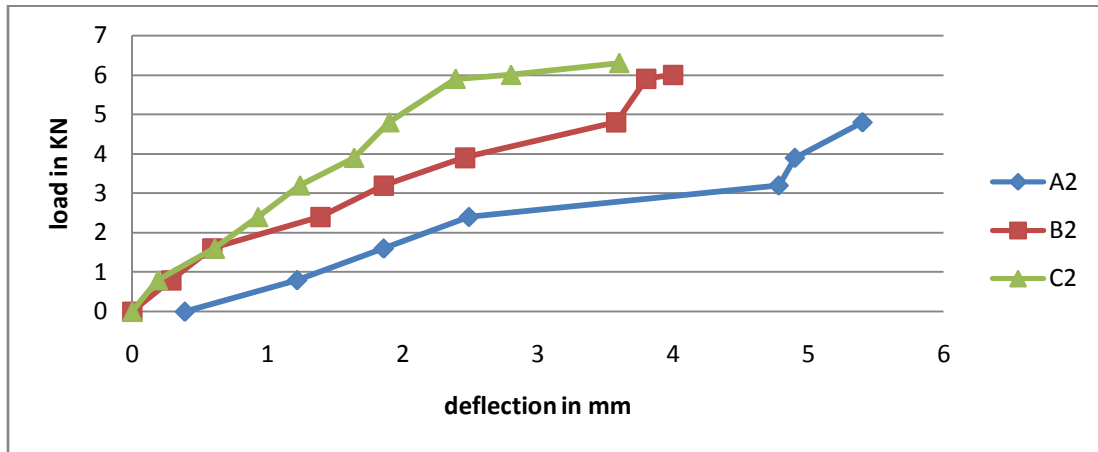
B0: Slab specimen with zero layer wire mesh in the presence of polypropylene and in the absence of frp sheet.

C0: Slab specimen with zero layer wire mesh in the presence of polypropylene and Frp sheets.

Table 7:- Slab thickness 60mm 2 layers of wire mesh

LOAD (KN)	Deflection (mm)	Deflection (mm)	Deflection (mm)
	A2	B2	C2
0	0	0	0
0.8	0.39	0.29	0.19
1.6	1.22	0.59	0.61
2.4	1.86	1.39	0.93
3.2	2.49	1.86	1.24
3.9	4.78	2.46	1.64
4.8	4.90	3.58	1.90
5.9	5.4	3.80	2.39
6.0	5.8	4.0	2.80
6.3	6.1	4.2	3.60
1 <sup>st</sup> crack	4.78	3.58	2.39
Max.Load	6400	7200	6400

A2: Slab specimen with two layer wire mesh in the absence of polypropylene and Frp sheet.  
 B2: Slab specimen with two layer wire mesh in the presence of polypropylene and in the absence of frp sheet.  
 C2: Slab specimen with two layer wire mesh in the presence of polypropylene and Frp sheets.

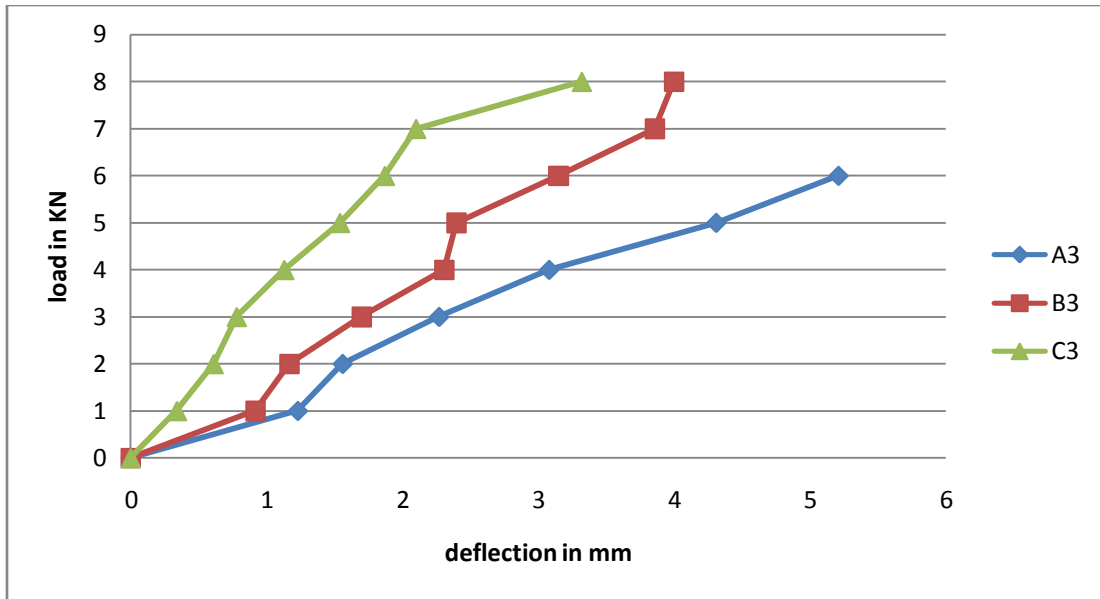


Graph 2:- Load v/s deflection (60mm 2 layer)

Table 8:- Slab thickness 60mm 3 layers of wire mesh

Load (KN)	Deflection (mm) A3	Deflection (mm) B3	Deflection (mm) C3
0	0	0	0
1	1.23	0.92	0.34
2	1.56	1.17	0.61
3	2.27	1.70	0.78
4	3.08	2.31	1.13
5	4.31	2.40	1.54
6	5.21	3.15	1.87
7	5.50	3.86	2.1
8	5.80	4.0	3.32
1 <sup>st</sup> crack	4.31	3.15	3.32
Max.Load	8000	8000	8000

A3: Slab specimen with three layer wire mesh in the absence of polypropylene and Frp sheet  
 B3: Slab specimen with three layer wire mesh in the presence of polypropylene and in the absence of frp sheet  
 C3: Slab specimen with three layer wire mesh in the presence of polypropylene and Frp sheets.



Graph 3:-Load v/s deflection (60mm 3 layers)

Table 9:- Experimental result.

slab ID	load at (N)		deflection in mm			ductility factor(Md) = (d2/d1)
	yield load	ultimate load (Wu)	yield (d1)	ultimate (du)	0.85*Wu (d2)	
A0	2200	2500	5.52	6.09	2.12	0.38
A2	3900	5900	4.78	5.4	5.01	1.05
A3	5000	6000	4.31	5.21	5.10	1.18
B0	2400	2800	4.2	4.56	2.38	0.57
B2	4800	6000	3.58	4	5.10	1.42
B3	6000	8000	3.15	4	6.8	2.15
C0	2500	3000	3.56	3.92	2.55	0.72
C2	5900	6300	2.39	3.6	5.35	2.24
C3	7000	8000	2.1	3.32	6.8	3.23

Crack Pattern Of Slabs:-



Fig 8:Specimen A0





**Fig 9:-** Specimen A1.



**Fig 10:-**Specimen A2



**Fig11:-**Specimen B0.



**Fig12:-** Specimen B1



**Fig13:-** Specimen B2.



**Fig 14:-** Specimen C0.





Fig15:- Specimen C1.



Fig 16:- specimen C2.

**Discussions:-**

- 1 Table 5 shows that the compressive strength of hybrid ferro cement slabs without polypropylene fibres and with polypropylene fibres. From results it is observed that the compressive strength at 28 days curing of hybrid ferro cement slabs with polypropylene fibres content of 0.3% is increased by 6.34% with compressive strength of conventional concrete plain.
- 2 Table 6 shows the test results of ferro cement slabs specimen A0 with zero layer wire mesh in the absence of polypropylene B0 in the presence of polypropylene and in the absence of frpsheet.and C0 in the presence of polypropylene and Frp sheets.Graph1 shows the corresponding load deflection behavior of different three slabs from the test results it is observed that the ultimate load carrying capacity in flexure is 75% is more for B0 compared to A0 and 50% more for C0 compared to A0 slab.
- 3 Table 7 shows the test results of ferro cement slabs with double layer mesh the Graph2 shows the corresponding load v/s deflection behavior of HFS it is observed that the load carrying capacity is more in case of B0 and C0 compared to A0 in the same way Table 8 shows the test results of ferro cement slabs with three layer Graph3 shows the load deflection curve having more load carrying capacity of slab C0 compared to B0 ,A0 slabs.
- 4 From the test results it is observed that the ultimate load carrying capacity in three layer weld mesh HFS with 0.3% fibre content is increased by 25% in comparison with double layer weld mesh of ferro cement slab without GFRP layer.
- 5 By studying the crack patterns it is observed that the appearance of the first crack is slower in case of three layer weld mesh ferro cement slab with fibre and GFRP sheet in comparison with double layer weld mesh with 0.3% fibre content and without fibrous ferro cement slabs

**Chapter9:-****Conclusions:-**

1. The fibre reinforced ferro cement slabs shows a good load carrying capacity and Ductility characteristics. In the tension zone, concrete matrix crack occurs as fibre starts acting. The fibre carries the load across the crack, transmitting the load from one sided of the matrix to other and as the fibre is randomly distributed, the crack do not have very long paths, thereby loads bearing capacity of the \whole matrix is increased and multiple cracking is observed.
2. Increasing in numbers of layers from 2 to 3 significantly increases the load carrying capacity and ductility characteristics and capability to absorb energy of the slabs.
3. Presence of polypropylene fiber reduces the cracks and protects the corners of slab and increase the abrasion resistance, reduce the seepage of water.
4. Addition of super plasticizer will results in achieving self-compacting concrete and thus which reduce up to 6.34% of water. It also helps in placing of mortar which can easily flow by its own Wight without any vibration.
5. The compressive strength of cubes with presence of polypropylene fiber which increase about 6.34% as compared to conventional cube specimens.
6. The gfrp wrapped ferro cement slabs shows the higher ductility than that of the conventional ferro cement slabs due to the fact that, better confinement is being provided by the wrapping in the tension zone of the slabs. The wrapping acts as an external reinforcement and takes load in the tensile zone after the concrete fails.

**Future Scope:-**

1. Further investigation can be carried out by increasing the fiber content and also by using the different types of fibres such as steel fibres and carbon fibres.

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## MONOGENIC DISORDERS: AN OVERVIEW.

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### Abstract

Monogenic Disorders (MDs) are the single-gene associated disorders. Approximately 5000 types of these disorders have been known by now. These have been found most commonly in the developing countries, more specifically in the rural areas with the highest ratio due to the consanguineous marriages. The recessive or minor unexpressed disorder carrier gene also gets expressed within their offspring. Depending upon the global prevalence and other various characteristics of the monogenic disorders, these have been classified on the basis of their patterns of inheritance i.e. Autosomal or X-Linked. Likewise, Dominant or Recessive. Several common monogenic disorders have been discussed comprehensively with their etiology, features, effects, diagnosis and cure. Osteogenesis Imperfecta (OGI), Retinoblastoma (RB), Cystic Fibrosis, Thalassemia, Fragile X Syndrome (FXS), Hypophosphatemia, Hemophilia and Ichthyosis are included in the category of MDs and are discussed in detail. Most of the monogenic disorders are rare to happen even their causes are still unknown while some are quite common with known causes. Various diagnostic techniques and the treatment methods have been developed for them which have not been proved enough to treat the disorders by conventional approaches. Therefore, some recent and updated approaches are also being implemented in the field of treatment of these disorders that includes the Gene Therapy, Stem Cell Transplantation and Bone Marrow Transplant.

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### Introduction:-

Gene is basically a specific length or segment of DNA containing some crucial information for the assembly of amino acids in an order to form a protein. The entire DNA compliment of cell or an organism is known as "Genome" (Alberts, B. et al., 2002; Dongen, J. 2015). It turns on within a cell for a specific time interval only in the case of need. It consists of various alternative forms known as "Alleles" ( Terao, C. et al., 2016), from whom only a single form can be expressed or inherited depending upon its potential of ruling over its partner form in a chromosome (Perry, S. et al., 2014). These alleles or gene may act in an abnormal way and said to be "Mutated" and leads to a "Genetic Disorder" (Bagheri, M. et al., 2015). These genetic disorders can be either Monogenic or Polygenic. Single-Gene or Monogenic Disorders can take place in an organism due to mutation or change in the single gene within a genome (Thornhill, A. et al., 2015). The gene either stops working or perform any unwanted or improper role. While the Polygenic disorders happen due to change or mutation in the multiple genes (Tao, J. et al., 2015).

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Monogenic is actually the combination of two Greek words; Mono means “Single” and Genic means “Gene”. These are the disorders caused by the inheritance of the single mutated gene from parent to offspring known as “Monogenic disorders or Single-gene Diseases” [MDs] (Tuomi, T. et al., 2014). These disorders are categorized as “Autosomal” or “Sex-Linked” based upon their origin whether the mutation is in an autosome or in a sex chromosome. Further these disorders may exist because of the expression of an allele of a gene over the over i.e. “Dominant” or “Recessive” on the basis of the inheritance of the copy of the single mutated gene either from single parent or both (Kashyap, M. et al., 2015). Whereas, the Monogenic Disorders can also be further categorized as “X-Linked”, “Y-Linked” and “Mitochondrial” on the inheritance basis of any mutated gene because of mother (Antonarakis & Beckmann, 2006; Bamshad, M. et al., 2011). These disorders take place due to sex chromosomes. Though there are not much genes in the Y chromosome as it is too small, it does not show any monogenic disorder. Y-Linked disorders are often and polygenic. Most of the monogenic disorders are spontaneous and naturally occurring whereas, some are non-spontaneous and due to environmental changes (Yazdi, F. et al., 2015). There is a large figure of the monogenic disorders i.e. More than 5000 which includes most of the rare disorders along with some of the common ones. Most probably these disorders vary from cell to cell, though the entire genome of the organism is same among all the body cells (Fiorentino, F. et al., 2005; Harper & Sen Gupta, 2012). The global prevalence of this disease is 10/1000 at the birth and an estimate of 360 Million people are victims of monogenic disorders (Aslamkhan, M. 2015; Irfan-Maqsood, M. 2015).

Monogenic disorders [MDs] have always remained a common issue in the developing countries due to poor environmental factors and unnecessary mutations i.e. Pakistan, India, Afghanistan, Bangladesh and Sri Lanka from Asia. Our main focus is on the health issues regarding to the genetic disorders in Asian sub-continent (Kumar, D. 2012; Yamada, Y. 2006). The percentage of the monogenic disorders is too high in this particular area that includes Thalassemia, Osteogenesis Imperfecta, Hemophilia and Ichthyosis (Pemberton, T. et al., 2012; Ropers, H. 2007). A survey has been conducted recently in 2012, according to which the population of Pakistan is around 190 Million from which more than 65% of the population belongs to the rural or scattered areas and consanguinity has been observed in almost 80% of the cases which is one of the most common cause of the inheritance of genetic disorders from generation to generation (Halim, N. et al., 2013; Hussain, R. et al., 2001; Obeidat, B. et al., 2010). As the consanguineous individuals have at least one common ancestor somehow from any of their previous generations. Hence, there are more chances of the occurrence of any genetic disorder whose genes were present among consanguineous parents (Harlap, S. et al., 2008; Sheridan, E. et al., 2013) but were not expressed but now with the inbreeding, risk of disease in the descendant is 99% sure and can be proved lethal whether the parents are carrier of any dominant defective trait or of recessive, it leads to the congenital disorders and genetic disorders. These disorders affects in both way, genotypic and phenotypic (Bittles, A. 2012; Sandridge, A. et al., 2010; Warsy, A. et al., 2014).

The cause of several monogenic disorders is still unknown; various techniques have been introduced in order to diagnose these disorders at the genetic level over last 3 decades for the better understanding and consideration. As long as the new technologies like Next Generation DNA Sequencing [NGS] and DNA microarrays are being launched (McPherson, E. 2006; Yoo, H. 2010) and getting advanced day by day for the entire Genome [Gene or DNA] Analysis while the prenatal diagnosis has been proved as the conventional one, In contrast to that a number of a number of more monogenic disorders are being identifying (Cavalli, P. 2009; Pagon, R. 2002). Human Genome Project [HGP], a scientific research project, was presented in 2003 that gives the entire information about all the genes present in the human body regarding to their sequence and the functions. Hence, it has been proved very useful for the determination of the causes of disorders that are monogenic as well as polygenic (Antonarakis, S. 2001). In former studies, Mapping techniques have been used so far for the analysis of monogenic disorders. But due to some limitations, Massively Parallel Sequencing [MPS] Technology can also be used for studying the advances relevant to the genome analysis for the determination of monogenic disorders (Duncan, E. et al., 2014).

Monogenic disorders are also known as “Mendelian Disorders” as the concept of inheritance of the genetic characters along with the gene copies was introduced by the Father of Genetics, Gregor Mendel (Kosztolányi, G. 2011; Pembrey, M. 2010; Williams, S. et al., 2014). In order to study about the monogenic disorders inheritance patterns as described by the Mendel’s Law, we need to go either through the pedigrees of the characters being mutated within a species or by the help of various molecular techniques such as PCR and Sequencing (Pommerenke, C. et al., 2016) and after the detection of the disorder, the presence of the disorder has been confirmed. Now the struggle towards the remedy of these disorders should be made appropriately (O’Connor & Crystal, 2006; Wong & Chiu, 2010). Through the applied and advanced researches we came to know that almost all the monogenic disorders



are part of the coding regions “Exons” present within the human genome which encodes and controls almost all the body characters as well as functions (Valencia, C. et al., 2015). Hence, our main focus turned towards the exome of the body and the technologies used for the exome analysis are genotypic arrays and the exome sequencing. Just by analyzing the exome rather than the whole genome of an organism (Pommerenke, C. et al., 2016), we may perform experiments and get better results in less time than other sequencing techniques of the entire genome of an organism (Shigemizu, D. et al., 2015). Exome sequencing is basically the selective re-sequencing of a selective segment of the DNA which is doubtful as mutated (Nash, B. et al., 2015). With the help of exome sequencing, while studying a monogenic disorder which have been still unknown by cause and is newly discovered by the sequencing analysis, its certain perspectives get clear with its discovery due to the advancement in the field of genetics and technology (Lacey, S. et al., 2014). But still there is a large figure of the monogenic disorders whose causes are still unknown. It’s actually all about the complexity of the disorder which is either at a single site or sequence within a gene at a copy or at the certain sites or sequences within both the copies of gene [Dominant or recessive] (Lalonde, E. et al., 2010; Valencia, C. et al., 2015).

There was no possible cure of monogenic disorders up till now but these days, the advanced remedies are being used and processed further with the passage of time as they are not time consuming at all but these remedies require the experience and are expensive as well as at risk i.e. Stem cell treatment and transformation (Lida, Y. et al., 2014; Xie & Tang, 2016). These are at risk as the treatment is either on a possibility of being occurring in case transformation for any therapeutic cure or the failure if the vector does not hits the target properly. Whereas, the success rate of stem cell therapy is a bit higher as it is quite efficient that transformation technique and is comprised of the modifications being made in the body cell of patient itself or another healthy donor (O'Connor & Crystal, 2006).

#### Modes of Inheritance of Monogenic Disorders:-

In the Monogenic Disorders, the copy of a mutated gene or multiple copies are inherited and causes a characteristic phenotype of that gene by following the Mendelian Segregation patterns (Ahmed, N. et al., 2006; Chen, N. et al., 2014; Fountain, E. et al., 2016). The patterns of inheritance can be predicted in both cases of autosomes as well as sex chromosomes. They also describe whether the single copy of a gene is inherited and responsible for the cause or the both copies of respective gene are mutated i.e. Dominant and recessive (Lalonde, E. et al., 2010; Valencia, C. et al., 2015). Pedigrees can be drawn to study the family or ancestry record for distinguishing among the affected and wild type generations and individuals in a family line and their pattern of inheritance. [Fig. 1] shows the signs used in the pedigree for distinguish among males and females, affected and wild type (Chen, N. et al., 2014; Fountain, E. et al., 2016).



**Fig. 1:** Signs for Pedigree.

Some crucial modes of inheritance that help in the demonstration of monogenic disorders are as follows [Fig. 2];

1. Autosomal Dominant Inheritance
2. Autosomal Recessive Inheritance
3. X-Linked Dominant Inheritance
4. X-Linked Recessive Inheritance
5. Y-Linked Inheritance

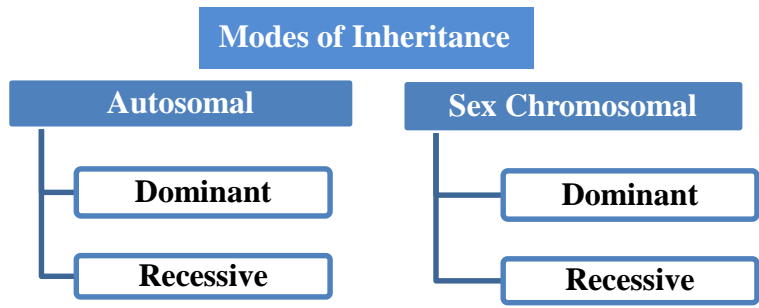


Fig. 2: Modes of Inheritance in Monogenic Disorders.

**Autosomal Dominant Inheritance:-**

The monogenic autosomal dominant inheritance takes place due to a single mutated autosomal gene present in any of the parents [Usually Heterozygotes] (Oleinikov, A. 2008; Pan& Weissman, 2002). As the mutation is on an autosome, hence both the males and females can be equally affected and the probability of the inheritance of the disorder is 50% due to the presence of a wild type and a mutated allele or gene copy in the child from each of the parents (Regalado, E. et al., 2011). Punnett square helps us in predicting the possible outcomes of the offspring from the single or both affected parents [Table. 1]. A copy of the gene is enough either to produce a wild type or a mutated offspring as the genes are Dominant Autosomal genes are represented as “A” while recessive ones are represented as “a”.

Table 1: Possible outcomes of Autosomal Dominant Inheritance

Parents	Affected Parent	
Normal Parent	A	a
a	Aa	aa
a	Aa	aa
Offspring	50% Affected	50% Normal

**A: If One Parent is affected**

Parents	Affected Parent	
Affected Parent	A	a
A	AA	Aa
a	Aa	aa
Offspring	75% Affected	25% Normal

**B: If Both Parents are affected**

Single dominant in their pattern and one of the parents is surely affected as well. They transmit from generation-to-generation randomly and can remain silent or unexpressed at any generation and again expressed at the other one (Cutting, G. 2010). Pedigree for the autosomal dominant inheritance patterns of the monogenic disorders is shown in [Fig. 3].

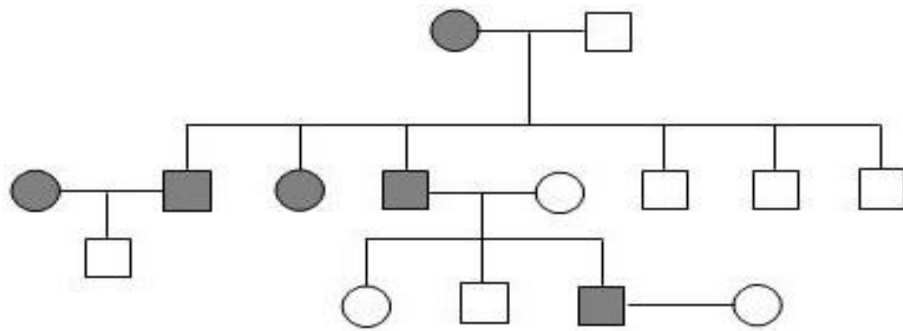


Fig. 3:- Pedigree for the Autosomal Dominant Inheritance.

**Autosomal Recessive Inheritance:-**

In Monogenic autosomal recessive inheritance, the single mutated autosomal gene copy from the both parents is inherited in the offspring [Homozygote] and the repressed or recessive characteristic of a trait is again expressed due to the similar gene copy of both the alleles (Gialluisi, A. et al., 2012; Jonker, M. et al., 2015).

In case of the recessive autosomal inheritance, both the genes present should be mutated. If any of them is wild type than they may be asymptomatic [Doesn't show any of the abnormal features or symptoms] and the individual would be the healthy one phenotypically but are still the carrier of that disease and are capable of passing the disease into the upcoming descendant generations if remain in consanguinity (Harlap, S. et al., 2008; Sheridan, E. et al., 2013). Such disorders can be observed in only single generation as they can be repressed by avoiding the consanguineous relations. The risk of inheritance of these disorders is high in the consanguineous parents. As if both are the carriers of the disorder then there is 25% possibility of the disorder in the child (Ahmed, N. et al., 2006; Gao, Z. et al., 2015; Henn, B. et al., 2016). Punnett Square helps us in showing the predicting outcomes of the offspring from the normal, affected or carrier parents [Table. 2].

**Table 2:** Possible Outcomes of Autosomal Recessive.

<b>Parents</b>	<b>Normal Homozygote</b>	
<b>Normal Heterozygote</b>	<b>A</b>	<b>A</b>
<b>A</b>	<b>AA</b>	<b>AA</b>
<b>a</b>	<b>Aa</b>	<b>Aa</b>
<b>All Normal Offspring</b>	<b>50% Homozygous Normal</b>	<b>50% Heterozygous Carriers</b>

**A: If One Parent is Carrier and other is Normal**

<b>Parents</b>	<b>Normal Heterozygous</b>	
<b>Normal Heterozygous</b>	<b>A</b>	<b>a</b>
<b>A</b>	<b>AA</b>	<b>Aa</b>
<b>a</b>	<b>Aa</b>	<b>aa</b>
<b>Offspring</b>	<b>75% Normal Carriers</b>	<b>25% Affected Homozygous</b>

**B: If Both Parents are Carriers**

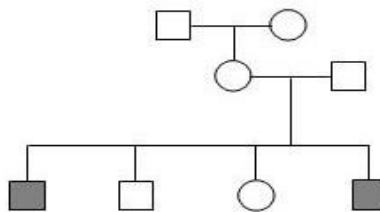
<b>Parents</b>	<b>Affected Homozygous</b>	
<b>Normal Homozygous</b>	<b>a</b>	<b>a</b>
<b>A</b>	<b>Aa</b>	<b>Aa</b>
<b>A</b>	<b>Aa</b>	<b>Aa</b>
<b>Offspring</b>	<b>100% Heterozygous Carriers</b>	

**C: If one Parent is Affected and Other is Normal**

<b>Parents</b>	<b>Affected Homozygous</b>	
<b>Normal Heterozygous</b>	<b>a</b>	<b>a</b>
<b>A</b>	<b>Aa</b>	<b>Aa</b>
<b>a</b>	<b>aa</b>	<b>aa</b>
<b>Offspring</b>	<b>50% Heterozygous Carriers</b>	<b>50% Affected Homozygous</b>

**D: If One Parent is Affected and Other is Carrier**

Pedigree for autosomal recessive inheritance patterns of the monogenic disorders is shown in [Fig. 4].



**Fig. 4:** Pedigree for the Autosomal Recessive Inheritance

**X-Linked Dominant Inheritance:-**

The Mutation in the X-chromosomal gene of the sex chromosomes leads to numerous disorders which are said to be X-Linked Disorders. As the males contain only one X while the females contains 2 X-Chromosomes (Dobyns, W. 2006). Hence, the pattern of inheritance of the X-Linked dominant disorders is straight forward it will either produce the affected offspring or the normal ones at the possibility of 50% and the disorder transmits continually over the generations because the mutated gene is Dominant and it has to be expressed at each condition (Dobyns, W. et al., 2004; Rappaport, H. 2003).

The sons of affected father will not be affected further nor inherit the disorder whereas, the daughters would surely be the carriers or the affected ones and keep on inherit the disorder (Amberger, J. et al., 2015; Chong, J. et al., 2015).

Punnett Square helps us in showing the predicting outcomes of the offspring from the Normal and Affected parents [Table. 3]. Normal Chromosome is represented as “X” while the affected one is represented as “X’”.

**Table 3:** Possible Outcomes for X-Linked Dominant Inheritance

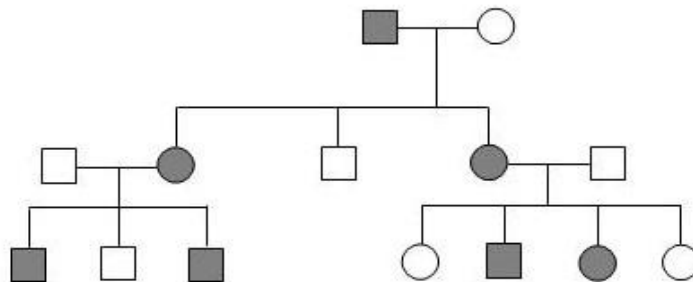
Parents	Affected Female	
Normal Male	X’	X
X	X’X	XX
Y	X’Y	XY
Offspring	50% Affected	50% Normal

**A: If Mother is Affected and Father is Normal**

Parents	Normal Female	
Affected Male	X	X
X’	X’X	X’X
Y	XY	XY
Offspring	50% Affected Females	50% Normal Males

**B: If Mother is Normal and Father is Affected**

Pedigree for the inheritance patterns of X-Linked Dominant monogenic disorders is shown in [Fig. 5].



**Fig. 5:** Pedigree for X-Linked Dominant Inheritance.

**X-Linked Recessive Inheritance:-**

The X-Chromosomal genes are mutated in the X-Linked recessive monogenic disorders which are not expressed as a characteristic trait under certain conditions of the heterozygote but can only be expressed in case of the homozygote or hemizygote [Gene with one allele at a loci instead of two] (Bamshad, M. et al., 2011). In X-linked recessive disorder, the hemizygotes are mostly the male ones as they consists of two different genes at different loci and are commonly affected as comparative to the female ones (Rappaport, H. 2003).

Though the females have an affected chromosome but there is an unaffected chromosome present as well and due to **Lyonization** process (Boulard, M. et al., 2016), only one chromosome is functional or active at a time. Hence, the female would be carrier of disease and is unaffected itself but have the ability to pass the disorder over the

generations in the offspring (Amberger, J. et al., 2015; Chong, J. et al., 2015). Punnett Square helps in showing the possible outcomes of the offspring from Affected, Normal and Carrier Parents [Table. 4].

**Table 4:** Possible Outcomes for X-Linked Recessive Inheritance.

Parents	Normal Female	
Affected Male	X	X
X'	X'X	X'X
Y	XY	XY
Offspring	50% Carrier Females	50% Normal Males

**A: If Mother is Normal and Father is Affected**

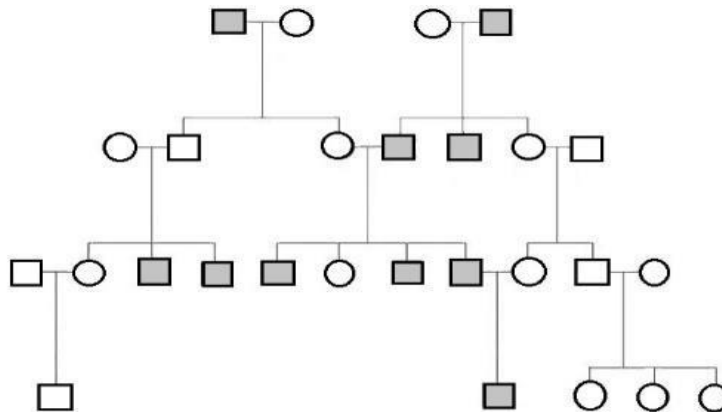
Parents	Carrier Female	
Normal Male	X	X'
X	XX	X'X
Y	XY	X'Y
Offspring	25% Carrier Females 25% Normal Females	25% Normal Males 25% Affected Males

**B: If Mother is Carrier and Father is Normal**

Parents	Carrier Female	
Affected Male	X	X'
X'	X'X	X'X'
Y	XY	X'Y
Offspring	25% Affected Females 25% Carrier Females	25% Affected Males 25% Normal Males

**C: If Mother is Carrier and Father is Affected**

Pedigree for the X-Linked Recessive Inheritance Patterns of the Monogenic Disorders is shown in [Fig. 6].



**Fig. 6:** Pedigree for X-Linked Recessive Inheritance

**Y-Linked Inheritance:-**

The gene on the Y- Chromosome is mutated which leads to the Y-Linked Genetic disorders. As the Y-Chromosome is much smaller in size and comprised of a few genes. Hence, there are very limited Y-Linked genetic disorders which are too rare as well (Amberger, J. et al., 2015), which mainly cause the fertility problems and are not usually inherited to the offspring but in some of the cases may be inherited but just affects the sons whereas, the daughters are entirely healthy as they does not carry any Y-Chromosome. Hence, it can be easily distinguished (Hadi, S. 2015). Pedigree for the Y-Linked Inheritance Patterns of the Monogenic Disorders is shown in [Fig. 7].

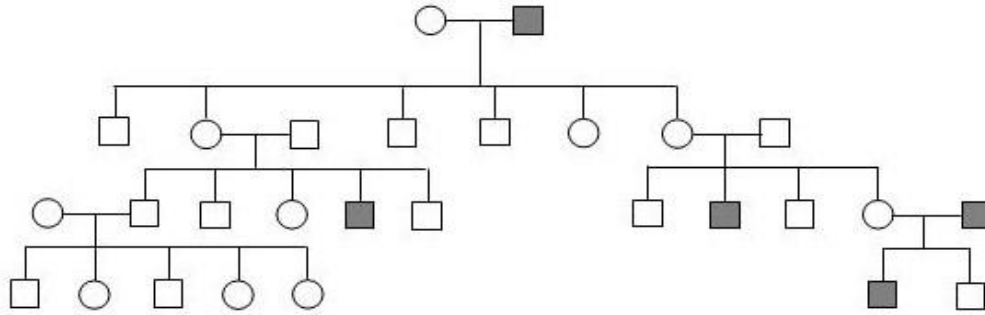


Fig. 7: Pedigree for Y-Linked Inheritance

**Frequency of Occurrence:-**

As Mentioned above, the differences among the modes of inheritance of the monogenic disorders are described in detail but their possibility of occurrence over their patterns of inheritance within the offspring of the normal, affected or the carrier parents (Ahmed, N. et al., 2006; Chen, N. et al., 2014; Fountain, E. D. et al., 2016) is described as below in [Table. 5]. The major frequencies of occurrence of the monogenic disorders distinguishing among autosomes and sex chromosomes are as follows;

Table 5: Frequency of Occurrence

	Autosomal Dominant	Autosomal Recessive	X-Linked
<b>No. of Mutations in Patients</b>	1	2	1
<b>Sex of Patients</b>	Both	Both	Usually Boys
<b>Risk of Affected Offspring</b>	1 on 2	Small	Small
<b>Risk of Affected Grandchild</b>	1 on 4	Small	1 on 8
<b>Risk of an Affected Sibling</b>	Small, if parents are Normal 1 on 2, If any Parent is Affected	1 on 4	Small, If mother isn't Carrier 1 on 4, if Mother is Carrier

**Classification of Monogenic Disorders:-**

The monogenic disorders [MDs] are very much in number therefore, they are classified into several categories on the cellular, organ and system basis whose origin is either case is actually a mutated gene. Some of the most common monogenic disorders (Antonarakis & Beckmann, 2006; Bamshad, M. et al., 2011) are mentioned in the [Table. 6] and all the perspectives of these disorders are discussed in detail, in this review article.

Table 6: Classification of Some Monogenic Disorders in Different Organs

Autosomal Dominant	
Osteogenesis Imperfecta	Retinoblastoma
Autosomal Recessive	
Cystic Fibrosis	Thalassemia
X-Linked Dominant	
Fragile X Syndrome	Hypophosphatemia
X-Linked Recessive	
Hemophilia	Ichthyosis

**Autosomal Dominant Monogenic Disorders:-**

**Skeleton: Osteogenesis Imperfecta:-**

Osteogenesis Imperfecta [OGI] is a congenital and heritable genetic disorder of abnormal bone or skeletal tissues formation which is either low in mass or weak enough to be fracture. The ratio of the disease at global incidence is about 1 per 10,000 of the individuals (Primorac, D. et al., 2001; Wekre, L. et al., 2011). Some ancient names were given to this disease (Chevrel, G. 2004; Madu & Olamijulo, 2013) are as follows;

- Brittle Bone Disease
- Glass Bone Disease
- Lobstein's Disease
- Porak & Durante's Disease

#### Etiology:-

OGI takes place due to the mutation in any of the collagen type-I encoding genes which is most of the whole body protein content among the connective tissues i.e. COL1A1 and COL1A2 genes (Byers, P. et al., 2006; Christian, C. et al., 2015). Serum albumin or Vitamin D deficiency is not related to OGI, this helps in distinguishing OGI from Osteomalacia (Chagas, C. et al., 2012). As in most of the skeletal disorders, these are the major causes but OGI is a congenital disorder which occurs due to autosomal dominant transmission (Shapiro, J. et al., 2013). The cytogenetic location of the Osteogenesis Imperfecta causing COL1A1 or COL1A2 gene is 7q21.3 (Marini, J. et al., 2014).

#### Classification of OGI:-

The classification of OGI was presented by Silience in 1976 on the severity of the disease basis that is categorized into four major types whereas; the latter ones are the sub-types of Type-IV OGI, as they are correlated. Some clinical features of all the types of OGI are represented in [Table. 7] which helps in distinguishing among them while the examination of disease (Marini, J. et al., 2014; Roughley, P. et al., 2003).

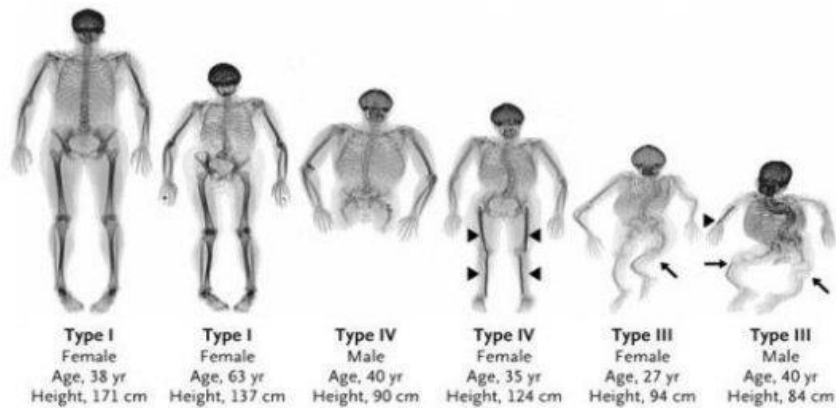
**Table 7:** Classification of Osteogenesis Imperfecta & its Clinical Features

Clinical Features of OGI					
Types	Characteristic	Deformity	Symptoms	Phenotype	References
<b>I</b>	Bone Fragility	No	Blue Sclera	Normal	(P. J. Roughley et al., 2003)
<b>II</b>	Lethal Perinatal Period	Severe	Undeveloped lungs & fractured ribs	Variable	
<b>III</b>	Dentinogenesis Imperfecta	Severe	White Sclera & short stature	Very Short	
<b>IV</b>	Fractures at birth	Moderate	Skeletal deformity & short stature	Variable	
<b>V</b>	Mesh-like Lamella appearance	Moderate	Hypeplastic callus & Interosseous membrane	Variable	(F. H. Glorieux et al., 2000)
<b>VI</b>	Fish-Scale like Lamella appearance	Moderate to Severe	Osteoid Accumulation & abnormal lamellation	Variable	(F. H. Glorieux et al., 2002)
<b>VII</b>	Due to autosomal recessive pattern	Moderate to Severe	Short humerus/femur	Variable	(L. M. Ward et al., 2002)

#### Diagnosis:-

OGI cannot be diagnosed at birth but at the age of walking or adulthood. The genetic analysis of the collagen type-I encoding genes has to be made at the first by keeping the clinical features of the disorder in sight (Marini, J. et al., 2014). Among all the clinical features, Scoliosis is the most common one which leads directly to the death due to the respiratory disorders (Dogba, M. et al., 2016; Dogba, M. et al., 2014).

Differential diagnosis of the disorder should also be made for avoiding the confusion of the similar symptoms of different diseases like, OGI is due to genetic mutation while other disorders might be due to vitamin D or calcium deficiency (Chagas, C. et al., 2012). Some skeletal disorders which resemble OGI may take place while performing the differential diagnosis i.e. Hypophosphatasia, Bruck Syndrome and Cole-Carpenter Syndrome (Henderson, B. et al., 2016). Bone biopsy in some cases may also show some abnormalities that help in the diagnosis (Cheung, M. et al., 2007; Glorieux, F. et al., 2000; Rauch, F. et al., 2013; Zeitlin, L. et al., 2006).



**Fig. 8:** Classification of Osteogenesis Imperfecta

#### **Treatment:-**

OGI can be treated by the help of medications or orthopedics in order to reduce the fracture rates and prevention from deformities. Medications involve Bisphosphonates, Neridronate and Estrogen (Alharbi, S. 2016) whereas; some therapeutic treatments of the disease are also available.

#### **Pamidronate Therapy:-**

It is a medical technique that is used to get relief from pain and provides enhancement in Bone Mineral Density [BMD] and vertebrae size. In contrast to this, it also favors the decrease in fracture incidence (Plotkin, H. et al., 2000; Van Dijk & Silience, 2014).

#### **Gene Therapy:-**

It is another approach for the OGI treatment by which the mesenchymal stem cells of the OGI patients can be taken, modified or transformed in vitro and re injected into the patient. This technique prevents the expression of mutant genes (Lindahl, K. et al., 2014; O'Sullivan, E. et al., 2014).

#### **Stem Cell Transplantation:-**

Bone marrow or its cells can be transplanted into the patient by taking up from a healthy donor in order to overcome the disease. This method provides best results even in the low concentrations and is the most recent one (Li, F. et al., 2010; Pauley, P. et al., 2014).

#### **Sight: Retinoblastoma:-**

Retinoblastoma is also a congenital disorder that is one of the most common intraocular tumors of the eye retina (Lakhoo & Sowerbutts, 2010; Shields & Shields, 2004). It is actually a rare disease. Its global incidence is about 1 in 17000 to 24000. 60% of the cases are observed to be occurred by the age of four years while remaining 40% of the cases occur at the early developmental stage in infants [Infancy] (Bakhshi & Bakhshi, 2007; Meel, R. et al., 2012).

#### **Etiology:-**

Retinoblastoma may be hereditary and sometimes non-hereditary as it happens due to the mutation in RB1 gene. The loss of any of RB1 alleles leads to the retinal cancer while, the loss of other allele would cause the development of the tumor within an individual (Barello, S. et al., 2016; Dimaras, H. et al., 2012; Luo & Deng, 2013; Selistre, S. et al., 2016). RB1 gene is a cell cycle negative regulator gene that has ability to repress the transcription and it is the first gene that have been cloned as tumor suppressor (Hanahan & Weinberg, 2011). The mode of disease transmission is autosomal dominant if inherited; one of the parents must also be affected to the presence of that dominant trait (Bakhshi & Bakhshi, 2007). The cytogenetic location of the Retinoblastoma causing gene is 13q14.2.

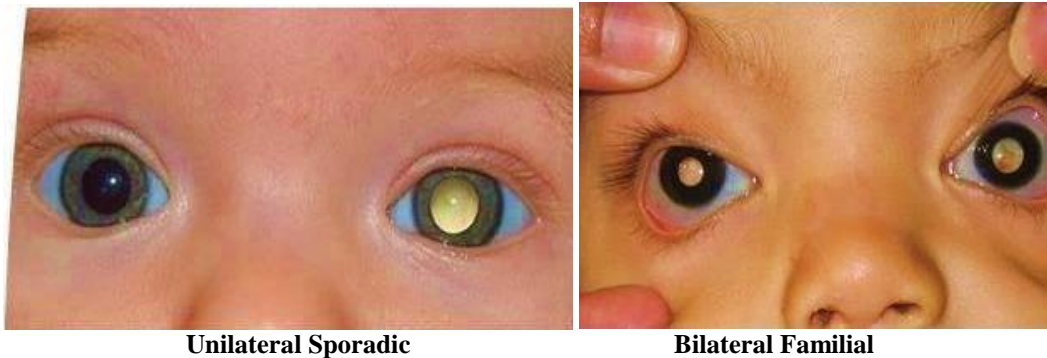
#### **Classification:-**

Retinoblastoma has been generally classified into 3 different categories;



1. Familial or sporadic
2. Bilateral or unilateral and
3. Heritable or non-heritable (Ghassemi, F. et al., 2014).

Former two categories are usually used for the clinical diagnosis. Therefore, the cases could be in the format of the combination of both the former categories i.e. unilateral sporadic, bilateral sporadic, unilateral familial or bilateral familial (Abramson, D. et al., 2003; Bartuma, K. et al., 2014). Approximately 2/3<sup>rd</sup> of these cases are unilateral while the 1/3<sup>rd</sup> of them are bilateral. The study of Retinoblastoma gets much easier with the latter one classified category i.e. Heritable or Non-Heritable (MacCarthy, A. et al., 2013; Mendoza & Grossniklaus, 2015). All of these categories are correlated. Bilateral and familial retinoblastoma has been found to be caused via germ-line mutation; therefore, it is a heritable cancer or tumor (Mohd Khalid, M. et al., 2015). In contrast to this, unilateral and sporadic retinoblastomas aren't heritable at all. Whereas, scarcely 10-15% of the cases has been detected having unilateral sporadic retinoblastoma via germ-line mutation. DNA testing of the suspected child helps in the identification of the cause whether it is heritable or not (Lakhoo & Sowerbutts, 2010; Shields & Shields, 2004).



Unilateral Sporadic

Bilateral Familial

Fig. 9: Classification of Retinoblastoma

#### Genetic Advancement of Retinoblastoma:-

As the major cause of the disease is the absence of the RB1 gene which turns the retinal cells into malignant and leads to 'Retinoma' that is the precursor of Retinoblastoma. Retinoma has been found occasionally in 5% of the individuals (Dimaras, H. et al., 2008; Rushlow, D. et al., 2013). On the other hand, it has also been detected in 16% of the enucleated cause. Non-dividable retinoma represents the RB1 gene loss along with the low genetic instability i.e. an additional allele on 1q chromosome contains a motor protein KIF14 and an apoptotic regulator MDM4. Dividable retinoma represents high genetic instability (Bowles, E. et al., 2007; Thériault, B. et al., 2014) having extra oncogene copies KIF14, DEK, E2F3 and MYCN with the loss of CDH11, a tumor suppressor gene (Marchong, M. et al., 2010).

As, all the tumors are linked with the body cell changes and requires the entire genome sequencing for the identification of the changes or mutations which are responsible for the cause of malignancy. These oncogenes have the tendency to enhance tumor growth, aggressiveness, resistance to therapy and metastasis (Hudson, T. et al., 2010)

**Table 8:** Risk of occurrence of Retinoblastoma in siblings & offspring of affected individuals

Subjects	Probability of Disease %
<b>RB1 gene mutation carriers</b>	90
<b>Offspring of Affected individual</b>	45
<b>Sibling of Affected individual (if either parent is affected)</b>	45
<b>Sibling of Affected individual with bilateral disease</b>	2
<b>Sibling of Affected individual with unilateral disease</b>	1

#### Diagnosis:-

Entire history, physical examination, external ocular inspection, slit lamp bio-microscopy and indirect ophthalmoscopy with scleral indentation are usually required for the precise diagnosis of a suspected child having retinoblastoma. The site of all the tumors and their number would be determined while going specifically towards the retinal tumors (Shields, C. et al., 2015). Biopsy is rarely required in such cases. Some additional diagnostic

studies have been proved quite beneficial for the confirmation of the retinoblastoma. Fluorescein angiography, Ultrasonography and computed tomography help in the demonstration of intraocular tumors along and also detect the calcium content in the mass (Lakhoo & Sowerbutts, 2010; Shields & Shields, 2004).

About 5-10% retinoblastomas don't represent any intrinsic calcification. There are numerous diseases that resemble the retinoblastoma in infants (Shields, C. et al., 2013). In about 50% of the cases patients shows the symptoms of retinoblastoma at initial stage but latter it doesn't seems to be retinoblastoma due to its simulating conditions. Pseudo-retinoblastomas are actually the most common that involves persistent hyperplastic primary vitreous, ocular toxocariasis and coats disease (Shields & Shields, 2004). Such confusions can be overcome by the differential diagnosis. Hence, the confirmation of the tumor located is necessary to be diagnosed prior to the treatment. Genomic analyses and microarray expression studies are the convenient techniques for the detection of the disease (Thériault, B. et al., 2014; Villegas, V. et al., 2014).

#### **Treatment:-**

The major purpose of curing the retinoblastoma is the salvation of the vision and to reduce the long-lasting adverse effects of the therapy. The advancement in the therapy has increased the success rate for the survival from almost 30-95% within last 60 years against the non-metastatic retinoblastoma while the uncured retinoblastoma can be lethal (Bakhshi & Bakhshi, 2007; Meel, R. et al., 2012). Enucleation, chemotherapy and external beam radiation therapy (EBRT) are the major therapies for the treatment of substantial diseases (Bakhshi & Bakhshi, 2007).

**Enucleation** is used often for the treatment of localized retinoblastoma but is risky as the cost is the loss of eyesight in some cases (Shields & Shields, 2004). Besides its adverse psychological and physiological effects, it is also associated with some long-lasting native effects i.e. contraction of socket, discharge from orbit and extrusion of implant. Therefore, some relatively noninvasive focal ophthalmological therapies are needed (Bakhshi & Bakhshi, 2007). Approximately 65-75% unilateral sporadic retinoblastoma can be cured with Enucleation (Epstein, J. et al., 2003).

**EBRT**- External beam radiation therapy is a mode of treatment of retinoblastoma by delivering whole eye irradiation. As retinoblastoma is a radiosensitive tumor. It may affect the mid-face growth in 90% patients. Radiation can harm the retina, lens and optic nerve that is difficult to manage (Shields, C. et al., 2013). EBRT usually cause 35% risk of the secondary tumors in the patients with germ-line RB1 gene mutation. It often leads to the loss of eyesight as well (Epstein, J. et al., 2003).

**Chemotherapy** has always been a significant mode of all the possible curing methods that does not cause any adverse effects (Shields, C. et al., 2004; Shields, C. et al., 2004). Many drugs like Cisplatin, Adriamycin, Carboplatin, Idarubicin, Etoposide and Cyclophosphamide are being used for the treatment of retinoblastoma. This approach can be used in the treatment by 3 means i.e. Micrometastatic Retinoblastoma, Intraocular Retinoblastoma or Overt Dissemination (Bakhshi & Bakhshi, 2007).

#### **Autosomal Recessive Monogenic Disorders**

##### **Metabolism: Cystic Fibrosis**

The most common autosomal inherited recessive monogenic disorder of the glandular epithelial cells present within the human body is cystic fibrosis. Approximately 2000 variations in that gene have been recognized by now (Cleveland, R. et al., 2009). Nearly 70,000 cases have been reported every year on the basis of multi-systemic metabolic disorder (Scott, A. 2013).

##### **Etiology:-**

Cystic fibrosis occurs due to the mutation or change in the CFTR gene i.e. cystic fibrosis trans-membrane conductance regulator, which regulates the mucous and sweat production from the exocrine secretory glands. The mutation of the CFTR leads to various defects in the functioning of CFTR glycoprotein (Hoffman & Ramsey, 2013; Jones & Helm, 2009). The cytogenetic location of the cystic fibrosis causing CFTR gene in the human genome is 7q31.2.

##### **Classification:-**

Cystic fibrosis has been classified into different categories on the mutation severity basis in the CFTR gene (Messick, J. 2010).

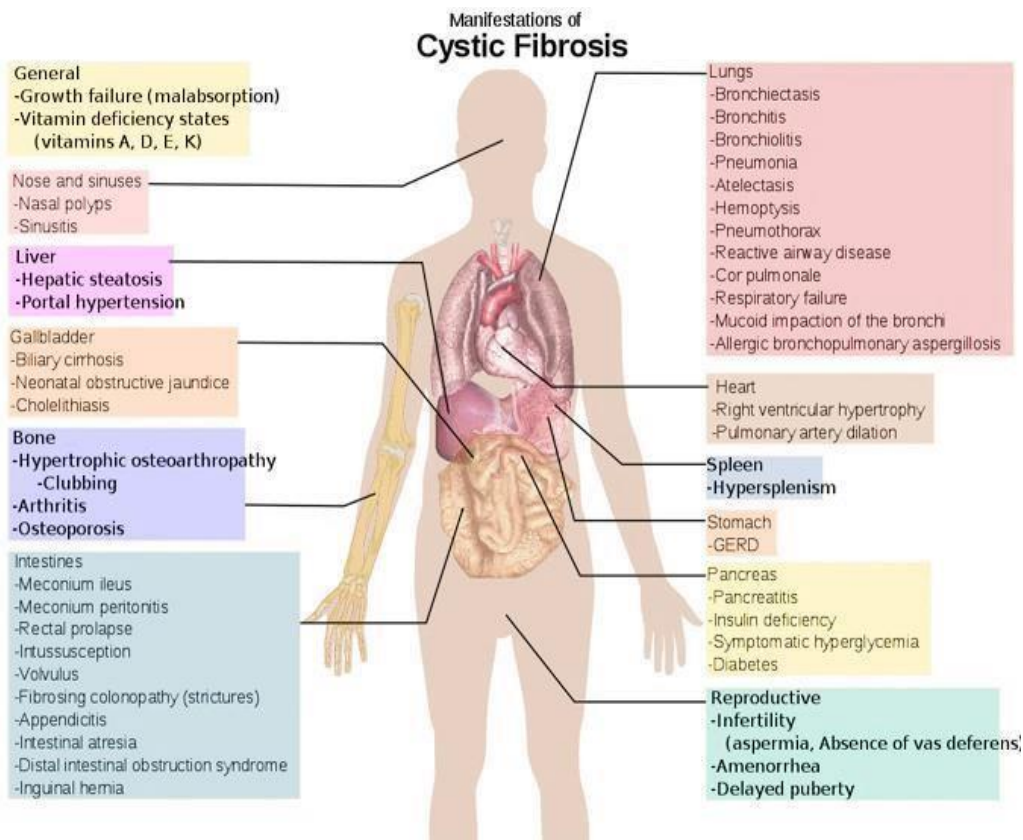
**Table 9:** Classification of Mutations in CFTR

Class	Mutations
<b>I</b>	Defective Production of CFTR Protein
<b>II</b>	Changes in CFTR Protein Maturation
<b>III</b>	Defective Regulation of CFTR Protein
<b>IV</b>	Decreased Chloride Conductance
<b>V</b>	Decreased No. of Functional CFTR Proteins
<b>VI</b>	Instability of CFTR Proteins

Class I, II & III are related to the insufficiency of the pancreas along with the CFTR improper expression and functioning as they are much severe while class IV, V and VI are related to the sufficiency of the pancreas and are relatively less severe (Cleveland, R. et al., 2009). In contrast to these classifications, cystic fibrosis can also cause the respiratory as well as the non-respiratory.

**Diagnosis:-**

Cystic fibrosis can be easily diagnosed with the help of some biochemical testing and genotyping techniques and biopsy of the patient can also be examined. As the disease shows the various effects upon the different body organs hence, it may cause the confusion in the detection and confirmation of the disease so in that case the differential diagnosis of the suspected diseases can be examined altogether over a single test and the results would confirm the presence of the disorder (Nelms & Sucher, 2015; Scott, A. 2013).



**Fig. 10:** Organs at risk of Cystic Fibrosis

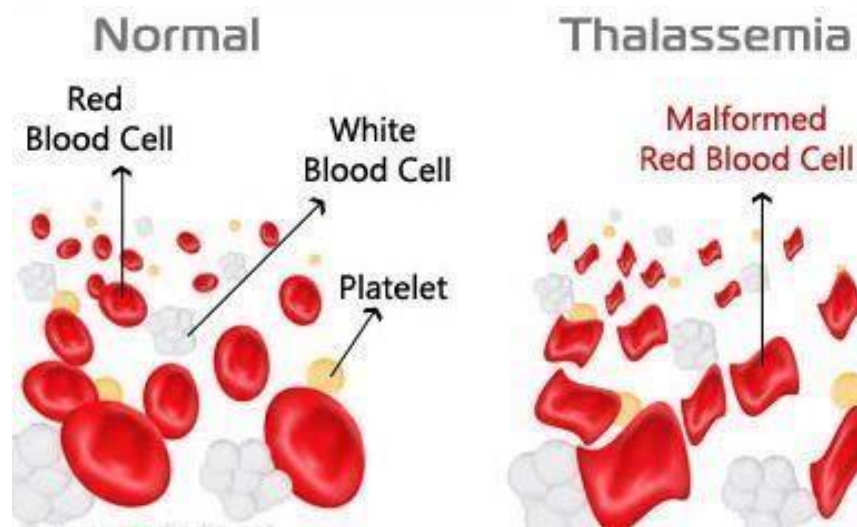
**Treatment:-**

Cystic fibrosis can be commonly cured by the help of the antibiotic therapy as it play a vital role in the reduction of the inflammatory response that occurs in the result of some chronic bacterial infection (Cohen-Cyberknoh, M. et al., 2013; Elizur, A. et al., 2008). The antibiotics like ibuprofen, glycerin, azithromycin and amphotericin B act as the anti-inflammatory agents (Wiehe & Arndt, 2010). Chest imaging i.e. High resolution computerized tomography [CT] Scan and the standard chest radiography are also being used for a purpose that is the evaluation of the lung status in the inflammatory stage of the body as it is an organ that is at the high risk of getting disease (Ashlock & Olson, 2011; Zemanick, E. et al., 2010). Hence, the anti-inflammatory therapy has been introduced in order to treat the lung disease that comes up as the resultant of the cystic fibrosis (Elizur, A. et al., 2008). The treatment of that disease is a huge challenge as it is a cost effective scenario as well as the treatment burden is also unbearable (Hoffman & Ramsey, 2013; Jones & Helm, 2009).

**Blood Cells: Thalassemia:-**

The most common of the autosomal inherited recessive congenital monogenic disorders is Thalassemia these days. It is an analog of inherited anemia. WHO has reported that approximately 60,000 births take place suffering from the major thalassemia disease on the yearly basis (Aydinok, Y. 2012). Thalassemia is one of the major global public health issues of the socio-economic importance in many countries of the Asia (Fucharoen & Winichagoon, 2002).

It has been assumed that in the upcoming decade, figure of the Thalassemic births would come around a Million. Out of which 95% of the cases would be from Asian regions (Cunningham, M. 2008; Vichinsky, E. 2005; Weatherall, D. et al., 2006; Weatherall & Clegg, 2001).



**Fig. 11:** Effect of Thalassemia on RBCs

**Etiology:-**

Thalassemia is actually a class of disorders that happen due to the improper synthesis or the lack of the globin chains of hemoglobin i.e.  $\alpha$ ,  $\beta$ ,  $\gamma$  and  $\delta$  present within the RBCs and performs various body functions (Fucharoen & Winichagoon, 2002). These changes occur due to the mutation of the Hemoglobin alpha [HBA] or Hemoglobin Beta [HBB] gene that regulates the synthesis of hemoglobin and the mutation in  $\alpha$ -gene leads to the  $\alpha$ -Thalassemia while the mutation in the  $\beta$ -gene leads to the  $\beta$ -Thalassemia (Cunningham, M. 2010; Hong, C. et al., 2013). The cytogenetic locations of these genes within the human genome are 16p13.3 and 11p15.4.

**Classification:-**

The classification of the Thalassemia has been made on the basis of the clinical significances which are mentioned as follows;

1. Severe Thalassemia [Thalassemia Major]
2. Thalassemia Intermedia
3. Asymptomatic Thalassemia [Thalassemia Minor] (Fucharoen & Winichagoon, 2002)

**Table 10:** Clinical Features of Thalassemic Patients

Syndromes	Severity	Hb Level [g/dl]	Mortality Rate
<b>Thalassemia Major</b>	Severe anemia	≤6	High
<b>Thalassemia Intermedia</b>	Mild anemia	7	Moderate
<b>Thalassemia Minor</b>	Asymptotic anemia	≥9	Low

**Diagnosis:-**

Thalassemia shows some signs and symptoms that are alike the condition of the Iron deficiency. Therefore, in order to get rid of the confusion of these disorders diagnosis, some tests like Red Blood Cell Distribution width [RDW], Mean Corpuscular Volume [MCV] (Muncie & Campbell, 2009), Peripheral smear, bone marrow aspirate, hemoglobin electrophoresis, serum ferritin & lead level, family history and differential diagnosis can be examined. All the results of these tests would be relatively lower than that of the iron deficiency condition (Cook, J. 2005; Goddard, A. et al., 2011).

**Treatment:-**

The major common remedies against the thalassemia that has been proves successful to some extent are as follows;

**Blood Transfusion** - The patients suffering from the high severity of this syndrome i.e. thalassemia major tend to need the blood transfusions on the proper schedule throughout the life in order to maintain the blood Hb-level that declines due to the improper globin synthesis and to promote the normal growth (Klein, H. et al., 2007; Olivieri & Brittenham, 2013; Rund & Rachmilewitz, 2005; Sornjai, W. et al., 2016).

**Endocrinopathy** - Growth hormone therapy has been recommended as a variable successful treatment for the  $\beta$ -thalassemia but it is an often used approach (De Sanctis, V. 2002; Delvecchio & Cavallo, 2010).

**Bone Marrow Transplant** - It is the most successful approach of the cure for the thalassemia major, as the precursor of the RBCs i.e. hematopoietic stem cells can be replaced with some healthy ones and ultimately the production of the healthy erythrocytes takes place (Rund & Rachmilewitz, 2005; Sornjai, W. et al., 2016).

**X-Linked Dominant Chromosomal Monogenic Disorders:-****Mental Retardation: Fragile X Syndrome:-**

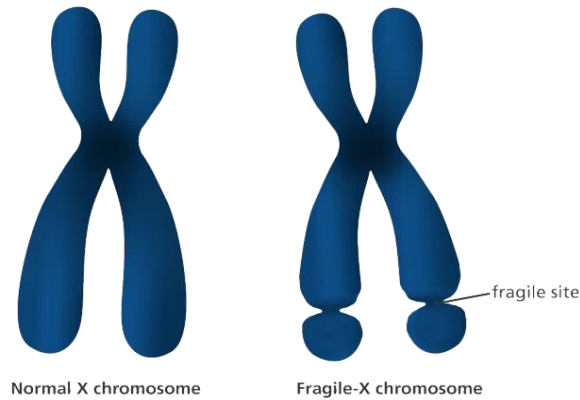
Fragile X Syndrome [FXS] is one of the most rarely occurring congenital X-Linked dominant chromosomal monogenic disorders. This disorder is the cause of learning disability and mental retardation that could be of any stage from mild to moderate and then to the severe in people throughout globe (Garber, K. et al., 2008). Its global prevalence is nearly 1/4000 in males and 1/8000 in the females (Klusek, J. et al., 2014; Sabaratnam, M. 2006; Sabaratnam, M. et al., 2003).

**Etiology:-**

FXS usually occurs due to the unexpressed FMR1 gene which encodes the fragile X mental retardation protein [FMRP]. The inexpression results because of the addition of GGG repeats within the 5'-UTR of the gene (Santoro, M. et al., 2012). The cytogenetic location of the FMR1 gene within the human genome is Xq27.3. FMR1 is one of the genes to be cloned for the first time that are related to the human intelligence (Garber, K. et al., 2008).

**Diagnosis:-**

FXS can be easily diagnosed by the help of fairly expressed phenotype of the infant. Besides this, the occurrence of the FXS can be confirmed by various genotyping technologies, Southern blot, PCR, microarray and differential diagnosis. The step towards the cure of the disorder can be taken when the cause is known (Hill, M. et al., 2010; Sabaratnam, M. 2006).



**Fig. 12:** Fragile X Syndrome



**Fig. 13:** Autism & Mental Retardation by FXS

#### **Treatment:-**

The possible cure for the Fragile X syndrome is based upon the medications that favors the mental relaxation by causing the impulsions, hyperactivity and distractions in the mind (Berry\_Kravis & Potanos, 2004). Selective Serotonin reuptake inhibitors [SSRIs], Ampakine and some other relevant drugs can be proved useful as they are effective against the conditions like anxiety and aggression etc. (Berry-Kravis, E. et al., 2006; Berry\_Kravis & Potanos, 2004; Garber, K. et al., 2008).

#### **Bone: Hypophosphatemia:-**

Hypophosphatemia is an X-linked dominant chromosomal genetic disorder. It refers to the disorder that leads to the depletion in the phosphate level in the blood serum. It is usually uncommon in the population (Brunelli & Goldfarb, 2007; Felsenfeld & Levine, 2012). As phosphate is an essential component for many body pathways that includes the plasma pH maintenance, cellular signaling, skeletal development, bone mineralization, structure of nucleotide and membrane composition (Bacchetta & Salusky, 2012).

#### **Etiology:-**

The major cause of the hypophosphatemia is the mutation in phosphate regulating endopeptidase gene [PHEX] that regulates the phosphate level in the serum (Bacchetta & Salusky, 2012). Its cytogenetic location within the human genome is Xp22.11.



**Classification:-**

Hypophosphatemia has been classified on the basis on its affecting duration period as well as the severity. It is mentioned as below;

- 1. Acute Hypophosphatemia
- 2. Chronic Hypophosphatemia

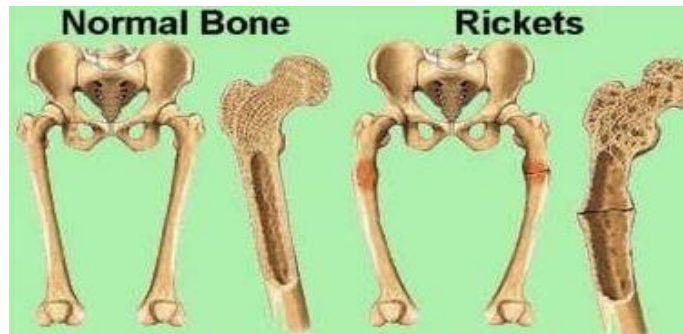
Acute Hypophosphatemia is actually due to nosocomial infections and can be significantly morbid as well as mortal and chronic hypophosphatemia is an inborn genetic disorder that promotes the skeletal disorders in the children [rickets] as well as in adults [Osteomalacia] (Felsenfeld & Levine, 2012). While on the severity basis, the hypophosphatemia can be categorized as;

**Table 11:** Phosphate Levels in different Hypophosphatemia Stages

Hypophosphatemia Severity	Phosphate Level
Mild	2-2.5 mg/dL
Moderate	1-1.9 mg/dL
Severe	1 mg/dL

**Diagnosis:-**

The hypophosphatemia can be easily diagnosed by the help of its unique signs and symptoms that includes the poor oral intake, increased renal loss and intracellular phosphate redistribution (Boateng, A. et al., 2010; Marinella, M. 2005; Ornstein, R. et al., 2003).



**Fig. 14:** Rickets due to Hypophosphatemia



**Fig. 15:** X-Ray view of the Rickets

**Treatment:-**

The treatment of the hypophosphatemia involves the approaches by which the phosphate depletion can be fulfilled or restored. Direct phosphate oral supplementation, vitamin D intake and the medications like Cinacalcet, Dipyrimadole and Calcitonin helps in treating this disorder. The salts of phosphates can also be used as the supplements for electrolyte balancing (Geerse, D. et al., 2010; Imel & Econs, 2012; Marinella, M. 2005).

**X-Linked Recessive Sex Chromosomal Monogenic Disorders:-****Bleeding: Hemophilia:-**

Hemophilia is also a common congenital X-Linked recessive sex chromosomal monogenic bleeding disorder (Caviglia, H. et al., 2015). It has been classified as hemophilia A and hemophilia B due to same outcomes but different causes of the disorder (Jayandharan, G. et al., 2012; Kaufman & Powell, 2013; Rodriguez & Hoots, 2010). As the disorders are X-Linked, it affects the males at the most and females can also be the carriers despite of being affected (Plug, I. et al., 2006). The global prevalence of the hemophilia A is 1/5000 in males and of the hemophilia B is 1/30000 in males (Stonebraker, J. et al., 2010; Stonebraker, J. et al., 2012).

**Etiology:-**

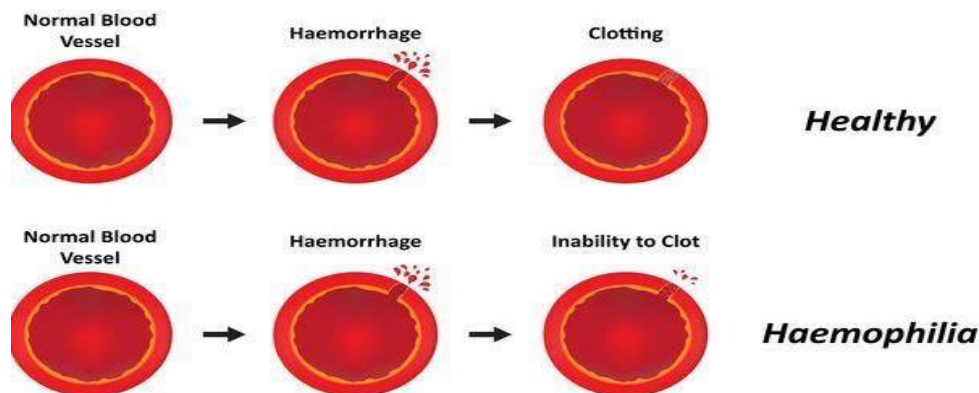
Hemophilia usually occur due to the lack of factor VIII [F8], in case of hemophilia A or factor IX [F9], in case of hemophilia B (Carcao, M. 2012; Peyvandi, F. et al., 2016). The cytogenetic location of these genes within the human genome is Xq28 and Xq27.1 (Bowen, D. 2002). Both of these genes play a role in the coagulation of blood normally.

**Diagnosis:-**

Hemophilia can be diagnosed by the genotyping technologies and via simple blood test for the factors on unit calculation. The prevalence of hemophilia generally gets disturbed by avoiding the mild cases from the count. As it do not usually diagnosed because of its less fatality rate as compared to the moderate and the severe types. This disorder reduces the life span of the patients as well as the prevalence (Bhat & Cabey, 2014; Carcao, M. 2012; Peyvandi, F. et al., 2016).

**Treatment:-**

Various adjunctive therapies have been discovered for the possible cure of the hemophilia including anti-fibrinolytic agents. Prophylaxis is another most successful approach for the cure of hemophilia and is the most ancient one that is being used since last 50 years (Feldman, B. et al., 2006; Gringeri, A. et al., 2011). Gene therapy and the stem cell transplantation are the most recent one approach in the field of the treatment of this very severe, inherited, monogenic and congenital disorder (Chuah, M. et al., 2013).



**Fig. 16:** Effect of Hemophilia on body cells

**Skin: Ichthyosis:-**

Ichthyosis is basically a group of skin related disorders that are X-linked recessive sex chromosomal inherited in pattern (Vahlquist, A. et al., 2008). It is most frequent in affecting the males completely whereas the females can also be the carriers of the disorder. It generally leads to the scaling and dryness of the skin with some prominent spotting.



The global prevalence of the ichthyosis is approximately 1/6000 in males (Fernandes, N. et al., 2010; Oji & Traupe, 2009).

#### **Etiology:-**

The major cause of the ichthyosis is the mutation in the steroid sulphatase [STS] enzyme. 1,2. Deletion mutations within the gene usually leads to the ichthyosis while almost complete deletion of the gene has been observed in the 90% of the affected individuals (Fernandes, N. et al., 2010).The cytogenetic location of the STS gene within the human genome is Xp22.31 (Vahlquist, A. et al., 2008).



**Fig. 17:** Effects of Ichthyosis on body

#### **Diagnosis:-**

The genetic and biochemical testing are the most concise diagnostic ways of the ichthyosis (Fernandes, N. et al., 2010).There is a great confusion in the identification of the disorder due to its similar related classified disorders i.e. ichthyosis vulgaris, lamellar ichthyosis and bullous ichthyosis but their causes varies as they are autosomal dependent dominant as well as recessive (DiGiovanna & Robinson-Bostom, 2003). Hence, the differential diagnosis and the prenatal diagnosis are the most reliable approaches for the detection and confirmation of the disorder in order to take the step towards the appropriate treatment including southern blot (Reed, M. et al., 2005), in-situ hybridization (Chen, H. 2006; Lebo, R. et al., 2013) and PCR (Sugawara, T. et al., 2000), the most commonly used techniques of the molecular biology (Vahlquist, A. et al., 2008).

#### **Treatment:-**

The ichthyosis can be proved lethal while going from mild to the severe stage. The possible cures for getting rid of these disorders include topical therapy, by hydration and lubrication, use of keratolytic agent for enhancement of the skin hydration and the systemic treatment for proper skin functioning i.e. sweat production (DiGiovanna & Robinson-Bostom, 2003).

#### **Future Prospects:-**

As the monogenic disorders are the most common issues of the society that are usually resulting from the consanguinity can be overcome by applying the precautionary measures to the social acts i.e. marriages. The genetic analysis of the individuals can be performed before performing such acts for avoiding such complications in future. Various detection methods and the possible treatments have been established against these monogenic disorders furthermore, some high throughput technologies are being implemented in this field of health for the fulfillment of the need of treatment. Prenatal diagnosis has also been proved a reliable technique of the diagnosis till now but also causes confusions while the diagnosis with some other resembling diseases. Therefore, the advancements are also

being made in the field for solving that problem. In the upcoming decade there is a possibility of gradual decrease in the monogenic disorders if preventive measures are done properly. Besides this, if the situation persists then there is equal possibility of the continuous increase in these disorders.

Several biomedical health related organizations are working on the genetic disorders, monogenic as well as polygenic, for the welfare of mankind. Along with the comprehensive study of these disorders, the public awareness is also being delivered so that the people must know about the complications while developing any decision. The fate of their offspring can be diagnosed whether it is normal or mutated. Recombinant DNA Technology and the techniques of Genetic Engineering are supposed to be beneficial for the most efficient cure of these abnormalities.

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### RESEARCH ARTICLE

#### SERUM GALECTIN-4 (GAL-4) IN PATIENTS WITH GASTRIC ADENOCARCINOMA: ACTIVE PLAYER IN THE FIELD.

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#### Abstract

**Introduction:** Galectin-4 is one of a  $\beta$ -galactosides binding proteins family that recognize a variety of glycan-containing proteins at the cell surface and are overexpressed in various tumors, including gastric cancer. Galectin-4 overexpression as well as changes in their subcellular distribution has been associated with gastric cancer progression and poor prognosis. It may provide diagnostic molecular markers for gastric cancer as well as clues for developing therapeutic targets on individual basis.

**Aim of the study:** To detect the levels of GAL-4 in the sera of healthy people and patients with gastric cancer and also, to investigate the validity of using GAL-4 as a specific diagnostic marker of gastric cancer.

**Patients and methods:** 25 gastric cancer patients were included in this study. They were among patients who attending the Endoscopy Department, during the period from September 2015 to March 2016. In addition, 15 apparently healthy people were chosen as a healthy control group. For these two groups, serum level of GAL-4 using ELISA technique was carried out.

**Results:** There was a statistically significant difference in serum level of GAL-4 among gastric adenocarcinoma patients in comparison to healthy controls ( $p \leq 0.001$ ), using receiver operating characteristic curve (ROC) area, serum GAL-4 has high area under the curve (0.924) with a cut off value equal to or above 0.42ng/ml which was associated with the highest sensitivity (100%).

**Conclusions:** Serum levels of GAL-4 were significantly higher in patients with malignant gastric adenocarcinoma which may confirm a possible role of this marker in the pathogenesis of the disease, furthermore the highest sensitivity and best accuracy obtained from serum GAL-4 was by using a cut off values equal to or above 0.42ng/ml. So, GAL-4 may be promising new diagnostic tools especially at early stages and among patients at high risk.

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### Introduction:-

Gastric cancers are one of the most frequent fatal malignancies in the world (1) and have a wide pathological and biological variety (2). However, accurate molecular pathways of gastric carcinogenesis and clinical progression are yet to be clarified. So that, a comprehensive proteins expression profile of gastric cancers is necessary to provide a diagnostic molecular markers for gastric cancer as well as to clue for developing therapeutic targets on individual basis (3).

Despite a major decline in incidence and mortality over several decades, stomach cancer is still has a 10-fold variation in incidence between populations at the highest and lowest risk. The incidence is particularly high in East Asia, Eastern Europe, and parts of Central and South America, and it is about twice as high among men than among women; It is estimated about 21,600 men and women (13,230 men and 8,370 women) will be diagnosed with it and 10,990 men and women will die from gastric cancer in 2013 (4,5). Galectins are a group of proteins that bind  $\beta$ -galactosides through evolutionarily conserved sequence elements of the carbohydrate recognition domain (CRD) (6, 7, 8), as galectins are expressed by different immune and inflammatory cells, therefore, they can affect and regulate different responses produced by the host against tumors. In addition, galectins are released by tumors and can modulate a variety of inflammatory responses (9, 10) either by amplification of the inflammatory responses, including regulation of leukocyte survival and function or activation of homeostatic signals to shut off immune effector functions. Like many other cytokines and growth factors, galectins may exhibit a 'double-edge sword' effect depending on many different intrinsic factors like microenvironment (11, 12). Moreover some galectins released by the tumor might help the tumor to avoid the immune surveillance (13).

### Patients and Methods:

This study involved 25 cases with gastric cancer were included in the study. Their age ranged between 34 to 77 years with a mean of  $60.4 \pm 10.7$  years ( $\pm$  SD). On the other hand a total of 15 healthy controls were included in the study. Their age ranged between 32 to 76 years with a mean of  $53.6 \pm 10.9$  years ( $\pm$  SD). Those patients were diagnosed clinically, radiologically, cytologically, and histopathologically, they were among patients who attending the Endoscopy Department, during the period from September 2015 to March 2016. Also, 15 apparently healthy persons were chosen as a healthy control group. For these two groups, serum level of GAL-4 using sandwich ELISA technique was carried out.

Galectin-4 (Gal-4) ELISA KIT (Antibodies-Online.Com): The kit was a sandwich enzyme immunoassay for in vitro quantitative measurement of GAL-4 in human serum, plasma & other biological fluids (14).

Statistical analysis was done using SPSS (Statistical Package for Social Sciences). The majority of the outcome quantitative variables were non-normally distributed. Such variables are described by median and interquartile range. Statistical significance of differences between averages for parameters of normal distribution was assessed using the Student's t-test, and the difference in median of a quantitative non-normally distributed variable between 2 groups was assessed by nonparametric Mann-Whitney test.

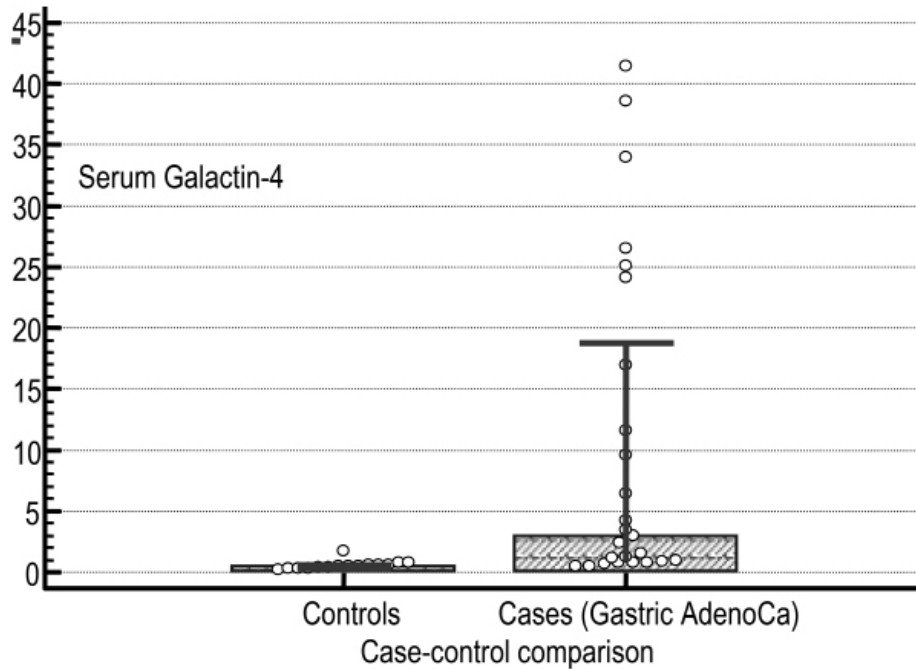
The statistical significance, direction and strength of linear correlation between 2 quantitative variables, one of which being non-normally distributed was measured by Spearman's rank linear correlation coefficient. P value less than the 0.05 level of significance was considered statistically significant (15).

### Results:-

The ranges, median and mean value of serum GAL-4 in blood of gastric cancer patient and control groups are shown in table 1; there was a statically significant difference in the serum level of GAL-4 between gastric adenocarcinoma patients and healthy controls ( $p < 0.001$ ), as shown in (table 1 and figure 1).

**Table 1:-** The ranges, median and mean values of serum GAL-4 in blood of gastric cancer patients and control groups.

Serum Galactin-4					
Case-control comparison	N	Range	Median	Mean rank	Interquartile range
Controls	15	(0.22 - 1.7)	0.50	9.90	(0.28 - 0.61)
Cases (Gastric Adenocarcinoma)	25	(0.46 - 41.41)	2.97	26.86	(0.85 - 16.96)

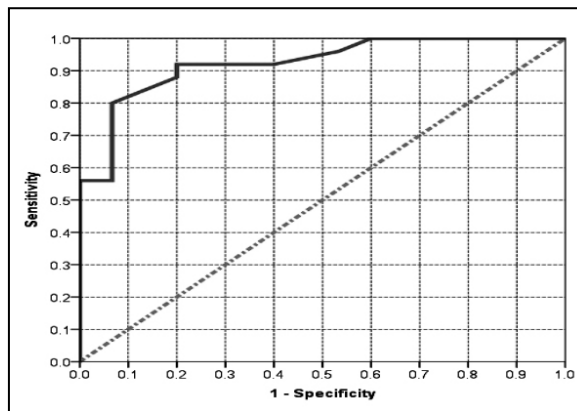


**Figure 1:-** Differences in median values of serum GAL-4 between 2 study groups.

As shown in (table 2 and figure 2) the large area under the ROC curve for galectin-4 (0.924) which was significantly higher than (0.5) area.

**Table 2:-** ROC area for galectin-4 as a predictor.

	AUC	P
Serum Galactin-4	0.924	<0.001



**Figure 2:-** ROC curve showing the trade-off between sensitivity (rate of true positive) and specificity (rate of false positive) for galectin-4 when used as a predictor test for advanced gastric adenocarcinoma.

The cut-off value of serum GAL-4 associated with highest sensitivity (100%) was equal to or above 0.42 ng / ml. Testing negative at this cut-off value (serum level < 0.42 ng/ml) would exclude a possible diagnosis of gastric adenocarcinoma with 100% confidence (NPV “negative predictive value”=100%). The cut- off value associated with highest specificity (100%) was set at equal to or above 2.07 ng /ml; this cut-off value has an average sensitivity (56%). Testing positive at this high cut-off value (obtaining a serum GAL-4 concentration of 2.07 and above ng/ml) would establish a diagnosis of gastric adenocarcinoma with 100% confidence in any clinical context (any pretest

probability). The optimum cut-off value of serum GAL-4 in the context of case-control differentiation is the cut-off value that can classify tested subjects into gastric adenocarcinoma cases and control groups with the highest accuracy possible. The optimum cut-off value was set at equal to or above 0.63 ng/ml, therefore the sensitivity was 92% and specificity was 80% at this cut off value.

**Table 3:-** The validity parameters of galectin-4 when used as test to predict cases with advanced gastric adenocarcinoma differentiating them from healthy controls.

Positive if $\geq$ cut-off value	Sensitivity	Specificity	Accuracy	Matthew's correlation coefficient	PPV at pretest probability =		NPV at pretest probability = 10%
					50%	90%	
<b>Serum Galactin-4</b>							
0.42 (highest sensitivity)	100.0	40.0	77.5	0.542	62.5	93.8	100.0
0.48	96.0	46.7	77.5	0.516	64.3	94.2	99.1
0.54	92.0	60.0	80.0	0.564	69.7	95.4	98.5
0.59	92.0	66.7	82.5	0.62	73.4	96.1	98.7
0.63(optimum)	92.0	80.0	87.5	0.731	82.1	97.6	98.9
0.69	88.0	80.0	85.0	0.68	81.5	97.5	98.4
0.75	84.0	86.7	85.0	0.692	86.3	98.3	98.0
0.79	80.0	93.3	85.0	0.711	92.3	99.1	97.7
0.83	76.0	93.3	82.5	0.671	91.9	99.0	97.2
0.90	72.0	93.3	80.0	0.633	91.5	99.0	96.8
1.04	68.0	93.3	77.5	0.597	91.1	98.9	96.3
1.20	64.0	93.3	75.0	0.561	90.6	98.9	95.9
1.41	60.0	93.3	72.5	0.527	90.0	98.8	95.5
1.62	56.0	93.3	70.0	0.493	89.4	98.7	95.0
2.07 (Highest specificity)	56.0	100.0	72.5	0.568	100.0	100.0	95.3

### Discussion:-

The study showed that the median serum GAL-4 was significantly higher among gastric cancer patients in comparison to healthy controls ( $p < 0.001$ ). These findings were in agreement with a study conducted by Barrow et al (2011) who reported that the concentrations of free circulating galectins-2,-3,-4and-8 were all markedly increased in the blood circulation of patients with gastrointestinal tract cancer and, in particular, those with metastasis. The presence of these galectins promotes cancer cell adhesion to vascular endothelial cells by interaction with the Thomsen-Friedenreich (TF) disaccharide on cancer associated mucin protein-1 (MUC1) (16). Furthermore, a series of experimental and clinical data demonstrated a correlation between galectins expression and tumor progression and metastasis. Galectins function inside the cells in both carbohydrate dependent and in dependent manners and can regulate signal transduction as well as epithelial morphogenesis via an effect on centrosome biology (17). This study showed that serum GAL-4 was associated with high validity when used as a predictor test for advanced gastric adenocarcinoma. The high validity is evident from the large area under the ROC curve (0.924) which is significantly higher than (0.5) area associated with an equivocal test. In order to study the validity of serum GAL-4 in differentiating between gastric cancer patients from healthy controls, the present study showed that in a patient with serum GAL-4 equal to or above 0.42ng/ml (cut off value) one can establish the diagnosis of gastric cancer with 62.5% confidence (PPV) in a clinical situation where the present probability of tumor is 50%, or 93.8% confidence (PPV) in a clinical situation with high pretest probability (90%). Testing negative at this cut off value would exclude a diagnosis of gastric cancer with 100% confidence (NPV) in a clinical setting were the primary diagnosis of tumor is of small probability (10%pretest probability). In another words, if a physician has a(50%) clinical suspicion about a patients as a case of gastric mass and send them for testing serum level of galectin-4 and the result was positive, this test gives 62.5% confidence for a physician to establish the diagnosis, but if that physician has 90% clinical suspicion about the patient to be a case of gastric cancer and the result of serum level of galectin-4 was positive, these results give a 93.8% confidence for the physician to establish the diagnosis; while if a physician suspicion was 10% for a patient to be a case of gastric cancer and want to exclude the diagnosis for the tumor, serum galectin-4 negative result can give 100% confidence to exclude the diagnosis. A subject with serum

concentration of GAL-4 less than 0.63 ng/ml is considered as compatible with normal value (negative test) while a value of 0.63 ng/ml and above is considered abnormally high (positive test for gastric adenocarcinoma), within the working range of the test (0.42 – 2.07 ng/ml). Testing negative at the optimum cut-off value would exclude a possible diagnosis of gastric malignancy with 98.9% confidence in a clinical context, when gastric cancer is highly unlikely on clinical bases (pretest probability is 10% only), Testing positive at the optimum cut-off value would establish the diagnosis of gastric adenocarcinoma with 82% confidence in a clinical context of equal odds pretest probability for gastric adenocarcinoma; when the pretest probability of having this disease is increased to 90% (high clinical suspicion) having a positive test would be almost diagnosis raising the confidence in the diagnosis of gastric malignancy to 97.6%.

The mechanism for the increased circulating galectins in patients with gastric cancer is unclear. Members of galectins family are expressed by many types of human cells including epithelial, endothelial and immune cells including monocyte, macrophage and lymphocytes (16). The expressions of galectins in immune cells are heavily influenced by inflammatory regulator and also by differentiation and activation (18, 19). Many pro-inflammatory cytokines including TNF- $\alpha$ , IL-1, IL-8, and GM-CSF are up regulated in cancerous conditions and their presences may cause the immune cells to secrete more galectins in the blood stream (16, 20).

Finally, targeting the actions of circulating galectins in the bloodstream of gastric cancer patients may represents a very promising therapeutic strategy for preventing metastasis (21).

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### RESEARCH ARTICLE

#### MECHANICAL & STRUCTURAL CHARACTERISTIC OF HYBRID FRC.

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IBC Life Member, India.

#### Manuscript Info

##### Manuscript History

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##### Key words:-

Hybrid fibers, Polypropylene, Coconut  
coir fiber, Rubber fiber & ductility

#### Abstract

Background/Objectives: To evaluate the suitability of short rubber fiber, coir fiber & PP as a reinforcing agent in cement concrete/ mortar. Methods/Statistical analysis: Based on basic properties data of material a mix design for M<sub>20</sub> grade concrete taking a weight fraction of cement is 1%. For this work 12nos of cube (150 mm \* 150 mm \* 150 mm) and 12nos of beam (700mm \* 150 mm \* 150 mm) were casted by using different fiber proportion of polypropylene fiber, coir fiber & rubber fiber in the laboratory; and for the compared study with the HFRC one set of control specimen were cast. Findings: All the cube specimens were tested by UTM and beam specimens were also tested in UTM by using two points loading as per IS 516-1959. The test result shows that the hybrid of 1% with PP, CC & RF combination specimens improves compressive strength & flexural strength as compared with control specimen. Applications/Improvements: The hybrid fiber reinforced concrete can be used in non-structural components like Walls & Surfaces of Septic Tank, Water Storage Tanks and Dams, Sports Grounds, Industrial, Residential Floors, Warehouses & also used in severe earthquake area etc. The major contribution of fibers in crack resistance and crack control, improve the ductility of concrete.

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#### Introduction:-

The design of a durable and economical fiber reinforced concrete for construction purpose is a technically challenged in developing countries like India. It has a potential to be used as a secondary reinforcing agent to overcome the inherent deficiencies in cementitious materials. Currently, different types of fibers are used included steel, glass, polymers, carbon & natural fibers. From the economical consideration have restricted to use of carbon fiber in cementitious composite due to corrosion & non-economic performance. Since the unreinforced concrete has adequate strength for much structural application but is relatively brittle materials. The addition of fibers in concrete has been used to overcome that problem. Factors affecting properties of FRC are fiber types, geometric forms, surface condition, mix proportion and age of curing period.

For a hybrid, more than two different fibers are mixed with a concrete matrix to produce a composite material. Use of both synthetic and natural fiber can give potential advantages in improving the performance of concrete matrix. HFRC can be useful in a variety of activity in the field of civil engineering. Hence, this experiment proves the feasibility of HFRC with required grade of the concrete matrix with a weight of cement fraction of 1% in various construction fields in future.



Previously straw, horse hair was used as reinforced brick & reinforced plaster respectively. Now- a-days asbestos fiber are being used with OPC to produced water resisting sheet.

From the study of HFRC of S.Sarangi& A.K. Sinha can be found out that combination of both coir fiber and PP fiber with mix proportion of CC 0.25 PP 0.75 gives a compressive strength & flexural strength of 40.98 Mpa & 14.339 Mpa respectively at the age of 28 days.

F.PachecoTorgal& S. Jalali proposed a review on tire rubber wastage based concrete matrix & recommended for a concrete structure located in areas of several earthquake risks and also used for a dynamic load like structure (railways sleeper).

Dr. T. Ch. Madhavi found from her review study that, Polypropylene fibers reduce the water permeability, plastic, shrinkage, and settlement and carbonation depth. Using excess amount of PP fiber in concrete gave poor workability, which can be counteracted by adding HRWR admixture even if at w/c ratio of 0.3.

### **Materials Used:-**

In this experimental study cement, fine aggregate, coarse aggregate, coconut coir fiber, polypropylene fibers were used.

#### **Cement:-**

Portland Slag based Cement (Brand-UltraTech) conforming to IS 455:1989. Test results are shown in Table 1

#### **Fine Aggregate:-**

Clean and air dry river silica grained sand locally available was used. Sand passing through IS 4.75mm sieve [IS: 383:1970] was used as sample specimens. The test result of FA is presented in Table 2

#### **Coarse Aggregate:-**

Locally available crushed granite stone of 20mm is used for this experiment. Test results on coarse aggregate are given in Table 3

#### **Polypropylene Fiber:-**

Fine fibrillated polypropylene monofilaments named as "Fiber Guard"; supplied by M/S Bajaj Reinforcement LLP Nagpur, Maharashtra, India was used. The various properties of Polypropylene fiber are given in Table 4

#### **Coconut Coir Fiber:-**

Brown clean coconut coir fiber was collected from a local market. Properties of coconut coir fiber are presented in Table 5

#### **Rubber (Tyre) Fiber:-**

Scrap rubber is collected from near tyre resoling center. Cleaned and air dry tyre particles are used in this experiment. Properties of rubber fiber are shown in Table 6

#### **Water:-**

Portable drinking water for mixing & curing,

#### **Mix Design:-**

A design mix has been adopted as per IS10262:2009 for M<sub>20</sub> grade concrete. Mix proportion details are shown in Table-7

### **Experimental Methodology:-**

#### **Compressive Strength Test:-**

It is determined by using the compressive testing machine as specified IS 516-1959. Cubes of 150 mm size were subjected to a uniformly rated compressive load of 140 Kg/cm<sup>2</sup> per minute until failure at ageof 28 days. Average of three is taken. Test results are shown in graph-1

**Flexural Strength Test:-**

Plain concrete also having a negligible tensile property as compared to compressive strength. Flexural strength value is very much similar to the tensile strength of the material. Here flexural strength test is done by using two points loading frame method in UTM is considered. According to Indian standard, a beam of 700 mm \* 150 mm \* 150 mm was cast in cast iron form work. After de-moulds allowed the beam for normal (submersed in a water bath) curing at room temperature for an age period of 28 days. By using two points loading method, applied a uniform load rate of 400 Kg / Min. & noted down the ultimate fracture load and by computing can find out the flexure strength of the concrete. Averages of three sample test results are. The beam set up in machine and cross-section of hybrid fiber reinforced beam is shown in Figure 2 and 3 respectively.

$$\text{Flexural strength} = 3/2 (pl/(bd^2))$$

b: Breadth of the tested beam (mm)

p: Ultimate cracking load (N)

l: Length of the support span(mm)

d: Depth of the tested beam(mm)

Test results are shown in graph-1

**Table 1:-**Properties of Cement

Properties	Value
Fineness (%)	3.5
Sp. gravity	3.10
Soundness (mm)	2
Consistency (%)	32
Initial setting time (Minute)	50
Final setting time(minute)	320

**Table 2:-**Properties of FA .

Properties	Value
Sp. gravity	2.67
FM	5.17
Zone	II
Moisture Content	8%
Bulk Density <sup>grm/cm<sup>3</sup></sup>	1.890

**Table 3:-**Properties of CA.

Properties	Value
Sp. gravity	2.95
FM	6.97
Bulk density( <sup>grm/cm<sup>3</sup></sup> )	1.635
Impact strength (%)	25.37

**Table 4:-**Properties of PP Fiber

Properties	Value
Length (mm)	20
Diameter (mm)	0.1
Sp. gravity	0.91
Water absorption	Nil
Tensile strength (KN/Sq mm)	0.67

**Table 5:-**Properties of Coir Fiber

Properties	Value
Length (mm)	6-24
Diameter (mm)	0.29-0.83
Water absorption	10%

**Table6:-** Properties of Rubber Fiber.

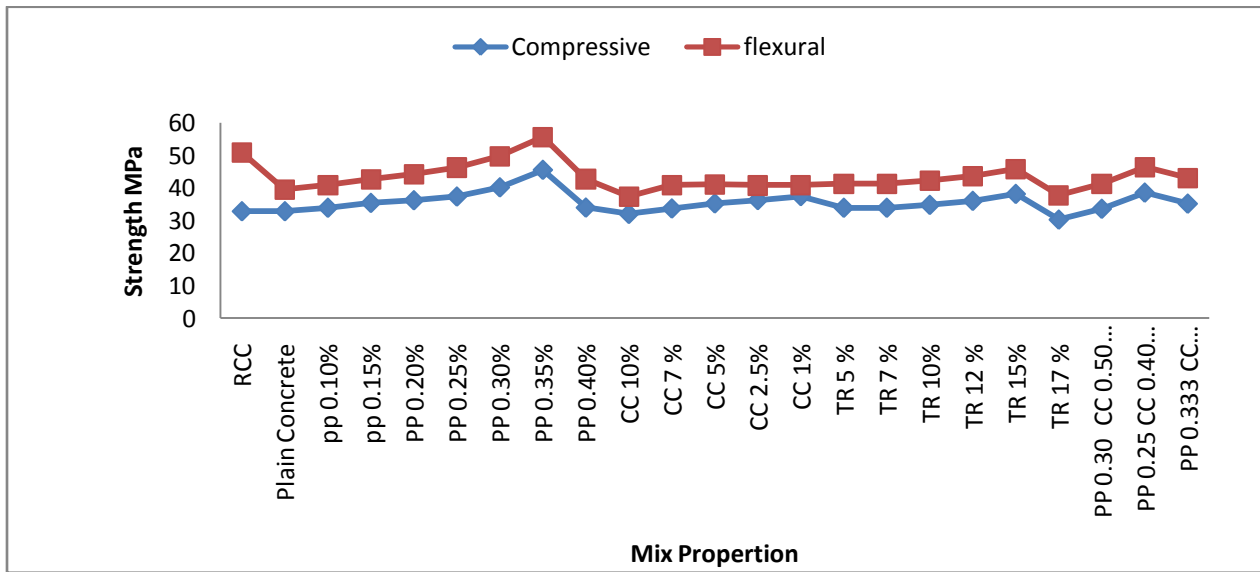
Properties	Value
Length (mm)	20
Diameter (mm)	0.2
Water absorption	Nil

**Table 7:-**Mix Proportion

Particulars	Value
Cement (Kg) per Cum	372
FA (Kg) per Cum	833
CA (Kg) per Cum	1125
Water (Lit) per Cum	186
w/c	0.50 %
Ratio (C:FA:CA)	1:2.23:3.13

**Results and Discussion:-**

Results of compressive strength and flexural strength test for M<sub>20</sub> grade concrete mix with 0%(PCC), RCC, PP (0.10% to 0.40%), CC (1%to 10%), TR(5% to 17%) with hybrid mix of{ (PP 0.30% CC 0.50% TR 0.20%),( PP 0.25% CC 0.40% TR 0.25%) & (PP 0.33% CC 0.33% TR 0.33%) } are shown in the Grahp-1.



**Graph1:-** Compressive & Flexural Strength



**Fig 1:-** Cubes in CTM.



**Fig 2:-** Beam is set for testing.



**Fig 3:-** C/S of beam after failure

**Conclusion:-**

From the all types of mix proportion PP0.25 CC0.40 TR0.35 gives a satisfactory strength with increased 17.38% as compared to plain concrete. But, from the analysis study of the flexural strength at 28 days of the entire specimen found that uses of RCC give more strength as compared to others. As reinforcement is a corrosion material. So, PP 0.35% achieved 52.12% of the strength i.e. (PFRC). However, a hybrid of all the three fiber gives 19.43% more strength as compared to normal (Ref) concrete specimen. Therefore, concluded that use of a hybrid form of the entire material can increase the structural & mechanical quality of the concrete which is economical & eco-friendly. Henceforth it can be used as construction materials.

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### RESEARCH ARTICLE

#### EDUARDO MENDOZA'S *LA VERDAD SOBRE EL CASO SAVOLTA*: AN EXPERIENCIAL JOURNEY THROUGH BARCELONA.

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##### Manuscript History

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Industrialization, Capitalism, Workers, Barcelona, Marx, Eduardo Mendoza.

#### Abstract

Spanish novelist Eduardo Mendoza has recently won the 2016 Cervantes Prize for *La verdad sobre el caso Savolta*. It is the Spanish-speaking world's highest literary honour. He has been awarded for bringing a new narrative style to Spanish fiction. The novel is about the industrial, social and economic changes the city of Barcelona saw during the 19th and 20th centuries. Since this fiction appeared to me as a classical text, this work proposes to see this novel from a Marxist perspective. Examining these novels in the light of Marxist theory facilitates a greater comprehension of the texts and enhances the understanding of Barcelona.

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#### Introduction:-

After the decline of feudalism in Spain and other European countries, a new class had emerged. This new class was of merchants and industrialists. They were called the Bourgeoisie class. The twentieth century Barcelona witnessed the development of the bourgeoisie that built and managed the factories and considerably increased the population of the working class. Capitalism became the dominant mode of production in Barcelona and has maintained its eminence since then. Along with industrialization, the process of urbanization was also very fast and influenced the lives of the people of Barcelona. The urban experience under capitalism was forming a different consciousness among the people and I would like to quote Marx here who said that "It is not the consciousness of men that determines their being, but, on the contrary, their social being that determines their consciousness." (Parkin, 1979, p.27)

*La verdad sobre el caso Savolta* is about the development of Barcelona in the 20th century. This work reflects exactly what was happening in the cities of Spain with urbanization and modernization. *La verdad sobre el caso Savolta* deals with Barcelona and Javier Miranda, the protagonist of the novel who is also the main witness in a New York court case concerned with the life insurance of his former boss, Paul-André Lepprince, who died in an incident in the Savolta factory. The proofs of the court and memories of Miranda give us detail about the life of Barcelona between the years 1917 and 1919. They were full of social tensions, anarchist rebellions marked by class conflicts. After Miranda moved to Barcelona from Valladolid, he met Paul-André Lepprince, a French businessman who after arriving in Barcelona in 1914 becomes rich and ranks among the upper class of Barcelona acquiring authority of the arms factory. He does this by marrying Maria Rosa Savolta, the daughter of the main shareholder of the Savolta factory. Miranda unknowingly becomes Lepprince's puppet and marries Maria Coral, Lepprince's another girlfriend so that he can continue his relationship with her despite his marriage with Maria Rosa Savolta. After the other shareholders of the Savolta plant are killed, Lepprince gains almost exclusive control over the business, which

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brings him huge wealth due to the First World War and the secret sale of arms on both sides of the conflict. However, anarchist rebellions, general work strikes and the end of the war caused the demise of the plant Savolta and Leppince. Before Leppince could be declared bankrupt, an anarchist agitation ended his life, burning the factory along with him.

### **Analysis:-**

This novel deals with a long history of Barcelona's industrial development. The city has also witnessed the development of both the bourgeoisie and workers socialist movements. In order to understand exactly how this historical novel deals with the questions of Spanish society, I intend to see the content of the novel from the perspective of Marx.

According to the article of 6th October 1917 that was published on the newspaper *La voz de la justicia* of Barcelona, the writer clearly shows two pictures of Spain. On one hand he is very happy to mention that there is freedom of press, constitutional guarantees, universal adult franchise and the nation is civilized. On the other hand he says that his land has entered into dark ages as there is exploitation of worker by the powerful. The workers who are illiterate, who are not able to understand the present situation are the victims of the capitalism which has started expanding in the city. The capitalist society does not address the problems of the workers. It does not work to create awareness among workers so that they know their rights. The custody of social justice is held by the ruling class which exploits the workers in factories like that of Savolta factory in order to earn profit. According to Marx, the worker is not free since he is forced to work for the capitalist in order to survive. All he can do is exchange one form of 'wage slavery' for another. Marx refers to the dominant ideas of each epoch as 'ruling class ideology'. Such ideology is a distortion of reality, a false picture of society. It binds members of society to the contradictions and conflict of interest which are built into their relationships. As a result they tend to accept their situation as normal and natural, right and proper. In this way a 'false consciousness' of reality is produced which helps to maintain the system. Marx says that

"the ideas of the ruling class are, in every age, the ruling ideas; i.e. the class which is the dominant material force in society is at the same time its dominant intellectual force. The class which has the means of material production at its disposal, has control at the same time over the means of mental production, so that in consequence the ideas of those who lack the means of mental production are, in general, subject to it." (Bottomore, 1971, p.51)

As there is exploitation in the society the words like equality and freedom are illusions. The employer-employee relationship is not equal. It is an exploitive relationship. Pajarito de Soto also believes that freedom and equality exists only upto a certain limit. The workers have to protest for getting these rights. Their working condition is deplorable, the salaries are not adequate. So, Pajarito de Soto says that "la misión de todos y cada uno de nosotros no es luchar por la libertad o el progreso, en abstracto, que son palabras huecas, sino contribuir a crear unas condiciones futuras que permitan a la humanidad una vida mejor en un mundo de horizontes amplios y claros." ("the mission of each and every one of us is not to fight for freedom or progress, in summary, these are hollow words, but to contribute to create future conditions in the world that will enable humanity to live a better life of broad and clear horizon"; Mendoza, 1975, p.124). However, the real democracy lies from the fact that there is political freedom, equality and the rule of law. These principles must be reflected in all the citizens of country so that they live a dignified life.

The class division was clearly visible from the fact that in order to maintain their privileged position in the society, the state machinery would do any kind of injustice or suffering to others. For example by inflation the poorest would suffer the most as their salaries remain constant. As also mentioned in the novel "Y así ocurrió lo que viene aconteciendo desde tiempo inmemorial: que los ricos fueron cada vez más ricos, y los pobres, más pobres y miserables cada vez." ("And so it has happened since immemorial time that the rich were getting richer, and the poor were getting poorer and miserable every time"; Mendoza, 1975, p.45). According to Karl Marx, in all stratified societies, there are two major social groups, a ruling class and a subject class. The power of the ruling class derives from its ownership and control of the forces of production. "Alienation occurs because capitalism has evolved into a two class system in which a few capitalists own the production process, the products, and the labor time of those who work on them." (Ritzer, 1988, p.22)

The ruling class who are also rich exploits and oppresses the subject class who are in most of the cases are poor. As a result, there is a basic conflict of interest between the two classes. The various institutions of society such as the legal and political systems are instruments of ruling class domination and serve to further its interests.

From a Marxian perspective, systems of stratification derive from the relationships of social groups to the forces of production. From a Marxian view, a class is a social group whose members share the same relationship to the forces of production. Thus during the feudal epoch, there are two main classes distinguished by their relationship to land, the major force of production. They are the feudal nobility who own the land and the landless serfs who work the land. Similarly, in the capitalist era, there are two main classes, the bourgeoisie or capitalist class which owns the forces of production and the proletariat or working class whose members own only their labour which they hire to the bourgeoisie in return for wages. This situation can be seen from the following sentences.

Cortabanyes tenía razón cuando me desengañaba: los ricos sólo se preocupan de sí mismos. Su amabilidad, su cariño y sus muestras de interés son espejismos. Hay que ser un necio para confiar en la perdurabilidad de su afecto. Y eso sucede porque los vínculos que pueden existir entre un rico y un pobre no son recíprocos. El rico no necesita al pobre siempre que quiera lo sustituirá. (“Cortabanyes was right when I was disillusioned, the rich only care about themselves. Their kindness, affection and signs of interest are mirages. You have to be a fool to trust in the endurance of your affection. And that happens because the links that can exist between a rich and a poor are not reciprocal. The rich does not need the poor whenever he wants to replace him”; Mendoza,1975,p.160)

Nemesio Cabra gomez criticizes the working conditions in a very different way and says that the conduct of people is the cause of the poverty which harms and makes the wives and children ill and unhappy. The misery, the famine, the illiteracy and the pain that the people receive is actually not because of them but because of the ruling class ideology. It is this group which oppress you, exploit you, betray you and if necessary, they kill you. Nemesio says that he knows the names of illustrious persons who have the red hands of blood of the workpeople but one cannot see them, because white suede gloves cover them. Gloves brought from Paris and paid with your money. You think that they pay you for the work that you do in these factories, it's a lie. They pay you so that you do not die of famine and could keep on working from sunrise to sunset. The money or the profit they will not give it to you as this is the true nature of a capitalist society. The author expresses this situation through a Greek statue in the novel which says “El hombre pobre y trabajador se halla oprimido por el que es rico y no trabaja.” (“The poor and hardworking man is oppressed by the one who is rich and does not work”; Mendoza,1975,p.397). Here the working class is oppressed by the powerful but there is also another kind of oppression, which is like passing on the oppression that the man has suffered, oppressing in turn the female. This female has no relief as she suffers from famine, the cold and the misery that causes the bourgeois development. In the earliest form of human society, the land and its products were communally owned.

From a Marxian perspective, the relationship between the major social classes is one of mutual dependence and conflict. Thus in capitalist society, the bourgeoisie and proletariat are dependent upon each other. The wage labourer must sell his labour power in order to survive since he does not own a part of the forces of production and lacks the means to produce goods independently. However, the mutual dependency of the two classes is not a relationship of equal or symmetrical reciprocity. Instead, it is a relationship of exploiter and exploited, oppressor and oppressed. In particular, the ruling class gains at the expense of the subject class and there is therefore a conflict of interest between them.

One crucial characteristic of capitalism, according to Marx, is that it exploits individual workers. Following Ricardo, Marx adopted a labour theory of value. This theory held that the value of any good depended upon the amount of labour spent producing it. Marx provided a second, and similar, perspective on surplus value. He noted that the essence of capitalism was to take money and use this money to buy things (labour and machines). Marx held that the appropriation of surplus value by the owners of the capital constitutes exploitation. (Chaudhary,2006,p.557)

In the Savolta factory, which was privately owned we could see that as Lepprince belonged to the ruling class, his privileged position inside the company was allowing him to carry out the thefts with a minimum risk as he had ownership of the equipments. On the other hand as the business was doing well, the problems related to the working condition were witnessed.

Los obreros estaban quejosos: se veían obligados a trabajar en ínfimas condiciones un número muy elevado de horas a fin de producir el ingente volumen de armamento que los acuerdos secretos de Lepprince exigían sin que sus emolumentos experimentaran el alza correspondiente. (“The workers were complaining: they were forced to work in deplorable conditions with high number of hours in order to produce the enormous volume of armament that Lepprince had agreed to provide without increasing their emoluments”; Mendoza,1975 p.415)



The whole idea was to pay the workers less and make them work more. There were attempts of strike and “El Hombre de la Mano de Hierro”, knew how to settle similar situations but Leppince did not want anyone to intervene as the investigation would reveal his illegal activities. Marx says that capital, as such, produces nothing. Only labour produces wealth. Yet the wages paid to the workers for their labour are well below the value of the goods they produce. Since they are non-producers, the bourgeoisie are therefore exploiting the proletariat, the real producers of wealth. Marx maintained that in all class societies, the ruling class exploits and oppresses the subject class.

In the industrial capitalist society there is dehumanization of worker and his living conditions become deplorable. The productive labour is the primary, most vital human activity. According to Marx, man is essentially a creative being who realizes his essence and affirms himself in labour or production, a creative activity carried out in cooperation with other and by which the external world is transformed. The process of production involves transformation of human power into material objects or ‘objectification’ of human creative power. In other words, in the production of objects man ‘objectifies’ himself, he expresses and externalizes his being. However, if the objects of man’s creation come to control his being, then man loses himself in the object. The act of production then results in man’s alienation. This occurs when man regards the products of his labour as commodities, as articles for sale in the market place. The objects of his creation are then seen to control his existence. They are seen to be subject to impersonal forces, such as the law of supply and demand, over which man has little or no control. In Marx’s words, ‘the object that labour produces, its product, confronts it as an alien being, as a power independent of the producer’. In this way man is estranged from the object he produces, he becomes alienated from the most vital human activity, productive labour. “In the *Economic and Philosophic Manuscripts of 1844*, Karl Marx identified four types of alienation that occur to the worker labouring under a capitalist system of industrial production.” (Flew,1984, p.10) According to Marx, alienation manifests itself in four ways: Firstly, the worker is alienated from the product of his labour, since what he produces is appropriated by the capitalist and the worker has no control over it. Secondly, the worker is alienated from the act of production itself because all decisions as to how production is to be organized are taken by the capitalist. In fact, work becomes a commodity to be sold and its only value to the worker is its saleability. The labour therefore is not voluntary but forced, it is *forced* labour. Thirdly, in addition to the fact that wage labour alienates man from his product and his productive activity, which distinguishes him from animals, he also becomes alienated from his people. The capitalist system stratifies man, destroys the human qualities and renders man to a state worse than animal. No animal has to work for its survival at other’s bidding while man has to do that in a capitalist system. Fourthly, the form of wage labour prevalent in the capitalist society also leads to social alienation. Consequently, man ultimately becomes alienated from that which is a product of his actions i.e the society. In other words, the worker in a capitalist system is also socially alienated, because social relations became market relations, in which each man is judged by his position in the market, rather than his human qualities. In the novel we can observe similar case when Mendoza writes “En modo alguno. El campesino vive en contacto directo con la naturaleza. El obrero industrial ha perdido de vista el sol, las estrellas, las montañas y la vegetación.” (“In any way. The peasant lives in direct contact with nature. The industrial worker has lost sight of the sun, the stars, the mountains and the vegetation”; Mendoza,1975,p.34). Alienation is therefore the result of human activity rather than external forces with an existence independent of man.

When there is exploitation of workers by the ruling class, there is an increase in solidarity among their own social group. The workers go on strike and at this stage its members have class consciousness and class solidarity. Members of the working class are class in itself as they share the same relationship to the forces of production. Marx argues that a social group only fully becomes a class when it becomes a class for itself. At this stage its members have class consciousness and class solidarity. Class consciousness means that false class consciousness has been replaced by a full awareness of the true situation, by a realization of the nature of exploitation. Members of a class develop a common identity, recognize their shared interests and unite, so producing class solidarity. The final stage of class consciousness and class solidarity is reached when members realize that only by collective action can they overthrow the ruling class and when they take positive steps to do so. This positive step is reflected in the novel as the workers always go on strike. “Los obreros sólo saben hacer huelgas y poner petardos, ¡y todavía pretenden que se les dé la razón! La huelga es un atentado contra el trabajo, función primordial del hombre sobre la tierra; y un perjuicio a la sociedad. Sin embargo, muchos la consideran un medio de lucha por el progreso.” (“The workers only know strikes and firecrackers, and they still claim to be right! The strike is an attack on work, the main function of man on earth, and a prejudice to society. However, many consider it a means of struggle for progress”; Mendoza,1975,p.99).

To tell the truth, the situation of the country in the year 1919 was the worst anyone had ever faced. The Factories were closed, unemployment had increased and the people left their fields and started moving towards the City in order to feed their children. People came through the streets with hunger and thirst, by dragging their poor belongings demanding work, asylum, food and tobacco. The condition of children and women of all ages were pathetic. The trade unions and civil societies had started protesting along with strikes and attacks, the rallies took place in cinemas, theatres, squares and streets, the masses were raiding the bakeries. With several movements, either the life of people was going to change or become worst. Nobody could predict what would be the future of the nation. The writer mentions in the novel that “En las paredes aparecían signos nuevos y el nombre de Lenin se repetía con frecuencia obsesiva.” (“New signs appeared on the walls, and Lenin's name was often obsessively repeated.”; Mendoza,1975,p.185) Marx believed he could observe the process of polarization in nineteenth-century Britain when he wrote, “Society as a whole is more and more splitting into two great hostile camps bourgeoisie and proletariat”. (Marx,1888,p.7). Now the battle lines were clearly drawn, Marx hoped that the proletarian revolution would shortly follow and the communist utopia of his dreams would finally become a reality. But it did not happen.

It is often argued that Marx's view of history is based on the idea of the dialectic. From this viewpoint any process of change involves tension between incompatible forces. Dialectical movement therefore represents a struggle of opposites, a conflict of contradictions. Conflict provides the dynamic principle, the source of change. The struggle between incompatible forces grows in intensity until there is a final collision. The result is a sudden leap forward which creates a new set of forces on a higher level of development. The dialectical process then begins again as the contradictions between this new set of forces interact and conflict, and propel change. However Marx rejects this priority that Hegel gives to thoughts and ideas. He argues that the source of change lies in contradictions in the economic system in particular and in society in general. As a result of the priority he gives to economic factors, to 'material life', Marx's view of history is often referred to as 'dialectical materialism'. Since men's ideas are primarily a reflection of the social relationships of economic production, they do not provide the main source of change. It is in contradictions and conflict in the economic system that the major dynamic for social change lies. Class conflict forms the basis of the dialectic of social change. Social change is not a smooth, orderly progression which gradually unfolds in harmonious evolution. Instead it proceeds from contradictions built into society which are a source of tension and ultimately the source of open conflict and radical change. In Marx's view, “The history of all hitherto existing society is the history of the class struggle”. (Adoratsky,1938,p.76) The conflict presented a violent picture of Barcelona as men armed with bars of iron, hardware and forceful objects moved around the city. The Telegraph stopped working. The strikers cut electricity and there was a chaos in the city. Most of the people were unemployed during this time and therefore their participation was obvious, at least few of them could raise flags in order to prove their commitment towards the struggle. In la plaza de pueblo one could see the image of Lenin painted on the walls.

Los obreros se reunían a diario y pasaban la jornada tomando el sol a la puerta de la taberna, discutiendo y filosofando y haciendo circular bulos sobre los acontecimientos revolucionarios acaecidos en otras localidades. A la caída de la tarde se organizaban mítines en los cuales los socialistas y los anarquistas se insultaban recíprocamente. Al término de los mítines, los oradores y sus oyentes se congregaban ante la iglesia y apostrofaban al cura, acusándole de usurero, corruptor de menores y soplón. (“The workers gathered daily and spent the day sunbathing at the door of the tavern, discussing philosophizing and circulating pamphlets about the revolutionary events that took place in other locations. In the evening, meetings were organized in which the Socialists and the Anarchists debated with each other. At the end of the meeting, the speakers and their listeners congregated before the church and apostrophized the priest, accusing him of usurer and corrupt practices.”; Mendoza,1975,p.393)

### **Conclusion:-**

After analyzing *La verdad sobre el caso Savolta* we can say that Mendoza portrays different types of images in his novel, images that a capitalist society can offer such as corruption, class hierarchy, alienation, anomie, social divisions, inequalities and on the other side solidarity. Through his work, Mendoza has reflected some of the results of urbanization and capitalism. It can be said that under capitalism the world is moving towards an unequal and unjust society.

In today's democratic societies, the relationship between the capitalist and the worker is defined as an equal exchange. Emphasis on words such as freedom and equality in capitalist society, illustrated by phrases such as 'free market', 'free democratic societies' and 'the free world'. All these are illusions. The ideology of the ruling class produces 'false class consciousness', a false image of the nature of the relationship between social classes. Members

of both classes tend to accept the status quo as normal and natural and are unaware of the true character of exploitation and oppression. In other words, the members of both social classes are largely unaware of their true situation.

Now we can say that capitalism dictates the world today. The growth of Barcelona brings changes only in a few individuals while others suffer because capitalism only favours some people. Only a few contractors, capitalists have benefited from this trend. Thus, industrialization is the false opportunity, saying that industrialization will bring new opportunity and will transform every individual is a trap. It only brings more corruption that benefits the rich and exploits the poor, which is the true nature of capitalism.

Any activity, without broad avenues of transparency, accountability and good governance, actually leads to inequality and corruption, resulting in the misery of the people. If a capitalist is not able to control and balance the mechanism and competition in the market, it may lead to concentration of wealth in a few powerful hands. Barcelona, like other big cities of India, did not have any regulatory mechanism, transparency, and accountability. The intention to win more and more without the transparency of the system only leads to an unfair society. The free market system has a natural tendency to increase the concentration of wealth, because the rate of return on property and investment has been consistently higher than the rate of economic growth. The world is moving towards an unequal and unjust society with the effects of capitalism on every corner. There is very little chance that capitalism would reverse the increase in inequality. Governments can initiate changes now, by adopting a global tax on wealth, to prevent inequality and poverty contribute to economic or political instability around the world. Eduardo Mendoza tries to reach us through his different visions of Barcelona. In the novel, he has shown us the complex nature of the city and its social implications but the most important question that comes up here is the following. For whom is the city? The experience under capitalism and industrialization is definitely an ongoing process in which some may win and some may lose.

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### RESEARCH ARTICLE

#### ENDOSCOPIC EVALUATION OF 100 CASES OF GASTRO INTESTINAL BLEEDING .

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##### Keywords:-

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#### Abstract

Upper gastrointestinal bleeding(UGIB) is one of the surgical emergencies<sup>1</sup>.The etiological spectrum of gastrointestinal bleeding is diverse and variable from one geographical area to another. Earlier barium meal used for study of UGIB which has its own drawbacks . Now upper GI scopy used as diagnostic too<sup>2</sup>1.

**Aims And Objectives:-** Study the endoscopic evaluation and management of upper gastrointestinal bleeding in our college(ks hegde hospital)

**Methods:-** A cross sectional study of 100 cases of upper GI bleeding who are admitted in justice K S Hedge Charitable Trust between October 2014 to October 2016

**Results:-** A Total of 100 patients who underwent upper GI scopy during the period. The patients range in age from 18 to 80, Mean age is 50.5 years .Median 52 years.Out of 100 patients lesions found in 95% patients. Majority of patients are presented with haematemesis (76%) .Oesophageal varices secondary to alcoholic cirrhosis of liver were the most frequent cause of upper GI bleeding followed by PUD. Cirrhosis is the main etiological factor of upper GI bleed in this study (p value – 0.0001) . Esophagus is the most common site of bleeding in this study.In the present study, endoscopic management was the one of the main modality of treatment in 40% of the total patients, consisting of banding (40%). Rest of the patients (57%) were managed conservatively with medical therapy, 3% of the patients were treated surgically.

##### Conclusion:-

- Endoscopy is essential in the initial evaluation and management of upper gastro intestinal bleeding. In this study UGI endoscopy provided accurate diagnosis in 95% of Patients.
- The most common cause of UGI bleeding was oesophageal varices secondary to cirrhosis of liver with portal hypertension. Therapeutic endoscopy was useful in 40% of patients. No complications were encountered during after Endoscopy.
- UGI endoscopy serves its best role in the diagnosis of UGI bleeding and in therapeutic

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**Introduction:-**

In modern surgery, Esophago-gastro-duodenoscopy (EGD) is an important tool to visualize the upper part of the gastrointestinal tract up to the duodenum<sup>1</sup>. It is considered a minimally invasive procedure since it does not require an incision into one of the major body cavities and does not require any significant recovery after the procedure (unless sedation or anaesthesia has been used)<sup>3</sup>. Endoscopy is useful in assessing a variety of pathologies. It is used not only as a diagnostic but also a therapeutic tool. Various procedures like variceal band ligation, sclerotherapy, biopsy and hemostasis of bleeders can be achieved in the same sitting. It has indeed become a cost effective and reliable tool to modern surgery.

**Aims And Objectives:-**

Study the endoscopic evaluation and management of upper gastrointestinal bleeding at KS Hegde hospital, Deralakatte, Mangalore.

**Methodology:-****Source of Data:-**

The patient admitted in our KS Hegde hospital with the history of any upper gastrointestinal bleed from will be taken up for the study

**Study period:-** October 2014 to October 2016

**Sample size:-** 100 cases

**Study method:-** Descriptive cross sectional study

**Statistical analysis:-** Collected Data was analysed by frequency ,percentage, Statistical analysis was derived by performing binomial, chisquare test and Fischer exact test

Pvalue of <0.05 was considered to be significant

**Method Of Collection Of Data:-**

- As soon as the patient is admitted a detailed history regarding nature of bleeding whether it has ceased at the time of admission and the time since the onset will be recorded.
- The patients will also be interrogated regarding symptoms of nausea, vomiting, dysphagia, regurgitation, heart burn, abdominal pain, appetite, weight gain or loss and recent changes in bowel habits prior to the bleed.past history of ingestion of drugs over the preceding 48 hrs and frequent ingestion over the preceding months will be enquired about and previous histories of cardiovascular, respiratory, liver diseases will be thoroughly evaluated
- habit of consumption of alcohol by the patient
- Examination of the abdomen for any area of tenderness, palpable masses, ascites and rectal examination will be carried out.
- Based on clinical data obtained a provisional diagnosis will be made.
- These patients will be then submitted to oesophagogaastro duodenoscopy using a fiberoptic instrument

**Inclusion Criteri:-**

All types of upper GI Bleeds admitted in KSHEMA Hospital

**Exclusion Criteria:-**

Age below 18

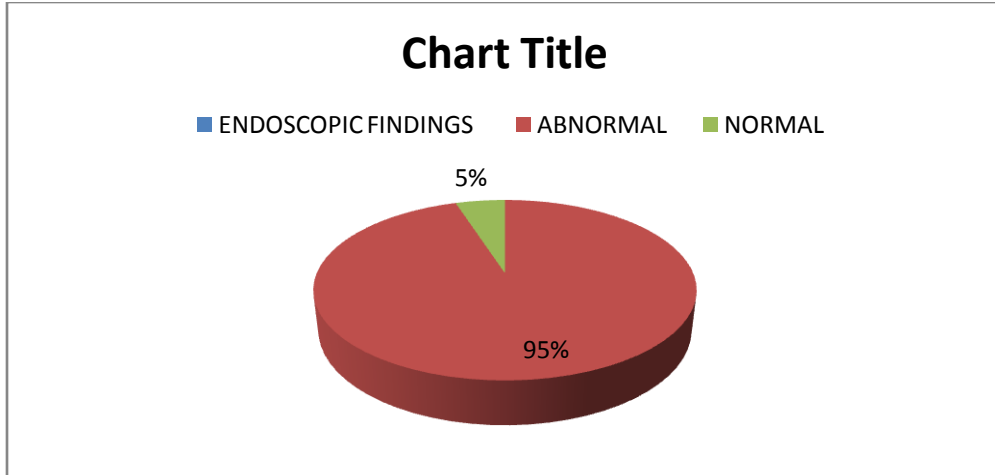
Patients who are not willing

**Results:-**

**Table 1:-** Disturbtion Of Endoscopic Findings.

Endoscopic findings	cases	%
Abnormal	95	95
Normal	5	5

**Binomial test,p =0.0001 HS**



**Figure 1:-** Disturbtion Of Endoscopic Findings

In this out of 100 cases, 95% patients shows abnormality in endoscopic findings, WHICH IS STATISCALLY HIGHLY SIGNIFICANT COMPARED TO 5% Patients there are no findings found.

**Table 2:-** Disturbtionof Endoscopic Findings According To Causes

DISEASE	TOTAL	FREQUENCY
VARICES	48	48%
DUODENAL ULCER	11	11%
GASTRIC ULCER	11	11%
MALLORY WEISS SYNDROME	4	4%
PANGASTRITS	6	6%
NORMAL	5	5%
EROSIONS	12	12%
Malignancy	3	3%
TOTAL	100	100%

Chi Square= 111.2, P= 0.0001 ,Hs

In this out of 100 patients , endoscopic findings are varices in 48% which is the highest followed by duodenal ulcer (11%) and gastric ulcer(11%) ,Mallory weiss tear seen in 4% , pangastritis in 6% and erosions in 12% and malignancy noted in 3%.



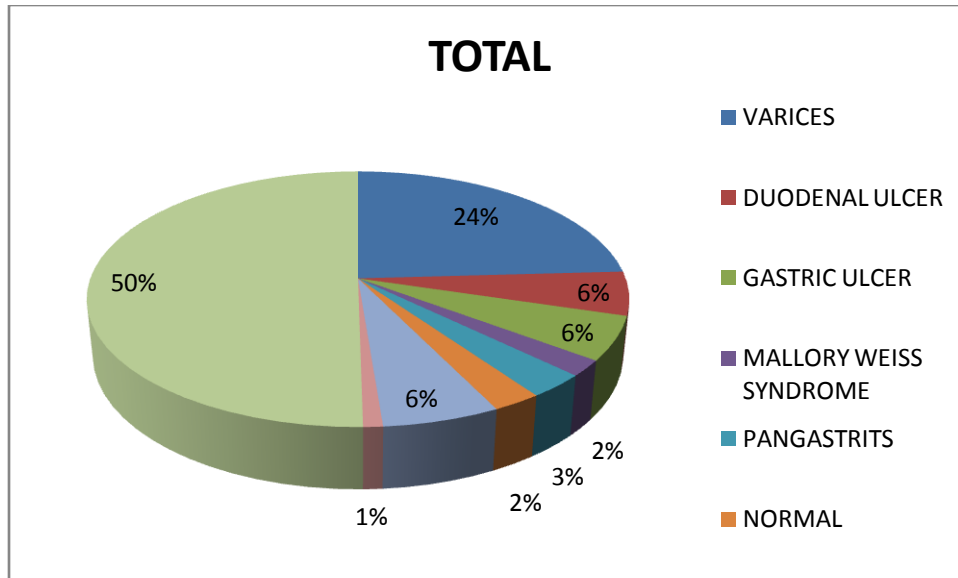


Fig 2:- Distribution Of Endoscopic Findings According To Causes.

Table 3:- Distribution Of Endoscopic Findings According To Sex

ETIOLOGY	MALE	FEMALE	TOTAL
VARICES	42	6	48
DUODENAL ULCER	7	4	11
GASTRIC ULCER	10	1	11
MALLORY WEISS SYNDROME	2	2	4
PANGASTRITS	4	2	6
NORMAL	4	1	5
EROSIONS	8	4	12
MALIGNANCY	0	3	3
TOTAL	77	23	100

Fischers Exact Test, P= 0.0007, HS

In this out of 100 cases 77 are male and 23 are female. Most common endoscopic finding in male are varices(42%) followed by erosions(8%).

In female most common endoscopic finding is varices(6%) followed by duodenal ulcer(4%). Presence of endoscopic findings are associated with gender .

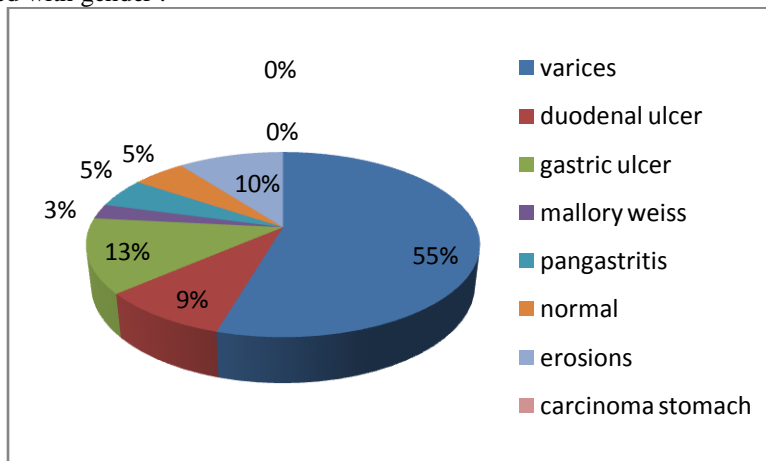


Fig 3.1:- Distribution Of Cases According To Sex (Male)

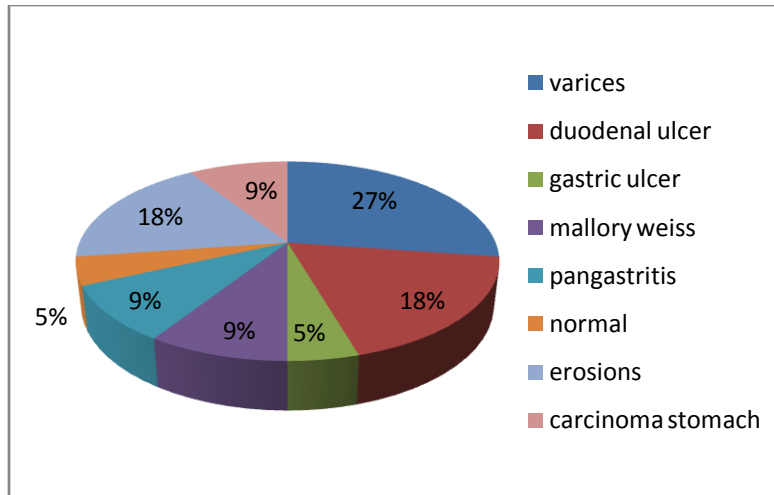


Fig. 3.2:- Distribution Of Cases According To Sex (Female)

Table 4:- Distribution Of Patients According To Presenting Symptoms

SYMPTOMS	CASES
HEMTEMESIS	76 (76%)
MELENA	24(24%)
HEMATOCHEZIA	0

BINOMIAL TEST, P= 0.0001,HS

In this out of 100 patients more number of patients 76 are presented with hemtemesis followed by melena (24%) and no patients complained of hematochezia. HENETEMESIS IS A SIGNIFICANT PRESENTING SYMPTONS COMPARE TO OTHER

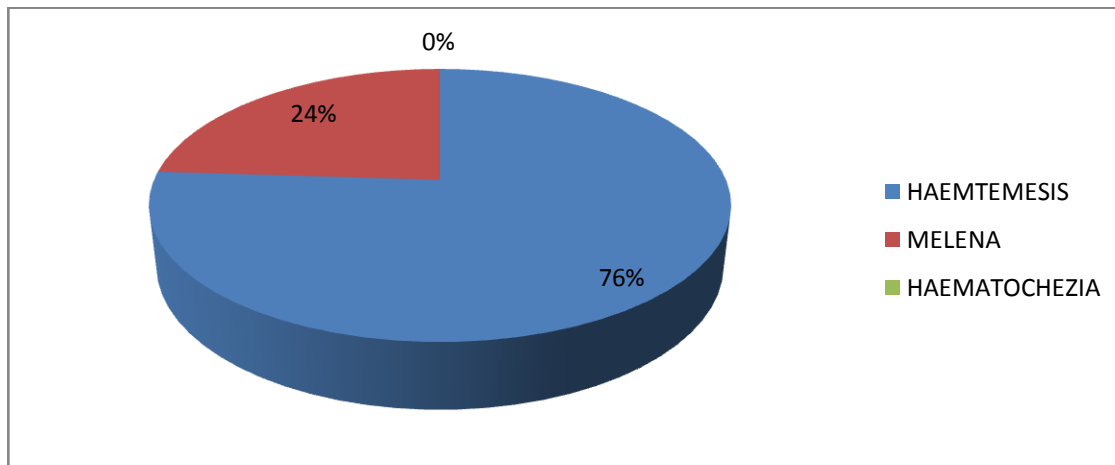


Fig 4:- Distribution Of Patients According To Presenting Symptoms.

Table 5:- Distribution Of Patients According To Etiology Of Portal Hypertension

S.NO	ETIOLOGY	%
1	ALCHOLIC CIRRHOSIS	46 95%
2	CRYPTOGENIC	1 0.02%
3	PERIPORTAL FIBROSIS	1 0.02%

Chisquare =40.33, P=0.0001, Hs

Alcholic Cirrhosis Is Significantly Higher Etiology Compare To Others.

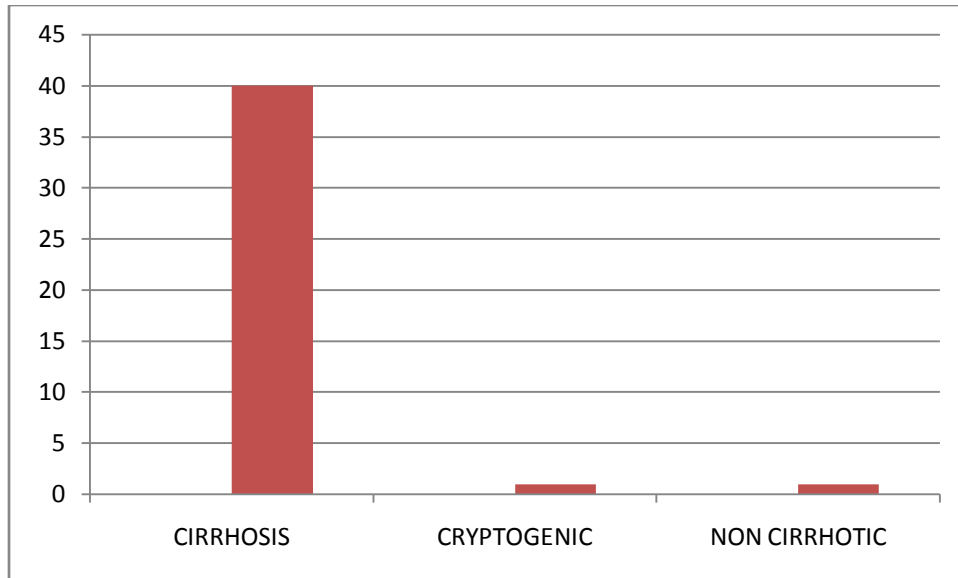


Fig 5:- Distribution Of Patients According To Etiology Of Portal Hypertension.

Table 6:- Distribution Of Patients According To Age.

AGE	VARICES	PUD	EROSIONS	PANGASTRITIS	MW	CARCINOMA STOMACH	NORMAL
18-30	-	3	-	1	-	-	1
31-40	12	3	-	1	2	-	2
41-50	9	5	5	-	-	2	-
51-60	16	10	2	3	2	-	1
61-70	10	-	3	1	-	-	1
71-80	1	1	2	-	-	-	-
TOTAL	48	22	12	6	4	2	5

Fischers Exact Test=0.0008, HS

In this age is ranged between 18-80 years, more number of patients are at range of 51-60 , In that variceal bleed are more in range of 51-60 followed by 31-40 and then 61-70, ulcers are more common in range of 51-60 (10) followed by 41-50.

Age association is observed.

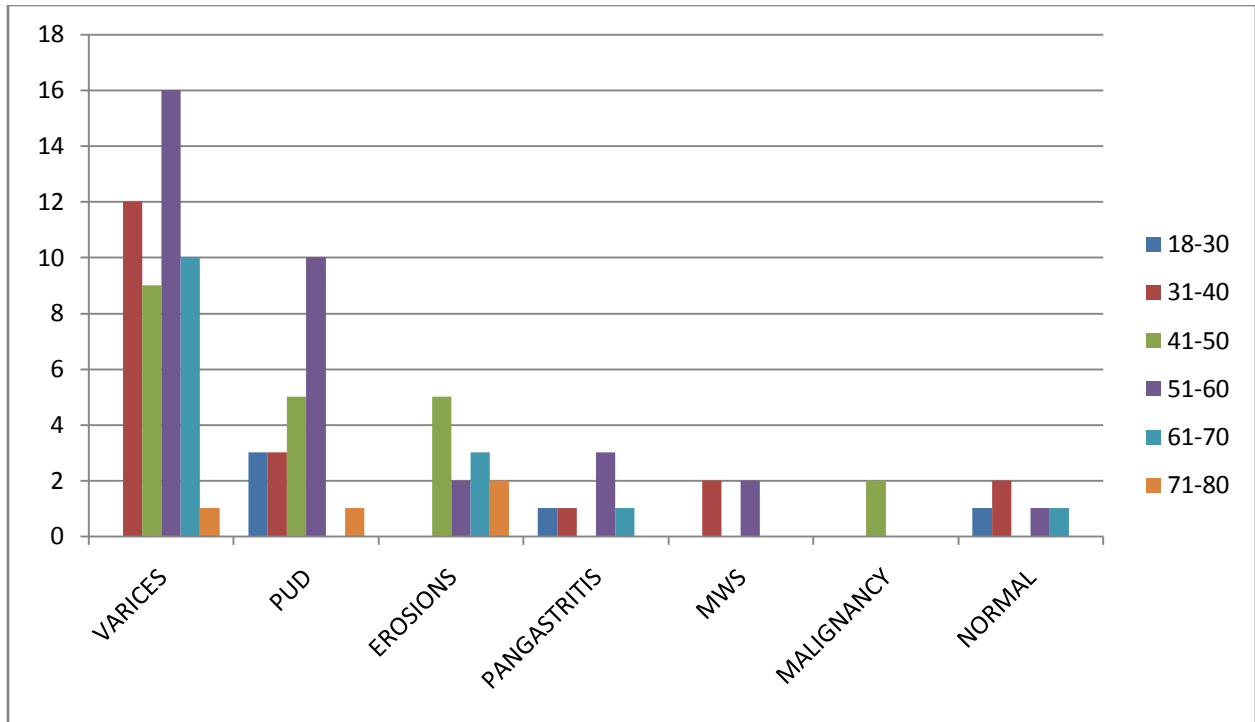


Fig 6:- Distribution Of Cases According To Age

Table 7:-Disturbtion Of Endoscopic Findings According To Cirrhosis.

ENDOSCOPE FINDINGS	Cirrhosis present	Cirrhosis absent
Varices	48	-
Duodenal ulcer	-	11
Gastric ulcer	-	11
Mws	-	4
Pangastritis	-	6
Erosions	-	12
Malignancy	-	3
Normal	-	5
Total	48	52

Fischers Exact Test,P= 0.0001,Hs

Varices Is Significantly Associated With Cirrhosis

Table 8:- Disturbtion Of Endoscopic Findings According To Alchol

ENDOSCOPE FINDINGS	Alchol present	Alchol absent
Varices	46	2
Duodenal ulcer	11	-
Gastric ulcer	11	-
Mws	2	2
Pangastritis	2	4
Erosions	11	1
Malignancy	-	3
Normal	-	5
Total	83	17

Fischers Exact Test,P = 0.0001,Hs

Alchol Is Significantly Associated With Varices , Ulcer, Erosions.

**Table 9:-** Disturbtion Of Endoscopic Findings According To Nsaids.

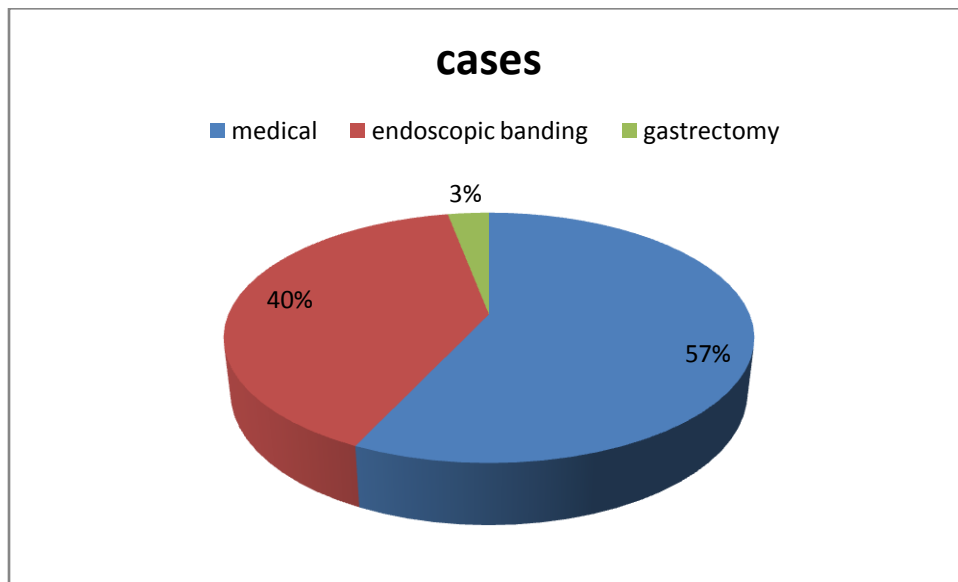
ENDOSCOPIC FINDINGS	NSAIDS PRESENT	NSAIDS ABSENT
Varices	-	48
Duodenal ulcer	-	11
Gastric ulcer	-	11
Mws	2	2
Pangastritis	4	2
Erosions	1	11
malignancy	-	3
Normal	-	5
total	7	93

Fischers Exact Test, P=0.0001,Hs  
 Nsaids Are Associated Significantly With Pangastritis And Mws

**Table 10:-** Disturbtion Of Cases According To Treatment.

s.no	Treatment	Cases
1	Medical	57(57%)
2	Endoscopic banding	40(40%)
3	gastrectomy	3(3%)

In this study out of 100 cases 57 are treated conservatively ,40 are treated by endoscopic banding and gastrectomy in 3 patients, endoscopy not only help in diagnosing but also by its therapeutic role



**Fig 10:-** Disturbtion Of Cases According To Treatment

**Table 11:-** Disturbtion Of Endoscopic Findings According To Site.

Endoscopic Findings	Esophagus	Stomach	Duodenum
Varices	44	4	-
Ulcer	-	11	11
MWS	4	-	-
Pangastritis	-	6	-
Erosions	-	12	-
Malignancy	-	3	-
Total	48	36	11

In this study, in total of 100 cases in 48 patients site of bleeding is esophagus ,in that most common cause of bleeding varices 44% and in 36% patients stomach is site of bleeding followed by duodenum 11%

**Table 12:-** Varices Types.

VARICES	CASES	%
FUNDAL	4	8.7
ESOPHAGEAL	42	91.3
BOTH	0	0

### Discussion:-

Upper GI bleeding is one of the emergency conditions to admit in surgical intensive care unit. Upper GI scopy is the important procedure to evaluate all kinds of upper GI bleed.It is done by standard gastroenterologist to subside diagnostic error .

In this study the commonest cause of upper GI bleed was esophageal varices seen in 48% of the patients and was secondary to cirrhosis with portal hypertension. But study conducted by Crook<sup>5</sup> et al shows the peptic ulcer disease as commonest cause of upper GI bleed, other causes were extra hepatic portal hypertension.

In the present study consisting of total 100 patients major were presented with upper GI bleed. In this study males were 77%, whereas females were 23%. The median age was 31-40. In study conducted by Hyasinta Jaka<sup>4</sup> et al majority were males 73% and females 26.6% and median age was 52 years .

In the present study alcohol was commonest precipitating factor for cirrhosis of liver and remained as main etiology of upper GI bleed In this study cirrhosis of liver is main cause of upper GI bleed(P value-0.0001). This study shows the value of endoscopy in upper GI bleed as not only a diagnostic tool but also helped in therapeutic intervention especially in patients with variceal bleed. In the present study, endoscopic management was the one of the main modality of treatment in 40% of the total patients, consisting of banding (40%). Rest of the patients (57%) were managed conservatively with medical therapy, 2% of the patients were treated surgically. whereas, in the study done by Hyasinta Jaka et, al; majority of the patients (60.8%) were treated conservatively and endoscopic and surgical treatments were performed only in 30.8% and 5.8% of cases respectively

Most of the non-variceal bleeding in upper GI was amenable to conservative medical management.

This study highlights the value of endoscopy both as a diagnostic and therapeutic tool in the management of all upper GI bleed.

In this study stomach is common site of bleeding followed by esophagus and duodenum., In study made by Libyan<sup>6</sup> esophagus is most common site of bleeding.

### Conclusion:-

- Endoscopy is essential in the initial evaluation and management of upper gastro intestinal bleeding.
- In this study UGI endoscopy provided accurate diagnosis in 95% of Patients
- The most common cause of UGI bleeding was oesophageal varices secondary to cirrhosis of liver . Therapeutic endoscopy was useful in 40% of patients. No complications were encountered during / after Endoscopy.
- The most common site of bleeding is stomach in my study
- UGI endoscopy serves its best role in the diagnosis of UGI bleeding and in therapeutics.

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### RESEARCH ARTICLE

#### ANTIBIOTICS USE AND MISUSE IN UPPER RESPIRATORY TRACT INFECTION PATIENTS: KNOWLEDGE, ATTITUDE AND PRACTICE ANALYSIS IN UNIVERSITY HOSPITAL, SAUDI ARABIA.

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##### Key words:-

Antibiotics, awareness, misuse, upper respiratory tract infection.

#### Abstract

**Background:** Excessive use of antibiotics among general public is a topic of global concern. The present study aimed to assess the awareness and causes of antibiotics use and misuse in patients with upper respiratory tract infections.

**Methods:** This cross-sectional hospital-based survey was conducted in the Primary Care Department, College of Medicine, King Saud University Riyadh, Saudi Arabia during the period Jan 2014 to Dec 2015. In this study, a well-established self-administrated questionnaire was randomly distributed to the patients suffering from URTI visiting at King Khalid University Hospital, Riyadh, Saudi Arabia. The questionnaire consisted of 3 parts: demographic variables, knowledge, beliefs and behaviors toward antibiotic use and misuse. Descriptive statistics were used for the analysis of data. Out of 420 collected responses, we included 400 and the remaining 20 were excluded.

**Results:** The results show that 45.5% of participants used antibiotics without prescription ( $p=0.050$ ) and 10.8% used it over a pharmacist's advice ( $p=0.030$ ). 17.3% participants forced the physicians to prescribe antibiotic and 22% patients stopped taking antibiotics when they felt better ( $p=0.007$ ). Moreover, 45% had the antibiotic stocks at home in case of emergencies. In addition, 16.8% were ignoring the instructions when taking antibiotics ( $p=0.004$ ). 12% of the participants denied that an antibiotic could cause an allergic reaction ( $p=0.054$ ) and a similar percentage of participants (12%) believed that the effectiveness of the treatment would not be affected if a full course of antibiotic is not completed ( $p=0.029$ ). 7.2% of the participants with high educational level believed that all antibiotics do not cause side-effects ( $p=0.002$ ) and 17.8% of them believed that if symptoms were improving the antibiotic course can be interrupted without completing ( $p=0.037$ ).

**Conclusion:** It is concluded that misconceptions exist about the use and indications of antibiotics. Lack of knowledge regarding antibiotic resistance and risks associated with use of antibiotics was prevalent. It is suggested that more interaction is required between physicians and patients, and involvement of both print and electronic media to improve the antibiotics knowledge and practices among community and

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consequently, control the problems of antibiotics misuse.

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### **Introduction:-**

Upper respiratory tract infections are the most prevalent infectious diseases in many societies and are one of the major reasons that patients visit the primary care clinics especially during the winter. Both bacteriological and viral microorganisms are etiological factors contributing to the development of upper respiratory tract infections<sup>1</sup>. However, most of them are caused by viruses, in which antibiotics are not needed<sup>2,3,4</sup>. Respiratory system conditions are the most common cause for antibiotics prescription<sup>5,6</sup>. Several studies showed that physicians practice in prescribing antibiotics in such cases could be related to the physician response to the patient pressure<sup>7,8,9</sup>. In addition, over-prescription practices have been attributed to vague diagnosis and the fear of inadequate level of health care. Antibiotics misuse in cases where no definite clinical benefits from them can lead to adverse effects<sup>10,11,12</sup>. The likelihood of antibiotics misuse by the public can be linked to the widespread glitches in the information about antibiotics. The general lack of knowledge and the poor awareness among the public with regard to the proper use of antibiotics and its indications have been documented.

There is a common public's misunderstanding such as the use of antibiotics can help in faster recovery and in the prevention of further illnesses in common conditions like upper respiratory tract infections<sup>13,14</sup>. The knowledge, attitudes and behaviors differ from one community to another. Limited literature is available from the Middle East Region addressing such topics<sup>14-15</sup>. However, still there is a great gap in the knowledge to understand the proper use of antibiotics. Therefore, this study aims to assess knowledge, attitudes and beliefs regarding antibiotics use and its effectiveness for upper respiratory tract infections in Riyadh, Saudi Arabia.

### **Research Methodology:-**

**Study Design:** This cross-sectional hospital-based survey was conducted in the primary care department, King Khalid University Hospital, College of Medicine, King Saud University Riyadh, Saudi Arabia during the period Jan 2014 to Dec 2015. King Khalid University Hospital is one of the largest and leading university teaching hospitals, located in the capital city of the Kingdom of Saudi Arabia. The hospital provides primary, secondary and tertiary health care services to all citizens over the country and from Gulf region.

The targeted population was adults from 16 years of age and above. A total of 420 well-structured English language questionnaires were distributed, 400 patients suffering from URTI completed the questionnaires were included while the remaining 20 were excluded due to incomplete filling or double answers, giving a response rate of 95.24% among them 48% were males and 51% were females.

The questionnaire was formed based on the questions taken from previous studies and edited to suit the objectives<sup>2, 14, 16, 17</sup>. A pilot study was conducted to test the validity of the questionnaire. The final version of the questionnaire contained 33 questions divided into four main parts. The first part was about demographic features. The second part was designed to assess recent antibiotics usage in the last year, the reason of the usage, and whether it was used with or without a prescription. The third part contained eleven statements with (Yes–No–Not sure) options to assess participant general knowledge and attitude about antibiotics. Statements included role of antibiotics, harmful effects of antibiotics and completion of treatment course. The fourth part was designed to evaluate the behaviors toward antibiotics use. This part consisted of nine statements about the antibiotics usage in common cold, patient's expectation from the physicians, patient's compliance, sharing and keeping antibiotics for emergency cases and others. Responses were taken also in (Yes–No–Not sure) pattern. One additional question was asked about the participants' source of information about antibiotics. Options were (from the doctor–pharmacist–internet- media-relatives and friends). A written consent was taken from all respondents before answering the questionnaires. Participants' anonymity was assured by assigning each participant with a code number for the purpose of analysis only. No incentives or rewards were given to participants. Data collection was conducted by research team from December 2013 to February 2014. Collected data were tabulated and analyzed by using SPSS software version 21 (SPSS Inc Chicago, IL). The prevalence of antibiotic use, misuse and its awareness were determined by comparing outcome measures. Numerical variables were reported as the mean±standard deviation. The statistical significance was defined as p-value <0.05.

**Ethical approval:** Study was approved by the Institutional Review Board, Department of Family and Community Medicine, College of Medicine, King Saud University, Riyadh.

## Results:-

**Demographic characteristic of respondents:** A total of 420 questionnaires were distributed at the primary care clinic, 400 completed questionnaires were included while the remain 20 were excluded due to incomplete filling or double answers, giving a response rate of 95.24% among them 48% were males and 51% were females. Participants were compared according to their demographic parameters: age, nationality, marital status, educational level, employment status, antibiotics usage per year, and recent antibiotics usage within one year (Table 1). Among the respondents, 37.5% were in the age group of 26-35 years ( $p=0.320$ ), 62.5% were married ( $p=0.057$ ), 57.5% were well educated (College or University) ( $p=0.000$ ), and 46% were employed ( $p=0.000$ ). About 70.3% of the individuals used antibiotics recently ( $p=0.578$ ) and 46% used 2-4 times per year ( $p=0.408$ ). Respiratory illnesses were the third highest cause of the use of antibiotics, other causes are shown in Figure 1. Data on respondent's knowledge, behavior and attitude towards antibiotics use are presented in Table 2.

**The impact of age on use of antibiotics:** 45.5% of participants were using antibiotics without prescription ( $p=0.050$ ) and 10.8% using the antibiotics over a pharmacist's advice ( $p=0.030$ ). 17.3% of all age groups had forced the doctor to prescribe antibiotic, 6.3% of them were between 26-35 years ( $p=0.014$ ). Furthermore, respondents who stopped taking antibiotics when they felt better were higher in the age group of 26-35 years, with a given percentage of 22% out of 51.7% ( $p=0.007$ ). Moreover, 45% of all age groups agreed on keeping the antibiotic stocks at home in cases of emergencies, with a higher percentage in the age group between 16-35 years ( $p=0.010$ ). In addition, 16.8% were found to be ignoring the instructions on the label when taking antibiotics ( $p=0.004$ ). (Table 2).

**The impact of gender on use of antibiotics:** In order to further explore the influence of gender in relation with the respondent's knowledge, attitude and behavior regarding usages of antibiotics. Knowledge and belief results were less remarkable than behavioral. 12% of the participants denied that antibiotics could cause an allergic reaction ( $p=0.054$ ). A similar percentage of participants (12%) among them 6.3% were males and 5.8% were females believed that the effectiveness of the treatment would not be affected if a course of antibiotic was not completed ( $p=0.029$ ). On the other hand, behavioral questions' results revealed that 7% of male participant out of 10.3% obtained antibiotics without prescription ( $p=0.042$ ) and the same percentage was recorded for male getting antibiotics over a pharmacist's advice. Moreover, males and females who took antibiotics when they suffered with common cold represented 24.6% and 19% respectively ( $p=0.014$ ). However, 10.3% of male and 7% of female enrolled in the study used to force the doctor to prescribe to them antibiotics when they felt sick ( $p=0.043$ ). The majority of both genders showed significant result in keeping antibiotic stocks at home in case of emergency (44.9%) ( $p=0.006$ ) and also using the leftover antibiotics for a respiratory illness (9%) ( $p=0.001$ ) (Table 3).

**The impact of educational level on use of antibiotics:** The analysis of educational levels' indicated that 7.2% of the participants with high educational level (College and University) believed that all antibiotics do not cause side-effects ( $p=0.002$ ). Furthermore, 17.8% of them considered that if their symptoms were improving they could interrupt the course of the antibiotic without completing it ( $p=0.037$ ). As a result, their percentage was the highest among all educational levels in stopping the intake of the antibiotic after feeling better (41.3% out of 51.7%) ( $p=0.012$ ). (Table 4).

Regarding antibiotics misuse prevalence, we calculated the percentage of behavior-related questions, 30.61% of the study participants' showed misuse toward antibiotics. (Figure 2). Figure 1 shows the causes of use of antibiotics among the participants were the relief of inflammation 24%; while 22% used the antibiotics for the relief of fever. Respiratory illness took the third place with a percentage of 21%, pain came after with a value of 10%. Urinary tract infection, skin diseases and wound showed percentage of 7%, 4% and 2% respectively. Furthermore, figure 2 shows that participants' sources of information about antibiotic were primarily doctors followed by pharmacists. The other sources were Internet, relative and friends, media, and finally the news and magazine (Fig 2).

**Table 1:-Demographic characteristic of the participants**

Parameter	Frequency	Percent %	Male	Female	P value
<b>Age (years)</b>					
16 – 25	83	20.8	11.8%	9%	0.320
26 – 35	150	37.5	16.3%	21.3%	
36 – 45	89	22.3	11%	11.3%	
46 – 55	52	13.3	5.5%	7.3%	
> 55	26	6.5	3.5%	3%	
<b>Nationality</b>					0.187
Saudi	375	93.8	46.1%	48.1%	0.187
Non-Saudi	23	5.8	2%	3.8%	
<b>Marital Status</b>					
Single	121	30.3	15.2%	15.4%	0.057
Married	250	62.5	31.4%	31.6%	
Divorced	15	3.8	1.3%	2.5%	
Widowed	10	2.5	0.3%	2.3%	
<b>Educational level</b>					
Elementary school or lower	49	12.3	1.3%	11%	0.000
Secondary school	27	6.8	2.3%	4.5%	
High school	94	23.5	10%	13.5%	
College or over	230	57.5	34.6%	22.8%	
<b>Employment status</b>					
Employed	184	46.0	35.3%	10.5%	0.000
Unemployed	132	33.0	2.8%	30.3%	
Student	60	15.0	6.8%	8.3%	
Retired	24	6.0	3.3%	2.8%	
<b>Antibiotics usage per Year</b>					
Once	123	30.8	14.5%	16.3%	0.408
2 – 4 times	184	46.0	23.6%	22.3%	
More than 4 times	93	23.3	10%	13.3%	
<b>Recently used antibiotics (One Year)</b>					
Yes	281	70.3	34.5%	36.3%	0.578
No	117	29.3	13.4%	15.9%	

**Table 2:-Comparison of age group of participants with regard to knowledge, beliefs and attitudes towards antibiotic use and awareness**

Age	Yes \ No	Not Aware	16-25	26-35	36-45	46-55	>55	P value
Antibiotics used by prescription	No	45.5%	12.3%	15.5%	9.3%	5%	3.5%	0.050
Antibiotics used by pharmacist's advice	Yes	10.8%	4.3%	3.3%	1.5%	1.3%	0.5%	0.030
I force to doctor to prescribe me antibiotics when I sick	Yes	17.3%	5.3%	6.3%	4.3%	1.5%	0%	0.014
I normally stop taking antibiotics when I start feeling better	Yes	51.7%	12.8%	22%	10.5%	4%	2.5%	0.007
I normally keep antibiotic stocks at home in case of emergency	Yes	45%	12.5%	17.8%	8%	5%	1.8%	0.010
I take antibiotics according to the instruction on the label	No	16.8%	2.3%	5.8%	3.3%	3%	2.5%	0.004

**Table 3:-**Comparison of gender in relation with participant’s knowledge, beliefs and attitudes towards antibiotic use and awareness

Gender					
	Yes \ No	NotAware	Male	Female	P value
Antibiotics use without prescription	Yes	10.8%	6.8%	4%	0.042
Antibiotics can cause allergic reaction	No	12%	5.8%	6.3%	0.054
The effectiveness of treatment reduced if a full course of antibiotic is not completed	No	12%	6.3%	5.8%	0.029
When I get a cold, I used to take antibiotics to help me get better more quickly	Yes	43.6%	24.6%	19%	0.014
I expect antibiotics to be prescribed by my doctor if I suffer from symptoms of common cold	Yes	56.4%	30.3%	26.1%	0.032
I usually force my doctor to prescribe me antibiotics when I get sick	Yes	17.3%	10.3%	7%	0.043
I normally keep antibiotic stocks at home in case of emergency	Yes	44.9%	23.6%	21.3%	0.006
I use leftover antibiotic for a respiratory illness	Yes	9%	4.8%	4.3%	0.001

**Table4:-** Comparing the education level of participants with antibiotic awareness

Educational Level							
	Yes/ No	Not Aware	Elementary school	Secondary school	High school	College or University	P value
Antibiotics do not cause side effects	Yes	15.8%	4.5%	1%	3%	7.2%	0.002
Stop taking a full course of antibiotic on improving of symptoms	Yes	36.5%	6.5%	3%	9.3%	17.8%	0.037
Normally stop taking antibiotics when feeling better	Yes	51.7%	7%	3.5%	15%	26.3%	0.012

**Fig 1:-**Participants reasons for the use of antibiotics

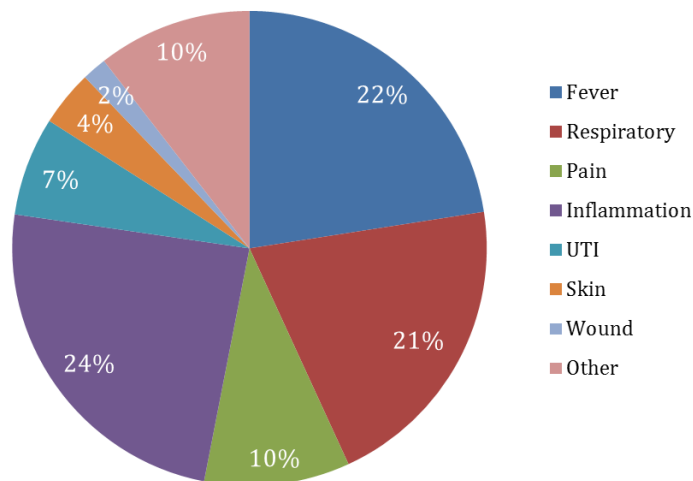
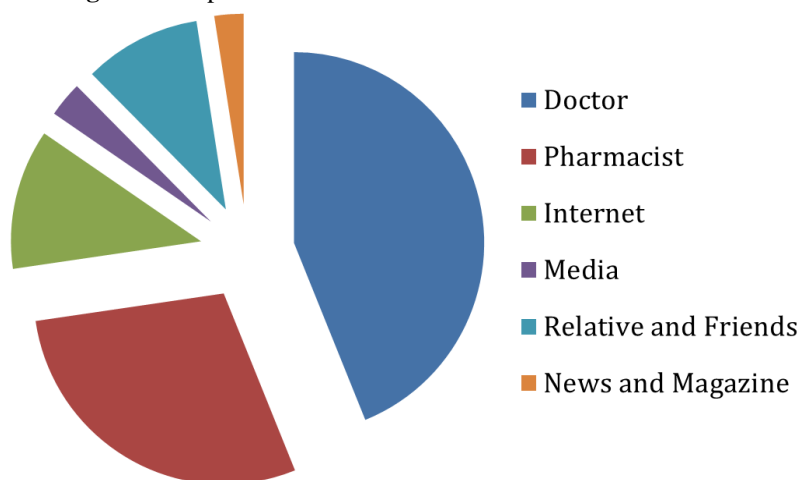


Fig 2:-Participants' source of information about the antibiotics



### Discussion:-

Antibiotics misuse can lead to a wide range of adverse consequences. The patients' knowledge and beliefs about antibiotics can dramatically affect the way they use these medications. Therefore, it is necessary to assess the extent of patients' knowledge in order to reach the right interventions, which in turn guide the patients' behaviors and usage toward these drugs<sup>14</sup>. This study demonstrates that the majority of the participants were using antibiotics frequently from two to four times per year. Furthermore, 281 (70.3%) of respondents had recently used antibiotics within the last year. In addition, the percentage reported in this study was even higher than the percentage reported by a study conducted in Oman by Jose et al.,<sup>14</sup> in which only 66% of the respondents had used antibiotics recently within the last year<sup>14</sup>. The causes for using antibiotics varied from one respondent to the other with higher percentages given to reason for inflammation (24%), fever (22%), and respiratory illness (21%). In terms of knowledge, 55.8 % of participants agreed that antibiotics could be used to treat viral infections compared to 46% as reported by Curry et al., 2006<sup>10</sup>. This confirms the lack of knowledge of the participants and their inability to recognize the differences between bacteria and viruses related diseases. The reason behind this can be due to the use of the word "germs" when counseling and seeking a medical advice instead of using the words "bacteria" or "viruses"<sup>2</sup>. Moreover, the majority of respondents believe that antibiotics can also be used to relieve pain and fever. While, when the participants questioned directly about their behaviors toward antibiotics, 79.3 % had a correct behavior in disagreement to the statement about "I usually force my doctor to prescribe me antibiotics when I get sick". Nevertheless, 56.3 % were expecting their doctors to prescribe them an antibiotic when suffering from common cold. This can be attributed to the large number of prescriptions for antibiotics in respiratory viral infections, which in most of the cases are self-limiting. This leads to the impact on the general belief that such medicines are effective against these diseases. Consequently, such incorrect belief contributes to the raising of the expectations that antibiotics are inappropriate treatment for common colds<sup>2</sup>. The findings in current study have shown that the vast majority of participants (74.3%) were more aware that if an antibiotic's full course was interrupted, the effectiveness will decrease in comparison with Oh et al., 2011 where 71.1% only had correct answer<sup>2</sup>. However, 51.8% agreed that they would stop using antibiotics when they start feeling better. This showed the inadequacy of knowledge wherein most people do not understand the real cause and the actual significance of completing the antibiotic's full course<sup>2</sup>. The results of this study showed the need of an urgent intervention by educating people through annual campaigns about antibiotics' uses, and the importance of compliance. Moreover, it is important to clarify the differences between bacteria and viruses, causes of common colds, and how to alleviate their symptoms apart from antibiotics' usage. The analysis of awareness based on demographics showed significant correlation between misuse and three main factors which are age, gender, and educational level. It was found that those in the age group between 26-35 years were behaving incorrectly more than the other age groups. Furthermore, it had been shown that after the age of 35 with each additional increase in the age, individuals become more aware and tend to have a more positive attitude toward antibiotics. As a result, this guides us to direct these campaigns to this age group in particular and the other age groups in general. Moreover, in this study females seemed to be behaving better than males in several ways like in using antibiotics without prescriptions, keeping stocks, and using leftover antibiotics. We can attribute this result to the females' nature where they are more careful and practical than men when it comes to their lives<sup>18</sup>. As reported, there is correlation between misusing antibiotics and high educational level (College and University).

When the participants questioned directly about their source of information about antibiotics, physicians were occupying the first place followed by the pharmacists. Therefore, it is also important to alert physicians to educate people about the rational uses of antibiotics, its adverse consequences, common cold etiology, and its management. In addition, pharmacists should be willing to refuse any selling of an antibiotic without prescription. Moreover, health officials can set policies to limit these actions globally.

**Strengths and limitations:**The strengths of this study are represented in several aspects. It was conducted in a tertiary care hospital that provides services to all citizens coming from different regions in Saudi Arabia. The questionnaire was distributed equally between both genders. However, there are some limitations in the present study. First of all, there was a high percentage of participants with high educational level (College and University) this could be due to shortage in the number of options provided in the questionnaire where diploma degree holders were not included. As a result, participants who hold diploma may choose "College and University" option. Therefore, increasing the number of options would have defined another representative. Second, recall bias might affect the results as some of the questions depended on recalling. Moreover, the results depended on the honesty and the understanding of the respondents, as it was a self-reported questionnaire. Even though King Khalid University Hospital attracts large number of citizens coming from different regions, this study can be generalized to the capital city Riyadh as Kingdom of Saudi Arabia has different culture in various regions. Furthermore, it would be a supporting study to future researches conducted in other regions as health related studies and policies supporting each other. Finally, we recommend starting a large-scale research covering the whole nation in order to represent the data optimally.

### **Conclusion:-**

It is concluded that, misconceptions exist about the use and indications of antibiotics in the community. This study highlights the need to educate patients regarding antibiotic use and the consequences of misuse. Which diseases actually require antibiotics, why full daily doses must be respected, risk of keeping part of a course for future uncontrolled use and need of a prescription for getting antibiotics from the pharmacist are some of the issues to be discussed with the patients. The majority of participants who show misuse were from age group 26-35, that makes them the main target for future awareness and educational programs to improve the knowledge, attitude and behavior toward antibiotic uses. Interaction is required between physicians and patients and involvement of both print and electronic media may help to improve the antibiotics knowledge and practices in community and consequently control the antibiotics misuse.

### **Recommendations:-**

The community needs well-planned educational campaigns to raise the awareness of antibiotic uses and its adverse effects. Moreover, we recommend that similar studies should be held in different regions in Saudi Arabia. In addition, it is important to have a standard policies regarding antibiotics' selling, wherein getting any antibiotic without prescription should not be allowed. Furthermore, since the majority of participants get their information from their doctors, educating patients by physicians about antibiotic uses, its role in treating etiologies of upper respiratory tract infections and its adverse effects will have a great impact on patients' knowledge and behavior. Major changes in prescribing practice supported by a national information campaign would be beneficial to reduce patient's expectation from antibiotics and to raise awareness about antibiotic resistance.

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### RESEARCH ARTICLE

## SCIENCE FICTION IN ARABIC LITERATURE: HISTORY, GROWTH, DEVELOPMENT AND POSITION.

Dr. Eisam Asaqli.

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#### Abstract

Science fiction literature is a somewhat new and less recognized field in the Arabic literary polysystem. The science fiction (SF) genre entered Arabic literature through translations of Western SF works. Nonetheless, we can see elements and sources of SF in classical and folk Arabic literature. In addition, the industrial-technological revolution in the twentieth century served as a catalyst for the growth of this genre.

From the moment it emerged, SF literature faced two types of criticism. The first viewed it as non-canonical, cheap, a sub-category of detective literature, popular and having no value. The second group of critics, diametrically opposed to the first, saw SF fiction as canonical literature that should be engaged with, critiqued and researched.

In recent years, we can see that diametrically literature has begun to establish itself and assume a position in the Arabic literary polysystem. We are witnessing a trend that is changing the approach to diametrically literature and beginning to recognize it as a canonical literary genre accepted by the academic establishment, meriting attention, research and criticism.

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#### Introduction:-

The beginnings of modern Arabic SF can be attributed to two processes. The first is the renaissance of the classical Arabic literary heritage, the “neo-classical movement”. This movement originated at the end of the nineteenth century and drew from classical literary genres, imitated them and adopted their writing style—e.g., in the manner of *Maqāma*, the stories of *ʿAlf Layla wa-Layla* (*One Thousand and One Nights*), and classical Abbasid poetry at its peak. The most prominent works of this stream were: Muḥammad al-Muwayliḥī, Jurjī Zaydān, Ḥāfiẓ ʿIbrāhīm and ʿAḥmad Shawqī. The second stream, which began with the translations of European literature into Arabic and was influenced by it, commenced in the nineteenth century when the Arab and Western worlds reconnected (the accepted date for historians is Napoleon’s conquest of Egypt in 1798). Among others, intellectuals from Lebanon and Egypt, who having learned a number of European languages, started translating Western literature into Arabic. Very quickly, Arabic writers began following the styles of the translated works and composing plays, novels and short stories. The first pieces written in Arabic were mainly pale imitations of what existed in French and English. Nevertheless, by the middle of the nineteenth century, writers and playwrights began producing original work in which they engaged in issues relevant to the society in which they lived.

The most prominent writers in this stream who left their mark on modern Arabic literature are: Jubrān Khalīl Jubrān, Michael Nuʿayma, Muṣṭafā al-Manfalūfī, Muḥammad ʿUṯmān Jalāl, Jabrā ʿIbrāhīm Jabrā, Tawfiq al-Ḥakīm and



Ṭāhā Ḥyṣṣayn. The Arabic novel developed and reached artistic maturity in the work of the Egyptian writer Najīb Maḥfūz (winner of the 1988 Noble Prize for Literature), much of which dealt with the world of his native city, Cairo. Maḥfūz focused in particular on the lives of the lower classes; yet, he also described the internal world and conflicts of the Egyptian intellectual. His short stories reflect the realism characterizing the lives of many of Cairo's residents. At the same time, his work is suffused with the universal truths of Man's nature.

In the 1940s, SF books and stories began appearing in Arabic literature. SF literature entered Arabic literature through translations of Western SF literature, though some researchers see the roots of Arabic SF drew from classical and folk Arabic literature. Further, SF literature grew and developed under the influence of the industrial-technological revolution, which reached the Arab world in the 1950s.

### Definition:-

James Gunn believes that 'defining SF is like measuring the properties of an electron: you may think you're measuring a solid object, but it's really a wispy cloud. Even its name leads to disputes. Jules Verne called what he wrote *voyages extraordinaires*, and H. G. Wells called it *scientific romance*. When Hugo Gernsback created the first true science-fiction magazine in 1926, he called what he intended to publish *scientifiction*, and he came up with the phrase "science fiction" only after he lost control of *Amazing Stories* in 1929 and created *Science Wonder Stories*. Robert A. Heinlein suggested that *speculative fiction* was a more appropriate designation. Abbreviations such as "sci-fi" (liked by the media but not by most fans, who use it to describe bad science-fiction movies) and "SF" (preferred by most readers) further complicate the issue.' (Gunn and Candelaria, 2005: ix)

Samuel R. Delany, insist that, 'like poetry, SF is impossible to define. Others have pointed out that genre titles are booksellers' conveniences, telling them where to put books when they arrive—and equally, of course, book buyers' conveniences, telling them where to look for the books they want when they go shopping. Brian W. Aldiss defined SF as 'a hubris clobbered by nemesis.' John W. Campbell: 'SF is what SF editors publish.' The fall-back position, epitomized by Damon Knight when he said: "SF is what we mean when we point at it," is that we know it when we see it. And even if we can't define it to everyone's satisfaction, the effort helps us clarify our thinking about the genre (quoted in Gunn and Candelaria, 2005: x).

*The Oxford English Dictionary* defines SF as 'imaginative fiction based on postulated scientific discoveries or spectacular environmental changes, frequently set in the future or on other planets and involving space or time travel'. Adam Roberts sees the terms of this basic dictionary definition are instructive: 'imaginative fiction' differentiates SF from 'realist' fiction, in which there is some attempt at a literary verisimilitude that reproduces the experience of living in the world we recognise as ours (Roberts, 2000: 2). Darko Suvin defined SF as 'a literary genre whose necessary and sufficient conditions are the presence and interaction of estrangement and cognition, and whose main formal device is an imaginative framework alternative to the author's empirical environment.' (Suvin, 1979: 8-9). Damien Broderick concludes that the SF is a 'species of storytelling native to a culture undergoing the epistemic changes implicated in the rise and supercession of technical-industrial modes of production, distribution, consumption and disposal.' (Broderick, 1995: 155)

James Gunn concludes that 'the attempt to define SF, moreover, is like the attempt to measure electrons in another way: you can determine the location but you can't also determine the momentum every attempt changes one or the other. The difficulty with identifying science fiction and proceeding from that to definition is that SF isn't just one thing. It has no recognizable action, like the murder mystery, or recognizable milieu, like the western, or recognizable relationship, like the romance. It is about the future except when it is about the past or the present. It can incorporate all the other genres: one can have a science-fiction detective story, a science-fiction western, a science-fiction romance, and, most commonly, a SF adventure story. It is best characterized by an attitude, and even that is hard to define. It is the literature of change, the literature of anticipation, the literature of the human species, the literature of speculation, and more.' (Gunn and Candelaria, 2005, x- xi).

In Arabic literature research, SF is usually defined as literature that deals with phenomena beyond our everyday reality, given that this literature describes scientific and technological discoveries that have yet to be realized in reality, especially regarding space, time travel, life on other planets and encounters with extraterrestrials. Accordingly, SF is a genre that is concerned with the responses of humans to improvement and progress in the fields of science and technology. The underlying premise of SF literature is the concept of focusing on predicting the future, with the emphasis on possible technological-scientific developments. Hence, we can see that its creators

write of time travel, the likelihood of world war three, the invasion of Earth by extraterrestrials, battles with strange beings, epidemics of dangerous bacteria, the ominous implications of genetic engineering, humans being ruled by robots and machines, etc. (see, e.g., Muştafā, 2007; Wahbī, 1974; Yāsīn, 2008)

### **The roots of SF in Arabic literature:-**

Chronologically, we can delineate five sources that spurred the growth and development of SF literature in the Arab world.

### **Arabic folk literature:-**

Robert Scholes sees ‘the tradition that leads to modern SF as a special case of romance. For this tradition always insists upon a radical discontinuity between its world and the world of ordinary human experience. In its simplest and most ancient form this discontinuity is objectified as another world, a different place—Heaven, Hell, Eden, Fairyland, Utopia, the Moon, Atlantis, Lilliput. This radical dislocation between the world of romance and the world of experience has been exploited in different ways. One way has been to suspend the laws of nature in order to give more power to the laws of narrative, which are themselves projections of the human psyche in the form of enacted wishes and fears. These pure enactments are the root of all narrative forms, whether found in “realistic” or “fantastic” matrices.

There is another way to exploit the radical discontinuity between the world of romance and that of experience, and this way emphasizes cognition. The difference can be used to get more vigorous purchase on certain aspects of that very reality which has been set aside in order to generate a romantic cosmos. When romance returns deliberately to confront reality it produces the various form of didactic romance or fabulation that we usually call allegory, satire, fable, parable, and so on— to indicate our recognition that reality is being addressed indirectly through a patently fictional device.

Fabulation, then, is fiction that offers us a world clearly and radically discontinuous from the one we know, yet returns to confront that known world in some cognitive way. Traditionally, it has been a favorite vehicle for religious thinkers, precisely because religions have insisted that there is more to the world than meets the eye, that the common-sense view of reality—“realism”—is incomplete and therefore false.’ (Scholes, 2005, 206)

According to a number of Arab researchers (see, e.g., ‘Abd al-Fattāh, 1993; Khurshid, 1994; ‘Azzām, 1994), the miracles and the Jinns (genies or spirits) described in *‘Alf Layla wa-Layla* (see, e.g., *‘Alf Layla wa-Layla*, 1998, V. 1, 30-35, V. 4, 58, 225) and in folk biographies such as *Sīrat ‘Alī al-Zaibaq* (2004) and *Kitāb al-Tījān fī Mulūk Ḥimyar* by Ibn Hishām (2008) , constitute the basis for modern Arabic SF literature. In other words, the roots of SF are embedded deep in Arabic folklore. Researchers claim that the concept of Jinns (genies) and their actions, the phenomenon of metamorphosis, the adventures of Sinbad, the idea of disappearance/reappearance and other supernatural phenomena are the basis upon which SF literature was constructed and from which it emerged.

These same researchers assert that the use of energy, nuclear power and knowledge of electronics in SF today is equivalent to the stories of the Jinn with supernatural power in folk literature and the dangers and crises faced by Sinbad in his travels and his use of tricks and ruses to escape these dangers. Similarly, the Jinn with his supernatural power—as in his ability to time travel, to organize and wage war—in folk literature is the same as today’s hero in SF movies. The researchers claim that the flying carpet that appears in *‘Alf Layla wa-Layla* (*One Thousand and One Nights*) is the equivalent of a spaceship or modern day airplane; the wondrous teakettle is comparable to an electric lamp; the crystal ball through which the witch sees the world is today’s computer; the phenomenon of metamorphosis described in mythology, folklore and *One Thousand and One Nights* by virtue of which an entity (sorcerer, witch) can change its form and become a different being, is seen today in SF stories such as Mary Shelley’s *Frankenstein*. Shelley’s hero, Dr. Frankenstein, takes body parts and pieces of skin from dead people and successfully imbues life into them to create a being. In *One Thousand and One Nights*, the sorcerer changes people into animals (a donkey, dog or cow). Today, in SF films, we see werewolves. We can distinguish other phenomena, which appear in Arabic folk literature, e.g., the ability to disappear that enables the hero to disappear by donning a hat or ring. This theme appears today in SF stories such as H. G. Wells’ *The Invisible Man*. And just as the authors of folk stories dived deep into the waters of seas and oceans, described and controlled them, today SF is engaging with the same subjects (see, e.g., Verne, 1998; Sharīf, 1977).

**Classical Arabic literature:-**

In keeping with the assumption that SF is based, essentially, on imagination, the description of futuristic fictionalized adventures, historical facts taken to imaginary horizons, the development of ideas and existing trends in scientific, technological, economic and artistic fields and their implications for the future of humankind, the presentation of unknown worlds and travel to strange planets, it is easy to distinguish the foundations in the imagination-rich Arabic literature. For example:

- a) *Al-Futūḥāt al-Macciyya* Ibn 'Arabī (1165-1240),
- b) *'Ārā'fī 'hl al-Madīna al-Fāḍila* by 'Abū Naṣr al-Fārābī (870-950),
- c) *Risālat al-Ghufrān* by 'Abū al-'Alā' al-Ma'arrī (973-1058),
- d) *Risālat al-Tawābi' wal-Zawābi'* by Ibn Shuhayd (992-1058),
- e) *Ḥay bin YaqZān* by Ibn Ṭufayl (1100-1185),
- f) *'Ajā'ib al-Makhlūqāt* by al-Qazwīnī (1208-1283).

Thus, for example, Ibn 'Arabī in his book, *al-Futūḥāt al-Macciyya (The Meccan Revelations)*, described a world that exists in a sesame seed. His world has people, land, gardens, animals and all types of metal. Anyone can enter this world, move about in it and talk to its people, stones or trees. Ibn 'Arabī also described groups of people with the ability to travel from one place to another at the speed of light. Further, he described the prophet Elijah who can walk on water, cross great distances with only two or three strides and fly in the sky on a flying carpet (Ibn 'Arabī, 1972: 257-261, 265-268; Ibn 'Arabī, 1985: 182-184). Likewise, he portrayed people that can change their form and take on another form and thereafter return to their original form. He also described a holy stone around which people turn, with which they converse, ask it to grant wishes, and give advice and information in all kinds of areas, and it answers them and fulfills their wishes (Ibn 'Arabī, 1972: 267). In addition, Ibn 'Arabī wrote of a sea made of dust, yet having the characteristics of water. The stones are drawn to and connect with each other, on their own, in the way that metal is attracted to a magnet, and in this way a ship is built. People board this ship and travel at the speed of light. These same people can walk on water without sinking (Ibn 'Arabī, 1972: 260-268). The same image appears in modern SF. For example, the same descriptions appear in the novel *al-Sayyid min Ḥaql al-Sabānikh* (1987) (*The Man in the Spinach Field*) by the Egyptian writer Ṣabrī Mūsā, and in the novel *al-Ṭūfān al-'Azraq* (1976) (*The Blue Flood*) by the Moroccan writer 'Aḥmad al-Biqālī, as well as other novels. In these novels, the holy stone has been replaced by an electronic brain that people turn to and pose questions and it provides answers and information and helps them solve problems and clarify issues. This same brain contains all human knowledge, thinks and records, prophesizes and predicts people's future, forecasts their illnesses, gives them medicine for their illnesses, explains their feelings to them and teaches them the right way to behave (al-Biqālī, 1976; Mūsā, 1987).

The same theme appears in numerous short stories. For instance, *Ḥub fī al-Qarn al-Wāḥid wal-'Ishrīn* (1987) (*Love in the Twenty-First Century*) by Ra'ūf Waṣfī, his hero turns to the electronic brain and asks it for help and direction in how to cope with problems and issues related to his lover.

It is important to note that the literary researchers, Alexei Panshin and Cory Panshin, noted the similarity between the descriptions in the story by Ibn 'Arabī and the descriptions appearing in Fredric Brown's *What Mad Universe* (1949) and *Waldo* (1942), a short story by Robert Heinlein (Panshin & Panshin, 2005, pp. 219-223).

Brian Stableford sees that 'the concept of a *utopia* or "Ideal State" is linked to religious ideas of Heaven or the Promised Land and to folkloristic ideas like the Isles of the Blessed, but it is essentially a future-historical goal, to be achieved by the active efforts of human beings, not a transcendental goal reserved as a reward for those who follow a particularly virtuous path in life. The term was coined by Thomas More in *Utopia* (Latin edition 1516; trans. 1551). It can be argued that all utopias are SF, in that they are exercises in hypothetical Sociology and political science. Alternatively, it might be argued that only those utopias which embody some notion of scientific advancement qualify as SF.

The scientific imagination first became influential in utopian thinking in the seventeenth century: an awareness of the advancement of scientific knowledge and of the role that science might play in transforming society is very evident in Francis Bacon's *New Atlantis* (1626) and Tommaso Campanella's *City of the Sun* (1637).

It was left to a school of French philosophers during the second half of the eighteenth century to become the first strident champions of the idea that moral and technological progress went hand in hand. L S Mercier's pioneering

euchronian novel, *L'an deux mille quatre cent quarante* (1771) proposed that the perfectibility of mankind was not only possible but inevitable, with the aid of science, mathematics and the mechanical arts.' (Stableford, 1995, 1260)

Other researchers (e.g., Scholes & Rabkin, 1977: 173-174; Hillegas, 1979; James, 2003) see utopian literature as a literary genre upon which SF developed. Utopia was the source of inspiration for many SF writers such as H.G. Wells, Jules Verne, Aldous Huxley, Isaac Asimov, Arthur C. Clarke, Ivan Yefremov, Edward Bellamy, and James Blish. The researchers also noted that many modern SF novels contain utopian elements.

In his book, *'Ārā' fī 'Ahl al-Madīna al-Fāḍila (On the Perfect State)*, al-Fārābī tried to describe an ideal utopian state in social, economic and political terms. His state is based on science, wisdom and philosophy, and all its citizens enjoy equal rights, justice and a high standard of living (al-Fārābī, 1998). The same descriptions appear in the novel *al-Sayyid min Ḥaql al-Sabānikh* (1987) (*The Man from the Spinach Field*), by the Egyptian writer Ṣabrī Mūsā. He portrayed a utopian state governed by a team of scientists, and wise and talented men (technocrats). This world has justice and social organization that ensures fair distribution among all its citizens of work, food, lodging and studies. There are no illnesses or wars. There is no crime or punishment. Robots help prepare food and run the households. The government allocates property equitably. Citizens work at jobs they enjoy, that benefit everyone and that leave them free time to dabble in the arts and sciences. The institution of marriage has disappeared. There is a laboratory that produces children from test tubes (in vitro fertilization). The government decides how many children are to be produced, in line with its needs.

Equality is reached through scientific-technological and robotic development that enable a high standard of living. The state laws are clear and guarantee equal rights and obligations for all citizens, and every citizen has the right to express his opinion and has free will when voting.

#### **The industrial-technological revolution:-**

An examination of the historical background behind the growth of SF in Arabic literature reveals a link between the industrial-technological revolution and the history of its development. The age of scientific discoveries and social changes fed this literary genre's growth. On the foundations of the scientific and industrial revolution, a number of writers began writing fictional books and stories whose subjects were inspired by scientific ideas and technological inventions. The interest in technological innovations and in subjects related to space and supernatural phenomena increased significantly in the 1950s in the Arab world. The reality of the lack of original literature to supply the demand, literature that would deal appropriately with these types of subjects, led to translations into Arabic. These dealt with the typical subjects of SF such as the existence of life on other planets and the possibility of making contact with them. Western writers, most prominently Arthur C. Clarke and Isaac Asimov, filled the very important role of introducing Arab readers to SF. In this context, their engaging with the link between scientific progress and space research, and the emergence and development of SF should be particularly noted (see, e.g., Asimov, 1960; Asimov, 1964; Asimov, 1979; Asimov, 1980; Clarke, 1973).

The link between the industrial-technological revolution and the literature has been discussed in a number of studies and in several papers translated into Arabic. One book that was translated, received especially broad recognition and made a substantial impact was that written by the Russian critic Valentina Ivashova, *al-Thawra al-Tuknūlūjiyya wal-'Adab* (1985) (*The Technological Revolution and Literature*). He dealt with the immense progress in science and technology in different fields and its impact on literature. In addition, its author discussed the tendencies of many writers to deal with the most modern scientific developments and the predictions that anticipated these developments.

At the end of the 1950s and at the beginning of the 1960s, books and papers in Arabic that dealt with the industrial-technological revolution and space began appearing. These increased Arab readers' awareness of SF significantly. Albeit these books focused on science and not literature, they still mentioned science fiction books and the most important SF writers, and included summaries of the most famous Western novels as well as discussions related to the mutual relations between SF and the technological revolution. Thus, for example, Muḥammad 'Awaḍ' Allāh, in the book *al-Faḍā' wa-Shuḥub* (1973) (*Space and the Comets*), discussed the relations existing between scientific facts and literature and the writers that take scientific facts and weave them into a literary story.

SF literature itself also entered the literary polysystem of Arabic literature by virtue of Arab writers who had scientific knowledge about space and supernatural phenomena. These people were involved in translating Western

SF books and stories. Later, these same writers began creating original SF literature. Among these are: Ra'ūf Waṣfī, Maḥmūd Muṣṭafā and 'Anīs Maṣṣūr. The series, 'Aghrab min al-Khayāl' (*Stranger than What You Could Imagine*), (five volumes) by Rājī 'Ināyat, was the one that succeeded more than any other in making Arabic readers aware of important and modern developments in the field of SF such as miracles, supernatural phenomena, space, theories of time, other civilizations, electronic brains and other essential subjects in SF (see, e.g., 'Ināyat, 1980; 'Ināyat, 1983; 'Ināyat, 1984).

We cannot explain the development of this literature in Arabic without discussing the influence of the features of the period and the changes that occurred in it. Arab researchers agree that the spread of SF literature ensued as a result of the technological progress that reached the urban areas during this period and following the industrial-technological revolution when atomic science and study of space abounded. Further, the application of a number of revolutionary discoveries such as the existence of inherited genes also contributed to the impact of SF literature.

#### **The translation enterprise:-**

Translations of Western SF books, short stories etc. were a critical feature in the introduction of the genre into Arabic literature. The translation enterprise of Western SF began in the 1940s. It can be classified into four types:

#### **Translations of short stories:-**

At the beginning of the 1960s, short SF stories written by the most important Western writers were translated into Arabic. The translations appeared in Egyptian magazines such as *al-Hilāl*, 'Ibdā', *al-Fikr al-Mu'āṣir*, *al-Qāhira*, *al-Jadīd*, Kuwaiti magazines such as 'Ālam al-Fikr and *al-'Arabī*, and Lebanese magazines such as *al-'Adīb* and *al-'Ādāb*. The stories of Arthur C. Clarke, Isaac Asimov, Ray Bradbury, Damon Knight, H. G. Wells, Varlin Strongin, Bertram Schindler and others were translated. An examination of the Arabic text, however, shows that some translations were very far from being faithful to the original and that they omitted sentences and even full paragraphs (see, e.g., Asimov, 1978; Bradbury, 1986).

#### **Translations of novels:-**

From the beginning of the 1940s, SF novels were translated into Arabic. The first novels to be translated were two of H. G. Wells' books, *The Invisible Man*, which was translated and published in 1940 in Egypt, and *The Food of Gods and How It Came to Earth*, which was translated and published in 1947, also in Egypt (Wells, 1940; Wells, 1947). The latter translation was reprinted in Damascus in 2001. Another famous and important novel that was also translated for the first time in 1956 was George Orwell's *Nineteen Eighty-Four*, which was actually translated and published six times in the Arab world by six different publishers. Other novels that were translated were those of Arthur C. Clarke, Karel Čapek, Aldous Huxley etc. The translation enterprise continues today. Thus, for example, Clarke's *Rendezvous with Rama* was published in Cairo in 2010.

In parallel, articles and papers appeared in newspapers and journals that dealt with translated novels and other Western literary works. For example, there were papers that discussed and reviewed the novels of Kurt Vonnegut, *Player Piano*, *Cat's Cradle*, and *God Bless You, Mr. Rosewater*, of Roger Zelazny, *This Immortal*, of Ray Bradbury, *Fahrenheit 451*, of Anthony Burgess, *A Clockwork Orange* and *Earthly Powers*, and others, were published.

#### **Translations of scientific books and papers:-**

Another element that had a significant role in bringing SF literature into the world of Arabic readers was the translations of papers, research studies and books dealing with this literature, how it emerged, and central schools of thought and writers. Through these studies, Arabic readers became cognizant of the growth and development of SF and to associate SF with the scientific-technological revolution. Likewise, with the exposure to some Western writers and their work, Arabic readers learned about the subjects and content of SF literature and its place in the literary system.

*The Strength to Dream: Literature and Imagination* (1962) by Colin Wilson is believed to be the first book to be translated into Arabic and it had enormous impact on the entry and diffusion of SF into the Arab world. The first translation of the book appeared in 1966 and was followed by four other editions, the last one in 1981 (Wilson, 1966). Other books that were translated into Arabic and that also had great influence were *Histoire de Roman Moderne* (1962) by René Marill Albérès, translated in 1978, and *La Science-fiction* (1983) by Jean Gattégno, translated in 1990. Translation of books dealing with SF continues today. Thus, in 2011, *Science Fiction and*

*Philosophy: From Time Travel to Superintelligence* edited by Susan Schneider (2009), was translated in Egypt (Schneider, 2011).

In addition, in the 1980s, scientific papers by top Western critics were translated and published. For example: Robert Scholes, *The Roots of Science Fiction* (1976); Darko Suvin, *On the Poetics of Science Fiction* (1976); Mark R. Hillegas, *The Literary Background to Science Fiction* (1979).

These papers were published in Egypt in the journal *al-Fikr al-Mu'āṣir, al-Qāhira, al-Jadīd*. They discussed SF literature, and through them, Arabic readers were exposed to topics such as the history and development of the genre, the link between the genre and the scientific-technological revolution and astrophysics and the relation with other genres such as fantasy, utopia, and life on other planets. Further, these papers also mentioned SF writers and books and included abstracts of famous Western novels (see, e.g., Hillegas, 1980; Scholes, 1986).

A close look at Arabic journals today will show that they are still publishing translated articles dealing with SF. For example, in 2007, *Fuṣūl* (71), an Egyptian periodical, published three papers by Veronica Hollinger, Istavan Csicsery-Ronay Jr. and Donald M. Hassler.

#### **Anthology translations:-**

Another factor that helped introduce SF into the world of Arabic readers was the translation of anthologies that included pieces by Western SF writers and examples of their work. The first anthology to be translated was one edited by Edward Morgan Forster, which was translated in 1961, in Cairo. The second such book was an anthology edited by Robert Silverberg, which was translated in 1986, also in Cairo. This anthology included nine short SF stories that won the Nebula Prize and the biographies of the writers of these stories (Forster, 1961; Silverberg, 1986).

#### **Biographies:-**

A pivotal type of text that strongly influenced the entry of SF literature into the Arab world was **biographies**. From the 1960s on, biographies of Western SF authors began appearing in the Arab world, in newspapers and in periodicals. Included among these were biographies of Jules Verne, George Orwell, Aldous Huxley, Ray Bradbury and H. G. Wells, which appeared in journals such as *al-Fikr al-Mu'āṣir, al-Jadīd, 'Ālam al-Fikr, al-'Arabī, al-'Ādāb* and others. Some biographies included short excerpts of the subject's writings as well as reviews of their work. Some of these newspapers and periodicals devoted special columns to the subject of SF literature. These often dealt with a certain book that was presented to the reader and whose main subject matter and content were described briefly. Some of these books were translated afterwards into Arabic (see, e.g., Sharīf, 1975; Sharīf, 1976).

#### **The position of SF literature in the Arab world:-**

The 1970s and 1980s were characterized by a gradual shift from being based solely on translated SF to the writing of original texts by Arab authors. An examination of the history of SF shows that this genre, from the moment it emerged, confronted two types of critics. There were critics who called it cheap, popular literature with no value and grouped it with detective novels and non-canonical literature. The second type of critics saw this genre as a form of legitimate literature belonging in the canon and believed that it should be read and critiqued.

The former critics who did not see any redeeming value in SF literature felt that it lacked maturity and reflected an inferior type of writing style. They identified lacuna such as weak and minor plots, underdeveloped characters not delineated sufficiently, a dark and even absurd style, a purposeful appeal to a broad, uneducated public in order to stimulate its senses and imagination and a move away from serious literature and from the noble arts so as to get closer to literature intended to entertain. Other critics, when it first began penetrating the world of Arab literature, also responded negatively. They saw it as a literary genre without value and belonging to the realm of popular literature and detective novels. They even claimed that it was neither scientific nor intellectual. SF novels were accused of not providing enough tools to analyze human behavior and lacking depth and purpose. SF literature was presented, as such, as fit only for entertainment purposes, arousal and making money. As a result, it was considered undeserving of serious research and criticism (Farrāj, 1983; Maḥmūd, 1983; Snir, 2000; Qāsim, 1993; 'Abd al-Fattāḥ, 1993).

In contrast, the latter group of critics (Sharīf, 1983; al-'Ānī, 1986; 'Abd al-Malik, 1989), described SF as a literary-artistic art form having a universal value that makes it worthy of being related to and seriously evaluated in the same

way that other literature is treated. The assertions of this group of critics were based on the premise that SF has within it a way of thinking that is likely to help humankind solve many of its problems. SF was presented, accordingly, as a literary genre dealing with a number of human issues and that satisfactorily realizes the hopes and aspiration of humankind. Further, it demonstrates the existence of an advanced society, is a means for teaching children and youth values, develops one's imagination, thinking and ability to draw conclusions, and is a warning and a prognosticator of might happen in the future. The position of SF devotees and those who recognized its value has, in the past few years, been supported and accepted by critics and literary agents by virtue of the increase in the number of writers and readers of SF as well as in the number of research studies and papers that have been published on the subject and that included criticism and evaluation.

When it first entered the Arabic literary polysystem, SF was met by disregard on the part of the official establishment and critics. Most research into Arabic linguistics that dealt with Arabic literature ignored the existence of Arabic SF literature. Most anthologies of the world's best SF stories that were published snubbed this literary genre in the Arab world and did not mention Arabic SF authors or give examples of their work (see, e.g., Aldiss & Lundwall, 1986; Asimov et al. 1985 ; Broderick & Di Filippo, 2015; Pringle, 1985).

In the official cultural institutions of the Arab world, the perception that asserts that SF is a type of **cultural invasion** by Western culture predominated and still holds sway today. Critics maintain that this cultural invasion has three main objectives: 1. To undermine the foundations of the Islamic nation and its language; 2. To enable Western culture to supplant Arabic culture; and 3. To prevent the Arab world from rebuilding its real self by ensuring it remains subservient (Snir, 2000).

Despite the scorn heaped on SF literature and the disregard of the critics from the official cultural institutions, we can discern a change in the last few years, which is being expressed by a new tone of respect and esteem SF literature and recognition of it as a serious literary genre worthy of the attention of artists and critics. The official establishment has begun, even if only slowly, to recognize this literary genre as meriting consideration and evaluation as given to other literary genres. Thus, for example, we can find academic research and university papers that discuss this literary genre.

#### Examples:-

- ❖ We can find studies and papers on the subject in the Egyptian journal *'Ibdā'* and *Fuṣūl* (see, e.g., al-'Abid, 2007; 'Abdullāh, 1989; al-Jayyār, 1984; al-Jayyār, 1987; Muṣṭafā, 2007 ).
- ❖ The Syrian journal, *Majallat al-khayāl al-'ilmī* (*The Science Fiction Journal*), has been in print since 2008. It publishes, in addition to SF papers, papers on other topics such as space, physics, chemistry, natural science and more.
- ❖ In 2001, a doctoral dissertation at Cairo University.
- ❖ In 2007, a doctoral dissertation at the University of Haifa.
- ❖ In 2008, a graduate thesis at Damascus University in Syria.
- ❖ In 2011, a doctoral dissertation at Georgetown University, Washington, DC, USA (Boutz, 2011).
- ❖ In 2007, the publication of the book, *al-Khayāl al-'ilmī wa-Tanmiyat al-'Ibdā'* (*Science Fiction and the Development of Creation*) ('Abū Qūra & Salāmi, 2009).
- ❖ In 2009, the publication of the book, *Tanmiyat al-Taḥkīr al-'Ibdā' ī Fī al-'Ulūm wal-Riyāḍiyyāt bi-'Istikhdam al-Khayāl al-'ilmī* (*Development of the Work in Sciences and Mathematics through Science Fiction*) (Shawāhīn, et al. 2009).
- ❖ Since 1986, six books in Arabic that discussed the development of SF in the Arab world have been published (see, e.g., al-Tallāwī, 1990; al-Shārūnī, 2000).
- ❖ At the end of the 1990s, in Egypt, the publication of two series of books aimed at children and adolescents.
- ❖ Similarly, we are witnessing a steady increase in the number of writers and readers in the Arab world. For example, in Egypt, we have writers in Arabic such as Ṣabrī Mūsā, Ra'ūf Waṣṣfī, Nihād Sharīf, Muṣṭafā Maḥmūd, in Syria Ṭālib'imrān, Līnā Kīlānī, Diyāb 'īd, in Tunisia al-Hādī Thābit, in Algeria Muḥammad Dhīb, in Morocco Muḥammad al-Ḥabābī, 'Aḥmad al-Biqālī, in Kuwait al-Ṭība 'Ibrāhīm, and in Lebanon Qāsim Qāsim.
- ❖ We are also seeing Arab authors writing in foreign languages; for example:
- ❖ Ebnou, Moussa Ould. (1990). *L'Amour Impossible*. Paris: Éditions L'Harmattan.
- ❖ Ebnou, Moussa Ould. (1994). *Barzakh*. Paris: Éditions L'Harmattan.
- ❖ In addition, we can find books and papers in foreign languages that discuss SF in the Arab world; for example:

- ❖ Barbaro, Ada. (2013) *La fantascienza nella letteratura araba*. Collana: Lingue e Letterature Carocci.
- ❖ Snir, Reuven. (2000). The emergence of science fiction in Arabic literature. *Der Islam*, 77(2), 263-285.
- ❖ Snir, Reuven. (2002). Science fiction in Arabic literature: Translation, adaptation, original writing and canonization. *Arabic Language & Literature*, 2, 209-229.
- ❖ Qader, Nasrin. (2002). Fictional testimonies or testimonial fictions: Moussa Ould Ebnou's Barzakh. *Research in African Literatures*, 33 (3), 14-31.
- ❖ Nuruddin, Yusuf. (2006). Ancient black astronauts and extraterrestrial Jihads: Islamic science fiction as urban mythology. *Socialism and Democracy*, 20(3), 127-165.

#### Conferences focusing on SF, its development and position, are also being held; for example:-

- The 1<sup>st</sup> Science Fiction Conference in the Arab World, Damascus, 2007.
- Science Fiction and Islam Conference, Boston, 2012.
- Science Fiction Conference, Morocco, 2012.
- Science Fiction Conference, London, 2013.

#### Summary:-

SF is a literary genre concerned with describing fictional futuristic stories in the fields of science, technology, genetic engineering, time travel, life on other planets, encounters with extraterrestrials and their implications for the future of humankind.

SF literature appeared in Arabic at the beginning of the 1940s through translations of Western SF literature. It simultaneously drew from classical and folk Arab literature for its inspiration. Some Arab critics and literary researchers viewed it as non-canonical literature, cheap, popular and worthless, while others saw in it canonical literature deserving consideration and research.

In the last few years, we can discern that SF literature has begun to establish its position in the Arabic literary polysystem. Thus, for example, we can find studies, articles and academic papers that discuss this genre and an increase in the number of writers and readers and serious conferences being held about this genre.

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### RESEARCH ARTICLE

#### THE ROLE OF HU IN THE MANAGEMENT OF VASO-OCCLUSIVE CRISES IN SICKLE CELL ANEMIA.

Dr. Mattar Al-Sulami and Dr. Salwa Al-Najjar.

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#### Abstract

**Background:** Sickle Cell Anemia (SCA) is a chronic inherited form of haemolytic anemias. The estimated prevalence of SCA trait carriers in Saudi Arabia is 4.2%. Patients manifest with frequent infections and recurrent Vaso-Occlusive Crisis (VOC). Hydroxy Urea (HU) is used to modulate the severity of SCA phenotype, and for treating painful VOCs. This study aims to explore the perceptions of SCA patients on HU, and other clinical and biomedical manifestations.

**Methods:** A prospective comparative study, conducted in Jeddah. Patients were classified into two groups; (10) patients in the study group on HU, and (8) others in the control group on other treatments.

**Results:** The study included (18) patients, (12) females and (6) males, aged between (8-36) years. While the group on HU had slightly lower Hb levels ( $7.95 \pm 1.3$  Vs  $8.44 \pm 1.3$ ), the controls had lower MCV levels. Platelets, Reticulocytes and WBCs were lower for the HU group. Except for Alkaline Phosphatase (ALP), liver function indices were higher for the study group. A significant association was detected between low ALP and using HU. Six patients on HU said: "they felt better after using HU", and felt that "their need for blood transfusions decreased after using HU". Patients noticed a decrease in admissions after using HU, and the average number of admissions was (3) per patient.

**Conclusion:** Patients on HU experienced some improvement, some stability of their hematologic parameters, and reduced hospitalization. More studies should be conducted to understand the benefits and risks of HU use in SCA patients.

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#### Introduction:-

Sickle Cell Anemia (SCA) is a chronic inherited form of haemolytic anemias. The abnormal form of Haemoglobin (i.e. HbS) polymerize Red Blood Cells (RBCs) into the deformed characteristic sickle shape, leading to functional disturbances and hemolysis. <sup>(1-3)</sup> SCA is a recognized global burden world-wide. It is particularly common in Sub-Saharan Africa, South and Central America, southeast Asia and the Mediterranean countries. <sup>(4-7)</sup> The Saudi National Premarital Screening Program estimated the prevalence of sickle cell trait carriers to be (4.2%), with (0.26%) of the screened population already suffering from sickle cell disease, <sup>(8-9)</sup> with higher rates in some regions. <sup>(10)</sup> In Saudi Arabia, SCA is more prevalent in the Eastern, Western, and Southwestern provinces.

SCA is attributed to many serious complications such as strokes, retinopathies, priapism, splenic infarctions, renal and hepatic failures, pulmonary hypertension, and acute chest syndrome. <sup>(11-12)</sup> Patients usually manifest with chronic haemolysis, frequent infections and recurrent Vaso-Occlusive crisis (VOC). The latter is characterized by severe acute pain in the abdomen and /or extremities, and can result in organ damage as result of progressive vasculopathy and acute infarctions. <sup>(13-15)</sup>

The treatment of SCA can vary between countries according to the available resources and disease prevalence. Treatment options include rehydration and blood transfusion to correct anemia, vaccinations and prophylactic antibiotics to reduce and prevent infections, as well as pain management to reduce the burden of painful crisis and improve the functioning abilities of patients. <sup>(16-18)</sup> Hydroxy Urea (HU) is a urea analogue which inhibits DNA synthesis in the S-phase of cell cycle. <sup>(19)</sup> It is used to modulate the severity of SCA phenotype, and for the treatment of painful crisis. The benefits of HU in sickle cell disease were evaluated in a number of studies, some of which facilitate the wider use of HU, and others highlighted some of its adverse effects. <sup>(20-25)</sup>

Although the condition is widely prevalent in Saudi Arabia, research around SCA management and the use of HU remains limited. In this study, we explore the perception of SCA patients admitted with VOC on the use of HU, and any accompanying clinical or biomedical changes.

### **Materials and Methods:-**

This prospective comparative study was conducted at King Abdulaziz University Hospital (KAUH) in Jeddah, in the western region of Saudi Arabia. Ethical approval was obtained from the Ethical and Technical Committee at KAUH, along with all other administrative approvals. We recruited patients over a one year period, starting June 2011 to May 2012, and targeted known SCA patients who were admitted to KAUH for the management of VOC. Prior to participation in this study, informed consent was obtained from adult patients, and from the guardians when children were involved.

### **Patient Characteristics:-**

The study's population consisted of SCA patients admitted suffering from an acute VOC. As per the diagnostic protocol followed by Department of Haematology at KAUH, patients in VOC are those experiencing an episode of acute pain in the abdomen and/or extremities, with other signs of increased or exacerbated hemolysis. In order to assess patients' condition, including disease phenotype and severity, the following investigations are requested at the time of admission; Complete Blood Count (CBC), Blood Film (BF), Haemoglobin Electrophoresis (HbE), Sickle Solubility test, Liver Function Tests (LFTs) including serum bilirubin, and Renal Function Test (RFTs) namely serum creatinine. Patients were invited to participate in the study irrespective of their age, gender, previous history or current treatment regimen. The latter is often decided by the attending hematologist after discussing treatment options with the patient.

Eighteen patients were recruited, and all were known to carry the Hb (SS) phenotype. According to the treatment used patients were classified into two groups; a study group and a control group. The study group included (10) patients, all were on an escalating dose of HU starting at 10 mg/kg/dose, and up to 35 mg/kg/dose. The remaining (8) patients were enrolled in the control group, and were prescribed other treatments.

### **Data collection:-**

In order to use the most appropriate tool, a literature search was undertaken in the search of relevant questionnaires. We've considered studies focusing on: (a) the prevalence of HU use in a country or region; (b) the indications, age group, dosing and regimen, route of drug administration, maximum tolerated dose, minimum effective dose and (c) monitoring for efficacy and side effects. We compared these tools against each other, and to our study's objectives. We developed a questionnaire that was tested and validated prior to data collection. The questionnaire was designed to collect the following information: date of birth, nationality, number of VOCs, hospital admissions and blood transfusions, and for those on HU, their perceptions on their appreciated health, their compliance, and any side effects (including: drowsiness, nausea, vomiting and diarrhea, constipation, mucositis, anorexia, stomatitis, bone marrow toxicity and/or infections).

### **Management protocol:-**

Patients in the study group were prescribed HU, while the control group were on different medications including paracetamol, bruffin and folic acid as well. Prior to commencing treatment, patients were oriented on the adverse

effects of HU and its monitoring protocol. All female patients within reproductive age were advised against pregnancy, and were strongly advised to use suitable contraceptives during the trial period. All male subjects were counselled regarding the effects of HU on spermatogenesis, and when feasible sperm cryopreservation was recommended before commencing the HU treatment. All patients received the recommended vaccines, including Haemophilus Influenza, Neisseria meningitis, Hepatitis B and influenza, and were on penicillin prophylaxis.

For the study group: all (10) patients were started initially on an oral, daily, (10) mg/kg dose of HU. This dose was increased at a rate of (5) mg/kg/week, as long as the hematologic indices remained within acceptable range, and given that the patient showed no evidence of adverse effects. The maximum dose of HU reached per patient was between (25) to (35) mg/kg/day. All patients remained on HU for six to nine months, and was only discontinued when adverse events were reported, the latter included symptoms such as hair loss, gastrointestinal upset and rash, or disturbance of their blood indices; Hb drop to (6) g/dl, platelet count <80,000 or a neutrophil count <2,500. Regarding monitoring, patients' hematological profile including Hb, Fetal Hemoglobin (HbF), MCV levels, neutrophil and platelet counts were measured every two weeks in the first month, and then once per month until the end of the study period. Moreover, features of organ damage were monitored by assessing several parameters, including but not limited to: LFTs (liver damage); creatinine levels (chronic renal failure); pitted red cells (spleen damage); transfer factor (chronic sickle lung disease); intelligence quotient (IQ) and changes in neuro-psychometric tests (neurological damage), Priapism, leg ulcers and any other appreciated toxicity or adverse effects.

#### **Statistical analysis:-**

Data were analyzed using a standard IBM Statistical Package for Social Sciences (SPSS) version 19.0; SPSS, Inc., Chicago S. Descriptive analysis was used to summarize patient characteristics in frequencies and percentages for categorical variables, while continuous variables were presented by means and standard deviations (SD). The student *t-test* was used to compare statistical differences between the two group. A p value below ( $P < 0.05$ ) was considered statically significant.

#### **Results:-**

The study included (18) diagnosed SCA patients, (12) females and (6) males. Their ages ranged between (8 – 36) years, and with a mean age of (29) years. Patients were randomly assigned into two groups, a study group including (10) patients, and the remaining (8) were enrolled in the control group. The following parameters were measured and compared for the two groups:

#### **Hematological Profile:-**

Regarding their hematological profile, those on HU reported slightly lower Hb levels when compared to the controls ( $7.95 \pm 1.3$  Vs  $8.44 \pm 1.3$ ), yet they had higher MCV levels ( $88.25 \pm 14.3$  Vs  $78.78 \pm 12.77$ ). (**Table 1**) Platelets, Reticulocytes and WBCs were all lower for the study group. A significant difference was detected between the two groups, suggesting an association between being on HU and having lower hematological indices. ( $P < 0.001$ ) (**Table 1**)

#### **Measures of organ damage:-**

Except for Alkaline Phosphatase (ALP) levels, all other liver function indices, including total protein, albumin, serum bilirubin and other enzymes' levels, were found higher for the study group. (**Table 2**) When tested, no significant difference was detected. However, a significant association was found between low ALP and using HU. Serum creatinine levels were ( $41.79 \pm 11.37$ ) for SCA patients on HU, and ( $35.75 \pm 9.37$ ) in the SCA patients not taking HU. Elevated serum creatinine levels was strongly associated with the use of HU. ( $P < 0.001$ ). (**Table 2**) All other monitored parameters showed no differences between the two groups.

#### **Self-assessment of HU use:-**

We investigated in depth patients' perceptions on HU, and asked the study group to self-assess their management. Regarding compliance, Patients were asked to describe their use of HU, exactly as prescribed by their attending hematologist. We asked them to choose between "seldom", "sometimes" and a "regular" use. A majority of (6) patients (60%) reported regular use, while (2) described their use to be "sometimes" and the last (2) as "seldom". In order to assess the effects of HU, Patients were also asked to describe how they felt after using HU. Again 6 (60%) of patients who took HU said that: "they did feel better after using HU", while the other (4) patients (40%) said "they did not". (**Figure 1.A**) This was again reflected when patients were asked to estimate their need for blood transfusions while using UH. They chose between "much less need", "less need", "the same need" or "the need for

more transfusions”, and (60%) of patients expressed that their need for blood transfusions has improved, and became less after using HU. (Figure 1.B)

We recorded the number of admissions for major care of each patient during the last six months. All patients acknowledged to notice a decrease in the number of admissions, specifically in the number of VOC they had experienced while being on HU. In fact, out of the total patients in the study group, (4) were never admitted during the study period. The remaining (6) were admitted for different reasons, with an average of (3) admissions/patient. Only few patients reported scattered side effects including minimal bleeding, hair loss, and gastrointestinal symptoms.

### Discussion:-

This prospective study aimed to assess the usefulness of HU in the management of SCA patients, along with patients’ perceptions on HU. One limitation that should be acknowledged is the few number of patients recruited during the short study period. As HU is widely known among our community as an anti-cancerous agent, used solely by cancer patients, many patients refused to join this study. Moreover, within the recruited group some patients were noncompliant to HU dose, after appreciating some unwanted side effects, and this might have affected their perceptions on HU.

Comparing the two groups above, most patients on HU admitted to feel better after using it, yet some of their hematological indices were slightly lower than the controls. Although Hb levels were lower in the group using HU, their MCV levels were higher, all the remaining parameters were decreased and the latter was found associated with the HU treatment. These results correspond to reports from other international groups, one example is a clinical trial in Belgium among pediatric SCA patients. <sup>(26)</sup> In the latter study, those on HU also had higher MCV levels and lower reticulocytes and WBCs counts. <sup>(26)</sup> Similar results were also reported from the HUSOFT trail among infants, in order to explore HU toxicity. <sup>(23)</sup> Unlike our group, infants on HU showed increased levels of Hb, Fetal hemoglobin, but again being on HU was found associated with decreased reticulocytes, WBCs, and platelets counts. <sup>(23)</sup>

Regarding measures of organ damage, elevated serum creatinine was associated with the use of HU in our sample, yet the effects of HU on renal function remains controversial as reported by other studies. <sup>(24)</sup> On the other hand, proteins levels and liver enzymes were found slightly higher in the study group, but we did not find any significant difference between the two groups, and accordingly we could not attribute these changes to HU. Despite the latter, decreased ALP levels were found associated with the use of HU, and since several globally working guidelines recognize ALP as the prime marker to increase during sickle cell crises, <sup>(27)</sup> it is rational to assume that ALP decreased levels in our study group can indicate a decrease in VOCs experienced by these patients.

The latter was further augmented when we questioned patients about their admissions for major care. Four patients were never admitted during the study period, and the rest had an average number of (3) admissions per patient, the latter was considered an improvement by the patients themselves. These matched findings of other studies. The number of admissions was significantly reduced in patients using HU in the Belgian study, <sup>(26)</sup> the “BABY HUG” trail, <sup>(24,28)</sup> and in a nine-year follow up study. In fact, the latter concluded that their patients on HU were of less morbidity and mortality because of elevated HbF levels and less frequent VOCs. <sup>(29)</sup> Clinical improvements associated with HU were also related to the decreased need for blood transfusions. Most patients described their need for blood transfusions to be “less”, and although blood transfusion remains superior to the use of HU in SCA management, more local studies must be conducted to weigh HU use in the management of SCA patients against the other measures.

Despite the self-appreciated improvements among our study group, adverse events were still reported during this relatively short study period, and this highlighted the importance of monitoring patients while on HU. There is a limited number of studies which focused specifically on HU use in Saudi Arabia, studying both its benefits and risks. There is also an apparent absence of updated local guidelines governing the use of this drug among SCA patients. More context-based, age-disaggregated studies are needed to answer similar questions, inform policies and regulate the use of HU.

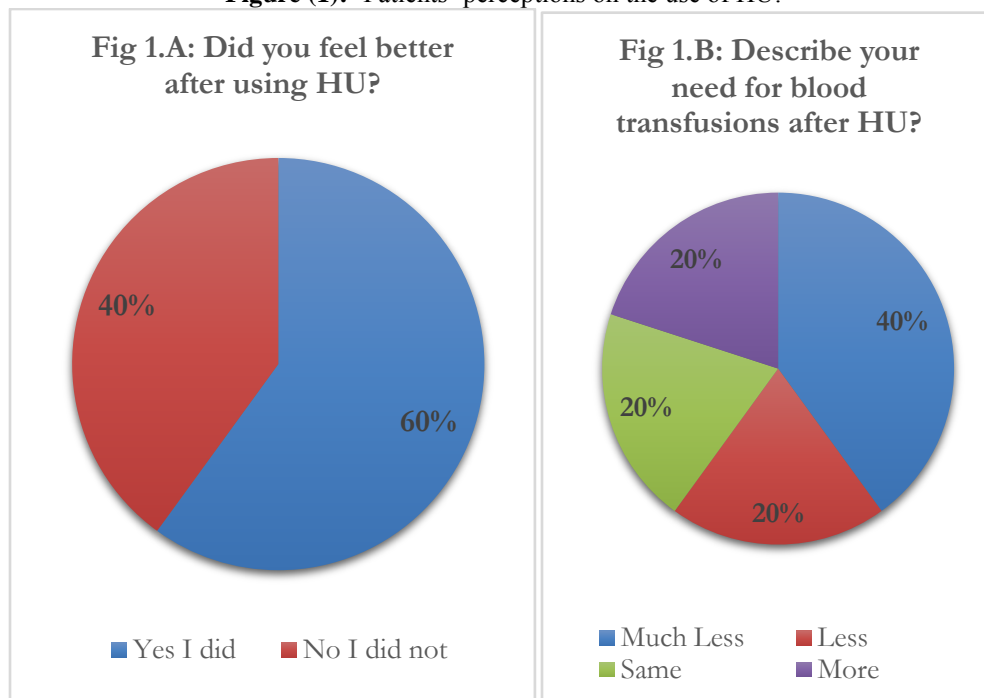
**Table (1):- Hematological profile of patients**

Characteristics	Study Group (on HU)	Control Group	P-Value
Hb (g/dL)	7.95 ± 1.3	8.44 ± 1.3	0.018
MCV	88.25 ± 14.3	78.78 ± 12.77	<0.001
Platelet	407 ± 155	478.34 ± 177	<0.001
Reticulocytes	0.21 ± 0.75	0.22 ± .110	---
WBC	12.20 ± 3.861	18.15 ± 8.799	<0.001

**Table (2):- Measures of Organ Damage**

Parameter	Study Group (on HU)	Control Group	P-Value
Total Protein	78.17 ± 5.661	75.08 ± 6.803	---
Serum Albumin	37.41 ± 3.51	35.80 ± 7.72	---
Bilirubin	51.59 ± 52.49	44.34 ± 31.62	---
ALT	57.70 ± 35.90	48.03 ± 23.00	---
ALP	121.36 ± 52.15	204.56 ± 24.88	<0.001
AST	53.61 ± 26.51	49.48 ± 21.94	---
Gamma-GGT (GGT)	55.75 ± 32.850	53.71 ± 45.627	---
Serum Creatinine	41.79 ± 11.37	35.74 ± 9.37	<0.001

**Figure (1):- Patients’ perceptions on the use of HU:**



**Conclusion:-**

HU use in SCA cases presenting with VOC was associated with appreciated improvement, stability of hematologic parameters, and reduced hospitalization. More studies should be conducted to understand the benefits and risks of HU use among local SCA patients.

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### RESEARCH ARTICLE

#### STRATEGIES FOR MEDICAL CARE OF DIABETIC PATIENTS DURING RAMADAN

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#### Abstract

**Introduction:** Ramadan is the ninth month of the Muslim calendar and the daylight fasting that accompanies it is one of the five pillars of Islam. Fasting during Ramadan is obligatory for all healthy adult Muslims, although exemptions exist for people with serious medical conditions, elderly, and children.

**Method:** This cross-sectional survey study was done during a period from 10 June to 1 December 2016, A questionnaire design in Arabic language (national language of KSA) was distributed among eastern regions Saudi population through social media (as Facebook, twitter and what's up). A total of 110 participants (known case of DM = 39, healthy = 71), aged from 15-60 years.

**Result:** One hundred ten (110) participants shared in our study. Their mean age was 30 SD that ranges from 20-60 years. They were classified according to age into 3 age group. Group 1 (younger than 20 years) group 2 (20-40yrs) group 3 (older than 40yrs). Most of them was healthy, only 39 participants was affected by DM. They were subdivided according to their level of Education and knowledge about DM into have enough information and don't have enough information.

**Discussion:** In this study, we are interested to evaluate the role of health-care educator during Ramadan, include Campaigns, social media, medical staff in the Saudi population specifically the population of eastern region.. In 2015, the number of people living with diabetes globally was estimated to be 415 million, with a 55% rise expected by 2040 [2]. The number of patients with diabetes in the Middle East and Africa – a region where a high proportion of inhabitants are Muslim – is predicted to more than double by 2040. A similar increase is expected in South East Asia, another area where Islam predominates (2).

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**Introduction:-**

Ramadan is the ninth month of the Muslim calendar and the daylight fasting that accompanies it is one of the five pillars of Islam. Fasting during Ramadan is obligatory for all healthy adult Muslims, although exemptions exist for people with serious medical conditions, elderly, and children.

Pre-Ramadan education provides a base to diabetic patients about the importance of diet and exercise, and that regular glucose monitoring is essential to avoid complications..

Education of medical staff, including physicians, nurses and pharmacist, is also needed..

However, Ramadan can result in an extra burden of calories. After, the meal taken when the fast is broken at sunset often turns into a celebration, with huge volumes of food laden with sugar and carbohydrates. Regional variations exist in the timings of meals during Ramadan and physicians need to understand regional and cultural differences to advise the patient accordingly (1).

Because of the metabolic nature of the disease, patients with diabetes are at particular risk of complications from marked changes in food and fluid intake (1). Potential health hazards include hypoglycemia, hyperglycemia, dehydration and acute metabolic complications such as diabetic ketoacidosis DKA (11).

Fasting during Ramadan may provide enduring benefits. Indeed, Ramadan can provide an opportunity for a better lifestyle, facilitating weight loss and smoking cessation (12).

Most diabetic patients prefer fasting during Ramadan to earn the reward of Allah..It's also a good time to control blood sugar and loss weight.

The month of Ramadan can precipitate dramatic changes in meal schedule, sleep patterns and circadian rhythms (1).even though that fasting Muslims tend to avoid consulting their doctors (13)

Therefore, patients with diabetes, and in particular those with T1DM, should seek medical advice before deciding to proceed with Ramadan fasting (1).

**Objective:-**

in this study Our aim here is to the assessment the role of education programme including Campaigns, social media, text messages and medical staff for diabetic patients during Ramadan about physical activity, meal planning, glucose monitoring, hypoglycemia, dosage and timing of medications.. Education, communication and accessibility are all critical to the success in reduce complication of diabetic patients during Ramadan. With the correct guidance, many people with diabetes can fast safely.

**Method:-**

This cross-sectional survey study was done during a period from 10 June to 1 December 2016, A questionnaire design in Arabic language (national language of KSA) was distributed among eastern regions Saudi population through social media (as Facebook, twitter and what's up). A total of 110 participants (known case of DM = 39, healthy = 71), aged from 15-60 years. Some of the participant were interviewed randomly..The questionnaire included the role of education programme, Campaigns, social media and medical staff for diabetic patients during Ramadan about physical activity, meal planning, glucose monitoring, hypoglycemia, dosage and timing of medications, The questionnaire answered anonymously and in private..

**Result:-**

One hundred ten (110) participants shared in our study. Their mean age was 30 SD that ranges from 20-60 years. They were classified according to age into 3 age group. Group 1 (younger than 20 years) group 2 (20-40years) group 3 (older than 40years)

Most of them was healthy, only 39 participants was affected by DM. They were subdivided according to their level of Education and knowledge about DM into have enough information and don't have enough information.

**Table 1:-** Awareness of the study population about the healthy life style of DM patients during Ramadan and the role of publicize education programme

Age group		N	%
Age group	Under 20	4	3.6
	From 20-40 years	75	68.2
	Above 40 years	28	25.5
1) Are you diabetic?	Yes	39	35.5
	No	71	64.5
2) Do you have enough information about diabetes?	No	39	35.5
	Yes	71	64.5
3) Have you Attended events to raise awareness about diabetes for the month of Ramadan and benefited from their publications?	No	74	67.3
	I don't care	11	10.0
	Yes	25	22.7
4) Have you benefited from social media in dealing with diabetes in Ramadan?	No	50	45.5
	Yes	60	54.5
5) Have you consulted your physician before Ramadan to take advices and instructions and make the required check-ups, if necessary?	No	74	67.3
	Yes	32	29.1
6) Have you prepared a food plan in preparation for the month of Ramadan with your doctor?	No	74	67.3
	Yes	32	29.1
7) Does your family members take into account that you are diabetic when preparing breakfast and Suhoor?	No	56	50.9
	Yes	46	41.8
8) Do you examine diabetic levels several times a day in the month of Ramadan?	Sometimes	29	26.4
	I do not	46	41.8
	I do it	29	26.4

Table 1 demonstrates the sociodemographic distribution of the studied population according to their age. There's a significant difference in the level of education between difference between age group, (20-40) group much more educated than other age groups..

**Table 2:-** shows Chi-Square test of the studied groups age, affection and level of education and awareness about DM

	Df	chi square value	p-value
1. age * Are you diabetic?	3	9.186	<b>0.027</b>
5. age * Have you consulted your physician before Ramadan to take advices and instructions and make the required check-ups, if necessary?	6	12.892	<b>0.045</b>
2. Are you diabetic? * Have you Attended events to raise awareness about diabetes for the month of Ramadan and benefited from their publications?	2	24.151	<b>0.000</b>
4. Are you diabetic? * Have you consulted your physician before Ramadan to take advices and instructions and make the required check-ups, if necessary?	2	26.933	<b>0.000</b>
5. Are you diabetic? * Have you prepared a food plan in preparation for the month of Ramadan with your doctor?	2	9.863	<b>0.007</b>
6. Are you diabetic? * Does your family members take into account that you are diabetic when preparing breakfast and Suhoor?	2	5.745	<b>0.057</b>
7. Are you diabetic? * Do you examine diabetic levels several times a day in the month of Ramadan?	3	44.984	<b>0.000</b>
9. Are you diabetic? * Do you know what the best time for exercises in Ramadan is?	3	11.945	<b>0.008</b>
10. Are you diabetic? * Do you think that the Tarawih prayers are useful for diabetics?	3	22.815	<b>0.000</b>
14. Are you diabetic? * In your opinion, what is the best way to increase the awareness of the community about diabetes?	6	17.159	<b>0.009</b>

Age is the only parameters that shows significant correlation P value.

Table 2 shows the role of publicize education programme that increase awareness Including campaigns, posters in public places such as local libraries, supermarkets, mosques and community centers , social media and medical staff to decrease complication of fasting in DM patients. An evaluation of result revealed poor levels of knowledge as the majority of respondent provided the wrong answers. Only one-fourth of study respondents were able to give correct answer about healthy life style of DM patients during Ramadan.. The information and advice that the patients received in that programmes provided additional knowledge for the patients to continue their diabetes self-management and to take responsibility for their care beyond the month of the Ramadan fast.

Regarding the role of education programme, 22%of the patients had attended structured education previously. 67% didn't attend..

54% use social media and have benefit from programme about DM , 45%don't use it . Regarding the medical staff ,29% manage their healthy lifestyle during Ramadan with their doctor ,67% don't do it ..

Table 2 shows the awareness level of the studied population to risk factors, recommendation and management of complication during fasting.

Structured diabetes counseling before Ramadan includes educating patients, health care providers, and patient's families.. provide education for the patients and families to get ready for change lifestyle pattern during Ramadan,41% of family take care to prepare of healthy diet for their DM patients during Ramadan ,while 50% ignore that issue..

Counseling has to be provided by the health care provider to the patient to prevent complication, So that patients welcome to fast Ramadan in stable and healthy regimen..29% of patient's take advise from their doctor before Ramadan , while 67% ignore that issue..

The misconceptions were in relation to physical activity during fasting (27%) .

Blood glucose monitoring was done by 26% of participants, were they regularly monitoring their blood glucose at home by Self-Monitoring of Blood Glucose..

Symptoms of feeling of hypoglycemia was correctly answered by 83% of subjects..

### **Discussion:-**

In this study, we are interested to evaluate the role of health-care educator during Ramadan, include Campaigns, social media , medical staff in the Saudi population specifically the population of eastern region.. In 2015, the number of people living with diabetes globally was estimated to be 415 million, with a 55% rise expected by 2040 [2]. The number of patients with diabetes in the Middle East and Africa – a region where a high proportion of inhabitants are Muslim – is predicted to more than double by 2040. A similar increase is expected in South East Asia, another area where Islam predominates (2). Most Muslim majority countries are in less-developed regions of the world, and developing countries are disproportionately affected by diabetes [2,3,4]. Therefore, Ramadan has a major impact on the management of diabetes in the Muslim population..

Fasting during Ramadan has a number of physiological effects on both homeostatic and endocrine processes. In patients with diabetes, these changes and the type of medication being taken to treat the condition can be associated with the development of complications such as hypoglycemia and hyperglycemia (4).

Fasting with diabetes poses significant risks. Most of the research on fasting and diabetes surrounds Ramadan, the annual Islamic observance that requires fasting from sunrise to sundown for 29 or 30 days. A commentary published in 2010 in Diabetes Care developed in collaboration with the American Diabetes Association (ADA) focused on fasting during Ramadan, though many of the issues it raises are relevant to other types of fasting as well. It says that “most often, the medical recommendation will be not to undertake fasting” if you have diabetes..

A study that include 110 participants , found that 71 percent of people with have enough information about diabetes mellitus and 39 percent of people don't have enough information .

"Anybody with diabetes needs to first talk to their doctor about going on a fast," says Early, and some experts recommend a pre-fasting medical assessment to help ensure safety include medication, nutrition, and hydration into account 32 percent of people Carried it, while 74 percent So neglected.. Educational campaigns that target the general public should aim to raise awareness of the issues and misconceptions that surround diabetes and Ramadan fasting and emphasize the importance of maintaining good diabetes management during fasting. In addition to medical advice, religious regulations should be included (1)

Between 61.4 and 92.9% of healthcare professionals felt that people with diabetes needed to improve various self-management activities; glucose monitoring (range, 29.3-92.1%) had the biggest country difference, with a between-country variance of 20%(10).. It is also of educational value as it provides patients with feedback on the effect of lifestyle changes such as food and exercise on glucose control (3). Regularly monitoring blood glucose during fasting is key to avoiding health emergencies, 29 % of people did it regularly, while 46% of people didn't do it at all, 29% of people did it at sometimes.

It is worth reemphasizing that fasting for patients with diabetes represents an important personal decision that should be made in light of guidelines for religious exemptions and after careful consideration of the associated risks following sample discussion with the treating physician. Most often , the recommendation will be to not undertake fasting. However, patients who insist on fasting need to be aware of the associated risks and be ready to adhere to the recommendations of their health care providers to achieve a safer fasting experience. Patients may be at higher or lower risk for fasting-related complications depending on the number and extent of their risk factors .

During Ramadan, there is a dramatic change in dietary patterns for fasting Muslims compared with other months of the year. Health issues may arise due to improper eating habits and reduced physical activity (5)

The diet during Ramadan should not differ significantly from a healthy and balanced diet. It should aim at maintaining a constant body mass. In that study, 46% of individuals who fast maintain their healthy diet during the month, while 56% of individuals didn't maintain their healthy diet..

Ingesting of large amounts of foods rich in carbohydrate and fat, especially at the sunset meal, should be avoided .

Diabetic patients with regular exercise habits showed a 2.8-fold increased chance of outcome improvement compared with those who did not exercise regularly(6)..Normal levels of physical activity may be maintained 74% of individuals did their exercise after breakfast by one or two hour. However, excessive physical activity may lead to higher risk of hypoglycemia and should be avoided, particularly during the few hours before the sunset meal. If Tarawaih prayer (multiple prayers after the sunset meal) is performed, then it should be Correspond to amount of diet which was consumed . In some patients with poorly controlled type 1 diabetes, exercise may lead to extreme hyperglycemia

### **Strengths & Weakness:-**

KSA is a large country previous studies was concentrated on the capital population. Our study strength points is that this study was carried out in a new region in KSA. And it investigated people awareness about this disease and the role of health care to management of diabetes during Ramadan..

Our weak relative point small sample size, and the way of collecting data by social media can be less accurate. But some of the questionnaire was filled by direct contact with participant..

### **Conclusions:-**

We face an enormous burden of diabetes in the Saudi country, but our understanding of managing diabetes during the month of Ramadan/fasting is still far from perfect

Lifestyle and religious activities can have implications when managing patients with diabetes. During Ramadan, it can be very Difficult for the health professional and the individual to control patient's blood sugar level within accept level and avoid hypoglycemia.

Diabetes education helps to overcome certain barriers to diabetes care. Making easy and low cost access to the recommendation in management of diabetic patients during Ramadan is necessary to avoid its complication and to support people with diabetes to fast during Ramadan

With the Diabetes education, including the use of point-of-care (POC) glucose testing, take healthy diet and do regular exercise, readiness to break the fast in case of hypoglycemia resulted in fewer episodes of complications.

Although few recent large scale studies, including randomized trials, have been conducted with diabetes patient, there is need for more well-designed research with appropriate controls

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### RESEARCH ARTICLE

## IMPACTS OF EFFECTIVE, CREDIBLE AND SUSTAINABLE INTERNAL CONTROL SYSTEMS ON CUSTOMER TRUST, VALUE AND LOYALTY IN PRIVATE BUSINESS CORPORATIONS.

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Customer value, Governance

#### Abstract

Effective credible and sustainable internal control system plays an important role in any private business entity; besides ensuring achievement of core objectives achievement of organizations, effective and credible internal control adherence reinforces and improves the confidence of both current and prospective internal and external corporate customers. Therefore, the aim of this paper is to examine, describe and compare in a qualitative way how effective credible and sustainable internal control systems impact on the corporate customer trust, confidence, value and loyalty and to evaluate the effective internal control system's role in institutionalizing management policy in embracing customer value and awareness.

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#### Introduction:-

Internal control is a process affected by management and designed to provide reasonable assurance regarding the achievement of objectives in the following categories: Effectiveness and efficiency of operations; Reliability of financial reporting and Compliance with applicable laws and regulations. Effective internal control helps an organization achieve its operations, financial reporting, and compliance objectives. It is a built-in part of the management process (i.e., plan, organize, direct, and control). Internal control keeps an organization on course toward its objectives and the achievement of its mission, and minimizes surprises along the way (International Standard for Auditors – ISA No. 315).

Internal control promotes effectiveness and efficiency of operations, reduces the risk of asset loss, and helps to ensure compliance with laws and regulations as well as ensures the reliability of financial reporting (i.e., all transactions are recorded and that all recorded transactions are real, properly valued, recorded on a timely basis, properly classified, and correctly summarized and posted). According to International Standard for Auditors (ISA 400- Internal Control environment), Internal control can provide only reasonable assurance - not absolute assurance regarding the achievement of an organization's objectives. Effective internal control helps an organization achieve its objectives; it does not ensure success. There are several reasons why internal control cannot provide absolute assurance that objectives will be achieved: cost/benefit realities, collusion among employees, and external events beyond an organization's control.

In his document “Corporate Customers” Michael Munkumba defines customer as closed and open types. Closed customer is “Any person who is buying goods or services for money” and open system approach defines a customer as “All those utilizing an organization’s products and services” (Michael Munkumba, 2010). The first definition has a weakness of looking only at one aspect of customer; the buyer, where as the open system introduces both internal

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and external customers with the following implications: Customers have to be categorized as they certainly have different requirements; customers need different ways of managing them and emphasis has to be made on relationship building for both internal and external customers. Organizations on the other hand evaluate themselves by measuring customer, trust, confidence, loyalty and satisfaction with their products or services. As organizations evolve, the measurement of customer satisfaction and the related parameters across the entire organization becomes imperative. The first step is for an organization to implement effective policies that aligned to its objectives for tracking customer trust, confidence, loyalty and satisfaction {Gangdhar (Ganges) Bhardwaj o., [www.Isigma.com/members/Ganges](http://www.Isigma.com/members/Ganges), October 2016}.

Up to 1980s, organizations were more important, their focus was internal, highly centralized and products were designed, refined, honed and then offered to the market – all these are done without consultation by and large with customers (Michael Munkumba, 2001). This focus shifted in a paradigm form when Tom Peters/Walterman and Drucker made very loud noise that woke the world up. The reverberations those noises new no bounds, as a result forced the focus to shift from the internal to external, especially to the customers; (Tom Peters – Liberation Management, 1985 and Thriving on Chaos, 1987).

In the new paradigm, service excellence is imperative for business success and the situation became tops-curved and the business purpose became “create a core customer” and a new slogan was born in the 1980s; *Delight the Customer*. This became a reality because if you are good to your customer, they will keep coming because they like you. If they like you, they will spend more money; if they spend more money you want to treat them better and if you treat them better they will keep coming back.

Customer Value Management was started by Ray Kordupleski in the 1980s and discussed in his book, *Mastering Customer Value Management*. A customer value proposition is a business or marketing statement that describes why a customer should buy a product or use a service. It is specifically targeted towards potential customers rather than other constituent groups such as employees, partners or suppliers. Similar to the unique selling proposition, it is a clearly defined statement that is designed to convince customers that one particular product or service will add more value or better solve a problem than others in its competitive set.

In the February, 2012 issue of the *TIM Review*, the author described customer value and how it is *delivered* to customers (Shanker, 2012). In this article, the focus is on *creating* customer value, particularly in the context of businesses that generate revenue using open sources assets. From a marketing theory perspective, customer value refers to customers’ perceptions of what they receive, in return for what they sacrifice (Zeithaml, 1988). There are two aspects to customer value: desired value and perceived value (Woodruff, 1997). Desired value refers to what a customer desires in a product or service. Perceived value is the benefit a customer believes he or she received from a product after it was purchased. Customer value propositions are formulated by assessing the current market offerings, identifying what customers want, and then developing solutions that meet the market need for a product or service (Anderson et al., 2006).

An effective control environment must incorporate the following principles: 1) Integrity and ethical values, 2) Commitment and competence, 3) Attention and oversight provided by Board of Directors or audit committee, 4) Management philosophy and operating style, 5) Organizational structure, 6) Manner of assigning authority and responsibility, and 7) Human Resources policies and procedures (ISA 400, Internal Control Environment).

According to International Standard for Auditors No. 400, an effective control environment is an environment where competent people understand their responsibilities, the limits to their authority, and are knowledgeable, mindful, and committed to doing what is right and doing it the right way. They are committed to following an organization's policies and procedures and its ethical and behavioral standards. The control environment encompasses technical competence and ethical commitment; it is an intangible factor that is essential to effective internal control. The central theme of internal control is (1) to identify risks to the achievement of an organization's objectives and (2) to do what is necessary to manage those risks. Another way of saying this is that Risk Assessment is the process of setting objectives; prioritizing and linking those objectives; and identifying, analyzing, and managing risks relevant to achieving those objectives (ISA 315 & 400).

Goal setting is the first component of effective customer confidence. Or trust management. The individuals and team customer service goals should be aligned with the organization’s customer service goals that are established through



carefully crafted organization's procedures and belief. Setting appropriate individual and team standard goals is extremely important for effective customer confidence and trust management. Research has revealed that if goals are too low or too high, the motivation and commitment level of employees become low. (Conellan and Zenke, 1993). Also the research has revealed that; specific hard goals result in higher performance than vague or easy goals, or no goals at all. It further explains that specific hard goals that are accepted by employees result in higher performance than easy goals (Locke and Latham, 1984).

It has been confirmed through relevant research, that feedback regarding individuals past performance does not lead to improved further performance, unless the feedback leads to or is accompanied by a goal for improved performance. In their research on performance session, Locke and Lathan found out that people who are given feedback perform no better than those who receive no feedback. However, when goal setting takes place as a result of the feedback, performance improves.

Locke and Latham, 2012 noted that goals direct individual's thought by means of three major factors: Goals direct a person's thoughts and actions; Goals guarantee energy expenditure, and Hard goals that are accepted by employees increase that employee's performance in achieving the desired goal (Locke and Latham, 2012) When employees or individuals are involved in setting of goals, the chances of accepting the set goals by them increase, even though employees involvement alone does not improve performance. (Locke and Latham, 2012). Customers are found both outside and inside the organization. The employees are internal customers where as those who buy or will buy from the organization are external customers. Providing high quality internal customers (employees) service can improve the ability of an organization to satisfy the external customers. Internal customer service is needed to meet the expectations and requirements for success of those people inside the company so that they can delight customers in the market place; (Azzolini and Sheiiaber, 2000). Organizations with excellent external and poor internal customer services are lucky and often performing on the edge of acceptability.

Asking customers what they want is the most important part of goal setting for customer service standards, both at management level and individual/group level (Connellan and Zemke, 1993). Society is always taken by surprise at any new examples of common sense, (Ralph Waldo Emerson, 2002). The good news is "You have no choice", no organization big or small is secure, (Peters, 2000)

There is a new Platinum Rule outside there: "Do to the customers what they want you do to them and not what you would like to be done to you because wants of customers are never the same", the competition is absolutely cut-throat and it is all time; at the global level, national level, and industrial level. The fight is for the heart and mind of the customer. There is an epidemic disease: quality customer service, any organization that does not catch it will not survive. In the light of this paradigm common sense demand that every organization should put the customer at the centre of all it does, to spend as it were, a day in the life of a customer. (Michael Munkumba. 2002).

Using the Servqual survey mechanism and the resulting matrix, it is possible to evaluate and rate the impact of effective internal control on customer satisfaction and loyalty in private business corporations. **Satisfaction rating: How effective internal control affects customers' satisfaction/confidence** – This was aggregated by question or dimension. Table 2 shows a satisfaction rating gathered within a single question;

**Figure 1:** Table 3 shows a satisfaction rating aggregated from responses to all questions within a single dimension.

**Table 2:-** Sample Satisfaction Rating at the Survey Question Level

Please Rate How Well the Product Met Your Requirements					
Response options (1 = Poor, 5 = Excellent)	1	2	3	4	5
Number of responses	5	0	8	23	22
Percent of responses	8.6	0	13.8	39.7	37.9

**Table 3:-** Sample Satisfaction Rating at the Dimension Level.

Reliability/Satisfaction					
Response options (1 = Poor, 5 = Excellent)	1	2	3	4	5
Number of responses	12	7	11	25	45
Percent of responses	20.7	12.1	19	43.1	77.6

Source: Analyzing the VOC Matrix Research, <https://www.isixsigma.com/members/ganges>, Oct. 16 2016

Trust has been a widely studied concept both by itself but, most importantly, as a component of the quality of relationships. In psychology and interpersonal communication, trust has been one of several dimensions identified in relationships. It also has been studied extensively in business management and organizational communication sometimes as a single concept but, again, most often as a component of relationships (Katie Delahaye Paine Copyright, 2003). Kate, 2003 contends that in psychology and communication, the emphasis has been on interpersonal relationships among spouses, friends, relatives, and the like. In business management and organizational communication, emphasis has been on relationships among managers and between managers and other employees. Only recently have public relations researchers began to use similar concepts to study organization-public relationships. The International Association of Business Council, (IABC) document 2010, Measuring Organizational Trust, and the Institute for Public Relations Guidelines for Measuring Relationships both contain extensive bibliographies that will be useful to any organization seeking to implement a trust measurement program; (Katie Delahaye Paine Copyright, 2003).

In his document; Guidelines for Measuring Trust in Organizations, Katie Delahaye Paine, gives a wide perspective of the definition of Trust/confidence. He states that it is universally agreed that trust is a multi-dimensional concept. It is: *Multi-level*; trust results from interactions that span co-worker, team, organizational and inter-organizational alliances; *Culturally-rooted*, trust is closely tied to the norms, values and beliefs of the organizational culture, *Communication-based*, trust is the outcome of communications behaviors, such as providing accurate information, giving explanations for decisions and demonstrating sincere and appropriate openness; *dynamic*, trust is constantly changing as it cycles through phases of building, destabilization and dissolving; *Multi dimensional*, trust consists of multiple factors at the cognitive, emotional and behavioral levels, all of which affect an individual's perceptions of trust/ or confidence. Trust and confidence has been one of several dimensions frequently included in measurement of relationships. Since its measurement is intrinsic to measurement of relationships, it may be concluded that trust dimensions include: *Competence*, the belief that an organization has the ability to do what it says it will do. It includes the extent to which the customers see an organization as being *effective*; that it can compete and survive in the marketplace, *integrity*-The belief that an organization is fair and just. *Dependability/Reliability*; the belief that an organization will do what it says it will do; that it acts consistently and dependably

Katie Delahaye Paine explains that, trust measurement and evaluation involves assessing the success or failure of much broader efforts an organization makes to improve and enhance the relationships that organizations maintain with key constituents and customers. More specifically, trust Measurement is a way of giving a result a precise dimension, generally by comparison to some standard or baseline and usually is done in a quantifiable or numerical manner. It seeks to answer questions such as: Have the behaviors, programs and activities we implemented changed what people know, what they think and feel about the organization, and how they actually act (as exhibited by protests, votes and purchases); Have the actions or behaviors of my organization had an impact on the trust that our constituencies feel towards our organization?; Have those public relations and communications efforts that we initiated to build trust had an impact—that is, "moved the needle" in the right direction and, if so, how can we support and document that with research? (Katie Delahaye Paine, 2003).

Customer loyalty is both an attitudinal and behavioral tendency to favor one brand over all others, whether due to satisfaction with the product or service, its convenience or performance, or simply familiarity and comfort with the brand. Customer loyalty encourages consumers to shop more consistently, spend a greater share of wallet, and feel positive about a shopping experience, helping attract consumers to familiar brands in the face of a competitive environment. (PR Loyalty Solutions, 2011) To understand customer loyalty one must recognize that there are different types and degrees of loyalty. There is monogamous loyalty and there is polygamous. There are also behavioral and attitudinal aspects. In a world where your competitors are only a click away, customer loyalty really is the new marketing. Today's customers have access to an endless amount of information about your business including how credible an organization is run, and research shows that customers are ready and willing to stop dating around and stick with companies who go above and beyond to create a fantastic customer experience through effective basic policies and controls. When customers feel taken care of and feel comfortable relating with your company because the company has a name and can be vetted for credibility, they are more inclined to buy from you again. Since studies have shown that it costs 6 to 7 times more to acquire a new customer than keep an old one, outpacing your competition depends upon having a loyal tribe of happy customers. (PR Loyalty Solutions, 2011).

We live in a world of polygamous, not monogamous loyalty. For example, a person might shop at Nakumatt, Uchumi Super Market and Naivas Ltd and unfailingly shop at all three. The person is then loyal to them, but not to

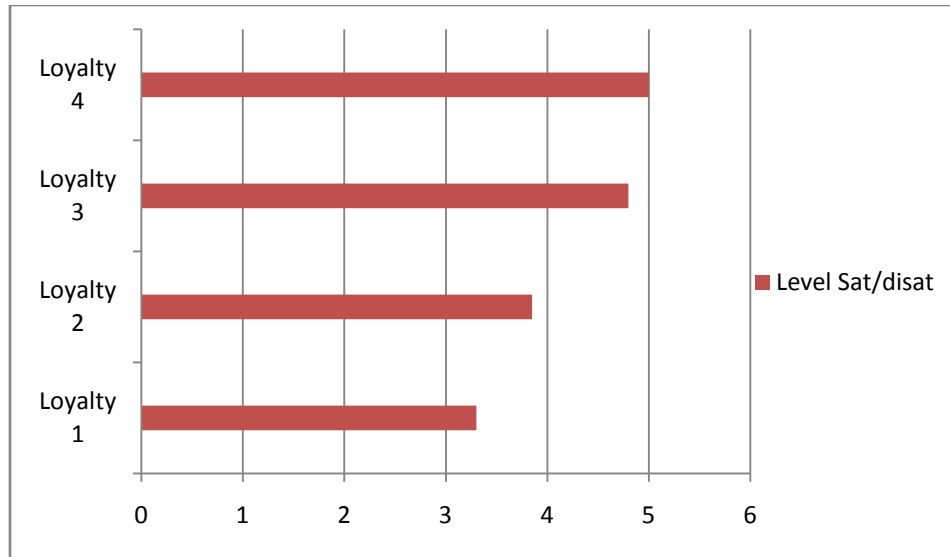
others, and yet 100% loyal to none. In their book *Loyalty Myths*, Keiningham et al. (2005) suggest that “loyalty can in part be thought of as the probability a customer will purchase a brand on any particular purchase occasion. The objective of businesses, and therefore loyalty programs, should be to make the organization’s share of customer loyalty as high as possible. According to Dowling and Uncles (2000) from Australia, “‘polygamous loyalty’ is a better description of actual consumer behavior than either brand switching (a conscious once-and-for-all change of allegiance to another brand) or promiscuity (the butterfly tendency to flit from brand to brand without any fixed allegiance).”

In the past, many scholars defined loyalty in behavioral terms. If a person made most purchases in a given product category from one supplier, regardless of the reason, the person was defined as loyal. As Kumar and Shah from the University of Connecticut’s School of Business (2004) point out, “a majority of existing loyalty programs follow these measures to reward behavioral loyalty. That is, the more you spend with the company, the more rewards you earn”. This is exhibited by main Super Markets in Kenya, when you buy you earn points or with Safaricom Ltd, you earn “Bonga” points. A second element of loyalty is attitudinal loyalty. Like behavioral loyalty, attitudinal definitions have existed for a long time. This second element of loyalty focuses on how strong the psychological commitment or attachment is to the brand. By itself, it too has limitations. For example, how loyal are people who rave about a product and promote it to their friends, but then for whatever reason fail to buy it regularly themselves? In the opinion of many scholars, as a minimum, an adequate definition of customer loyalty includes the history of actions plus feelings and intentions toward the brand or commercial relationship. Loyalty action and talk (i.e., promotion to others) are both valuable to businesses, but in different ways.

Why does customer loyalty matter? The answer to this important question is as simple as “rewards of great service”. A variety of research shows that today’s customers place a priority on receiving great service. A 2011 report (<http://about.americanexpress.com/news/pr/2011/csbar.aspx>, Oct.16, 2016) published by American express revealed that 3 out of 5 customers were willing to give up a former favorite brand in order to have a better service experience. Even more telling are the results of the 2010 ‘Right Now Customer Experience Impact report’, which revealed that 9 in 10 Americans are willing to spend more with companies they believe provide excellent customer service (<http://www.slideshare.net/RightNow/2010-customer-experience-impact-Oct. 18, 2016>). There is usually high cost of bad service, ‘News of bad customer service reaches more than twice as many years as praise for a good service experience’. (White House Office of Consumer Affairs, 2010). Bad service really scare customers away from your business. Consumer Reports surveys have shown that nearly 91 percent of customers will not do business with you a second time if you botch the first encounter.

White House Office of Consumer Affairs, 2010 research uncovered that two-thirds of customers have walked out of a store/ or Super Market when they felt the service was subpar and that the amount of customers willing to immediately abandon a business reached nearly 70 percent when it came to poor service on the phone, conclusively showing that customers are willing to shut you out if you do not provide the quality of service they expect.

The worst part is that one may not know how much of an impact your poor quality of service is having before it is too late. For every one customer who bothers to complain, nearly 26 others remain silent and just vote by foot – just walk away probably to your competitors.



**Figure 2:-** Impact of quality service and internal control on customer loyalty and confidence

**Source:** Report published by American express, 2011; 2010 'Right Now Customer Experience Impact report'; White House Office of Consumer Affairs, 2010

**KEY:** Loyalty 4: Customers (91%) who would not do business 2<sup>nd</sup> time if 1<sup>st</sup> was poor and poor control  
 Loyalty 3: Customers (90%) who would spend more with corporations believed to have excellent services and effective internal control  
 Loyalty 2: Customers (70%) willing to abandon on-going business on learning that the corporation have poor services and poor internal controls  
 Loyalty 1: Customers (60%) willing to abandon former favorite brand corporation on learning that the corporation have poor services and poor internal controls

Effective internal control will emphasize on a policy that will be based on credible research and development on the customer service; confidence and loyalty. The advent of social media has created the belief that you must constantly engage customers or risk losing the sale, but the data says that it is not true, because how do you connect with customers that want limited engagement? Many marketing campaigns are designed entirely around moving products. What if instead using credible organization research policy changes the perception so that the campaign is designed around moving people? A Corporate executive Board (CeB) study published by the Harvard Business Review, which included 7,000 consumers across the United States, United Kingdom and Australia, showed that loyalty to brands is almost impossible to achieve without one key element: shared value, "Of those consumers who said that they had a strong brand relationship, 64% cited shared values as the primary reason". (<http://hrb.org/2012/05/to-keep-your-customer-keep-it-simple/ar/1>)

Shared values are by far the largest driver of brand loyalty. According to the CeB, who researched the topic of brand loyalty for more than a year, consumers everywhere stated that they were loyal "not to companies, but to beliefs." Most customers are not particularly loyal to any one business, but they are loyal to what the business stands for, as reflected in its management as shown through effective internal control. "We saw that emotional attachments to brands certainly do exist, but that connection typically starts with a 'shared value' those consumers believe they hold in common with the brand." (Aaron Lotton, CEB.) (<http://www.executiveboard.com/marketing-blog/author/alotton>). Connecting with your customers on a personal level as an organization is crucial as that will retain customer loyalty. Since research has shown that a majority of customers do not care about having a close relationship with a brand, it makes sense that those who do care more deeply about the things organization stand for than how often organization engages with them. The only thing that is going to enhance this type of relationship is the knowledge that your business is on the same team as them. These customers will want to see that you share their beliefs and that you incorporate those beliefs into how you conduct business, hence importance of effective and credible internal control system.

Customer value can be summarized in one central question that all organizations must align to their internal control philosophy and ask frequently: “What do customers really want and how do we meet their demands?” or in other words, “What do customers really value?” Professor Art Weinstein, in his customer value theory, or what he terms “superior customer value”, says that: Customers would want businesses to overwhelm and surprise them by going above and beyond the ordinary to meet their needs and wants (Weinstein, 2012). This means delivering above and beyond on every value-point of the customer value spectrum in terms of four components: service, quality, image, and price. Weinstein (2012) calls these the “The Essence of Customer Value” (p. 6).

Weinstein (2012) regards customer value as best defined from customers’ perspectives as tradeoffs between benefits received from offers versus the sacrifices including money, stress, and time to obtain products and services or these offers. Describing the SQIP (S-Q-I-P) approach, Weinstein (2012) states that value is expressed in many ways as a combination of service (S), product quality (Q), image (I) and price (P). Customer value encompasses the total experience of the customer regarding the organization credibility, its products and services, purchase and post-purchase services and customer support, as well as the overall impact of the interaction between consumer and product, the benefits conferred and how these affect well-being and are perceived by influential others (Duncan, 2005; Kerin, Hartley and Rudelius, 2009).

Customer value has become a mandate for business leaders and managers as companies lose other core and distinctive competencies in the current rapidly changing and highly competitive global economy. Customer value creation is no longer an activity or process relegated to marketing and sales departments and specialists; it is an organizational-wide philosophy like Total Quality Management (TQM) that requires each member of the organization to play an active role in adding value to the customer experience. The organization must essentially take a marketing orientation approach backed by value driven management (VDM) philosophy and attitude (Pohlman and Gardiner, 2000). The strategic and overall importance of customer value can be summarized in ten (10) salient points made by Professor Art Weinstein in his book, Superior Customer Value: Strategies for Winning and Retaining Customers (Third Edition, 2012):

(1) Designing and providing superior customer value are the keys to successful business strategy in the 21st century. (2) Value reigns supreme in today’s marketplace and market space. (3) Customers will not pay more than a product is worth and will reward excellence. (4) A customer-centric culture provides focus and direction for the organization, ensuring that exceptional value will be offered to customers. (5) Designing and delivering superior customer value propels organizations to market leadership positions in today’s highly competitive global markets – absolute advantage. (6) Providing outstanding customer value has become a mandate for management. (7) In choice-filled arenas, the balance of power has shifted from companies to value-seeking customers. (8) Managing customer value is even more critical to organizations in the new service and information-based economy. (9) Firms not providing adequate value to customers will struggle or disappear – customer value is a key ingredient in building competitive advantage. (10) Today’s customers are quite smart and sophisticated and are looking for companies that (1) create maximum value for them based on their needs and wants, and (2) demonstrate that they value their business (Weinstein, 2012). Designing and delivering superior customer value will help organizations develop winning and retention strategies in an environment where competition has eroded other bases for differentiation and market leadership.

Riding on the famous quote: *"If you cannot measure it, you cannot improve it."* - Lord William Thomson Kelvin (1824-1907). As one of the measurements of the performance of the Quality Management System, the organizations shall monitor information relating to customer perception as to whether the organization has met customer requirements. There is obviously a strong link between customer satisfaction resulting from confidence, trust and loyalty and customer retention. Customer's perception of Service and Quality of product will determine the success of the product or service in the market.

### **Conclusion:-**

The review established that it is fair to assume that entities that are not dormant have some controls in place however rudimentary. These controls need not be formal or formally documented; they just need to be appropriate for the entity concerned. Auditors (financial) are required to perform some work to evaluate the design and implementation of controls in order to assess control risk. However, auditors cannot allow an expectation that controls are operating effectively to have any effect on the nature, timing and extent of substantive procedures unless the operational effectiveness of the controls is tested. (<https://www.frc.org.uk/Our->

*Work/Publications/IFIAR/IFIAR-2014-Survey-of-Inspection-Findings.pdf*.- October 20, 2016). Customers are more than just avid and hard-to-please individuals patronizing your business. Businesses must come to understand that customers are their most valuable long-term strategic partners (Dr. McFarlane Winter 2013). Organizations must understand that customer value is not simply a tactic or short-term oriented endeavor; it is a way of doing business, and understanding the dynamics of business value drivers and how they interact to create profitability and success overtime.

The key to retention is customer satisfaction and high customer satisfaction comes from delivering superior customer value Weinstein (2012). Highly satisfied customers stay loyal longer, talk favorably about the organization, pay less attention to the competition, are less price sensitive, offer service ideas to the organization, and cost less to serve than new customers (Weinstein, 2012). This should also remind organizations of the 80-20 rule; essentially that 80% of sales comes from 20% of customers, and that this 20% of customers represents repeat customers who are loyal because of the exceptional customer value they perceive in your business. Organizations must now measure themselves by their ability to please customers, meet their expectations, and retain them. (*Guidelines for Measuring Trust in Organizations: By Katie Delahaye Paine, 2003*)

The evaluation for controls of information systems is largely based on the flow of information for significant transaction classes and processes that relate to key financial reporting areas which take place at the control activities level. Organizations evaluate themselves by measuring customer satisfaction with their products or services. As organizations evolve, the measurement of customer satisfaction across the entire organization becomes imperative. The first step is for an organization to implement a metric for tracking customer satisfaction. To develop a metric, an organization should explore these questions: Who are its customers? What type of survey should be administered to them? How will satisfaction be measured across the organization? This paper brings in to reality, the fact that businesses only exist because of customers alongside the fact that current business world is complicated and technical such that total loyalty is impossible to achieve. The only tool available is provision of quality and exemplary customer service.

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### RESEARCH ARTICLE

#### PSEUDOSEIZURES: A CASE REPORT.

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#### Manuscript Info

##### Manuscript History

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 Published: February 2017

##### Key words:-

Pseudoseizures, epilepsy PNES.

#### Abstract

**Background:** Pseudoseizures a disorder in which paroxysmal series of changed behavior are noticed, it misdiagnosed due to its similarity to true epilepsy.

**Case presentation:** A male patient of 22 years old with no medical illness admitted to emergency department with a history of repeated attack of involuntary movements affecting all four limbs, he has no medical or surgical history, his vital signs were recorded upon arrival, he experienced full examination and analysis, computed tomography, Electroencephalogram and Magnetic resonance image were performed on the patient.

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#### Introduction:-

Pseudoseizures or Psychogenic Non-Epileptic Seizures (PNES) are disorders in which there are paroxysmal series of changed behavior that looks like epileptic seizures however it lacks organic causes such as dysfunction of central nervous system and the expected electro-encephalographical epileptic changes [1]. It is considered as somatoform disorder [2]. Pseudoseizures diagnosis can be suspected by physical examination, personal and psychiatric history [3], however the exact and accurate diagnosis of Pseudoseizures is still a challenge [4]. Its incidence was evaluated to be 6.5- 10.6 % in many studies [5-8] and 20 % of patients visiting the epilepsy centers [9]. One from 5 patients with apparently epilepsy referred to specialist centers was found to suffer no organic reason for seizures but mistaken for epilepsy this is due to diagnostic error [10], so we must focus on history and symptoms of the patient to avoid the mistakes.

#### Case Presentation:-

The patient was a 22 years old male works as a military officer in the National Guard, he was not known to have any medical illnesses, he was admitted on 5<sup>th</sup> February 2017 AD as a case of query seizures versus pseudo seizures. The patient presented to our emergency department then transferred to neurology department. The patient has history of repeated attack of involuntary movements affecting all four limbs with neck hyperextension for three days each event lasting around 30 seconds. There were no preceding symptoms by an aura. He was aware of

his surroundings during the event. There was no eye rolling, no tongue biting or loss bladder control (urinary incontinence). After each event he regained full consciousness and function. Trunk extension with opisthotonus movement with irregular arrhythmic asynchronous; jerky movement of all limbs with open eyes.

He initially presented to a different hospital where he stayed for two days then was discharged against medical advice. His systemic review was unremarkable. He was alcohol Consumer, his last drink was 3 days ago, also he was smoker (20 pack/year). He suffers from increased social pressure.

There was no past medical or surgical history and no history of drug or food allergy, he was not exposed to blood transfusion. The patient had an event which was witnessed by the neurology specialist. It was noted that the patient usually develops such event during physician rounds or visiting hours. Oxygen saturation was 96% during the event on room air, no dilatation or tachycardia were found and Plantars were downing. There was spontaneous recovery of consciousness without headache, vomiting or fatigue. There was no cranial nerve involvement, he has normal reflexes with intact motor and sensory functions, also cerebellar exam was normal and normal gait was found. According to Cardiovascular examination it was found that CVS: S1+S2+0, for chest examination it was found that B/L vesicular breath sound with no added breath sounds. Examining abdomen showed soft, Lax; no organomegaly and no palpable masses were felt.

His vital signs were as follow; T.: 36.2 C BP: 102/52mmHg P: 77bpm RR: 19breaths/min. spO2: 96% RA, RBS: 69 mg/dl. Electrocardiography(ECG) showed Sinus Rhythm, his blood tests were found as follow; for complete blood count (CBC) his white blood cell count was  $11 \times 10^9$  /L, platelets was  $211 \times 10^9$  /L, ANC 7.04, HGB 15.5m MCV 81 and MCH 28, his coagulation profile showed that prothrombin time (PT), INR, aPTT were 13.9 sec, 1.04, 32.5 sec respectively. By measuring kidney function tests, Blood urea nitrogen(BUN)= 3.01mmol/L, Creatinine (Cr)=79  $\mu$ mol/L, Na= 143 mmol/L, K= 4.1mmol/L, Cl= 106mmol/L, Ca= 2.3mmol/L, Mg= 0.8mmol/L, PO<sub>4</sub>= 1.1mmol/L. Liver function tests were; AST= 35 U/L, ALT= 29U/L, ALP= 110 U/L, Albumin= 38g/L, Amylase= 71 U/L, LDH =289 U/L. By estimation of Creatine kinase (CK) level=320U/L, CK-MB= 23 U/L, Prolactin = 314 nmol/ml, Thiamine level= 70 mmol/L, Vit B 12 level= 180 pg/ml, Venous blood gas = 155.

CT scan in brain was performed on patients' brain on the day of admission (5/2/2017) and it was normal. Electroencephalogram (EEG) was performed 9<sup>th</sup> February 2017 to find the problems related to electrical activity of the patients' brain, it was performed after giving 10mg IV midazolam as a sedative agent, results showed that it was essentially normal EEG recording during wakefulness, drowsiness and activating procedure demonstrating normal background with no abnormal focal slowing or epileptiform discharges, also there was no clinical or electrographic seizures. Excessive fast activities were noted which may be related to benzodiazepines that was given prior to this study.

Magnetic Resonance image (MRI) was performed 8<sup>th</sup> February 2017, the study was suboptimal to artifact produced by braces making evaluation of the images slightly difficult. There was no mass lesion or midline shift noted, hydrocephalus also was not found. Brain stem and both cerebellar hemispheres are unremarkable and both temporal lobes show normal signal intensity with no atrophic changes. We did not find cortical dysplasia or evidence of mesial temporal sclerosis also no diffusion restriction observed in diffusion weighted images. CP angle was unremarkable. Figures (1-3)



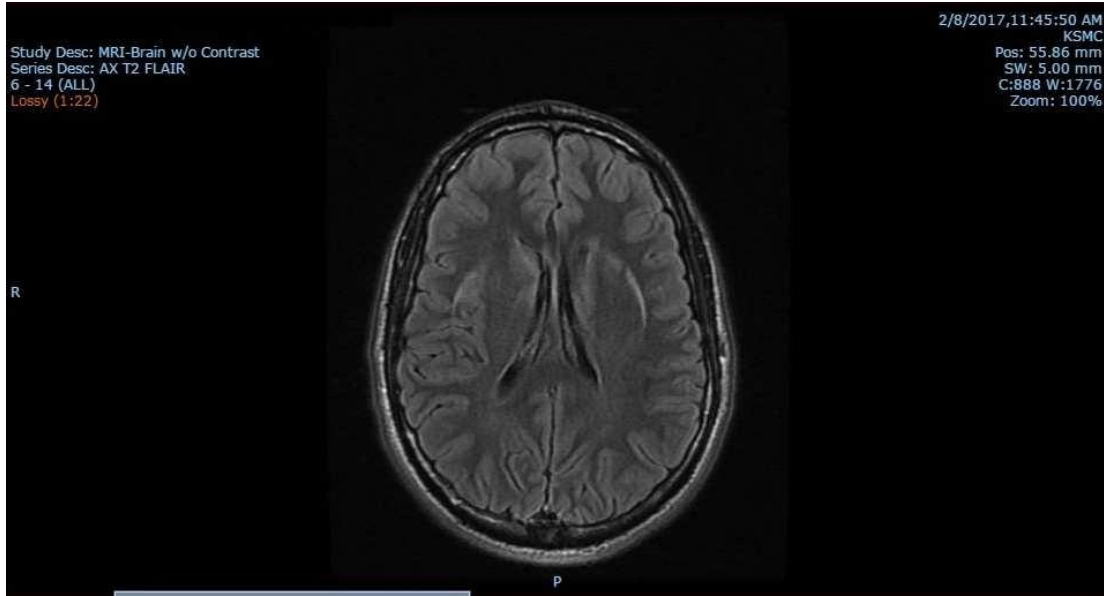


Fig.1.normal

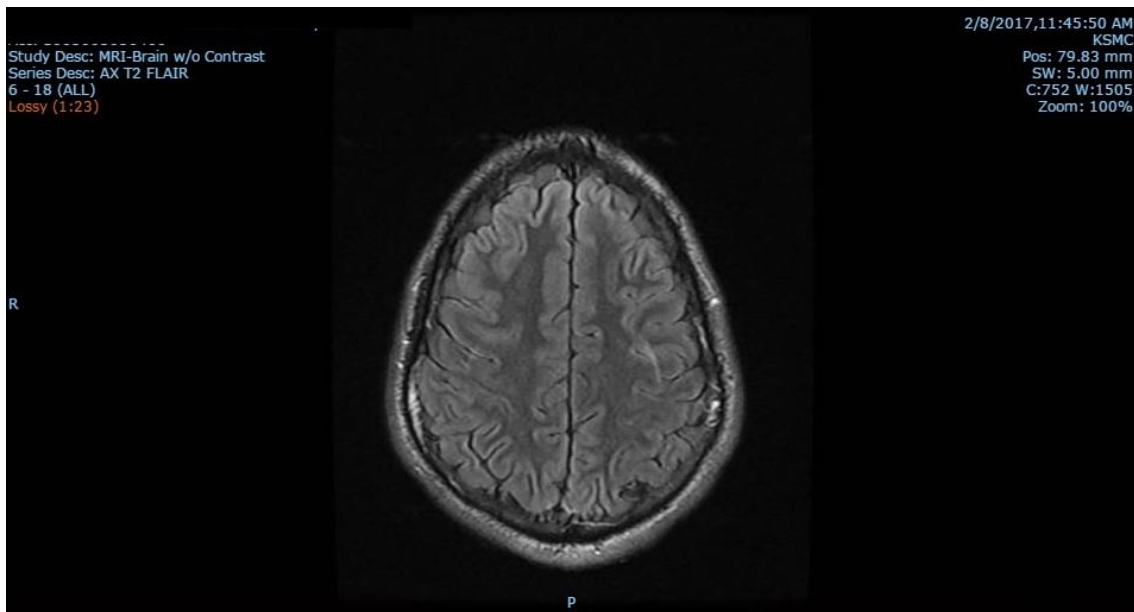
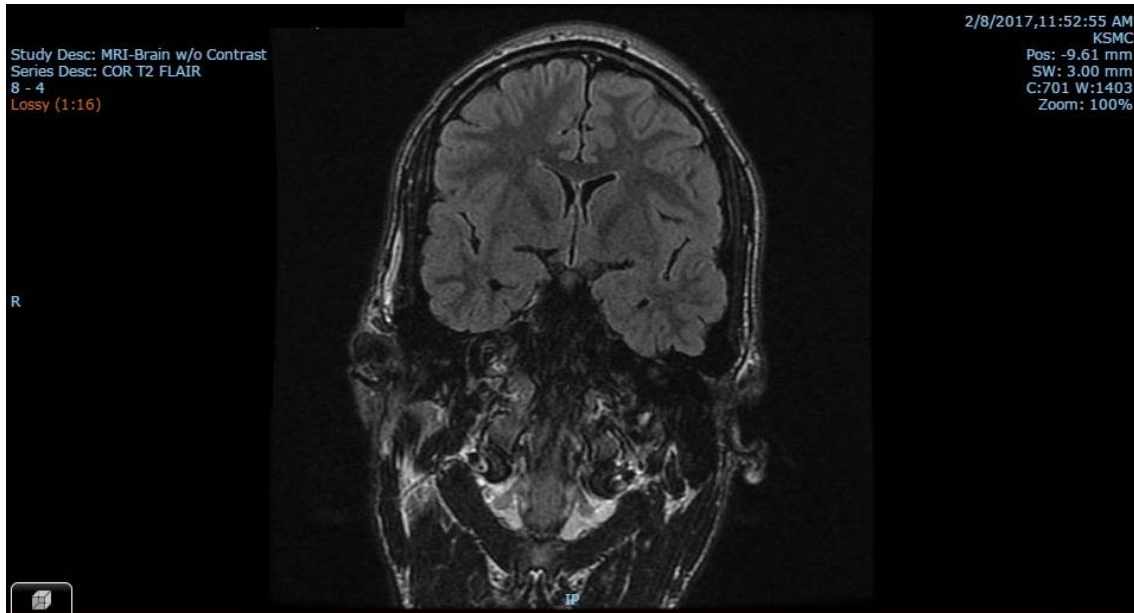


Fig 2 .normal



**Fig.3.normal**

A dose of 1 g of Phenytoin was given to the patient and he was put on a regular dose of 100 mg IV TID and Thiamine dose of 500 mg for three days. Folic acid dose of 1mg PO OD was given to the patient, D50 of 50 ml was given after thiamine injection as a STAT dose. Keppra of 1 g PO BID was added after 2 days to optimize treatment if he was a true seizure patient. Also He was put on a placebo of 15 ml D5 water which he would stop his event after receiving the injection.

### **Discussion:-**

The description of paroxysmal alterations in behavior that looks like epileptic seizures is called pseudoseizures but lack any organic cause [9]. Pseudoseizures or Psychogenic Non-Epileptic Seizures (PNES) accounts for 17% to 30% of patients admitted to epilepsy units [1]. Patients of pseudoseizures are often alcoholism and suffer pressure of performance [9], our patient was alcohol consumer and suffers from increased social pressure. The patient has normal laboratory tests and physical examination. Diagnosis of Pseudoseizures must be precisely recognized because mistake in diagnosis can be harmful [9]. Actually it is very difficult to diagnose Pseudoseizures due to presence of overlapping in syndromes of real epilepsy with pseudoepilepsy [11]. There are many characteristics of Pseudoseizures including no tongue bite, absence of urinary incontinence, normal pupillary reflex and normal pupil size where, it is dilated in organic seizures, occurrence of event in all times, especially when the patient is awake among all the relatives, or persons related to the issue, and plantar reflex is always flexor [1,11]. In the present case almost all the previous conditions where exist with our patient, the patient did not suffer tongue biting and had no loss in bladder control, also there was no pupillary dilatation, the patient usually develops the events during physician rounds or visiting hours it was recorded that plantars were downing. All these indicate that this person was suffering pseudoseizures. He was suffering from repeated attack of involuntary movements affecting all his four limbs, but during the vent he was aware of his surroundings and he regained full consciousness and function after the event. Pupillary dilatation is not common, however it was observed a mild papillary dilatation [11], in the present case there was no papillary dilatation. Bladder incontinence is rare in Pseudoseizures [11], our patient did not loss bladder control. The time for seizure episodes ranged from 4 seconds to 19 minutes [11], in the present study the patients' neck hyperextension around 30 seconds every time.

Aura is unusual in pseudoseizures [9] this is what found in our patient who had no Aura. Serum prolactin concentration was found to be higher than 500 IU/ml in percent exceeding 90% of patients after a tonic-clonic seizure while it increases in 60% of patients after a complex partial seizure, prolactin does not increase after Simple partial seizures [10], in the present patient the Prolactin concentration was 314 nmol/ml. Electroencephalogram (EEG) may be normal in 30% of epilepsy patients [10], however it is important to be

performed during the seizures to establish a correct diagnosis [1]. In the present case, normal EEG was recorded which demonstrating a normal background with no abnormal focal slowing or epileptiform discharges. In our patient, his MRI showed no diffusion restriction in diffusion weighted images, no hydrocephalus or mass lesion or midline shift were noted. In conclusion we found that the present patient suffered Pseudoseizures, so misdiagnosis of Pseudoseizures is present due to similarity in some symptoms with true epilepsy.

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### RESEARCH ARTICLE

#### THE RELATIONSHIP BETWEEN SPORTS AND MEDICAL STUDENTS GPA IN AL.

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Ministry of Higher Education, Al-Imam Mohammed Bin Saud Islamic University, College of Medicine Kingdom of Saudi Arabia.

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##### Manuscript History

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##### Key words:-

sports and students GPA,- Imam medical college, medical students, exercises, enhancement health

#### Abstract

**Background:** It is known that the sport a positive effect on physical and mental health, it strengthens the muscles of the body and the level of immunity in the body and therefore, through practicing the sport, we prevent a lot of diseases that affect our body.

##### Material and method:

- 1- sample size:142 students
- 2- sample technique: Convenient Sampling.
- 3- data collection methods:
- 4- The questionnaire will be send through all leaders of all medical students to distributed to all groups of medical students through emails.
- 5- data management and analysis plane:  
Statistic software (SPSS) will be used to find out the result of this research.

##### Result:

Percentage of student	GPA		
7%	4-5	3 % (non athlete)	4% (athlete)
93%	3-3.99	20% (non athlete)	73% (athlete)

**Conclusion:** in this study conclude that student which participate in sports have higher GPA than other students. which they do not participate by the percentage of difference is about 1-2%

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#### Introduction:-

It is known that the sport a positive effect on physical and mental health, it strengthens the muscles of the body and the level of immunity in the body and therefore, through practicing the sport, we prevent a lot of diseases that affect our body , for example, the heart and lungs, as well as the bones.

The focus of our study in this research is the impact of practicing sports on the academic achievement of students at the College of Medicine and if it were so, does this impact positive or negative.

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Address:- Ministry of Higher Education, Al-Imam Mohammed Bin Saud Islamic University, College of Medicine Kingdom of Saudi Arabia.

Many studies have worked on high school students and middle us reflect the positive impact of exercise on academic achievement among these students and also has some international institutes do similar studies showed similar results we will review.

That medical students are more students busier study and educational attainment and what they are studying is very important because it relates to human life and the dangers surrounding it.

When logged in to lacquer ware medicine in any of the universities in the Kingdom or abroad, you find students from more students are busier because of scientific subjects taught and other organizing scientific conferences college and establish awareness days and other activates.

**Hypothesis:-**

the practicing sports helps in enhancement the student health and subscently lead to improvement of studyingperformance.

**Objectives:-**

The goal of this research is to find out if there are any relations between practicing sports and students GPA in Al-Imam medical college, Riyadh city at 2015.

**Material and method:-**

1-sample size:142 students

2-sample technique: Convenient Sampling

3-data collection methods:

The questionnaire will be send through all leaders of all medical students to distributed to all groups of medical students through emails.

4-data management and analysis plane:

Statistic software (SPSS) will be used to find out the result of this research.

عدد الردود: 100

برص كل الردود: متر المثلثات

ملخص

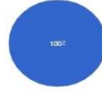
Age

99%	99	20-25
0%	0	25-30
1%	1	30-35
0%	0	More than 35



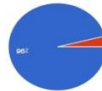
Sex

100%	100	male
0%	0	female



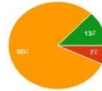
Marital Status

96%	96	Single
4%	4	Married



Size of your household, i.e. the number of people, including yourself, who live in your house

0%	0	Alone
7%	7	1-3
80%	80	3-5
13%	13	More than 5



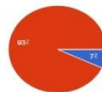
Smoking

37%	37	Not smoker
47%	47	Ex smoker
16%	16	Smoker



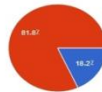
(Approximate cumulative grade point average GPA: (choose one

7%	7	4-5
93%	93	3.99-3
0%	0	1.99-1
0%	0	Less than 1



?Are you interested in practicing the sport on a daily basis

18.2%	18	yes
81.8%	81	no



?Do you engage in any kind of study conflicts with your study times

76%	76	yes
24%	24	no



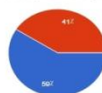
?Do you think that practicing sports have a positive impact on the achievement of science

77%	77	yes
23%	23	no



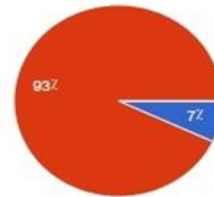
?Do you think that a medical student has enough time to practice the sport

59%	59	yes
41%	41	no



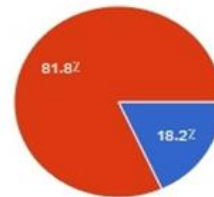
:(Approximate cumulative grade point average GPA: (choose one

7%	7	4-5
93%	93	3.99-3
0%	0	1.99-1
0%	0	Less than 1



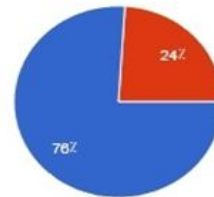
?Are you interested in practicing the sport on a daily basis

18.2%	18	yes
81.8%	81	no



?Do you engage in any kind of study conflicts with your study times

76%	76	yes
24%	24	no



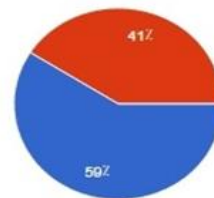
?Do you think that practicing sports have a positive impact on the achievement of science

77%	77	yes
23%	23	no



?Do you think that a medical student has enough time to practice the sport

59%	59	yes
41%	41	no



**Discussion:-**

In previous study about the relation between high school athletic participation and academic performance conclude that as students' school-sponsored athletic participation increases, their academic achievement, based on tests and GPA, will be lower than those who did not participate.

In sport participation and academic performance from the national longitudinal study of adult cents health provide only limited evidence that sports participation leads to enhanced academic performance.

In a study grade point average of athletes and non athletes the results of the study determined that there was a significant difference in the GPA of athletes and non-athletes.

In this study we conclude that there is significant relation between GPA and practicing sports.

**Conclusion:-**

in this study conclude that student which participate in sports have higher GPA than other students. which they do not participate by the percentage of difference is about 1-2%

**Recommendation:-**

the population should practicing sports regularly to improve their physical health.-1  
2- the regular sport practicing may increase academic achievements.

**Questionnaire form:-**

+ Age:

- 20-25
- 25-30
- 30-35
- More than 35

+ Sex:

- M
- F

+ Marital Status:

- Single
- Married

+ Size of your household, i.e. the number of people, including yourself, who live in your house:

- Alone
- 1-3
- 3-5
- More than 5

+ Smoking:

- Not smoker
- Ex smoker
- Smoker

+ Approximate cumulative grade point average GPA: (choose one):

- 4-5
- 3.99-3
- 2.99-2
- 1.99-1
- Less than 1

+ Are you interested in practicing the sport on a daily basis?



- ✓ Yes
- ✓ No
- ✚ Do you engage in any kind of study conflicts with your study times?
- ✓ Yes
- ✓ No
- ✚ Do you think that practicing sports have a positive impact on the achievement of science?
- ✓ Yes
- ✓ No
- ✚ Do you think that a medical student has enough time to practice the sport?
- ✓ Yes
- ✓ No

*The link for the questioner:*

<http://goo.gl/ERBwc>

### **Literature review:-**

1- Correlations between High School Athletic Participation and Academic Performance:

#### **Objectives:-**

This research study examines the correlation between high school students' school-sponsored athletic participation and their academic performance.

#### **Conclusion:-**

This study concludes that as students' school-sponsored athletic participation increases, their academic achievement, based on tests and GPA, will be lower than those who did not participate.

#### **Main finding:-**

This study was focused on two questions in order to evaluate any relationships. The first question asked —Is there a relationship between the amount of high school students' school-sponsored athletic participation and their academic performance,

The data showed a negative relationship between these two variables.

The second question this study asked was, —Does increasing the number of sports have a positive or negative correlation on the student's academic performance there is a negative correlation between the two.

#### **Reference:-**

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Klein, Tim, "Correlations Between High School Athletic Participation and Academic Performance" (2011). *Master of Education*

2- Sports participation and academic performance: Evidence from the National Longitudinal Study of Adolescent Health:

#### **Objectives:-**

the effect of sports participation on several measures of academic performance.

#### **Conclusion:-**

Our results provide only limited evidence that sports participation leads to enhanced academic performance.

**Main finding:-**

the instrumental variables estimates, like the individual fixed effects estimates, provide very little evidence of positive academic spillovers associated with playing an active sport.<sup>20</sup>

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3-a study in the grade point average of athletes vs. non-athletes:

**Objectives:-**

The purpose of this study was to analyze the grade point average of student athletes versus that of non-student athletes.

**Conclusion:**

The results of the study determined that there was a significant difference in the GPA of athletes and non-athletes.

**Main finding:-**

The maximum GPA for both non-athletes and athletes is 4.0. However, what the charts do not show is that the athletes actually had 4 students with 4.0 GPA and the non-athlete had only one.

The minimum GPA for non-athletes is 1.21 and the athletes' minimum was 1.79. The minimum for non-athletes was 0.58 lower than that of the athletes showing a significantly lower GPA minimum.

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### RESEARCH ARTICLE

## IMPACTS OF INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) IN LOGISTIC MANAGEMENT IN UNILEVER KENYA LIMITED.

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Impacts, Information, Communication Technology, Logistic Management, Kenya

#### Abstract

ICT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit and retrieve information, securely. Recently it has become popular to broaden the term to explicitly include the field of electronic communication so that people tend to use the abbreviation ICT (Information and Communications Technology (Greenwood, 1997). Due to the widespread adoption of the supply chain view by commercial enterprises all over the world, the business management providers are increasingly required to offer global logistics service packages to better satisfy customer needs. Information and Communication Technologies (ICT) play a key role in this process, assuring the linkages between chain participants as well as a more effective control of time, cost, and quality of the service rendered. Nevertheless, introduction of ICT is not equally distributed in the industry. In the case of manufacturing and production, crucial business links and interlinks lines seem to be comparatively slow in implementing ICT in comparison with parcel delivery companies or large freight forwarders.

The increasing importance of ICT for logistics as well as for the Supply Chain Management (SCM) presents business world with two alternatives: either to survive in a low-cost world of business providers or to pursue the expensive and problematic path of becoming value-added providers through an extensive use of ICT. Introduction of ICT in logistics provides management an integrated capacity of assurance and reliable communication advantage at every stage of operations, which encompasses activities like cargo tracing, answering customers complain, inquiry billing and information management (Baily 2005). The use of E-mail and other related bulk Short Message Services (EMS) that comes with the application and adoption of Information and Communications Technology provides quick and documented communications with customers and other important stakeholders. This as compared with manual operations besides providing customer value saves costs and time in operations a great deal

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**Introduction:-**

Information and Communication Technology (ICT), as defined by the Information Technology Association of America (ITAA), is "the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware (Donald 1997). Information and Communications Technology (ICT) is an increasingly powerful tool for participating in global markets; promoting political accountability; improving the delivery of basic services; and enhancing local development opportunities. But without innovative ICT policies, many people in developing countries - especially the poor - will be left behind. ICT deals with the use of electronic computers and computer software to convert, store, protect, process, transmit and retrieve information, securely. Recently it has become popular to broaden the term to explicitly include the field of electronic communication so that people tend to use the abbreviation ICT (Information and Communications Technology). It is common for this to be referred to as IT & T in the Australasia region, standing for Information Technology and Telecommunications (Greenwood, 1997).

In today's Supply Chain Management (SCM) practices, a successful strategy depends more on the performance of Third Party Logistics service providers (3PLs) (Kenneth, Brian, 2006). Accordingly, logistics providers play a key integrative role linking the different supply chain elements by the management of information flows connected with the entire delivery process of goods (Chopra, 2007). Information and Communication Technology is becoming one of the main drivers of change in the industry, posing new strategic challenges to logistics companies and management. Information and Communication Technology (ICT) developments are more and more influencing the transport and logistics service market and give rise to new organizational forms for these services. For example, the volume of electronic communication along the supply chain is fast growing together with the electronic exchanges of transport documentation, invoices, order instructions and payments (Trilog, 1999). This has created an increasing need to support customers supply chains requirements through an effective use of ICT (Meindl, 2007).

According to Saunders (1997), ICT in Logistics is the application of computer software and / or automated machinery to improve the efficiency of logistics operations. Typically this refers to operations within a warehouse or distribution center, with broader tasks undertaken by supply chain management systems and enterprise resource planning systems. The information systems applications in the field of logistics and supply chain management are not new, and have a long history dating back in the 1960s, when early Electronic Data Interchange (EDI) were first used; predating the use of computer power. An early example was maintenance of inventory records on ledger cards which at first were manually up-dated and later became semi-mechanically updated using magnetically encoded data. As such the computer has facilitated faster data processing and allowed significantly more data and information to be handled. It is not therefore outrageous to evaluate the impact of ICT on the Logistics Management of Unilever Kenya Limited.

The need to serve customers in a flexible and speedy manner has forced manufacturers and distributors to effectively exploit ICT by creating "global nervous system" that link a continuous flow of supply and demand information between suppliers and customers; (Kennet *et al.*, 1996). This has raised the level of information intensity in logistics and management as well as supply chain management services. In this perspective ICT has developed and have increasingly influenced the transport and logistics services industry, shifting the focus from a physical to a more electronic one and giving rise to new organizational forms for those services.

Previous studies revealed that growth in volumes of electronic communications along the logistics management and supply chain management, was expected to double by the year, 2005 thus electronic exchanges of transport documentation, invoices, orders instructions and payments are focused to grow 59% (Trilog, 1999). This has led to an increasing interest in assessing the effect of ICT on the transport and logistics industry.

According to Donald (1997), automated cranes (also called automated storage and retrieval systems) provide the ability to input and store a container of goods for later retrieval. Typically cranes serve a rack of locations, allowing many levels of stock to be stacked vertically, and allowing far high storage densities and better space utilization than alternatives. Further, automated conveyors allow the input of containers in one area of the warehouse, and either through hard coded rules or data input allows destination selection. Business Control software: provides higher level functionality, such as identification of incoming deliveries / stock and scheduling order fulfillment, assignment of stock to a large set of locations (Peter 2000).

Mobile technology; Radio data terminals: these are hand held or truck mounted terminals which connect wirelessly to logistics automation software and provide instructions to operators moving throughout the warehouse. Many also have in-built barcode scanners to allow identification of containers. Bar codes allow the automatic capture of data without use of the computer keyboard, which is slow and error prone. Software Integration software: this provides overall control of the automation machinery and for instance allows cranes to be connected up to conveyors for seamless stock movements (Lysons 1996).

According to Bailey (1978), Uneliver Kenya receives stock of a variety of products from suppliers and store these until the receipt of orders from customers, whether individual buyers (e.g. mail order), retail branches (e.g. chain stores), or other companies (e.g. wholesalers). Incoming goods are marked with barcodes and the automation system notified of the expected stock. On arrival, goods are scanned and thereby identified, and taken via conveyors, sortation systems, and automated cranes into an automatically assigned storage location. Automated Goods Retrieval for Orders: On receipt of orders, the automation system is able to immediately locate goods and retrieve them to a pick face location. Automated dispatch processing: Combining knowledge of all orders placed at the warehouse the automation system can assign picked goods into dispatch units and then into outbound loads (Bailey 1978).

### **Impacts of ICT on Management:-**

#### **Transparency/ or Accountability:-**

According to Lysons (1996) asserted that there are different tools available to coordinate effectively the supply chain. Technological tools constitute the most important management tools because these offer fast and convenient channels of communication within the organization and of the organization with its suppliers and customers. The predecessor of current technological channels of incoming and outgoing communication is the telephone, fax-machine and computers, which are still useful to modern businesses. However, these technological tools were enhanced by the internet and its unlimited potential for businesses. The internet provides a channel of communications that covers contract negotiations, buying and selling of products, monitoring of the transport of goods, payment of goods and services, coordination of internal tasks and a lot more benefits (Lysons, 1996).

#### **Record Keeping:-**

Stevens (1995) defines automation of records and documents as the storage and transmission of business documents via computer system. With the continuous implementation of ICT in various areas of logistics management which has reduced the manual way of keeping records and exchange of documents between the buyer and supplier in what is being termed as paperless trading. Automation of records and documents has resulted to e-business concept which relies on an automated business system.

Electronic business methods enable companies to link their internal and external data processing systems more efficiently and flexibly, to work more closely with suppliers and partners, and to better satisfy the needs and expectations of their customers. In practice, e-business is more than just e-commerce. While e-business refers to more strategic focus with an emphasis on the functions that occur using electronic capabilities, e-commerce is a subset of an overall e-business strategy ((Peter Baily 2005). Due to increased rise to paperless trading there has been need to implement the electronic data interchange (EDI) concept where partners are free to use any method for the transmission of documents. In the past one of the more popular methods was the usage of a bisync modem to communicate through a Value Added Network (VAN). Some organizations have used direct modem to modem connections and Bulletin Board Systems (BBS), and recently there has been a move towards using some of the many Internet protocols for transmission, but most EDI is still transmitted using a VAN. In the healthcare industry, a VAN is referred to as a "Clearinghouse". EDI and other similar technologies save a company money by providing an alternative to, or replacing information flows that require a great deal of human interaction and materials such as paper documents, meetings, faxes, email (Peter 2000).

According to Lysons (1996), business of keeping records in hard copy files should be a thing of the past, with the new technology that is available, every government office needs to automate, so to facilitate retrieval of supply chain information when needed, it can be made available in real time. Office automation refers to the varied computer software used to digitally create, collect, store, manipulate and relay office information necessary for accomplishing basic tasks and goals. The backbone of office automation is a LAN, which allows users to transmit data, e-mail.

**Distribution efficiency:-**

Occurs when goods and services are received by those who have the greatest need for them. This is made possible by use of Distribution Resource Planning (DRP) which is a method used in business administration for planning orders within a supply chain. DRP enables the user to set certain inventory control parameters (like a safety stock) and calculate the time-phased inventory requirements (Menon 2004).

The on-hand inventory at the *end* of a period. DRP has the following variables the backordered demand at the end of a period, the required quantity of product needed at the beginning of a period, the constrained quantity of product available at the beginning of a period, the recommended order quantity at the beginning of a period. For DRP to function the following information is required, demand in a future period, the scheduled receipts at the beginning of a period, the safety stock requirement for a period and the on-hand inventory at the beginning of a period (Ammer, 1986).

It is all inventory control and scheduling technique that applies the MRP principle and distribution environment integration, the special needs of distribution and a time face plan of events that affect inventory, it's the rates IT tool for controlling inventory to the distribution system of organization. DRP is guided by customer demand. It allocates inventory from the central warehouse to the various distribution centres based on demand patterns, safety stock provisions, order quantity, reorder level and average performance cycle length. DRP also coordinates the finished goods required across the distribution network, the success of this system depends on the accuracy of performance with respect to location and time of requirement across the system is necessary for system effectiveness (Stevens, 1995).

Logistics professionals need to make greater use of available technology to drive positive and efficient business results. Systems solution is driven by knowledgeable people who clearly understand the business challenge and apply technology appropriately to this challenge one side-effect of technology is that it provides a solid short-term solution but cannot adapt to future needs. System designers must carefully assess the functionality required to allow the company to grow over time and adapt to changing logistics requirements. Without systems flexibility, logistics executives will continuously request funding for new or customized systems, leading to the perception that logistics is just a cost center worse yet, a black hole of continuous investment (Peter 2000).

Despite the risks in the systems problems, information and operations systems for logistics management will continue to be vitally important in leveraging logistics to achieve a competitive advantage. Third party logistics providers within the last decade, there has been a direct positive correlation between the role of systems in improving logistics programs and the increasingly important role of third party providers (Bailey 1978). Organizations must continually invest in logistics systems to support their core business this allows shippers to avoid systems development efforts by tapping into tap an existing infrastructure. Many companies have flat or declining information technology budgets, and logistics systems are well down the priority list for corporate systems investments. There should be incentive that drives logistics providers to adopt and implement technologies that deliver an attractive ROI, or risk extinction (Hooligan 1988).

One of the most exciting tools for applying systems to logistics management and changing the way people work is the internet. The shared network of the World Wide Web can link supply chain systems and partners through one identical, user-friendly interface accessible by anyone with a web browser. This enables complete and seamless supply chain integration, while still allowing providers to develop the unique software required for their specific applications (Kumpe 1988).

Today the internet remains more promise than panacea, to catch up to early adopters of internet commerce by implementing applications that are too often long on technology, but short on real value. There need to recognize the need to logistics excellence. These can eventually be achieved by those who focus their time and energy on understanding the business challenge, then use information and operations systems as tools to continuously improve process (Kumpe 1988).

**Cost reduction:-**

One of the aims of each business is to reduce cost to the minimum so as to realize profit, e-procurement aims to reduce cost and enhance efficiency. An important part of many B2B sites, e-procurement is also sometimes referred to by other terms, such as supplier exchange. Typically, e-procurement Web sites allow qualified and registered users to look for buyers or sellers of goods and services. Depending on the approach, buyers or sellers may specify

costs or invite bids (Bailey1978).Transactions can be initiated and completed. Ongoing purchases may qualify customers for volume discounts or special offers. E-procurement software may make it possible to automate some buying and selling. Companies participating expect to be able to control parts inventories more effectively, reduce purchasing agent overhead, and improve manufacturing cycles. E-procurement is expected to be integrated with the trend toward computerized supply chain management (Peter 2000).

According to Peter Baily (2005), Electronic funds transfer or EFT refers to the computer-based systems used to perform financial transactions electronically. Some of the transactions performed include sale, refund, withdrawal, deposits, cash backs etc. EFT transactions require communication between numbers of parties. When a card is used at a merchant or ATM, the transaction is first routed to an acquirer, then through a number of networks to the issuer where the cardholder's account is held.

A transaction may be authorized offline by any of these entities through a stand-in agreement. Stand-in authorization may be used when a communication link is not available, or simply to save communication cost or time. Stand-in is subject to the transaction amount being below agreed limits. These limits are calculated based on the risk of authorizing a transaction offline, and thus vary between merchants and card types. Offline transactions may be subject to other security checks such as checking the card number against a 'hotcard' (stolen card) list, velocity checks (limiting the number of offline transactions allowed by a cardholder) and random online authorization (Hooligan1988).

### **Conclusion:-**

The impacts of ICT in logistic management are; transparency, record keeping, distribution efficiency and cost reduction. This was demonstrated by the study findings where average of 75% of the respondents were presented to have accepted yes. The level of ICT in logistic employed are ineffective and this negatively affects effectiveness and efficiency of logistic management activities. Information communication technology ensures transparency among employees when conducting logistic activities which provides information for holding employees accountable for their actions, ICT provides clear communication channels for employees in every stage of logistic. Computerization of record keeping ensures elimination of manual way of storage and transmission of documents across the logistic network which reduces overall cost of record keeping. Records and documents stored electronically ensure security and easier retrieval when required. ICT in logistic management aims to enhance distribution efficiency and information communications technology is an important factor for any organization to achieve efficiently their long-term goals. Information communications technology provides the tool for the efficient coordination of the different process links throughout the logistic network. The main aim of the organization integration of ICT with logistic activities is to reduce cost; ICT management, e-procurement aims to reduce the cost of procurement process; reduces the cost of storage and processing of documents, inventory

### **Recommendations:-**

Transparency should aim to hold employees accountable for any action they take in the line of their duty. Information communication technology should encourage transparency in the whole of logistic network; ICT should be made more effective to minimize malpractices in logistic management, enterprise resource planning system should be implemented so as to provide information in every stage of logistic management. Automation of records keeping eliminates the need to store documents manually; the security of documents is improved, unauthorized users are denied accessibility as computer are have passwords which restricts unauthorized users. To reduce the security risks of the documents stored electronically, there is need to back up records which are vulnerable to virus, Trojan attacks which crash computer systems and destroying logistic information.

ICT should aim to make logistic management activities as efficient as possible, Just in Time (JIT) system should be implemented in inventory management which will avail materials in just the right time, right place to make the right amount of products, distribution resource planning (DRP) should be implemented to ensure efficient distribution of materials. The management of should implement ICT infrastructure which is capable of reducing the cost in logistic management, all documents, records and inventory management should be computerized, e-procurement should be implemented to reduce the cost in procurement process, Distribution resource planning (DRP) should be implemented so as to reduce the cost of distribution of products.

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### RESEARCH ARTICLE

#### EFFECTS OF OUTSOURCING ON ORGANIZATIONAL PERFORMANCE IN KENYA.

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Outsourcing, organizational performance, effects, Kenya

#### Abstract

The purpose of this study was to determine the effects of outsourcing on an organizational performance. Performance refers to how well or badly an individual or institution is doing in achieving its designated tasks (Ashby 2002). Managers want their organizations to achieve high levels of performance, no matter what mission, strategies, or goals are being pursued. Other specific objectives include productivity, costs and quality. It was established how productivity, costs and quality affect the performance of an organization. The review's findings established that outsourcing in the organization was not fully effective. It also showed that outsourcing had effects on productivity, costs and quality of goods and services produced thus subsequently affecting the performance of K.I.A (Kenya Institute of Administration) for instance. Bulk buying, procurement of approved goods and services, hiring qualified personnel and evaluation of the process to identify the best line of fit and identification of the best brand in the market, and checks to ensure goods and services procured are recommended.

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#### Introduction:-

Heshmati (2003) in his survey points out that there is no general definition or measurement of outsourcing, he broadly describes it as a different kind of corporate action related to all subcontracting relationships between firms and the hiring of workers in a non-traditional jobs. Outsourcing may provide a viable strategy if firms aim to save on labour costs (Abraham and Taylor, 1996), exploit production differentials both within the services sectors and between services and manufacturing (Fixler and Siegel 1999), or take advantage of Globalization (Freenstra and Hanson, 1999).

Outsourcing is a strategic management tool that involve contracting of a company's non-core, non-revenue generating activities to a third party, commonly referred to as service provider. The process of outsourcing entails a long relationship between the supplier and the beneficiary, with a high degree of risk sharing (Corbett, 2004). The essence of outsourcing is to look for expertise to handle certain business functions outside the existing firm. The decision making process that management must undergo when considering outsourcing hinges on a "make or buy" philosophy. Outsourcing emerged from the moribund economy of the 1980s and 1990s, with emphasis on cutting costs driving the primary focus of successful firms. The renewed focus on outsourcing has mainly been driven by changes in information technology, communication and reengineering organizations (Embelton and Wright1998).

An organization's performance goals can only be achieved through its employees. An effective performance measurement and management system links individual and team work behavior to the organization's business

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strategies, goals, and values. For achievement of its goals, it is essential for each employee to understand individual roles and responsibilities for goal achievement and there must be continuous dialogue between leaders and employees to set performance expectations, measure and analyze, and manage performance—three essential action steps that are interlinked and an ongoing in an organizational culture that successfully measures and account for performance. During the performance planning phase, the first phase of performance measurement, the organizational business strategy—including its mission, vision and objectives, and specific outcome required to achieve the overall strategy is defined. Goals and plans on how to measure achievement must be identified. In this step, outputs and measures are identified and requisite data collection and analysis process and procedure are developed and implemented.

Additionally, employees come to understand their individual roles and responsibilities with respect to performance measurement and are given the fundamental information, resources, competencies and motivation to ensure their successful execution. In the second phase measurement process—the measurement and analysis phase—data that informs areas of success and challenge for the organization are collected and are analyzed. Specific elements and factors that contributes success or challenge along with new/or modified information needs and lessons learned are identified. Once the performance data has been collected and analyzed, it must be effectively managed. The third phase of the process—performance management—is the phase in which solutions to address the identified challenges are developed and implemented, along with mechanisms to ensure the continuation of programme or organizational success. Additionally, performance measurement system and process may be modified as need to ensure that information collected through the performance measurement process is timely, relevant, and sufficient—steps that cycle back to performance planning (Poster, 2003).

Further, Smith (2000) asserted that most corporations believe that in order to compete globally and efficiently, cost must be rather than relying strictly on revenue growth. Therefore, organizations around the world are increasingly considering outsourcing as a strategic measurement tool which can be leveraged to allow focusing on their core competencies.

Heartman and Bengtsson (2007) point out that Business Process Outsourcing (BPO) gives tremendous help to companies to concentrate on the core areas of business. The most important factor in the growth of the BPO market worldwide today, is an increase in the number of enterprises that are reviewing their internal operations is an attempt to fully understand their true competencies. In this process companies are able to focus more on their core competencies to improve performance. Elmuti (2003) finally adds that those companies that are successful in outsourcing share the same success factors. These factors include clear understanding of their core activities, conducting adequate research and planning, and most importantly have developed clear objectives, goals and expectations of outsourcing activities. It is also essential that the right partners are selected based on a criteria like credibility, expertise and reliability.

A fundamental question to ask is whether outsourcing is value enhancing and, in particular, whether the firm that undertakes outsourcing shows higher profitability as a result. Essentially, this question renders down to the transactions cost question regularly posed to university undergraduates: should a firm manufacture its own input by some form of vertical merger or should it seek to obtain possibly more competitively priced inputs on the open market? While the viability of vertical mergers as determinant of profitability is comparatively well researched, less work has been undertaken on the viability of pursuing a less integrated strategy, namely of outsourcing inputs (Bhuyan, 2002).

Njihia (2005) affirmed that performance is an action or achievement considered in relation to how successful it is. It is the ability to operate effectively or to react quickly. Armstrong (2006) stated that performance is often defined simply in output terms—the achievement of qualified objectives. But performance is a matter of not only how people achieve, but how they achieve it. Performance means both behavior and results. Behaviors emulate from that performer and transform performance from abstraction to action. Not just the instruments for results, behaviors are also outcomes in their own right—the product of mental and physical effort applied to tasks and can be judged apart from results.

Outsourcing is subcontracting, a process such as product design or manufacturing, to a third party company. The decision to outsource is often made in the interest of lowering costs or making better use of time and energy costs, redirecting or conserving energy directed at the competencies of a particular business, or to make efficient use of

land, labour, capital, (information) technology and resources. It became part of the business lexicon in the 1980s. It is essentially a division of labour. It involves the transfer of management of day to day execution of an entire business function to an external service provider. The client organization and the supplier enter a contractual agreement that defines the transferred services. Under the agreement, the supplier acquires the means of production in the form of transfer of people, assets and other resources from the client. The client agrees to procure the services from the supplier for the term of the contract; business segments typically outsourced include information technology, human resources, facilities, real estate management and accounting (Oversby 2007)

Organizational performance is used in three time-senses-the past, present and the future, in other words, performance can refer to something completed or something happening now, or activities that prepare for new needs. Profitability, for example, is often regarded as the ultimate performance indicator, but it is not the actual performance. The actual performance occurred time back-first with decisions and then the actions that followed the decisions. Profit is therefore an indicator of previous performance. In this sense, performance is the outcome or 'end'.

There are behaviors that are associated with good or high performance, and then one must identify and assess them as they occur. These behaviors start with strategic planning process and continue into implementation, monitoring and assessment. In this sense, performance is the 'activity' or 'means' organizations are also interested in the predictors of performance-conditions and behaviors that have been shown over time to lead to better performance. In this sense, performance is a package of behaviors around strategic planning and programming ([www.strategic-conversation.com.au](http://www.strategic-conversation.com.au))

Robert S. Kaplan and David P. Norton (1992) introduced the balanced score card, a set of measures that allow for a holistic, integrated view of business performance. The scorecard was originally created to supplement "traditional financial measures with criteria that measured performance from three additional perspectives-those of customers, internal business processes, learning and growth (Kaplan and Norton, 1996,p. 75). By 1996, user companies had further developed it as a strategic management system linking long term strategy to short term targets. The development of the balanced scorecard method occurred because many business organizations realized that focus on one dimensional measure of performance (such as returns on investment or increased profit) was inadequate.

Too often bad strategic decisions were made in an effort to increase the bottom line at the expense of other organizational goals. The theory of the balanced scorecard suggested that rather than the focus, financial performance is the natural outcome of balancing other important goals. These other organizational goals interact to support excellent overall organizational preferences. If any individual goal is out of balance with other goals, the performance of the organization as a whole will suffer. The balanced scorecard system also emphasizes articulation of strategic targets in support of goals. In addition measurement systems are developed to provide data necessary to know when targets are being achieved or when performance is out of balance or being negatively affected. The Kaplan and Norton balanced scorecard looks at a performance refers to how well or badly an individual or institutions doing in achieving its designated tasks (Ashby, 2002). It may also be described as the end result of an activity but for an organization this would refer to how well it's achieving its mission, goals and objectives. It is the accumulated end result of all the organization's work processes and activities. Managers want their organization to achieve high levels of performance; no matter what mission, goals or strategies are being pursued. The first importance of measuring organizational performance is better asset management which refers to the process of acquiring, managing, renewing and disposing of assets as needed and of designing business models to exploit the value from the assets.

The second importance is of the increased ability to provide customer value. Customers will look elsewhere if they are not receiving value from an organization. Managers should therefore monitor how well they are providing customer value and they can do that when they measure performance. The third importance is on the impact on organizational reputation. Organizations strive to have a good reputation reflected to their customers, suppliers, competitors, community and others. The final importance is improved measures of organizational. Modern organizations must be able to learn and respond quickly i.e. they must be learning organizations. Organizational knowledge is that created by collaborative information sharing and social interaction that lead the organization members taking appropriate actions thus considered an asset (Robbins and Courtler, 2003).

The most frequent measures of organizational performance include organizational productivity, organizational effectiveness and industry rankings. Kaplan and Norton (1997) assert that productivity is an economic term that means output created in terms of goods and services produced rendered per resource unit. It is the overall output of goods or services divided by the inputs to generate that output. Robbins and Coutler (2003) add that organizational effectiveness as the measure of how appropriate organizations are in achieving their goals.

While outsourcing of services has received a lot of attention in the media and political circles in recent years largely because media reports seem to equate outsourcing with job losses (Wei and Amiti, 2004) or creation of jobs (Russell, 2007), this concept has made its accessibility to many organizations on a national and international level. Offshore outsourcing has provided many businesses with the opportunity to harvest the benefits of lowering labour costs in developing countries (Frayer *et al.*, 2000) and also exploiting the value of artificially manipulated foreign currencies, where the exchange rate is undervalued. Countries that have benefited on these outsourced programs include India, china and Latin America. According to Russell (2007), almost every organization applies the outsourcing concept in some way.

Typically , the function being outsource is considered non-core to the business. However, there exists instance where organizations have outsourced their core business (Bengtsson and Haartman, 2007). These authors have reported that in their studies about 50% of engineering companies outsourced manufacturing, a process that is viewed as a core business. This study also reported that outsourcing is more common among larger companies than smaller ones. Embelton and Wright (1998) add that large organizations are doing more extensive outsourcing than small to medium size firms especially for maintenance and repairs outsourcing MRO. The study also indicated that manufacturing organizations seem to do less outsourcing than other commercial enterprises. In this study, 80% of the firms doing substantial and extensive outsourcing of MRO had revenues of over \$5 billion. For strategic items, only 15% of the companies reported moderate to extensive outsourcing activity. More than half of this group is composed of companies with \$5 billion or more in annual revenue.

Outsourcing entered the business lexicon in 1980s since then many organizations have embraced this concept with major interest if reducing costs and also focusing on the core competencies which would contribute greatly to performance of their companies. According to Automated Data Processing (2007), 100% of Canadian executives surveyed agreed that outsourcing allows their companies to focus on their core competencies, 89% of these respondents also identified payroll as the best candidate for business process outsourcing in an endeavor to reduce costs.

In Kenya, the organizations that have adopted the concept of reengineering of their process have mainly done so in an effort to reduce costs. In an interview with some key players in the manufacturing process in Nairobi (March 2007), they asserted that outsourcing of processes had greatly contributed to the good performance of their organizations. This achievement was mainly attributed to cost reduction, enhanced focus on core business and increased flexibility and efficiency of their process, this confirms their reports in literature (Elmuti, 2003).

According to Johnson & Scholes (2007), many managers find the process of developing a useful set of performance indicators for their organizations difficult. One reason for this is that many indicators give only a useful but partial view of the overall picture. Also some indicators are qualitative in nature, whilst the hard quantitative end of assessing performance has been dominated by financial analysis. In an attempt to cope with this very heterogeneous situation, balanced scorecards have been used as a way of identifying useful but varied set of measures. Balanced scorecards combine both qualitative and quantitative measures, acknowledge the expectations of different stakeholders and relate an assessment of performance of different stakeholders and relate an assessment of performance to choice of strategy. Currently, outsourcing has taken many forms (Russell, 2007; Kakabadse and Kakabadse, 2002).

In Literature, the most common forms are information technology outsourcing (ITO) and business process outsourcing (BPO). Business process outsourcing encompasses call centre outsourcing, human outsourcing. These outsourcing deals involve multi-layer contact that can run into billions of dollars (Russell, 2007). Outsourcing is the practice of using outside firms to handle work done within a company and is a familiar concept to many entrepreneurs. Small companies routinely outsource their payroll processing, accounting, distribution and many other important functions often because they have no other choice. Many large companies turn to outsourcing to cut costs. In response, entire industries have evolved to serve companies outsourcing needs. But not many businesses

thoroughly understand the benefits of outsourcing. It is true that outsourcing can save money, but that is not the only reason to do it. As many firms discovered during the outsourcing mania of the early 1990s, outsourcing too much can even be a bigger mistake than not outsourcing any work at all. This creates the need to understand it well as to apply it. ([www.allbusiness.com](http://www.allbusiness.com)).

### **Effects of Outsourcing on Performance:-**

#### **Increased productivity:-**

Smith (2000) noted that organizations around the world are continuously considering outsourcing as a strategic management tool which can be leveraged to allow them to focus on their core competencies. Non-core processes should be outsourced allowing the organization to realize financial and competitive advantages by reallocating internal resources to focus on core competencies. Okafor (2005) established that the practice of outsourcing began simply as a cost cutting technique and developed to a core strategic activity aimed at enabling companies focus on their core business. This concentration on the core competencies leads to improved efficiencies and productivity. Elmuti, (2003) affirmed that traditional outsourcing emphasizes on tactical benefits like cost reduction but this has recently been replaced by productivity, flexibility, speed and innovation in developing business applications and access to new technologies and skills. Once an outsourcing of certain processes takes place, it becomes easier for the company to compare and evaluate the efficiency and effectiveness of services that are being delivered from outside to inside. This trend is leading to an increased keenness to outsourcing process that are considered non-core yet critical activities.

Russel, (2003) outlined that it is now clear for many outsourcing companies that what began 25 years ago as a cost cutting measure has evolved into an important way of achieving efficiency with the organizations. Over the years, there has been a change in the type of work that is being outsourced by firms. There has been a shift from single clerical type of work to more skilled, professional type of services. Several firms have developed different methods of achieving efficiency and productivity. Though what stands more are the generally accepted world class process improvement systems that are widely acceptable. Most of these process improvement systems employed by organizations are aimed at improving efficiency and productivity. This is because these systems eliminate defects: resolve respective quality and productivity issues. The first efforts of improving quality are usually on improving their process and hence productivity (Brecker Associates, 2007)

In Kenya Microsoft reported company growth due to the outsourcing of noncore services. This was through working with local service providers who gave it better control of its processes by working closely with companies within reach. This created local partnership and built efficiency. Despite the growing significance of outsourcing, there is a limited understanding of performance outcome of the firms that engage in outsourcing. Literature is abounding with contradictory information on the effect of outsourcing on the efficiency and productivity of the process. These differences are varied as the many types of operations (The Standard, May 16, 2007)

#### **Costs/value addition:-**

Russell (2007) pointed out that even when a business attempts to improve customer services or increase quality; it does so within the framework of cost reduction. In most professional Organizations typically have 10% or more profit opportunity hidden in their business that can be achieved through reduction of costs. These hidden profits can be trapped through outsourcing as a strategic tool in most organizations.

Ellram (1997) asserts that outsourcing not only impart an organization with the best practices, but also brings about greater level of integration among processes and technology. Good outsourcing drive high level of efficiency, hence improved profits.

When choosing suppliers or vendors, sourcing managers must compare options based on the supplier's impact on the total cost of ownership (TCO). Several other factors besides purchase price are included in TCO analysis. They may include: replenishment lead time, on-time performance, supply flexibility, delivery frequency, supply quality, inbound transportation cost, pricing terms, information coordination capability, design collaboration capability, exchange rates, taxes and supplier viability. There is a three step process to evaluate supplier using the total cost of ownership concept: Identify all activities to be captured in TCO, qualify cost drivers using activity-based costing and calculating the TCO of each supplier (Chopra and Meindl, 2007).

In many firms the understanding of concept of outsourcing stops at the process of cost cutting. Indeed, shareholders are still putting pressure on managers to cut costs. This pressure to cut costs and reorganize has been felt most strongly in vertically integrated companies. While the internal importance of these efforts has been evident, cost reduction is gaining increasingly more attention from companies as well. In addition, consultants and companies frequently use cost saving figures when discussing the success of the latest business initiative, including strategic sourcing. Outsourcing is not only based on cost advantage but also viewed as an integral part of creation of sustainable competitive advantage in today's business should possess a competitive advantage in order to compete effectively in the market place (Corbett, 2004).

#### **Quality improvement:-**

Elmuti (2003) reported that quality improvement was one of the top reasons why organizations undertake outsourcing projects. This supports previous findings (Quinn, 2000) that outsourcing was undertaken for purposes that have impact on the organization's bottom line, quality and other reasons. Corbett (2004) adds that poor quality of products and services are accepted by consumers because accountability systems regarding consumer or user feedback are limited. In order to maintain or increase quality many outsourcing firms employ quality management models such as Six Sigma, TQM and lean thinking. He adds that outsourcing increases productivity, quality services as well as substantially lowering the firm's and consumer costs. The ability to influence the quality of outsourced production or services depend on the consumers and producers.

The ability to influence the quality of the outsourced production/services depends on the relationship between the client and service provider. If not handled well the product quality suffers. In order to maintain high quality, it is important to employ quality management system. Outsourcing has contributed greatly to the enhancement of quality in organizations because this concept involves the process of concentration on core competencies, hence quality output (Robinovich *et al*, 1999)

Outsourcing leads to improved customer service in terms of efficient attendance of customer issues and faster document delivery to customers (Brown, 2007). Limited information is available on the effect of outsourcing on quality improvement on products and services in Kenya. Hence the need for this study.

#### **Critical review:-**

Although outsourcing is a bound with benefits to the organization there are several other disadvantages or constraints that companies must be aware of because they might affect their performance (Kendrick 2007) companies should therefore strive to minimize the potential effect these risks could bring into their business. It should also be noted that there may be other factors that determine the extent of success of outsourcing that may out of the control of the organization.

#### **Conclusion:-**

From the review, it is evident that outsourcing affects productivity, costs and quality and thus the performance of an organization. This has been reflected by the high response which favours the variables with regard to outsourcing and subsequently the organizations performance. It is noted that the following services are outsourced: cleaning services, software development, renovations, security and catering services. Outsourcing was also noted to lead to cost saving, receipt of quality goods and services, efficiency in the organization and competitive prices for the goods and services outsourced the said in the productivity of the K.I.A for example. Outsourcing was also noted to affect costs since it leads to reduced costs of spending, outsourced services were cheap to maintain and that the outsourced services are timely thus reducing the costs of spending. Outsourcing also affected quality of goods and services procured as it enabled procurement of up to standard and this in turn affected the performance of the organization.

#### **Recommendations:-**

Based on the review findings, the following recommendations apply:

#### **Improving on Outsourcing:-**

Based on this study it would be concluded that evaluation of the tenderers, monitoring of performance, transparency in bidding process, supervision of staff, the tendering process done by independent company and the auditing of the local purchase orders and vouchers for contracts had positive impact. This would improve the outsourcing process and therefore the performance of the organization.

**Improving on Productivity:-**

The analysis did suggest that competitive bidding, use of tenders to select suppliers, personnel involvement in the outsourcing process, price analyses and creation of awareness among staff should be enhanced and taken seriously so that the staff should be able to look at outsourcing as a cost cutting activity of the Institute and not as a way of taking over their jobs.

**Improving on costs:-**

The bulk buying, procurement of approved goods and services, hiring qualified personnel and evaluation of process to identify the best line of fit

**Improving on Quality:-**

The respondents suggested that there should be a clear policy that supports the current procurement Act within the Institute and the policy should be tied together with the Institute's outsourcing activities, before outsourcing, or putting open advertisement when requesting interested parties to bid for outsourcing services contracts, for the suppliers to buy and compete, giving specifications of outsourced services and goods, identification of the best brand in the market, and checks to ensure goods and services procured are of high quality.

**Suggestion for further research:-**

The study only focused on Kenya Institute of Administration. Further research should be done in the public sector and other organizations on the effect of outsourcing on the organizational performances. This will give a broader scope of the effects of outsourcing on organizational performances in the public sector

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### RESEARCH ARTICLE

#### ANALGESICS OVERUSE AMONG STUDENTS OF DAMMAM AND KING FAISAL UNIVERSITIES IN SAUDI ARABIA.

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#### Abstract

**Background:** Migraine prevalence in KSA range from 2.5 to 5% according to a study conducted in 2010. Chronically affected migraine patients are more likely, than other headache patients, to overuse analgesics. Overuse of analgesics among patients with episodic migraine put them at great risk of getting chronic migraine. The Aim of this study is to determine whether students with migraine in Dammam and King Faisal universities overuse analgesics or not.

**Subjects and methods:** A cross sectional study was conducted in July 2016 among students with migraine in Dammam and King Faisal universities. Participants (n =195) completed a questionnaire to assess current migraine medication and how many days the medications are used per month.

**Results:** 143 (72.8%) students are using drugs to relieve headache once it has started. 12 (6.2%) students out of the total responders reported analgesia overuse. Panadol was the most commonly used medication by over users. 10 (83.3%) out of the 12 consumed it (P= .071). Panadol was followed by Ibuprofen that was taken by 5 (41.7%) overusers, followed by Aspirin which was taken by 2 (16.7%) of the overusers.

**Conclusion:** This study showed that small percentage of the participants were overusers. Even though most of the participants were from medical and medical related colleges, most of the overusers were from non-medical colleges. In general, Panadol was the most consumed drug by participants followed by Ibuprofen.

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#### Introduction:-

Migraine is the third prevalent disorder worldwide affecting 11% of the population. Globally, it is the seventh leading cause of disability. Migraine prevalence in KSA range from 2.5 to 5% according to a study conducted in 2010. In general, another study conducted in Al-Khobar in February 2010 showed that headache syndromes were the most common neurological complaints in adult. In addition, it is found that mean headache-attributed lost work-days per person/year for migraine was 24.0 days in KSA. <sup>[1-3]</sup>

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Unfortunately, chronically affected migraine patients are more likely, than other headache patients, to overuse analgesics.<sup>[4]</sup> Each year, 2.5% of patients with episodic migraine (EM) develop new-onset chronic migraine.<sup>[5]</sup>

Overuse of analgesics among patients with episodic migraine put them at great risk of getting transformed migraine, progression from episodic migraine (<15 days/month) to chronic migraine. Analgesics overuse can cause medication overuse headache.<sup>[6]</sup> Medication overuse headache is a condition that can complicate any type of headache including migraine due to overuse of all kind of acute headache medications.<sup>[7]</sup> The Aim of this study is to determine whether students with migraine in Dammam and King Faisal universities overuse analgesics or not.

## **Subjects and Methods:-**

### **Study Design:-**

A cross sectional study was prepared to assess analgesics overuse among participants.

### **Study Area and population:-**

This study was conducted in July 2016 among students with and without migraine in Dammam and King Faisal universities.

### **Sampling procedure:-**

Sequential sampling was done. Sample collected through total coverage of the study population between 24<sup>th</sup> of July and 2<sup>nd</sup> of August 2016.

### **Questionnaire sheet:-**

A well-structured questionnaire was designed in English and Arabic languages, including biographical data; age, name of the university and college, year of study and gender. In addition, it includes questions about the characteristic symptoms of migraine and how many of them the participant is experiencing, was the participants with headache diagnosed by a physician and which type of headache was his/her diagnosis. In addition, the questionnaire contains questions about type of drugs used by participants to relieve headache and how many days the chosen drug/drugs is/are used per month. This questionnaire was distributed online using social media with a written briefing for the aim of the study.

### **Statistical Analysis:-**

The statistics were performed by using software program SPSS version 21. Data were presented as frequencies and percentages. Also, the chi-square test and t test were used for the comparison and to assess the possible associations between different variables.

## **Results:-**

During the study period, 218 university students participated in the questioner. Among the 218 responses that were collected, 23 were excluded because of incomplete informations. Finally, a total of 195 university students were enrolled in the study.

57 (29.2%) students are male and 138 (70.8%) are female with mean age  $22.18 \pm 1.95$  years. 95 (48.7%) students from King Faisal University and 100 (51.3%) from University of Dammam, 120 (61.6%) are studying in college of medicine and medical related colleges (including Dentistry, Applied Medical Sciences and pharmacy colleges) while 75 (38.4%) are studying in non-medical related colleges. 9 (4.6%) are studying in 1<sup>st</sup> year, 17 (8.7%) in 2<sup>nd</sup> year, 42 (21.5%) in 3<sup>rd</sup> year, 38 (19.5%) in 4<sup>th</sup> year, 36 (18.5%) in 5<sup>th</sup> year, 19 (9.7%) in 6<sup>th</sup> year and 34 (17.4%) in 7<sup>th</sup> year (medical interns).

Out of the 195 students, 158 (81%) stated that they have 2 or more headaches in last 3 months. From these 158 students, 129 (81.6%) have headache that limits their ability to work, study or enjoying life, 97 (61.4%) students want to talk to a healthcare professional about headache they have, 66 (41.8%) already consulted their healthcare professional about their headaches, and their physician told them what kind of headache they suffer from. Table 1 summarizes the frequency of diagnoses that students gave. The most common diagnosis was migraine where 38 students (9 males and 29 females) report it followed by headache due to stress in which 11 students (2 males and 9 females) and tension headache in which 7 students (3 males and 4 females) report them. 104 students (65.8%) out of the 158 felt nauseated or sick to stomach with headache, 111 (70.3%) experienced photophobia with headache, and

122 (77.2%) had headaches that limited their ability to work, study or do what they need to do for at least one day in the last 3 months.

Out from 195 students whom participated in the study, 143 (72.8%) students are using drugs to relieve headache once it has started. The most commonly used medications by students was Panadol (Paracetamol), which was consumed by 114 (79.7%) students followed by Ibuprofen which was used by 54 (37.8%) students. Table 2 summarizes the medications used by the students.

Students also asked regarding number of days per month they take medications to relieve headache. Results are shown in table 3. 12 (6.2%) students out of the total responders reported analgesia overuse according to the revised criteria of the International Classification of Headache Disorders 2<sup>nd</sup> Edition (ICHD-IIR) for medication-overuse headache. A medication over user was defined as a person overusing acute headache medication in terms of treatment days / month ( $\geq 10$  days/ month for ergotamine, triptans, and combination analgesics;  $\geq 15$  days/month for paracetamol, ASA, and NSAIDs) during the previous 3 months.<sup>[8]</sup> The mean age of the over users was  $22.833 \pm 1.337$  years ( $P = .231$ ). 8 of the over users (66.7%) are female while 4 are male (33.3%) ( $P = .747$ ). 9 (75%) are from non-medical colleges while 3 (25%) from medical and medical related colleges ( $P = .007$ ). Regarding the kind of headache in the over users, 3 (25%) of the over users have headache due to stress, 2 (16.67%) of them due to migraine, another 2 (16.67%) due to tension headache, 1 (8.33%) due to neck problem and 4 (33.33%) did not consult a healthcare professional about their headaches ( $P = .141$ ).

Panadol was the most commonly used medication by over users. 10 (83.3%) out of the 12 consumed it ( $P = .071$ ). Panadol was followed by Ibuprofen that was taken by 5 (41.7%) over users, followed by Aspirin which was taken by 2 (16.7%) of the over users.

**Table 1:-**Number of diagnosed students and their headache diagnoses

Diagnosis	Number of students	Percent
Migraine	38	57.6
tension headache	7	10.6
Cluster	3	4.5
Stress	11	16.7
neck problem	2	3.0
I don't remember	3	4.5
Other (e.g. sinusitis)	2	3.0
Total	66	100.0

**Table 2:-**Summary of medications used by students

Name of medication	Number of students using it	Percent
Aspirine, Aspro, Aspégic	13	9.1%
Dafalgan	3	2.1%
Panadol	114	79.7%
Panadol + Codéine	17	11.9%
Ibuprofen, Brufen, Nurofen	54	37.8%
Primpéran	1	0.7%
Motilium	1	0.7%
Imitrex	2	1.4%
MaxaltRelert	1	0.7%
Naramig	2	1.4%
Family recipe	8	5.6%
Varapamil	1	0.7%
Corticosteroids	1	0.7%
Ergotamine	1	0.7%
Propranolol	1	0.7%
Eletriptan	1	0.7%

**Table 3:-**Number of days per month in which medications are used by students to relieve headache

Number of days	Number of students	Percent
Less than one day per month	81	41.5
1-3 days per month	56	28.7
4-9 days per month	37	19.0
10-14 days per month	11	5.6
15 days or more per month	10	5.1
Total	195	100.0

**Discussion:-**

This is the first study to evaluate Overuse of analgesics among students with migraine in King Faisal and Dammam Universities. The present study demonstrate high consumption of paracetamol by participants. It is consumed by 114 (79.7%) students followed by Ibuprofen which is consumed by 54 (37.8%) students. These results are in agreement with another study conducted in Belgium between December 2009 and May 2010, shows that paracetamol is the most purchasing OTC analgesic by pharmacy customers. Low percentage were consider overusers<sup>12</sup> (6.2%) out of the total responders. In contrast to the previous study, there were high prevalence of medication overuse (24%) among pharmacy customers.<sup>[9]</sup> In addition, another study conducted in china shows that overuse of Acetaminophen-containing agents are common in Chinese patients with chronic Migraine. Those patients are found to have a longer duration of headache, more severe pain intensity and a higher frequency of elevated BP.<sup>[10]</sup>

**Conclusion:-**

This study showed that small percentage of the participants were overusers. Even though most of the participants were from medical and medical related colleges, most of the overusers were from non-medical colleges. In general, Panadol was the most consumed drug by participants followed by Ibuprofen.

**Study limitation:-**

The participants were not interviewed by neurologist to confirm the diagnosis.

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### RESEARCH ARTICLE

#### A COMPARATIVE STUDY ON KNOWLEDGE REGARDING NEWBORN CARE BETWEEN PRIMIPARA AND MULTIPARA

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Primipara, Multipara, New born care,  
 Karl Pearson correlation coefficient .

#### Abstract

The care a newborn receives depends a lot on the knowledge, skills and attitude of the mother. This study aimed to assess the level of knowledge on new born care between primipara and multipara in selected hospitals of Tricity. A quantitative approach with descriptive, comparative research design was adopted. By purposive sampling technique 160 postnatal mothers were selected. Structured Interview Schedule was used to collect the data from postnatal mothers in civil hospital in the month of December. Study finding shows majority of the primipara mothers (96.2%) had average knowledge, 73.8% of multipara had good knowledge on newborn care.

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#### Introduction:-

The birth of a baby is one of life's most wondrous moments. The first week of life is the most crucial period in the life of an infant. In India 50-60% of all infant deaths occur within the first month of life. Of these, more than half may die during the first week of birth. This is because the newborn has to adapt itself rapidly and successfully to an alien external environment. The risk of death is greatest during the first 24-48 hrs (PARK K 2005). The ideal basic needs for any newborn include breathing, warmth, cleanliness and mother's milk. Colostrum, the yellowish, sticky breast milk produced at the end of pregnancy, is recommended by WHO as the perfect food for the newborn and feeding should be initiated within one hour of birth (WHO) (UNICEF). Recent researches are concerned with topics of newborn care giving, maternal knowledge and practices because it facilitates growth and development, protection against infection and detection of any abnormalities. The study revealed that mothers' knowledge and practices were within good and satisfactory average scores in most of the studied items related to newborn care giving at home except breast feeding. Significant differences were found between primipara and multipara mothers for most of the studied topics related to different topics of newborn care giving (McMillan J S). The mother is the key person in maintaining the health status of her child.

#### Materials and Methods:-

A quantitative approach with descriptive, comparative research design was adopted. The study was conducted in Civil hospital, phase 6 and Liberty hospital, 3b2 Mohali. Sample of the study includes 80 primipara and 80 multipara within 7 days of their delivery who fulfill the inclusion criteria. By using non – probability, purposive sampling technique 160 antenatal mothers were got selected for the present study. Interview schedule with Structured Knowledge Questionnaire on Newborn care was used to collect the data.

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**Results and Discussion:-****Table-1:-** Comparison on Level of Knowledge regarding Newborn Care Between Primipara And Multipara

N = 160

S.NO	Group	Level of knowledge on new born care (Score)			$\chi^2$ , p-value
		Poor (0-5)	Average (6-15)	Good (16-20)	
1	Primipara	2.5%	96.2%	1.2%	90.067, 0.000***
2	Multipara	0%	26.2%	73.8%	

\*\*\* Significant

**Table-2:-** Comparison on Level of Knowledge regarding Aspects of New Born Care Between Primipara & Multipara

N = 160

Sl.No	Aspects of Newborn care	Primipara (N = 80)		Multipara (N = 80)		t, p-value
		Mean	SD	Mean	SD	
1	Breast feeding	4.6	1.5	6.9	1.3	-10.680, 0.000***
2	Eye care	2.0	1.1	3.2	0.9	-7.707, 0.000***
3	Thermoregulation	1.3	0.8	2.3	0.8	-8.494, 0.000***
4	Immunization	2.6	1.2	4.1	0.9	-9.336, 0.000***
5	Knowledge score	10.4	2.5	16.6	2.3	-16.645, 0.000***

\*\*\* Significant

**Table-3:** Association between Knowledge on New Born Care and selected Socio - Demographic Variables among Postnatal Mothers

N = 160

Sl.No	Socio – Demographic variables	Level of knowledge (f)			$\chi^2$ , df /p value
		Poor	Average	Good	
1.	<b>Age(in years)</b>				5.512,4/ 0.238 <sup>NS</sup>
	22-24	0	36	15	
	25-27	1	36	32	
	28-30	1	26	13	
2.	<b>Educational status</b>				11.295,8/ 0.185 <sup>NS</sup>
	Non-formal education	1	16	5	
	Primary	0	23	21	
	Matric	1	43	30	
	Higher secondary	0	14	2	
3.	<b>Occupation</b>				8.12, 4/ 0.0872 <sup>NS</sup>
	Home maker	2	64	51	
	Govt. employee	-	3	1	
	Private employee	-	31	8	
4.	<b>Monthly family income (in Rs.)</b>				8.495, 8/ 0.386 <sup>NS</sup>
	<5000	2	26	11	
	5001-10000	0	24	20	
	10001-15000	0	33	21	
	15001-20000	0	11	6	
5.	<b>Religion</b>				29.11, 4 / 0.00000743***
	Hindu	1	32	29	
	Muslim	0	3	15	
	Sikh	1	63	16	
6.	<b>Type of family</b>				0.02,2/
	Joint	1	45	28	

	<b>Nuclear</b>	<b>1</b>	<b>53</b>	<b>32</b>	0.9900 <sup>NS</sup>
7.	<b>Area Of residence</b>				76.354,4/ 0.000**
	Rural	1	29	27	
	Semi-urban	13	11	0	
	<b>Urban</b>	<b>1</b>	<b>56</b>	<b>22</b>	
8	<b>Mode of delivery</b>				19.887,4 / 0.00052571**
	Caesarean	0	17	1	
	Vaginal delivery without episiotomy	<b>18</b>	<b>50</b>	<b>3</b>	
	Vaginal delivery with episiotomy	2	63	6	
9	<b>Source of information on newborn care</b>				99.046,4/ 0.000**
	<b>Family members/relatives</b>	2	58	23	
	Friends/Peer group	31	0	23	
	Mass media	9	0	14	

\*\* Significant

Present study shows that majority of the primipara mothers (96.2%) had average knowledge, 2.5 % had poor knowledge & only 1.2% had good knowledge, whereas most of multipara (73.8%) had good & 26.2% had average and none them had poor knowledge on newborn care. Calculated chi-square test ( $\chi^2 = 90.067, 0.000, p < 0.05$ ) shows that multipara have more knowledge on newborn care than the primipara mothers. The supportive study on breast feeding shows that the average knowledge scores was 70.90%.

Present study also shows that the multipara have higher knowledge on breast feeding (  $t = -10.680, 0.000; p < 0.05$  ), eye care (  $t = -7.707, 0.000; p < 0.05$  ), thermoregulation (  $t = -8.494, 0.000; p < 0.05$  ), immunization (  $t = -9.336, 0.000; p < 0.05$  ) than the primipara. One more supportive study to assess the level of knowledge of postnatal mother on new born care where as Primipara mothers had comparatively more knowledge on newborn health (mean % score: 72.13) than multipara mothers (mean % score: 7.38).

Present study findings shows that there is an association between the level of knowledge and religion, mode of delivery and source of information. The supported study shows that there was statistically significantly association between knowledge of newborn care with socio demographic variable (3.92) and there was no association found between knowledge score when compared to age, occupation, type of family and religion.

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**RESEARCH ARTICLE**

**CIVIL RIGHTS OF CUSTOMARY LAW PEOPLE IN THE COASTAL AREA, A REVIEW OF  
 CONSTITUTIONAL RIGHTS**

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**Abstract**

A claim of State to the sea territorial ownership as a right to control the State, its purpose for the greatest prosperity of the people, but can interact directly with civil rights to customary law people in the coastal areas. The potential for conflict is caused due to the conflict over the ownership of the natural resources management and its utilization in the coastal areas between customary law people and state. On one hand, the 1945 Constitution provides assurance, recognition and respect for the unity of customary law peoples and their traditional rights as constitutional rights. But on the other hand, the state must intervene in the natural resources management in the coastal areas, because sea has a public function, and allow anyone to exploit the sea for various purposes. This means that the need for legal recognition explicitly against the civil rights of customary law people in the coastal areas in natural resources management and its utilization. Thus, the authority of state to defend the people's interests, in line with the interests of customary law people rights to defend their civil for the survival of their lives in the future.

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**Introduction:-**

Coastal and marine areas have a strategic meaning and important for the future of Indonesia as the largest archipelago state in the world. Indonesia as the largest archipelago state in the world, which has a long coastline of 81.000 km and about 22% of the total population of Indonesia inhabit coastal areas.<sup>1</sup> This includes the majority of customary law people living in the coastal areas, and the coastal areas that provided life from generation to generation for concerned customary law people alliance.

Accordingly, Indonesia is an example of a "large coastal nation" in the same category as Australia, the United States and Canada.<sup>2</sup> We have large-scale geographic issues such as a broad range of climates, ecosystems, community structures and diverse sociocultural groups. Distance and remoteness are significant factors for communication and

<sup>1</sup> Processed of Statistical Data Center and Information (KKP), the Ministry of Marine and Fisheries, Indonesia 2013. Available online at: <http://statistik.kkp.go.id/>

<sup>2</sup> Rokhmin Dahuri, "The Challenges of Public Policy for Sustainable Oceans and Coastal Development: New Directions in Indonesia", in Ministerial Perspective on Ocean and Coasts at Rio+10, The Global Conference on Oceans and Coasts. December 3-7, Unesco, Paris, 2001,

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governance. Indonesia can also be seen, paradoxically, as a “small island nation” in the same category as the Philippines and Micronesia with small-scale issues.

The existence of customary law people has been recognized by the state that “the State recognizes and respects the unitary of customary law people and their traditional rights as long as they live and in accordance with the development of society and the principles of the Unitary Republic of Indonesia”.<sup>3</sup> This statement is the foundation for customary law people to claim their constitutional rights, so how should the state act to treat customary law people to gain recognition and respect for their traditional rights. In other words, the meaning contained in Article 18B paragraph 2 of the 1945 Constitution is a constitutional mandate that needs to be adhered by the government, to regulate the recognition and respect for customary peoples in legislation.

Besides customary law people have the right, in fact also have obligations to land and natural resources around them. Between the rights and obligations there must be a strong balance so as to form the management of the environment and natural resources that integrates the social, political, natural, cultural, and religious from the life of customary law people.<sup>4</sup> Soegiarto argues that, “beside the coastal areas as the center of activity is also can become the center of conflict or clash between the interests of one sector to others.”<sup>5</sup>

The tenure area (land and marine) including the natural resources therein should be managed in a sustainable manner. To be managed in a sustainable manner, then right to the tenure area need to be on the indigenous peoples based on customary law prevailing in the area. This is important because in their mind the indigenous peoples are bound in communal and religious-magical (*cosmic*). Such mind views everything in this life as a homogeneous unity, in which human life affect each other and are interdependent on each other. All are in a balance should always be maintained.<sup>6</sup>

The phenomenon that occurs associated with the ownership and natural resources management in the coastal areas still leaves internal conflicts between the state authorities and indigenous peoples. On the one hand, the state claimed that the management of coastal areas as domain of state, while on the other hand, the rights of customary law people to the tenure rights of coastal areas is a part that cannot be removed apart from the customary law life, and it is constitutionally recognized by the state.<sup>7</sup> The reality of civil rights in coastal areas has actually become the property of the customary law people, but its allocation is often claimed to be the property of the state. As described above, the issue of this research was to analyze the civil rights of the customary law people in the coastal areas in Indonesia.

### **Method of the Research:-**

The type of study was a normative research, with the object of study on the provisions of applicable law, both nationally and internationally, in order to answer the issues faced. The approaches used in this research were statute and conceptual.

### **Civil Rights in Normative Perspective: -**

Legal protection against the customary law people is closely associated with the right. According to George W. Paton,<sup>8</sup> that there are 4 (four) elements in any legal rights, which are: “(1) the holder of the right; (2) the act or forbearance to which the right relates; (3) the rest concerned (the object of the right); (4) the person bound by the duty.”

<sup>3</sup>Article 18B paragraph (2) of the 1945 Constitution of the Unitary State of the Republic of Indonesia.

<sup>4</sup>Ronald Titahelu, Paper on Indonesian Legal Center for Community Based Property Rights and Marine and Coastal Resources Management.

<sup>5</sup>Apriliani Soegiarto. (1988). *Pemanfaatan Sumber Alam Laut Menjelang Tahun 2000 di dalam Strategi Kelautan*, in John Pieris (ed). Pustaka Sinar Harapan, Jakarta, p. 42.

<sup>6</sup>Soepomo. (1996). *Bab-Bab Tentang Hukum Adat*. Jakarta: Balai Pustaka, p. 77

<sup>7</sup>Charles, A.T. (2001). *Sustainable Fishery Systems*. London, UK: Blackwell Sciences, p. 92

<sup>8</sup>George Whitecross Paton, *A Textbook of Jurisprudence*, 3rd ed., University Press, Oxford, 1964, p. 249

Rights are all things that must be obtained by any person who has been there since birth and even before birth. In the Indonesia's Dictionary a right has a sense of the right thing, property, ownerships, authority, power to do something (as determined by the Acts, rules, etc.), power is right on something or to demand something, degree or dignity.<sup>9</sup>

When talking about civil rights, then it is very closely related to the rule of law governing those rights. An understanding of civil rights is actually composed of two types of civil rights: *First*, the right is absolute, includes: a) The right of personality, for example: the rights to name, to honor, to life, liberty and so forth; b) The rights located in family law, that is rights and duties of husband and wife, the relation of parent and child; c) absolute right to the object, is called as the right of material. *Second*, the right is relative, that is, all rights arising from the engagement relationships that sourced in the agreement and law. This right is called as the rights of individuals.<sup>10</sup>

Absolute right of land ownership as an immobile object can be owned by humans, and are included in the category of material rights. "Article 499 of Civil Code/BW can also know the sense of objects as all things that can be owned or which may become the object of property rights".<sup>11</sup> The provision gives a description that everything that can be owned by human is object, so that cannot be had for example the sea, moon, stars and so on, not an object."<sup>12</sup>

Land tenure rights as in Act No. 5 of 1960 on the Basic Regulation of Agrarian (BAL) contains several levels of land tenure, namely: 1) Right of Indonesia nation; 2) Right to control of the State; 3) Tenure rights of customary law people; 4) Individual rights. Explained that the right to control the state set out in Article 2 of the BAL, the authority contained in the right to control of the state is a public authority, so that this right is not similar as the concept of the domains imposed by the Dutch colonial government.<sup>13</sup>

Customary rights as a part of civil rights owned by the customary law people, as stipulated in Article 3 of the BAL, according to BoediHarsono that customary rights is "a series of authorities and duties of a customary law people relating to the land located within the territory. The subject of the customary rights are customary law people, both territorial (living in the same area) and genealogic (bound by ties of blood). Thus, the customary rights land that has been occupied by the customary law people since long time ago it is part of state-owned land. Thus, the argument of BoediHarsono provide an understanding that the customary rights of indigenous peoples are not categorized as belonging to the customary law people.

Civil law especially Indonesian agrarian law illustrates that in fact "there is no inch of land at the Indonesian state is what is called *res nullius* or no mans' land."<sup>14</sup> While in a customary law perspective looked for the principle of *res nullius* as communal land ownership and it is not transferable to the individual. Humans as right users in its relation to the rights of state, then Civil Code, Article 1, explains, "Enjoyed civil rights cannot depend on state rights".<sup>15</sup>

The customary rights of sea or marine tenure in Maluku are related to the concept of ownership. An understanding of the marine tenure when linked to the marine tenure in Maluku province, the concept of ownership is reflected in the "marine tenure region" which in the aspect of boundaries shows the boundaries of tenure region is unclear. In other words, the rights of marine tenure as a concept of ownership by the customary law people are clearly exist and be recognized. However, differences in the perception of boundaries of marine tenure area are based on a different understanding between the peoples of each region (*customary villages*) is a matter that cannot be denied.<sup>16</sup>

<sup>9</sup>Source: <https://id.wikipedia.org/wiki/hak>, downloaded on 14 April 2016.

<sup>10</sup>Djaja S. Meliala. (2007). *Perkembangan Hukum Perdata Tentang Orang Dan Hukum Keluarga*, Bandung: CV. Nuansa Aulia, p. 38.

<sup>11</sup>F.X. Suhardana et al. (2001). *Hukum Perdata I: Bukum Panduan Mahasiswa*. Jakarta: Prenhallindo, p. 148

<sup>12</sup>*Ibid.*

<sup>13</sup>Boedi Harsono. (2005). *Hukum Agraria Indonesia: Sejarah Pembentukan Undang Undang Pokok Agraria, Isi dan Pelaksanaannya*. Jakarta: Djambatan, p. 268.

<sup>14</sup>BoediHarsono. (1997). *Hukum Agraria Indonesia (Sejarah Pembentukan Undang-Undang Pokok Agraria, Isi dan Pelaksanaannya)*, 7th edition. Jakarta: Djambatan, p. 217.

<sup>15</sup>Djaja S. Meliala. *Op.Cit.* p. 37

<sup>16</sup>S.E.M. Nrahua, 29 March 2016, A Paper presented on FGD Recognition, Protection and Legal Certainty for Customary Law, In Cooperation with Postgraduate Program University of Pattimura with Social Science Commission of Akademi Pengetahuan Indonesia (APII), Ambon, Page. 2

Although according to the law, every human being is a bearer of rights without exception, but there are restrictions. Elements that limit for the right is: a) Citizenship;<sup>17</sup> b) Residential;<sup>18</sup> c) Position;<sup>19</sup> d) Behavior and deed;<sup>20</sup> e) Gender; f) the condition of absenteeism (Article 463 of the Civil Code).<sup>21</sup>

#### **Customary Law People as Constitutional Guarantees: -**

The term of “indigenous peoples” is a common term used in Indonesia, whereas in the science of law and theory are formally known as “customary law people.”<sup>22</sup>The sense of indigenous people and customary law people in this paper is same its meaning. The State recognizes and respects the unity of indigenous peoples and their traditional rights as long as they live, and in accordance with the development of society and the principles of the Unitary State of the Republic of Indonesia, which is regulated by law.<sup>23</sup>So, through the constitution, the State recognizes and respects the unity of indigenous peoples and the rights attached to it as the living law.

Recognition of the unity of indigenous peoples should be respected and upheld by the state, due to the fact that the lives of indigenous peoples in Indonesia have existed long before the state there.<sup>24</sup> The state should provide protection of the rights inherent in customary law peoples, such as marine tenure rights in the coastal areas. Hence, in the 1945 Constitution, states that “The cultural identity and traditional community right must be respected in accordance with the period and civilizations.”<sup>25</sup> Therefore, according to Asshiddiqie on the categories of indigenous people can be said to be still living in reality, as follows:

1. The communities are still indigenous, the tradition is still practiced, and available records on that tradition;
2. The communities are still indigenous and also their traditions exist, but the records are not available;
3. The communities are not indigenous anymore, but their tradition is still practiced and also provided adequate records;
4. The communities are not indigenous anymore, and also not available records about it, but their tradition is still alive in practice.<sup>26</sup>

Definition of customary law people according to Act No. 1 of 2014 on the amendment of Act No. 27 of 2007 on the Management of Coastal Areas and Small Islands were “the coastal communities group for generations living in a particular geographical area because of their ties the ancestral origin, the existence of a strong relationship with the coastal resources and small islands, as well as their value system which determines the economic system, political, social, and legal.”<sup>27</sup> While, the meaning of coastal area as transition regions between terrestrial and marine ecosystems are affected by land and marine changes.

The scope of regulation of coastal areas and small islands includes the transition between the terrestrial and marine ecosystems are affected by changes in land and marine, towards the land covering the sub-district administration area and towards the marine covering as far 12 (twelve) miles measured from the coastline. Samik Wahab argued

<sup>17</sup> Only Indonesian Citizen who has the property right (See: Article 21 (1) UUPA).

<sup>18</sup> Only who living in the same sub-district with the position of agricultural land as the owner (See: Article 10 (2) UUPA).

<sup>19</sup> For a judge and other law officials are not obtaining the goods that still in a case.

<sup>20</sup> See, Article 49 and 53 of Act No. 1 of 1974, in which regulate the provisions that the power of parent and guardian may be evoked with the court’s decision and in this case is very neglected duties as parent/guardian behave badly.

<sup>21</sup> F.X. Suhardana et al. (2001). *Hukum Pedata I: Bukum Panduan Mahasiswa*, Prenhallindo, Jakarta, Pages. 46-47.

<sup>22</sup> Source: [https://id.wikipedia.org/wiki/Masyarakat\\_adat](https://id.wikipedia.org/wiki/Masyarakat_adat)., accessed on 16 April 2016.

<sup>23</sup> Article 18B paragraph (2) of the 1945 Constitution.

<sup>24</sup> Ibrahim, J., & Haykal, H. (2016). Religious Communal of Indigenous Peoples in Improving Economy Through Local Wisdom (A Juridical Study on Rural Credit Institution in Bali). *Hasanuddin Law Review*, 1(1), 89-98. doi: <http://dx.doi.org/10.20956/halrev.v1i1.216>

<sup>25</sup> Article 28I paragraph (3) of the 1945 Constitution.

<sup>26</sup> Jimly Asshiddiqie. (2007). *Hak Konstitusional Masyarakat Hukum Adat*, A Paper Presented on National Workshop, Jakarta 10 December 2007. p. 10.

<sup>27</sup> See Article 1 paragraph (33) Act No. 1 of 2014 on the Amendment of Act No. 27 of 2007 on the Management of Coastal Area and Small Islands.

that, “the coastal area that will cover all areas inland were still influenced by processes related to the marine and toward the marine are still influenced by processes that occur on the inland.”<sup>28</sup>

In general, civil rights for the customary law people may be right is absolute, in which the right to respect for recognized the existence of the customary law people, the right to live and to have a decent living in their area, and also the absolute right of an object/material already has for generations, such as customary rights consist of land, water and natural resources. Furthermore, Bushar Mohammed,<sup>29</sup> said the object of customary rights includes: land; water (such as: river, lakes, beaches and its waters); the plants that live in the wild (fruit trees, trees for timber or firewood, and so on); and free-living wild animals in the forest.

Depart from the construction, this means that among the civil rights of customary law people that inhabit coastal areas may be customary rights on the mainland and in coastal marine waters. If it can be described civil rights to those that can be managed by customary law people, civil rights in the sea waters may be; fish, sea cucumber, shellfish, seaweed, reef, beach sand, gravel, and mangroves. While, the civil rights of customary law people in the mainland may be; land/forest, fruit trees, trees for timber or firewood, and wild animals. Utilization of civil rights in the form of natural resources, conducted to maintain the viability of customary law people that inhabit coastal areas.

In fact, at historical level, the rights of customary law people in coastal areas are already there all along, but needs to be reinforced by the rule of law, so that there is legal certainty which protects the interests of customary law people in the coastal areas. And needed the customary law people be given the rights and duties under the law, which must be met related to the use and management of coastal areas, in which the rights of customary law people were:

- (a) Get access to coastal waters parts that have been given a permit of location and use it;
- (b) Propose a traditional fishing area in the Zoning Plan for Coastal Areas and Small Islands (RZWP-3-K);
- (c) Propose the territories of customary law people in RZWP-3-K;
- (d) Perform the management of coastal resources and small islands is based on customary law and not contrary to the provisions of the legislation;
- (e) Get the benefits of the implementation of the management of coastal areas and small islands;
- (f) Get information regarding the management of coastal areas and small islands;
- (g) Propose reports and complaints to the competent authorities for losses to them with regard to the implementation of the management of coastal areas and small islands;
- (h) Declare an objection to a management plan that has been declared within a certain period;
- (i) Report to law enforcement officers for alleged pollution, contamination, and/or destruction of coastal areas and small islands is detrimental to life;
- (j) Propose a complaint to the court against various problems of coastal areas and small islands is detrimental to life;
- (k) Obtain compensation; and
- (l) Get assistance and legal aid to the problems faced in the management of coastal areas and small islands in accordance with the provisions of the legislation.<sup>30</sup>

The duties of customary law people in the management of coastal areas and small islands are to:

- (a) Give information regarding the management of coastal areas and small islands;
- (b) Maintain, protect, and preserve the coastal areas and small islands;
- (c) Inform report the occurrence of hazards, pollution, and/or damage to the environment in coastal areas and small islands;
- (d) Monitor the implementation of the plan of management of coastal areas and small islands; and/or
- (e) Implementing the program of the management of coastal areas and small islands as agreed at the village level.

Also, the legislation provides duties for governments to take the customary law people in the management of coastal areas, that:

- (1) Government and local government are obliged to empower communities to improve their welfare.

<sup>28</sup>A. Samik Wahab.(1998).*Perubahan Pantai dan Kajian Pembangunan Pantai Utara Jawa Tengah*.(Report). LPM Gadjah Mada University, p. 37

<sup>29</sup>Bushar Muhammad. (1983).*Pokok-pokok Hukum Adat*. Jakarta: Pradnya Paramita, p. 109

<sup>30</sup>See Article 60 paragraph (1) Act No. 1 of 2014 on the Amendment of Act No. 27 of 2007 on the Management of Coastal Area and Small Islands

- (2) Government and local government shall encourage business activity of communities through capacity building, provision of access to technology and information, capital, infrastructure, market guarantees, and other productive economic assets.
- (3) In order for community empowerment, the government and local governments realize, develop, and increase awareness and responsibility in:
  - (a) Decision-making;
  - (b) Implementation of management;
  - (c) The partnership between the community, business, and government/local government;
  - (d) The development and implementation of national policies in the field of environmental;
  - (e) The development and implementation of preventive and proactive efforts to prevent a decrease in the carrying capacity and the capacity of coastal areas and small islands;
  - (f) The use and development of environmentally friendly technologies;
  - (g) Supplying and dissemination of environmental information; and
  - (h) Awarding to those who contributed in the field of management of coastal areas and small islands.
- (4) Further provisions concerning the guidelines for community empowerment regulated by the regulation of the minister.<sup>31</sup>

The reason the issuance of provisions regarding guidelines for community empowerment is regulated by the Regulation of the Minister of Marine Affairs and Fisheries of the Republic of Indonesia Number 40/Permen-KP/2014 concerning participation and communities' empowerment in the management of coastal areas and small islands, by give attention to the dynamics of participation and communities empowerment in the coastal areas. The purpose of this minister's regulation as basis and reference for the Ministry, local government, stakeholders and the public to realize participation and community empowerment in the management of coastal areas and small islands (PWP-3-K). With the aims to improve the effectiveness and sustainability in utilization of coastal areas and small islands; to improve the capacity and independence of the community to participate in PWP-3-K; to assure and protect the public interests in utilize coastal resources and small islands in a sustainable manner; and to strengthening the values of local wisdom to support the nation-building process in PWP-3-K.<sup>32</sup> That is, the customary law people have authority to use and manage natural resources in the coastal areas.

Abrar Saleng,<sup>33</sup> provides insight into the relationship of similarities and differences between customary rights with the right to state's control, namely:

- a) Subject, for customary rights is the legal community, not individuals, while for the right to state's control is the state.
- b) Object, for customary rights are land, water and natural resources (limited) in their territory, while the right to state's control is more widely, because in addition to all natural resources that exist in the territory of Indonesia, also the branches of production which are important for the state and dominate the life of many people.
- c) Content, for customary rights is a series of authorities and responsibilities includes: rule, giving way use of natural resources and maintenance, while the right to state's control are a number of authorities and public duties which include the setting, maintenance and monitoring of the use and utilization of all potential natural resources and the branches of production for the welfare of the people.
- d) Implementer, for customary rights is the Head of Law Alliance or Customary Chief, whereas for the rights of state's control is Government of the Republic of Indonesia.

A result of research by Professor R.Z. Titahelu,<sup>34</sup> against customary law people and the local communities that inhabit coastal areas and small islands in Maluku in managing natural resources on land and coastal and marine, have rules more or less is similar. Titahelu concluded that:

<sup>31</sup>See Article 63 paragraph (1) Act No. 1 of 2014 on the Amendment of Act No. 27 of 2007 on the Management of Coastal Area and Small Islands

<sup>32</sup> See Article 3 the Minister's Regulation of Marine and Fisheries Affairs of the Republic of Indonesia No. 40/Permen-KP/2014 on Participation and Communities Empowerment in the Management of Coastal Area and Small Islands

<sup>33</sup>Abrar Saleng. (2004). *Hukum Pertambangan*, Yogyakarta: UII Press, p. 52

<sup>34</sup>Ronald Z. Titahelu. (2014). *Aneka Masalah Masyarakat Hukum Adat Dalam Pembangunan*. Yogyakarta: Deepublish, p. 32-33

- 1) The coastal and marine resources in coastal villages and small islands, in some places used for living or for commercial purposes, while in others only used to sustain life only.
- 2) Recognition of government for the local/traditional management is important for people to achieve prosperity and environmental sustainability. Government recognition of community rights over the natural resources management (traditional fishermen or coastal community rights and natural resource management) should be legalized.
- 3) The rights of communities and authorities for natural resources management is a right that is not based on the administration of the state.
- 4) Recognition has more meaning for declarative statement rather than constitutive. More importantly, the recognition of the government should give effect to the public confidence that people have the capacity themselves to improve their lives better by practicing the local/traditional management to the natural resources around them.
- 5) Recognition of government affects the sense of local/traditional peoples in which they have ability to improve the living standards of their own to manage the resources around them. Legal recognition by the government is necessary.
- 6) It has consequences for community's lives. Traditional or local management is a reflection of the communities' condition, although for some conditions may change, because the community has dynamic life as they develop of current circumstances.

Titahelu's research emphasizes two key ingredients, that is: *First*, the people's right to manage the coastal and marine resources around them because it is assumed that they have ability to improve the living standards of their own; *Second*, the government's recognition of the rights of community is a requirement for people to achieve prosperity and sustainability of the environment.<sup>35</sup> This indicates a positive meaning that the development of people's political oversight in the utilization of natural resources, particularly in the coastal and marine resources does not come about through good will of the government solely.

In general, RohminDahuri<sup>36</sup> describing about coastal and marine environment as a source of "*common property resources*", so it has the function of public/public interest; sea is an "*open access*", allowing anyone to take advantage of ocean space for various purposes; sea is "*fluid*", where resources (marine) and *hydro-oceanography* dynamics cannot be partitioned; the coastal is a strategic area because it has the topography is relatively easy to develop and have a very good access (by utilizing the sea as movement "*infrastructure*"); the coastal area is rich in natural resources, both in the mainland and waters, which is needed to meet human needs.

Based on the statement above, it can be explained that there are differing ideas about the concept of coastal area management, that on the one hand the management of coastal and marine areas to allow anyone to take advantage of ocean for various purposes. On the other hand, argued that the interests of open access that make the coastal area as a resource that is not clear its tenure, so it is said that access to this resources is not regulated and open to anyone. Then, because the sea or marine as a common property resources has a public function in the public interest, and allow anyone to take advantage of ocean for various purposes, making the state should intervene in the natural resources management in the coastal and marine areas, for the achievement of equality and justice for all people, especially for local people or local customary law people.

The authority of State to control natural resources in Indonesia, stipulated in the 1945 Constitution of the Republic of Indonesia, describes that "earth and water and natural resources contained in it are controlled by the State and used for the greatest prosperity people".<sup>37</sup>Based on this statement, then the formulation of the meaning of State's control rights is to the natural resources management. According to P.M. Faiz,<sup>38</sup>state through the government has authority to decide on the use, utilization and rights to natural resources to regulate, administer, manage, and supervise the management and utilization of natural resources. Therefore, the natural resources that are important to

<sup>35</sup> *Ibid.*, 33-34

<sup>36</sup> RohminDahuri. (2003). *Paradigma Baru Pembangunan Indonesia Berbasis Kelautan*, (Scientific Oration), Institut Pertanian Bogor, Indonesia, p.15

<sup>37</sup> Article 33 paragraph (3) of the 1945 Constitution.

<sup>38</sup> Pan Mohammad Faiz, *Penafsiran Konsep Penguasaan Negara Berdasarkan Pasal 33 UUD 1945 dan Putusan Mahkamah Konstitusi*, <http://jurnalhukum.blogspot.com/2006/10/penafsiran-konsep-penguasaan-negara.html>, accessed on 15 December 2014.

the State and dominate the people, as it relates to the public utilities and public services, must be dominated by State and run by the government, where those resources should be enjoyed by the people in fairness, affordability, in an atmosphere of prosperity and general well-being are fair and equitable.

The principle of *res publicae in publicousu*, enabling the State to get authority to determine the use and utilization of resources in the public interest, it can be found in the form of State has the right to control the land, that “the State can perform a legal relationship such as individual objects with human as owner. Legal relation with the land included in the category of objects or land that used for public (*res publicae*). Thus, public roads and likes belong to the State”.<sup>39</sup>

#### **The Problem of Right Proprietary to Manage Coastal Area:-**

Neil Meyer,<sup>40</sup> a professor who is an expert in the field of agriculture, economics and rural sociology at the University of Idaho argues that “the problem of coastal areas and the development and management of which was never completed due to the system of *open access* that developed without any reinforcement by the State for the benefit of the coastal community. State’s intervention that makes all coastal area, marine, including small island as objects of state ownership so that its arrangements managed by the State.”

In conceptual can be said, the dualism of rights proprietary to manage the coastal area, which is between the State and the customary law people. Related to that, AbrarSalengargues their relationship is actually the similarities and differences between customary rights with the rights of State’s control are:<sup>41</sup>

- a) Subject, for customary rights is the legal community, not individuals, while for the right to state’s control is the state.
- b) Object, for customary rights are land, water and natural resources (limited) in their territory, while the right to state’s control is more widely, because in addition to all natural resources that exist in the territory of Indonesia, also the branches of production which are important for the state and dominate the life of many people.
- c) Content, for customary rights is a series of authorities and responsibilities includes: rule, giving way use of natural resources and maintenance, while the right to state’s control are a number of authorities and public duties which include the setting, maintenance and monitoring of the use and utilization of all potential natural resources and the branches of production for the welfare of the people.
- d) Implementer, for customary rights is the Head of Law Alliance or Customary Chief, whereas for the rights of state’s control is Government of the Republic of Indonesia.

Thus, the central- and localgovernment and the legislature as well as the unity of indigenous peoples in this case the agency has authority to recognize, justify and accept the rights of customary law people, need to understand several aspects, as follows:<sup>42</sup>

*First*;the authority for the territories of customary law people. Customary law people know very well their territory with clear boundaries obtained through a long historical process. Therefore, indigenous people need to communicate their communal land to surrounding communities, governments, and other parties by using similar language (media). This implementation can be to use a map, where in making a map is conducted in participative and in a simple technique, so that themap will be an effective tool to discuss the overlap of a region in their authority. The clarity of authority over the territory of customary law people can be done by agreement and acknowledgment by the surrounding community. Furthermore, requires explicit recognition from the government to the territory of customary law people was not transferred to another party, while ensuring the forest resources can be utilized. Clarity form of the customary law people’s authority can be done in the form of legal recognition of the customary law people by State Land Agency. In the case of the territory of customary law people first be given before the

<sup>39</sup> E. Algra. (1985).*Inleiding tot het NedherlandsPrivaatrecht*, W.E.J. TjeenkWillink, Zwolle, achtiendedruk, p. 121; WinahyuErwiningsih.(2009).“PelaksanaanPengaturanHakMenguasai Negara atas Tanah Menurut UUD 1945”, *JurnalHukum*,Special Issue: 118-136

<sup>40</sup>As cited on WALHI, Briefing Paper Harling, 2014, *DampakPolitikRejimKorporasiTerhadapSumberDayaPesisirdanPulau-Pulau Kecil di Indonesia DiTengah SituasiPerubahanIklimdanKrisisPangan Nasional*.

<sup>41</sup>AbrarSaleng, *Op.Cit.*, p. 52

<sup>42</sup>BesseSugiswati.(2012).“PerlindunganHukumTerhadapEksistensiMasyarakatAdat Di Indonesia” *JurnalPerspektif*,17(1): 31-43.

decree is published, it can be negotiated by the parties concerned (customary law people in the territory, right giver and right recipient).

*Second*, it is the authority of customary institutions. The authority of a territory of customary law people is needed to prevent dual-recognition or recognition for a territory that is not its authority. In this case, there are several possibilities that can be done: 1. Recognition of the existence of indigenous peoples by the indigenous people themselves and from surrounding community about their institutional authority; 2. Recognition of the existence of indigenous peoples by the judiciary based on court decisions; 3. Recognition of the existence of indigenous peoples by a Council of Indigenous Peoples are elected by the indigenous peoples themselves.

*Third*, the authority on the pattern forest resource management. Management pattern that carried out by customary law people in general is based on the existing indigenous knowledge and grow in the community with all norms that regulate limitations and sanctions. This pattern is developing very dynamically in accordance with the times. Generally, these dynamic nature does not explicitly define the form of natural resource management; such as forest, farm or agricultural, so it requires sufficient understanding by local governments on these patterns.

The basic character of the rights proprietary of indigenous people over natural resources has the meaning of joint ownership or communal, so the characteristic of right collectivity of indigenous people over customary rights sourced from the concept of natural law with judicial nature, it means the judicial nature the natural law would lose its meaning, thus there are some juridical nature inherent in the natural law, as follows:<sup>43</sup>

- a) Applicability of the natural laws does not depend on enforced or not the rules of natural law by the authorities.
- b) Natural law is the direction of the attitudes and human nature.
- c) The rules of natural law would apply even if no orders from the authorities to enforce the natural law.
- d) Applicability of the natural law in spite of the enactment of positive law.
- e) Natural law is the supreme law of human, so that the enactment of legislation in the positive law cannot exclude the existence of the rules of natural law.
- f) Natural law applies anywhere and anytime.
- g) The rules of natural law are discovered by human's mind and rational.
- h) The basics of natural law derived from the legal norms and morals.
- i) There is an opinion stating that the rules of natural law are nothing other than the shadow of a concept of utilitarianism thought and moral principles.
- j) There is also the theory of traditional character, namely natural law theory of positive law.

Based on the understanding above, it should the meaning of civil rights to the customary law people in coastal areas becomes clear that is these rights should not be ruled out with the rules of existing positive law.

### **Conclusion:-**

The proprietary of civil rights of indigenous people in coastal areas to be so important, because the right proprietary to manage and utilize the natural resources in coastal areas already exist and belong to the customary law people before this State exist. Thus, the utilization of coastal and marine areas that are *open access* need to be reviewed, arguing there should be a boundary, because basically coastal areas it is the property of a unity of customary law people that inhabit coastal areas. This means that the management and utilization in coastal areas that are intended for anyone to be able to manage it, must be known and received permission from the local customary law peoples. Hence, needed a rule of law are clear and explicit to prevent the conflict of authority between the State and the proprietary of civil rights of customary law people in the coastal areas.

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<sup>43</sup>Munir Fuady. (2013). *Teori-Teori Besar (Grand Theory) Dalam Hukum*. Jakarta: Kencana Prenadamedia Group, p. 20-21



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### RESEARCH ARTICLE

#### EVALUATION OF BITE FORCE IN COMPLETELY AND PARTIALLY EDENTULOUS PATIENTS (PRE AND POST REHABILITATION).

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#### **Abstract**

The aim of this study was to determine the maximum bite force prior and post rehabilitation in completely and partially edentulous patients rehabilitated with either complete denture, removable partial denture, fixed partial denture or implants in comparison with the control group in 75 patients belonging to each group who were randomly selected after clinical examination. A total of 75 patients made up the study population. The study was carried out with the aim of measuring the maximum bite force using the bite force meter. Comparison was made amongst the bite forces of control group with that of the study groups. Implants followed by fixed partial denture group exhibited an excellent increase in pre to post rehabilitation stages with its values evenly distributed between the genders across all the study groups. Further, a greater bite force was exhibited in fully dentate patients (controls) in the overall study. Higher bite forces were elicited in patients rehabilitated with implants and is considered as the most effective mode of rehabilitation with maximum bite force in comparison with the other rehabilitation methods.

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#### **Introduction:-**

Mastication is a highly coordinated neuromuscular function involving purposeful movements of the jaw and continuous modulation of force, representing a function that matures with growth as the teeth erupts. It is characterized by complex movements of the stomatognathic system structures, most importantly the mandible, which varies depending on the foods ingested, resulting in manipulation of a food bolus, salivation, and associated oscillatory movements of the head. The loss of teeth, and consequently, prosthodontic rehabilitation poses new challenges to the stomatognathic system, which alters masticatory function. Relatively little is known about the extent to which chewing differs between dentate subjects and completely or partially edentulous patients treated in various ways.<sup>6,14,15,19,28,41.</sup>

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Edentulism is defined as the loss of permanent teeth and is believed to be caused by dental caries, periodontal disease, trauma and others. It is an indicator of both population health and the functioning and adequacy of a country's oral health care system and is associated with low education level and poor socioeconomic status.<sup>1,2</sup>

The advances in the medical sciences have led to people living longer. Along with the increased life expectancy, there is a desire to live to the fullest with an esthetic appearance and functional rehabilitation. The patients who have lost their teeth are looking for custom made treatment modality in prosthetic rehabilitation. This helps in providing adequate masticatory, phonetic and esthetic function, simulating the natural dentition that does not jeopardize the remaining teeth,<sup>41</sup> thereby ranging from a complete coverage single crown or a long span fixed dental prosthesis to a full mouth rehabilitation.<sup>5</sup> Loss of teeth can be equated to an amputation, and gaps in the teeth are perceived as physical imperfections akin to missing body parts.<sup>9</sup>

Adult patients with varying severity of tooth loss can be rehabilitated by different types of fixed or removable constructions which are retained by the remaining natural teeth or dental implants, or in cases of edentulism, are supported directly by the oral mucosa.

At present, there exists three main methods which are used individually or in combination in order to replace lost teeth. The three methods are as follow:

1. A removable denture, which the patient can insert or remove.
2. A bridge retained by the natural teeth abutting the gap and which bears the replacement teeth.
3. Implants which are anchored in the jawbone and support a removable denture or fixed tooth-replacements.

Bite force is an important element of masticatory system.<sup>23</sup> The bite force is the ratio of the distance from the jaw joint which is the fulcrum or pivot point to the point of application, i.e. the biting versus the distance from the jaw joint to the muscle attachment which is the force required to close the jaw. This force results from the action of the jaw elevator muscles (in turn determined by the central nervous system and feedback from muscle spindles, mechanoreceptors and nociceptors) modified by the craniomandibular biomechanics.

Masticatory performance is a cumulative contribution of various factors like bite force, severity of malocclusion, occlusal contact area, body loss of teeth, restorations, facial forms and other motor activities. Maximum bite force indicates the functional state of the masticatory system.<sup>7</sup> Bite forces are correlated to diet, cranial design and are considered to be the key determinant of the masticatory function.

Factors including bite force and occlusal contact area, suggest that higher the bite forces and the larger the occlusal areas, the more efficient the mastication is. Bite force has also shown to be affected by a number of physiological and morphological variables such as craniofacial morphology, age, gender, periodontal support of the teeth, height and body weight, tempo-mandibular disorders pain, and dental status.<sup>29</sup>

Other variables reportedly affecting the bite force are the type of recording devices, technique employed to measure the bite force, position of the sensor in the oral cavity, patient position, unilateral or bilateral measurements and magnitude of mouth opening during measurements.<sup>4</sup>

### **Patients and Methods:-**

After obtaining the ethical clearance, subjects for the present study were selected amongst the patients who reported to the outpatient department of Oral and Maxillofacial Surgery, GITAM Dental College and Hospital, Visakhapatnam from June 2014 to March 2015 to evaluate the pre and post rehabilitation bite forces in completely and partially edentulous patients.

Details of the patients were recorded at the beginning. Bite forces prior and post rehabilitation were recorded. All selected patients were informed about the experimental nature of the study. Their cooperation was solicited. The effective mode of rehabilitation was determined on the basis of pre and post rehabilitation bite forces.



Bite force measurements were made using indigenous Bite Force Meter in 75 individuals belonging to different age groups. Follow up was done post rehabilitation. The maximum bite forces were assessed in the control group. Pre and Post rehabilitation bite forces were recorded in the study group which comprises complete denture, removable partial denture, fixed partial denture and implants.

The bite force meter consisted of a Wheatstone bridge assembly, instrument amplifier and a digital panel meter. An adjustable button is incorporated on the instrument for resetting the instrument reading to zero, at the start of each recording. This electronic device was connected to the bite force pads. The bite force pads were placed in the posterior 1<sup>st</sup> molar region on both right and left sides of the jaw. This was accomplished by instructing the subject to bite on the pads as the subjects were asked to remain seated with the head upright, looking forward, and in an unsupported natural head position throughout the trial refraining from extraneous movements. The force applied is seen on the bite force meter display. The high precision load cell and electronic circuit provided precise measurements.<sup>10</sup>

### Results:-

In the present study, the most common age groups that the subjects underwent rehabilitation procedures were between 35-53 years. The mean age group was 43 years.

There was a significant increase in the post rehabilitation bite forces in males and females on both right and left side when compared to the pre rehabilitation bite forces in all the groups. However, the group comprising removable partial denture indicated a significant decline in the post rehabilitation bite forces in comparison to pre rehabilitation bite forces.

Paired Samples Statistics						
Group			Mean	N	Std. Deviation	p-value
complete denture	Pair 1	right	10.8140	15	5.78130	0.001
		rightafr	22.1247	15	10.57687	
	Pair 2	Left	12.3260	15	6.62137	0.003
		leftafr	23.9547	15	11.77417	
removable partial denture	Pair 1	right	216.8453	15	289.18050	0.269
		rightafr	130.1687	15	36.83493	
	Pair 2	Left	196.6040	15	253.47638	0.908
		leftafr	185.5500	15	221.86138	
fixed partial denture	Pair 1	right	105.8340	15	30.51702	0.000
		rightafr	142.3220	15	29.76522	
	Pair 2	Left	99.1333	15	32.25323	0.000
		leftafr	142.9213	15	35.02141	
Implants	Pair 1	right	263.4800	15	44.21017	0.000
		rightafr	296.7827	15	45.55500	
	Pair 2	Left	263.2633	15	42.46300	0.000
		leftafr	293.0387	15	43.53010	

Higher bite forces were recorded from patients who were rehabilitated by fixed partial denture whereas the bite forces from the patients who were rehabilitated with Implants were found to be the highest.

**Discussion:-**

As a result of rehabilitation of tooth loss, the patient's oral function gets restored and eventually the patient regains the prerequisite conditions for participating in social activities again.<sup>1,2</sup> Specific improvements are described such as enjoyment of food, clarity of speech and attractive facial expression. Single tooth loss can be treated by a tooth-retained bridge, a resin-bonded retained bridge or an implant-retained crown. Few studies have shown that the survival of implant-retained crown constructions is over 90 percent and the risk of bone loss (>2mm) around the implant is small. Patients with more extensive tooth loss can be treated with tooth or implant-supported bridges. Around 95 percent of implant-supported bridges can be expected to survive after 5–10 years.<sup>5</sup>

Patients with long periods of edentia often lose more mandibular bone than those with a shorter period of edentia. Denture wearing is also very important in alveolar ridge resorption as the number of lower dentures worn is related with the period of edentia and alveolar ridge resorption. The individuals who wear their complete dentures continuously throughout the day and night, have more resorptive changes in the jaws when compared to those who wear dentures daily. The high success rate and consequently the widespread use of dental implants for prosthetic rehabilitation have led to revision of numerous aspects of the original treatment protocols.<sup>3</sup> The aim of this report was to evaluate the patients' livelihood with varying degrees of tooth loss and their response to the type of rehabilitation with the perseverance oral quality of life that the currently available methods of rehabilitation have after 5, 10 and 15 years according to its efficiency.

Maximum bite force is a useful indicator of the functional state of the masticatory system and the loading of the teeth, and its recordings can be performed in a relatively simple way in the clinic or the department.<sup>22</sup> A measuring device, essentially a bite force meter, is directed to a particular location, a bite point source of a specific tooth among the whole dentition and the bite force is measured.<sup>10</sup>

Comparison of bite forces between males and females on both right and left sides was done in the control group. The highest bite force was recorded on left side of females which was around 398 N. The left side of control group individuals was more significant when compared with the other groups. The right and left posterior regions did not show any significant difference in bite force. The mean bite force was around 350N on the right and 364N on the left side of the jaw. Few studies have shown that increase in the maximum bite force values was seen at the dentate side when compared to the rehabilitated side.<sup>8</sup> There may be hormonal differences that contribute to the composition of muscle fibers in both males and females. However the age factor has got relatively a small influence on the bite force.<sup>4</sup>

Comparison of pre and post rehabilitation bite forces on right and left side of the jaw was done in all the study groups that comprised of complete denture, removable partial denture, fixed partial denture, and implants group.

In complete denture group, the pre rehabilitation bite forces was around 10N on right side and 12N on the left side that showed no statistical significant increase whereas post rehabilitation bite forces was around 22N on right side and 23N on left side that showed a statistical significant increase on the left side of the jaw when compared across all other groups. Hence, many studies have stated that, the stomatognathic system behaves functionally depending on the type of oral rehabilitation.<sup>5</sup>

In removable partial denture group, there was a mild difference between the pre and post rehabilitation bite forces in the study group. Pre rehabilitation bite forces was around 216N on right side and 196N on left side where as post rehabilitation bite forces was around 130N on right side and 185N on left side. Post rehabilitation, bite forces were higher on the left side of females. Although studies on the influence of gender on maximum bite force have shown that in young adults, the females showed greater values when compared to males. Patients with mandibular anterior or posterior natural teeth have greater resorption of the edentulous maxilla than patients with mandibular complete dentures or patients with natural teeth. Hence studies have concluded that the cause of resorption of maxillary and mandibular bony structures was due to removable partial denture and mostly seen in removable partial denture wearers.<sup>3</sup>

In fixed partial denture group, the pre rehabilitation bite forces was around 105N on right side and 99N on left side where as post rehabilitation bite forces was around 142N on both left and right side as well. Thus, no statistical significance was elicited in both the pre and post rehabilitation stage. Higher bite force values were recorded in females on the right side post rehabilitation. It is believed that female adults between 13 and 20 years of age exhibit

a greater muscle thickness<sup>19</sup> whereas males have a gradual increase in muscle thickness that eventually occurs over time.<sup>39</sup> Many studies have proven that the occlusal force would be higher on the preferred chewing side and no statistical significance of occlusal force was found in relation to the quadrants.<sup>15</sup> As masticatory performance was mainly affected by occlusion factor the greater areas of contact and near contact provided better occlusal stability (tooth alignment and molar bite force) which helped in allowing the masticatory function to be more efficient.<sup>27</sup>

In the implant group, the pre rehabilitation bite forces was around 263N on right side and left side as well, whereas the post rehabilitation bite forces was around 296N on the right side and 293N on left side. The pre as well as post rehabilitation stages exhibited an excellent increase in the bite force when compared across all the groups. A statistically significant difference was seen between males & females post rehabilitation on the left side for implant group. On comparing across the other rehabilitatory groups, higher bite force values were elicited in the implant group individuals. Several studies have concluded that, higher bite force and masticatory efficiency was seen in individuals rehabilitated with implants and single crowns. An improved function was seen in those individuals rehabilitated with implant supported mandibular over denture when compared to those rehabilitated with conventional complete dentures.<sup>5,20</sup> The biting efficiency was affected by the postoperative occlusal plane angle.<sup>23</sup> A positive correlation was found between muscle function and tooth position in few studies.<sup>28</sup> The biting force measured for the ipsilateral and the contralateral pair of teeth has always shown higher values in the posterior pair of teeth.<sup>41</sup> A minimum period of twelve weeks is required for the tissues to adapt to a new vertical dimension as the bite force measurements were found to give consistent readings after twelve weeks.<sup>22</sup> A High score of satisfaction and quality of life has been found in patients rehabilitated with implant supported prosthesis.<sup>5,13</sup>

### Conclusion:-

Implants exhibited the maximum bite force in comparison with all the other groups, due to which it stands as one of the most successful and effective mode of rehabilitation. Thus it can be advised that tooth or teeth loss can be rehabilitated with either implant or implant based treatment options as it achieves the same bite force as the natural teeth.

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**RESEARCH ARTICLE**

**THE MARATHA NAVY UNDER KANHOJI ANGRIA (1669-1729).**

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**Abstract**

Kanhoji Angria was a diplomat of uncommon ability. He was regarded as the second Founder of the Maratha navy. He undoubtedly re-established Maratha prestige at sea. He defied the joint efforts of the English, the Portuguese's and the Sidis, and in his wars by land and sea. He had given evidence not only of good seamanship but also wise diplomacy. He offered significant competition and damage to the European powers who fought with Angria at sea, would later claim that he was pirate, but they deliberately ignored that he had been appointed an admiral in the Maratha navy by its legitimate leaders.

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**Introduction:-**

After Shivaji's death the Marathas passed through a great crisis. During the stormy days of Sambhaji and Rajaram most of their older leaders passed away. At one time it appeared that the nascent Maratha power might be crushed out by the Mughal empire. But the unusual crisis brought a number of young men of exceptional energy and ability to the fore front, and the new leaders not only saved the newly founded kingdom from imminent extinction but added to its power and prestige both land and Sea. While Balaji Vishwanath, the founder of the Peshwa family, was gaining Shahu's confidence, the Chief Command of the Maratha fleet had already passed to Kanhoji Angria, the founder of a family which made it self feared and respected by all the sea powers of the coast, Indian and European.

Kanhoji's origin was obscure; of his early career little of nothing is known A Portuguese Viceroy states that he started life as a humble servant of other Hindus in the island of Versova<sup>1</sup>. According to the official history of his family, Kanhoji was a Maratha Kshatriya by birth and the original surname of his ancestors was Sankpal. The new name of Angria was supplied by the Village of Argarvadi, where the family had long resided. Tukdoji Father of Kanhoji, had served under Shivaji<sup>2</sup>. His Son Kanhoji had naturally followed in the footsteps of the father When Rajaram sought refuge in Jinji he was accompanied by the Commander-in-chief of the navy Sidoji Gujar, and Kanhoji was appointed as in-charge of Suvarna. Durg. Here he distinguished himself against the Sidis of Janjira who had reconquered their lost possessions on the mainland and was appointed Subhedar of the Armada by Rajaram with the title of Sarkhel. Earlier Kanhoji made himself known in many a Skirmish with the Siddis. by 1703 he had attained so much importance that ceatano de Mello e Castro, Viceroy of Goa, addressed a friendly letter to him, sent him some presents and permitted the merchants chaul to purchase a vessel which Kanhoji had probably captured as a prize and was anxious to dispose of with Shahu's home coming the loyalty of the Maratha nobility was divided between the parties of Tarabai and Shahu Kanhoji threw his lot with Tarabai. Kanhoji as Tarabai's man, took the forts of Rajmachi, Tunga-Tikona and Dhanagad and Threatened to march on Poona and Satara. But Balaji Vishvanath Bhat handled the Circumstances and brought Kanhoji into Shahu's camp without having to shed drop blood. In the treaty concluded between Shahu and Kanhoji, the latter obtained ten Seas-forts and Sixteen land-forts.

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By this treaty, Kanhoji, received territory worth Rs. 34 Lakhs revenue<sup>3</sup>. He was now free to deal with the sea-powers who often questioned the sovereignty of the Matatha over the sea.

The Maratha navy had been an active unit for nearly forty years when Kanhoji succeeded to the chief command. As the admiral of the Chhatrapati had every right to levy tariff to force ships of all nations to purchase his passport, and to negotiate with any power he liked. His aims and objects were well known and clearly defined. The Maratha merchantmen were to be protected from the pirates who infested the Malabar coast, Maratha subjects were to be protected against the depredations of the Sid and the Sovereignty of the sea was to be secured for the Maratha state. It was however, no easy task and Kanhoji had to contend against no less than five rivals, the Sidi of Janjira, The Savants of Wari, the English of Bombay, the Dutch at Vinguar and the Portuguese of Goa. It was Kanhoji's duty to drive them back. But the Maratha fleet consisted of no more than eight or ten small vessels, as we learn from Conde de Fricira, when Kanhoji was called upon to assume its command<sup>4</sup>. Hence there was need of money for additional ships and for the enlistment of more men for the army and money could be obtained only by exercising the sovereignty of the sea and compelling alien traders to purchase, Kanhoji's Cartaz. All these rights had to be executed by the simple rule of might. If the Siddis, the Phiragis and the Topikars acquired territory, carried on trade, and ruled the waves on the authority of their distant Sovereigns, how could Kanhoji's right in these matters be questioned when he had the sanction of the Chhatrapati. The English and the Portuguese in addressing Kanhoji as a pirate have simply betrayed their hatred for one who challenged their authority.

#### **Kanhoji and the Siddis:-**

After Sambhaji's death, the calamity which befell the Marathas was the proper opportunity for the Siddis to extend their Sway over Konkan. They recovered a number of places which they had lost to Shivaji. Raigad, the capital of the Marathas, Mandargad, and Ratnagiri were also occupied by the Mughal officers. Their occupation of the ports off Rewash and Thal impeded the movements of the Maratha Ships at Kolaba and in the pen river. In that dire hour it was Kanhoji Angre who by his daring exploits kept the Maratha flag flying over Kolaba and Khanderi. He forced the Siddis and the Mughal Subhedar to share with him half a revenue of certain place which they had taken possession<sup>5</sup>. In 1697 when Kanhoji shifted his headquarters to Kolaba, the Siddis as well as the English were very much disturbed because he proved to be a challenge for these powers. In 1698 the Siddis attacked Kolaba similarly their attempt to take Kolaba and Khanderi in 1701 ended in failure.<sup>6</sup> A concerted attack on the Angrian territory by the Portuguese, the Siddis and others was foiled by Balaji Vishwanath<sup>7</sup> in 1714. The treaty between Shahu and Kanhoji greatly disturbed the Siddis as it transferred a number of places belonging to the former to Kanhoji's Jurisdiction. In 1725, fresh dissensions had taken place between Kanhoji and Siddis, who appeared before Kolaba with a large fleet of twelve pals, two frigates and one hundred Gallivats.<sup>8</sup> It is quite impossible that Kanhoji should have been ignorant of the intended invasion, for reason unknown to us. The Maratha Admiral considered it unsafe to face the Siddis on the Sea, and as was usual in that age. Silver served to avert the danger when steel offered little or no remedy. By experience Kanhoji had learnt that an attack on Janjira without the aid of the land power was hazardous.

#### **Kanhoji and the Portuguese:-**

Wavering behavior of the Siddis had greatly disturbed the Portuguese Kanhoji was also very much perturbed by the continuous struggle with the Siddis. Driven to despair he asked the help of the Portuguese which was readily given. An alliance<sup>9</sup> was formed between Kanhoji and the Portuguese against the Siddis in 1701. Till 1708, peace existed between Kanhoji and the Portuguese. But no sooner was the Mughal menace over than Kanhoji threw this friendship to the winds and started seizing Portuguese ships.

When exactly Kanhoji first challenged the Portuguese supremacy of the seas we do not know. In 1708, Kanhoji captured some Portuguese ships. In retaliation, the latter marched on Cheul but were defeated by the overwhelming number of the Marathas, 2000 against 400 of their own. Kanhoji fought two manchuas-of-war belonging to the Portuguese fleet of the north. He burnt one and captured another with 27 Portuguese. They were all put to the sword, according to a Portuguese official account, except one captain who purchased his life and liberty by paying a ransom of 12,000 Xerafins.<sup>10</sup> Many merchantmen sailing under Portuguese colours shared the same fate and contributed to Kanhoji's coffers. In 1712, during the Viceroyalty of Rodrigo da Costa, Kanhoji attacked the merchant fleet sailing for the ports of the north.

He fell upon the frigates with his pals, dismantled the Portuguese flagship, and captured no less than forty Parangues. This was a great blow to Goa, for a large number of its citizens lost all the capital they had invested in this

mercantile enterprise. The next year the merchant fleet was better convoyed, but Kanhoji did not hesitate to attack two pals but at last the Angria's fleet had to retire with much loss<sup>11</sup> However the possession of the Portuguese on the Bombay coast had been isolated and the Angria was in position to cut off their communications by land and sea. In 1713, he attacked a frigate of 34 guns that had just landed a Portuguese force at Chaul. In this combat also the Angria's fleet, though numerically superior, was discomfited, the Viceroy resolved to take the offensive and sent Antonio Cardim froes with a fairly numerous flotilla to reduce Kolaba. Having sailed with six pals and some Gallivats, he blockaded the port. The Angra, who was not inclined to hazard a naval action, responded by hauling his fleet a shore out of range of the Portuguese guns and leaving froes to continue his ineffectual blockade. Three Months later the Portuguese Captain was forced to depart by the receipt of news of the arrival of the Arab fleet at Surat.<sup>12</sup> The next in 1718 near Karwar, the Angra fleet was defeated with heavy losses.<sup>13</sup> Kanhoji recognized that his strength lay mainly in the Sea. The possession of the coast, was essential not only for the maintenance of uninterrupted communication between different ports, but also its revenue on which the navy, as in Shivaji's days, ordinarily depended. He therefore, received from Shahu Rajmachi and other places and the important island of Renery.<sup>14</sup> He acknowledged Shahu's Supremacy and concluded treaty with him in the latter part of 1713 or in the earlier months of 1714. After that the Angria's fleet rode the sea boldly, Seizing merchantmen of all nationalities which had omitted to purchase his passports, and the Portuguese found themselves powerless to circumscribe his activities of all their possessions on the coast, Chaul suffered most; for the main source of its income was the volume of dutiable commerce which suffered heavily from Angria's interference. As a result of it in 1721, the English formed an offensive and defensive alliance with the Portuguese against him. In 1721 an Anglo Portuguese Combined army reached the gates of Kolaba on the 21<sup>st</sup> of September. Attempts to pound the walls by erecting batteries were foiled as the labourers were panic stricken by the Angrian army. At this stage a force of 6,000 horses under Bajirao I, sent by Sahu stopped the war. It would have been a sheer folly to fight with so vast an army and the Portuguese Viceroy<sup>15</sup> concluded a treaty of peace with Bajirao on 12<sup>th</sup> January 1722.

#### **Kanhoji and the English:-**

Ever since Kanhoji made Kolaba the main station of admiralty the English were ill at ease. They become all the more restless when the island of Khanderi passed under his Command. Kolaba and Khanderi were within a couple of hour's sail from Bombay. Khanderi could easily keep a watch on the English vessels entering Bombay waters. It was dangerous for the trade and peace of Bambah.

It was the studied policy of the English to regard the enemies of Kanhoji as their friends. They were therefore, determined to give all possible aid to the siddis as foil to the Angria. With regard to the practice of the English to allow their friends to fly their flags and thereby avoid the purchase of passports was never accepted by Kanhoji. He also contended that outside the ports, beyond some specified limit he was free to deal with any vessel as he pleased.

In 1702, Kanhoji captured near Calicut a merchantship with its English crew as it was without his passport. In 1706, the Marathas and the Angers captured three English ship of which the Diamond had 12 guns. In 1712, Kanhoji Seized a yacht of the Bombay Governor along with the Anne of Karwar. But then he decided to come to terms with the English and sent a messenger to Bombay in February 1713 with proposals for peace, offering to deliver the captured vessels if an Englishman of credit was sent to Kolaba. The Governor and Council proposed the following terms.

1. Kanhoji was to return to the English to ships which he had seized from them and their people.
2. He was neither to molest the English ships nor those of their merchants.
3. He was not to molest ships of any nationality entering into the English harbor or insight of it (between Mahim stakes and Khanderi)
4. Kanhoji was to allow the English merchants to come to his ports on payment of due customs.
5. The English promised that they would not allow any ship to sail under their colour except that of their subject
6. The English granted Kanhoji the liberty to trade in their Bombay port on payment of regular customs<sup>16</sup>.

According to this treaty, Kanhoji returned the two English ships he had taken. But the peace did not last long. In 1717,, the ship 'Success' belonging to the English broker Govardhandas was captured by Kanhoji . When talks regarding its recovery were in progress another ship Robert fell a victim to Kanhoji's aggressing. He refused to return the ships. Within a couple of months from the Robert incident Kanhoji made prize of yet another ship the otter. These excesses of his goaded the English to the point of desperation and they detained at Mahim a shibar belonging to Kanhoji. At last on 17<sup>th</sup> June 1718 war was declared against Kanhoji. The nationality of the three captured ship was a highly controversial question. The owners if the ship were not English, but the cargo belonged

to English subjects, and Kanhoji contended that they were not entitled to exemption from the ordinary rules of passports. He wrote to captain Cornwall that the ships belonging to Bombay, Bengal or Madras. Shall not be molested by him that if the English will freight on country shipping they must expect that he will make price of them<sup>17</sup>. The real ground of contention was that the English had to load foreign boats with their goods and demanded for these boats the same immunity to which ships of undoubted English nationality were entitled. Kanhoji was unwilling to grant this demand which would have meant financial loss to him. The English led expeditions against Khanderi, Kolaba and Gheria without success<sup>18</sup>. In 1720, the English lost their ship charlotte to Kanhoji, and the next year they entered into an alliance with the Portuguese against their common enemy. This joint attack failed miserably, The ill-success of the Anglo-Portuguese expedition undoubtedly contributed to Kanhoji's prestige, and he was soon free to seek his enemies at sea. He continued to make prize of the English ships whenever he could. On 14 March 1722, his fleet, consisting of four pals and twenty Gallivats, had attacked two English pals between chaul and Rajapore. One of the two English vessels was burnet and the other was put to light. About the same time Angria captured a big English ship richly laden with coins and valuable goods. But his success was by no means uniform for one of his ships, surrendered to the English near Hennery sometime between March and October.<sup>19</sup> In October 1722, Kanhoji sailed from Kollba, leaving his eldest son incharge of the government. The last three or four years of Kanhoji's life were probably quiet and uneventful. In 1725 he went to satara to pay his respects to his sovereign and liege lord and died at Kolaba on 20<sup>th</sup> June 1729.

### Conclusion:-

Kanhoji Angre, following Shivaji's policy, boldly rode the sea capturing ships which sailed without his passes. The Portuguese and the Siddis had to respect his right on the sea. Kanhoji allowed English ships to enter his ports on payment of the usual customs. This term Speaks for his equality at sea what often led to heated controversy and war was the granting of a flag by the English to ship which did not belong to them or to their subjects. Kanhoji was unwilling to make more concessions to the English. He was prudent enough not to offer any additional offence to the Portuguese. Conde de Ericeira tells us that Kanhoji did not give Portuguese subjects any trouble during the terms of his Viceroyalty. One enemy at a time was enough for him. The Maratha navy had not yet emerged from the primitive galley stage. The seamen had, indeed, learnt to, make skilful use of their sails, but their fighting fleets were inferior as compared to contemporary Europe. They didn't take efforts to moderate nary. As a result of it the Maratha nary progressed satisfactorily up to a certain stage and then further improvements stopped.

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### RESEARCH ARTICLE

#### EFFICACY OF JESHTHAMADH SIDDHA TAIL KAWALDHARAN IN MANAGEMENT OF OSMF, A SINGLE CASE STUDY.

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##### Key words:-

OSMF, Kawaldharan, Jesthamadha siddha tail, mukharog.

#### Abstract

- OSMF is a complex, irreversible, highly potent pre-cancerous condition, which is characterised by juxta -epithelial inflammatory reaction and progressive fibrosis of sub mucosal tissue.
- In modern science, many medicinal and surgical treatments available having no satisfactory result with irreversible results.
- As the disease OSMF exactly cannot be equated with any *mukhrogas* in Ayurveda but can be managed according to Ayurveda.
- So to look for alternative treatment and proves efficacy of ayurvedic treatment, this study was carried out.

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#### Introduction:-

Oral sub mucous fibrosis is a chronic disease of oral cavity which is common in patients who are chewing betel-nuts in the Indian subcontinent<sup>1</sup>. It is characterised by the progressive build-up of constricting bands of collagen in the cheeks and adjacent structures of mouth which can severely restrict the mouth opening and tongue movement as well as cause problem with speech and swallowing<sup>2</sup>. In modern science various medical and surgical treatment modalities have been used, but results are not satisfactory.

In Ayurveda, this disease is not mentioned clearly in *mukhroga*, but some scattered symptoms can be correlated with OSMF such as.

1. *'krichchan vivrinoti mukham*<sup>3</sup> (difficulty in opening mouth)
2. *Mukhdaha*<sup>4</sup>, *ushna*<sup>5</sup> (burning sensation in mucosa).
3. *Mukhantergat vrana*<sup>6</sup> (ulceration of oral mucosa).

It seems to be to *vata-pitta* dominant chronic *sarvasarmukhroga* and many local treatment modalities like *Gandush*<sup>7</sup>, *kawaldharan*<sup>8</sup> and *pratisaran*<sup>9</sup> are mentioned by our *Aacharyas* which have great potential. Hence taking all considerations, this study was planned to deal this crippling disease.

#### Prevalance:-

In India, the prevalence increases over the past four decades from 0.03% to 6.42%<sup>10</sup>.

**Case study:-**

A 45yrs old female patient, Hindu by religion, came to OPD with complaints:-

1. Burning sensation in mouth (*mukhdaha*)
2. Unable to eat spicy food (*katu ras asahishnuta*)
3. Dryness in mouth (*mukh shushkata*)
4. Unable to open mouth

**Since 2-3 months:-**

Patient had taken allopathic treatment for above complaints but does not get relief, so she came to hospital for alternative treatment. Patient was thoroughly examined and detailed history was taken.

NoH/O – any major illness like HTN/ DM/ Chronic.

H/O- Pt. had habit of betel quid since 10-15 yrs.

**On Examination:-**

1. General condition-Fair, Afebrile
2. *Dehbhar*(weight)-60kg
3. *Deh prakriti-vata Kapha*
4. .Pulse – 68/min      BP-130/80mm of Hg.

**Local Examination:-****Oral cavity:-**

1. Lip – Dry, blackish discoloration.
2. Mouth opening- Restricted, measures 2 finger tight.
3. Tongue- Ulceration seen at tongue margin.
4. Oral mucosa- Discoloration(pale white).
5. Pharynx- Posterior pharyngeal wall congestion.
6. No tonsil hypertrophy.

Rest WNL.

By observing symptoms and signs, the disease was confirmed to-“OSMF” As per *Ayurvedic text*<sup>11</sup>- *Dosh: vat-pitta*  
*Dushya: mansa*.

**Assessment Criteria:-****Table no.1:-** Subjective criteria.

	0	1	2	3
1. <i>Mukhdah</i> (Burning sensation in mouth)	Nil	On taking spicy food	On taking normal food	continue
2. Ulceration In mouth	Nil	Mild	Moderate	Severe
3. Colour of oral Mucosa	Pink Normal	Red or deep pink	Pale white	Blanched White

**Table no 2:-** Objective Criteria : Inter incisal distance (mouth opening) -

0	1	2	3
Normal complete opening	Three finger tight	Two finger tight	One finger tight

**Investigations:-**

<u>Blood</u> - <u>Value</u>		<u>Urine</u> - <u>Value</u>
Hb% - 9.5gm%	Alb. - Nil	
TLC - 7600/cumm	Sugar - Nil	
ESR - 10mm	Micro. - NAD	
BSL(R) - 98mg/dl		

**Treatment Modality And Observations:-**

- According to *Ayurvedic* text,OSMF symptoms and signs can resembles with *vata-pitta* dominant chronic *sarvasaramukhroga*,so decided to give “*Jeshthamadsiddhatailkawaldharan*” *Jeshthamadh siddha tail*<sup>12</sup> –
- Prepared by –*samanya sneha siddhi kalpana*. *Kalka dravya - Jeshthamadh kalka* -10gm. *Sneha dravya –Tiltail* -40ml. *Liquid - Jeshthamadh kwath* -160ml.

Time of kawaldharan :Twice a day1. At morning and 2. At evening

**Duration:-** 1 month

**Assessment After treatment:-**

Assessment Criteria	Before treatment	After Treatment
1. 1. <i>Mukhdah</i> (Burning sensation in mouth)	2	0
2. Ulceration In mouth	2	0
3.Colour of oral Mucosa	1	0
4.Mouth opening	2	1

**Result and Discussion:-**

In above case study,patientgot relief from signs andsymptoms of OSMF.

*Jeshthamadh* having *vata-pittaghna* and *vranaropan* and *shodhan karya*<sup>13</sup>.

- According to modern research,*Jeshthmadh* contain liquorice which have properties like anti-inflammatory,anti-microbial,analgesic and immune modulatory.
- The compound glycyrrhizin plays key role in healing ulcers of mouth.
- As well as *til-tail*<sup>14</sup> having *vrana sandhan* and *sukshma*<sup>15</sup> properties(enters minute channels).
- Thus by doing *Jeshthamadh kawaldharan*,oral mucosa get nourishes by increasing blood circulation and tissue vascularity.
- It also gives physiotherapy,which needed for stretching the mucosal bands.

**Conclusion:-**

- The present study proves that,*Ayurvedic*medicine has great potential and ensures the regain of the oral mucosa to normal and healthy.
- It is effective in subsiding the symptoms and signs of OSMF in same extent without any adverse effect.
- This drug can be taken as a alternative medicines for patients of OSMF for better compliance.

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### RESEARCH ARTICLE

## ONE YEAR STOCK PRICE PREDICTION AND ITS VALIDITY USING LEAST SQUARE METHOD IN MATLAB.

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LQ45, blue chip stock, time series data, two LQ45's criteria, interpolation, least square method, polynomial, extrapolation, relative RMSE.

#### Abstract

Given time series data of 43 LQ45's monthly stocks price during the period January 2013 to December 2013; this research interpolates the data into best polynomials as many the stocks, with each RMSE (root mean square error) representing degree of investment risk. The polynomial also is used to extrapolate (i.e. to predict) the next months stock price during the period January 2015 to January 2016; finally the prediction prices is compared with the 13 monthly actual prices and their RMSE (root mean square error) are computed. The computations are run in MATLAB (Matrix Laboratory) programming language implementing the curve fitting procedure based on least square method. The important results of computations are following: (1) degree of polynomials are in the range [28, 97] of maximum 100, with average 73.7209, (2) relative RMSE of interpolation (RMSE-i) are in the range [0.2248%, 2.6804%] with average 0.6719%, (3) relative RMSE of extrapolation (RMSE-e) are in the range [2.1838%, 56.9015%] with average 11.5455%. The average of relative RMSE-e is small enough; it means that the risk for 13 months investment during the period January 2015 to January 2016 is small enough. The value of relative RMSE-e also explains why a stock is removed from or still in LQ45 index, and this is valid for 40 of 43 stocks.

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#### Introduction:-

Trend of stock price changing, i.e. the time series of the price, is interesting information for investor in investing his or her money in the stock; the others information that should be considered is performance of the associated company which is shown by its financial report, cash flow, and equity changing (Brigham, 2004; Xiao, 2014; Jianfeng, 2014). The expected (or predicted) stock price at certain future time, which is a continuum of the trend, can be derived from the time series using some prediction technique such as interpolation (curve fitting) one; this predicted price has some uncertainty that represents the risk of investment in the stock.

In this paper, the time series data is monthly stock price one of LQ45 index, released by IDX (Indonesian Stock Exchange). IDX has about twenties indexes such as LQ45 Index, Kompas100 Index, Jakarta Islamic Index, and InfoBank15. Some of the indexes consist of blue chip stocks, i.e. the stocks with stable return, issued by well-known and well-established companies having small liability and high liquidity (Investopedia, 2016). The monthly time series data can be interpolated to get the best polynomial, i.e. the one of certain degree with minimal relative RMSE

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(root mean square error); this relative RMSE represents the risk of investment in the stock. The polynomial actually is an extrapolator to get the prediction price of the stock, together with its relative RMSE, at certain future months.

The objective of the research is *to investigate validity of one year stock price prediction*, especially of 43 blue chip stocks which are member of LQ45 index defined in period of February 2015 - July 2015<sup>1)</sup>, here validity means degree of accordance of the prediction values and the actual ones, also to investigate why a stock is removed from or still in LQ45 index. The monthly data are the prices during the period January 2013 to December 2014. This historical data is interpolated to get the best polynomial for each stock; the chosen polynomial is the best one, i.e. the polynomial with certain degree over interval [1,100] having minimal relative interpolation-RMSE (RMSE-i). Each chosen polynomial is then used to extrapolate the stock price during the period January 2015 to January 2016; the resulted stock price is then compared with its actual data and the relative extrapolation-RMSE (RMSE-e) is determined; *the relative RMSE-e shows the validity of prediction* which in turn gives guidance for investor to keep track of his or her investment in the stock.

## Research Methodology:-

### LQ45 Index:-

Many blue chip stocks are member of famous indexes in IDX like LQ45, however not all member of LQ45 are blue chip stocks. A stock is member of LQ45 at a period if it fulfills the following “two LQ45’s criteria” (Fakhrudin, 2006):

#### for the first 30 stocks:-

- listed in IDX at least for 3 months
- the biggest 30 stocks in regular market trading

#### For the next 15 stocks:-

- part of 25 active stocks with the greatest number of trading days in regular market,
- then, part of 20 stocks with highest transaction value and frequency,
- finally, part of 15 stocks with biggest market capitalization

Membership each stock in LQ45 is evaluated every February and August. In August 2015, for example, two stocks with (in this research) codes “05” and “06” (ANTM, Aneka Tambang (Persero) Tbk, and CTRA, Ciputra Development Tbk, respectively) are removed from LQ45 and replaced by SRIL (Sri Rejeki Isman Tbk) and WTON (Wijaya Karya Beton Tbk), while in February 2016 stocks “17” (EXCL, XL Axiata Tbk), “23” (ITMG, Indo Tambangraya Megah Tbk), and WTON (Wijaya Karya Beton Tbk), are replaced by ANTM (Aneka Tambang (Persero) Tbk), HSMP (PT HM Sampoerna Tbk), dan MYRK (PT Hanson International Tbk) masuk (Febri, 2016; Kabar, 2016). Note that WTON is not one of 43 stocks under consideration in this research.

### Least Square Method:-

Given  $m$  pairs data  $(x_i, y_i)$ ; least square method constructs polynomial of degree  $n$ , i.e.  $p_n(x) = a_0 + a_1x + a_2x^2 + \dots + a_nx^n$ , i.e. to get the coefficients  $a_0, a_1, a_2, \dots, a_n$ , with following “least square procedure”:

- compute  $\sum_i x_i, \sum_i x_i^2, \sum_i x_i^3, \dots, \sum_i x_i^{2n}$
- compute  $\sum_i y_i, \sum_i x_i y_i, \sum_i x_i^2 y_i, \sum_i x_i^3 y_i, \dots, \sum_i x_i^n y_i$
- construct the following linear system:

$$\begin{pmatrix} m & \sum_i x_i & \sum_i x_i^2 & \cdots & \sum_i x_i^n \\ \sum_i x_i & \sum_i x_i^2 & \sum_i x_i^3 & \cdots & \sum_i x_i^{n+1} \\ \sum_i x_i^2 & \sum_i x_i^3 & \sum_i x_i^4 & \cdots & \sum_i x_i^{n+2} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \sum_i x_i^n & \sum_i x_i^{n+1} & \sum_i x_i^{n+2} & \cdots & \sum_i x_i^{2n} \end{pmatrix} \begin{pmatrix} a_0 \\ a_1 \\ a_2 \\ \vdots \\ a_n \end{pmatrix} = \begin{pmatrix} \sum_i y_i \\ \sum_i x_i y_i \\ \sum_i x_i^2 y_i \\ \vdots \\ \sum_i x_i^n y_i \end{pmatrix} \Leftrightarrow MA = B \quad (1)$$

<sup>1)</sup> Two of 45 stocks, i.e. SILO (Siloam International Hospital Tbk) and SSMS (Sawit Sumbermas Sarana Tbk), do not included in this research because of incompleteness data.

4. solve the linear system for  $A = [a_0, a_1, a_2, \dots, a_n]^T$ , where  $X^T$  is transpose matrix of  $X$ .

In MATLAB environment the 3-rd and 4-th steps are executed in two following instructions:

$$1. \text{ assign } M = \begin{pmatrix} m & \sum_i x_i & \sum_i x_i^2 & \dots & \sum_i x_i^n \\ \sum_i x_i & \sum_i x_i^2 & \sum_i x_i^3 & \dots & \sum_i x_i^{n+1} \\ \sum_i x_i^2 & \sum_i x_i^3 & \sum_i x_i^4 & \dots & \sum_i x_i^{n+2} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \sum_i x_i^n & \sum_i x_i^{n+1} & \sum_i x_i^{n+2} & \dots & \sum_i x_i^{2n} \end{pmatrix}, B = \begin{pmatrix} \sum_i y_i \\ \sum_i x_i y_i \\ \sum_i x_i^2 y_i \\ \vdots \\ \sum_i x_i^n y_i \end{pmatrix}$$

2.  $A = M \setminus B$

In this research the input is matrix  $M$  of size  $24 \times 43$  where the cell of  $i$ -th row and  $j$ -th column holds the prices of  $i$ -th month of  $j$ -th stock; the matrix is shown by Table 1.

**Table 1:-** Format of the monthly price data of 43 stocks for 2 years

Month	Price of Stock-1	Price of Stock-2	.....	Price of Stock-43
$x_1 = 1$	$y_{1,1}$	$y_{1,2}$	.....	$y_{1,43}$
$x_2 = 2$	$y_{2,1}$	$y_{2,2}$	.....	$y_{2,43}$
$\vdots$	$\vdots$	$\vdots$	$\ddots$	$\vdots$
$x_{24} = 24$	$y_{24,1}$	$y_{24,2}$	.....	$y_{24,43}$

**Computation Algorithm:-**

Let “dt1314.mat” be MATLAB file that holds matrix  $M$  of size  $24 \times 43$ , i.e. the prices of 43 stocks during the period January 2013 to December 2014, and “dt156.mat” MATLAB file that holds matrix  $M1$  of size  $13 \times 43$ , i.e. the prices of 43 stocks during the period January 2015 to January 2016; this algorithm construct 43 best polynomials, one for each stock, and so on, an finally compute each relative-RMSE-i and relative-RMSE-e:

**Compute relative-RMSE-i and get the degree deg of the best polynomial:-**

for stock  $j = 1$  to 43 do

1.  $x_j = [1:24]$ ,  $y_j = dt1314(1:24,j)$
2. for degree of polynomial  $n = 1$  to 100 do
  - a. construct matrix  $S$  and vector  $B$  of equation (1) in Section 2.2
  - b. solve the linear system  $SA = B$  for  $A = [a_0, a_1, \dots, a_n]$
  - c. for  $i = 1$  to 24, compute interpolation price  $y_{j,int} = a_0 + a_1x + a_2x^2 + \dots + a_n x^n$
  - d. compute relative RMSE-i(n) between  $y_j$  and  $y_{j,int}$
3. find the minimum relative RMSE-i(n) and get the degree deg of that best polynomial

**Compute relative-RMSE-e for the best polynomial of degree deg:-**

for stock  $j = 1$  to 43 do

1.  $x_j = [1:13]$ ,  $y_j = dt156(1:13,j)$
2. for  $i = 1$  to 13, compute extrapolation price  $y_{j,ext} = a_0 + a_1x + a_2x^2 + \dots + a_n x^d$
3. compute relative RMSE-e between  $y_j$  and  $y_{j,ext}$

**Result and Discussion:-**

Main outputs of computation of every stock are: degree deg of the best polynomial, the relative RMSR-i, the relative RMSR-e, the curves of interpolation and extrapolation. Following are the statistic of the output:

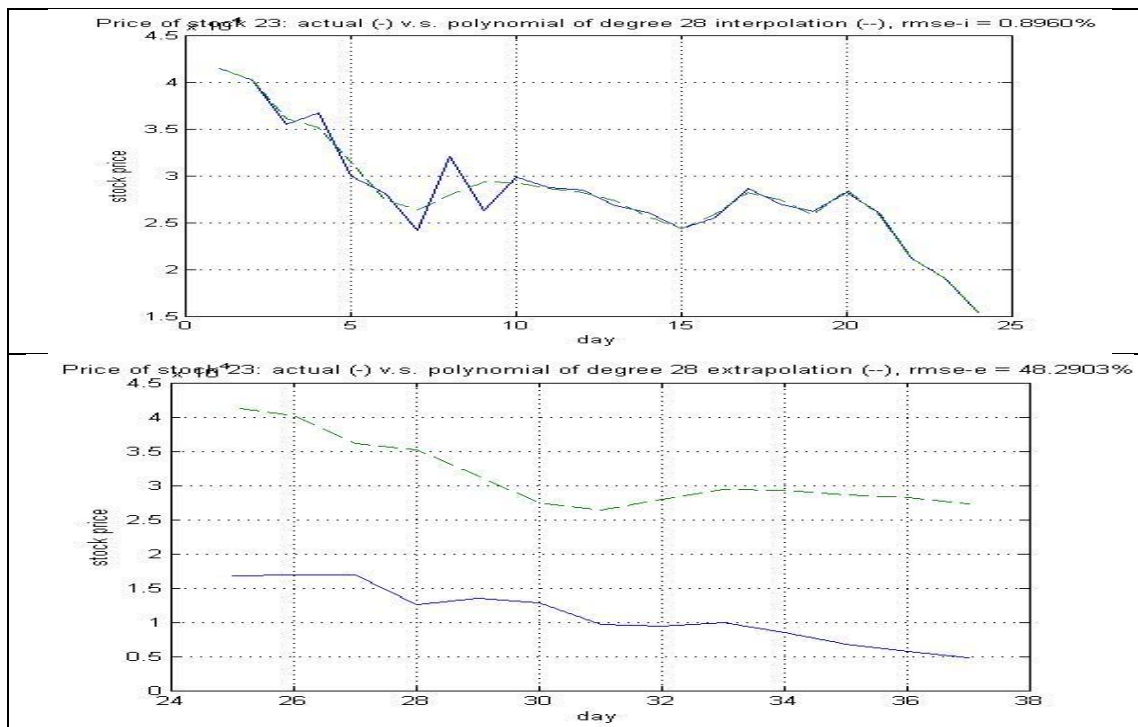
1. The interval of degree of the best polynomials is [28, 97] with average 73.7209.
2. The interval of the relative RMSE-i is [0.2248%, 2.6804%] with average 0.6719%.
3. The interval of the relative RMSE-e is [2.1838%, 56.9015%] with average 11.5455%.

The average of relative RMSE-e of all 43 stocks is small enough; it indicates that *investment in the stocks on average is save enough*. The complete statistic is shown in the Table 2.

Table 2 also tells more information like follow. As is stated in the previous section, two stock namely “05” and “16” are removed from LQ45 on August 2015 while “17” and “23” are removed on February 2016; Table 2 shows that the relative RMSE-e of the four stocks are, respectively, 29.7395%, 7.3793%, 9.4617%, and 48.2903%. The relative RMSE-e of stocks “01” and “23” give a reason why the two stocks are removed. However the relative RMSE-e of the two rest actually are small enough, below the average, so, in these cases, the relative RMSE-e is not sufficient to become the reason of the removing; there is other reason, of course, to make the “two LQ45’s criteria” are hold, and the reason is beyond the scope of the research. Also relative RMSE-e analysis fails to explain why stock “39” still in LQ45 index.

**Table 2:-** Degree of the best polynomial (deg), relative RMSE-i (%), and relative RMSE-e (%) of each of 43 stocks. Average(deg) is 73.7209, average(relative RMSE-i) is 0.6719%, and average(relative RMSE-e) is 11.5455%. The bold text indicate the removed stock fro LQ45.

No	deg	RMSE-i	RMSE-e	No	deg	RMSE-i	RMSE-e	No	deg	RMSE-i	RMSE-e
01	97	0.9205	6.3036	<b>16</b>	<b>95</b>	<b>0.8179</b>	<b>7.3793</b>	31	97	0.3743	13.5326
02	80	0.9227	9.0233	<b>17</b>	<b>49</b>	<b>0.2248</b>	<b>9.4617</b>	32	93	0.8519	17.4633
03	60	0.6751	15.9618	18	97	0.3895	4.4632	33	80	0.7535	18.7823
04	37	0.3909	7.3283	19	77	0.4072	7.0916	34	97	0.7672	8.5405
<b>05</b>	<b>72</b>	<b>0.6073</b>	<b>29.7395</b>	20	37	0.4764	8.3784	35	97	0.4414	4.6256
06	84	0.3459	2.1838	21	60	0.3285	4.5545	36	80	0.4336	9.1012
07	95	0.8046	15.9732	22	97	0.5881	2.9206	37	54	1.3913	10.6823
08	60	0.4150	6.5224	<b>23</b>	<b>28</b>	<b>0.8960</b>	<b>48.2903</b>	38	80	0.4396	8.9642
09	74	0.5415	6.7029	24	50	0.2561	3.8816	39	69	2.6804	56.9015
10	74	0.5673	7.7924	25	97	0.3932	6.5289	40	64	0.3363	3.7506
11	97	0.3502	8.5664	26	60	1.0949	5.1224	41	87	0.2665	8.1895
12	74	0.5637	3.6122	27	69	0.6812	13.0897	42	76	0.7175	10.5502
13	42	0.8210	18.2026	28	50	1.1610	6.2316	43	80	1.1097	17.4144
14	80	0.7973	5.3651	29	84	0.5055	11.8445				
15	60	0.7457	13.3012	30	80	0.6384	12.1394				



**Figure 1:-** Stock “23” (ITMG, Indo Tambangraya Megah Tbk) has the smallest degree of interpolation, i.e. 28, but its relative RMSE-e almost 50%. This stock is removed from the LQ45 in February 2016.

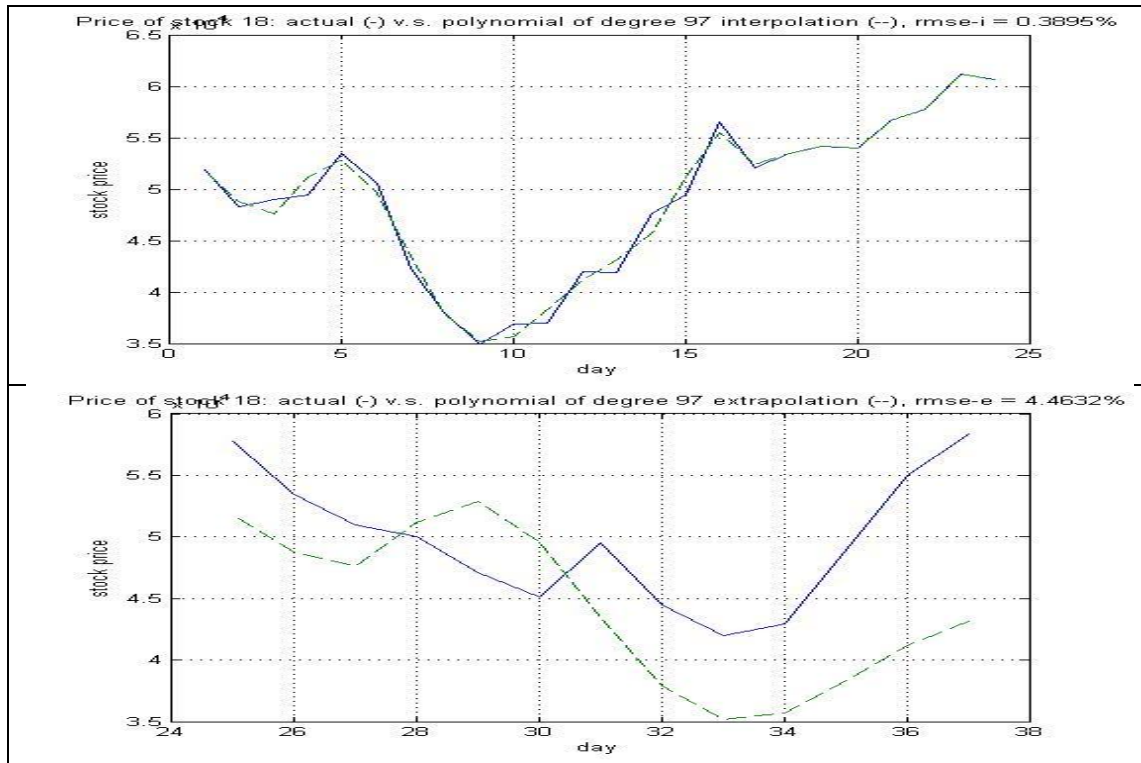


Figure 2:- Stock “18” (GGRM, Gudam Garam Tbk) is the stock having the largest degree of polynomial and relative RMSE-e less than 5%. This stock is saved in LQ45 in February 2016.

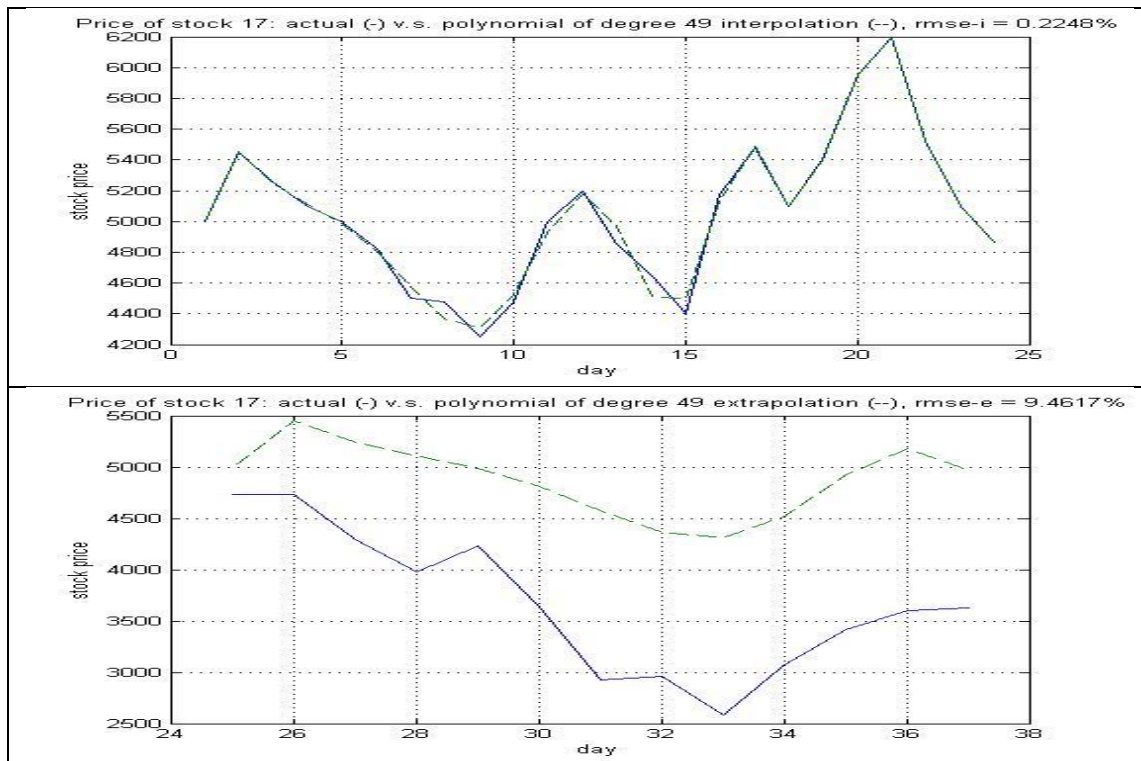


Figure 3:- Stock “17” (EXCL, XL Axiata Tbk) has smallest relative RMSE-i and relative RMSE-e small enough, below 10%. However this stock is removed from LQ45 in February 2016.

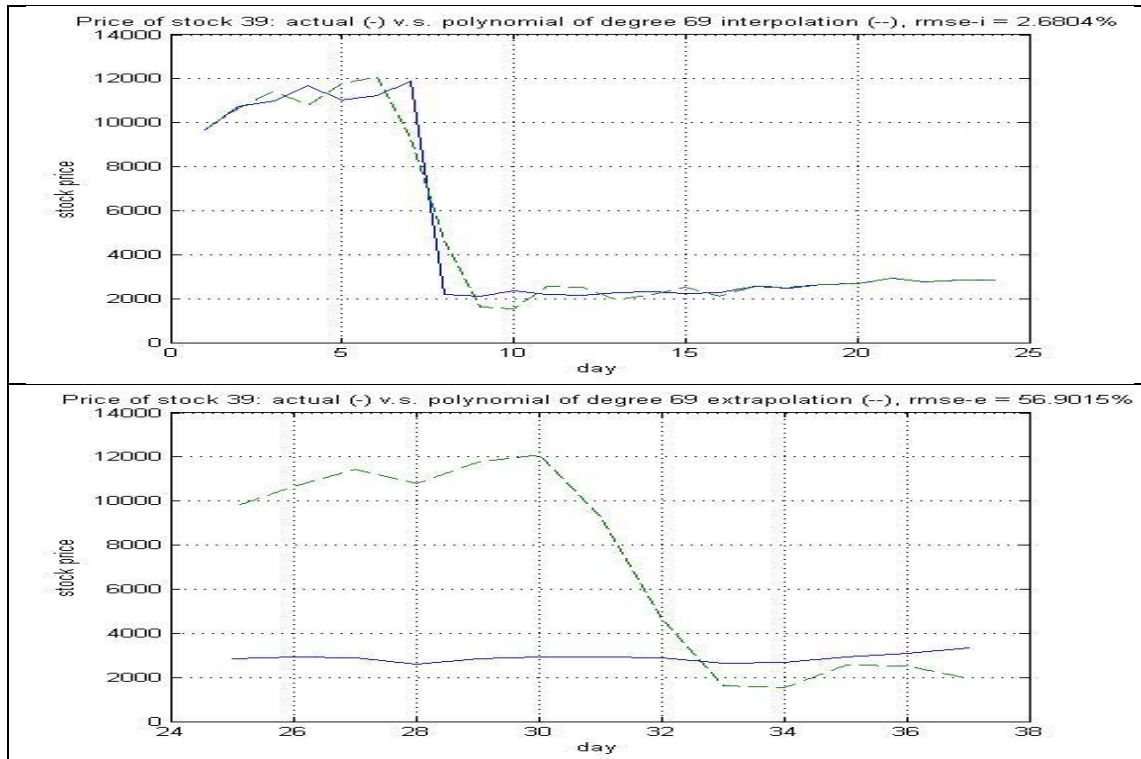


Figure 4:- Stock “39” (TLKM, Telekomunikasi Indonesia (Persero) Tbk) has largest both relative RMSE-i and relative RMSE-e; however this stock save in LQ45 in February 2016.

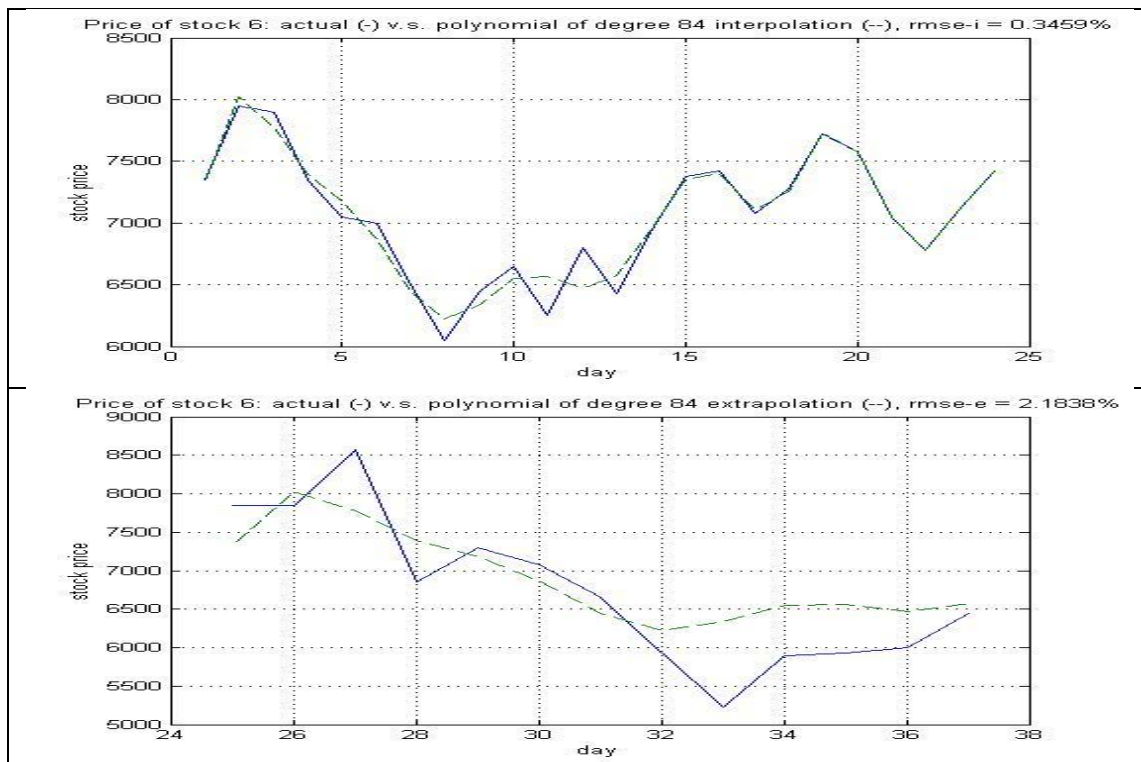


Figure 5:- Stock “6” (ASII, Astra International Tbk) has smallest relative RMSE-e. This stock is save in LQ45 in February 2016.



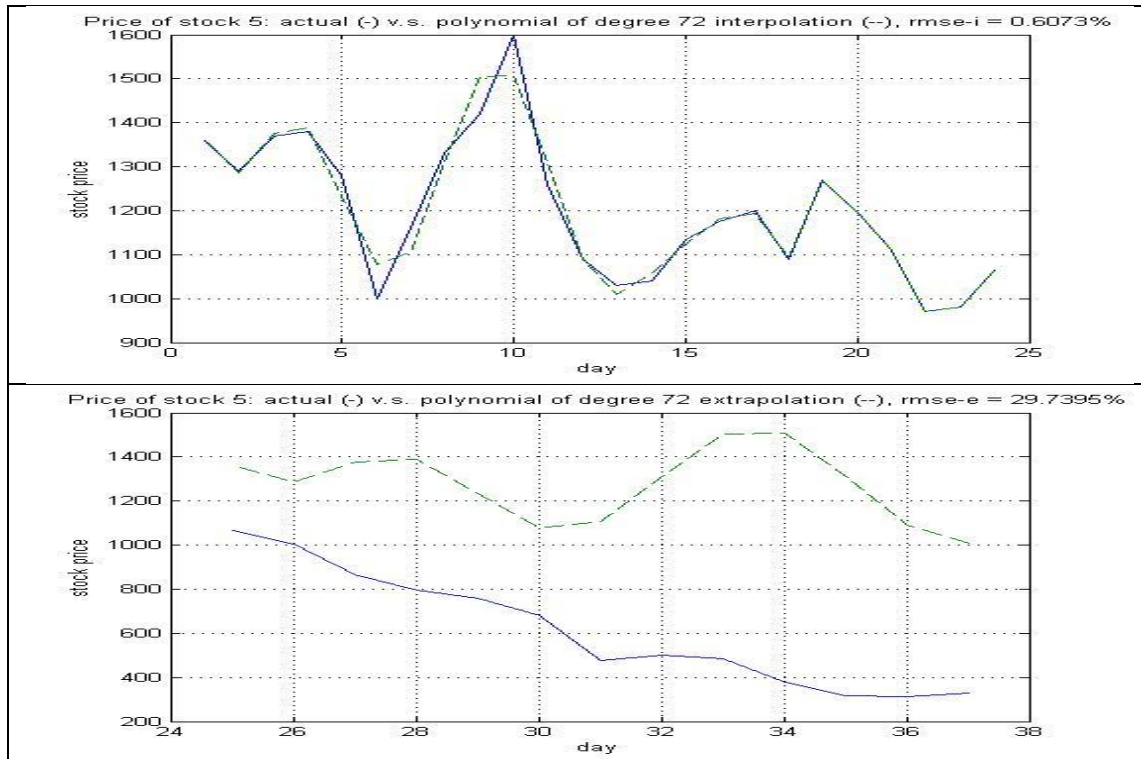


Figure 6:- Stock “5” (ANTM, Aneka Tambang (Persero) Tbk) has large relative RMSE-e. This stock is removed from LQ45 in August 2015.

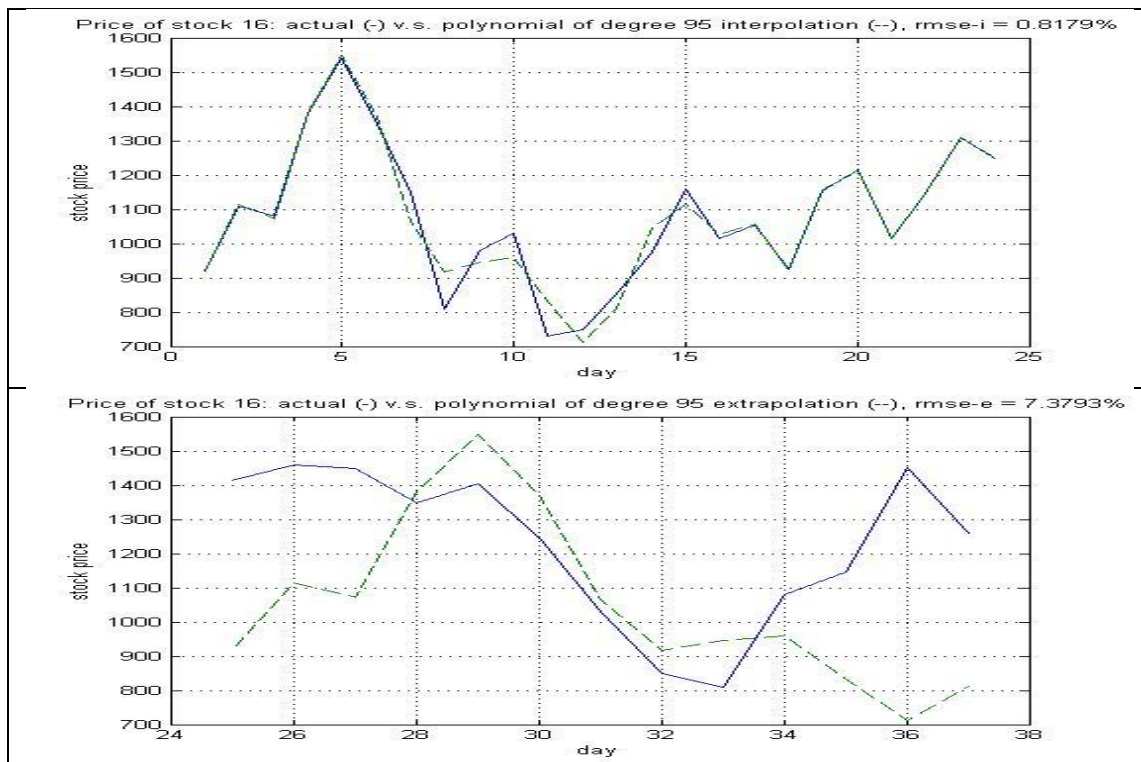


Figure 7:- Stock 16 (CTRA, Ciputra Development Tbk) has relative RMSE-e large enough. This stock is removed from LQ45 in August 2015.

Figure 1 until 7 shows seven selected stocks with variation of degree of the best polynomial, value of relative RMSE-i, and value of relative RMSE-i, represent all of 43 stocks. Figure 1, Figure 2, Figure 5, Figure 6, and Figure 7 show the stocks of which their relative RMSE-i determine their membership in LQ45 while Figure 3 and Figure 4 has anomaly in the sense of value of relative RMSE-i.

### Conclusion:-

1. The average of relative RMSE-e of all 43 stocks is small enough; it indicates that *investment in the stocks for 13 months on average is save enough*.
2. With the average of relative RMSE-e which is 11.5455%, 40 of 43 stocks can be explained why a stock is removed from LQ45 or still save in it, i.e. because the RMSE-much larger than the average or about the average, respectively.

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### RESEARCH ARTICLE

#### INTELLIGENT RECOMMENDATION SYSTEM.

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#### Abstract

Searching for articles of interest on publication sites can be difficult and time-consuming. Sometimes it takes lot of efforts to find the most relevant article because of which the reader loses interest completely. Recommender systems help the users find articles of their interest with personalized suggestions. In this paper, Hybrid Recommender System is implemented which is a novel combination of content-based filtering, collaborative filtering, trending article algorithm and user persona and recommend articles considering all the possible factors. User short-term interest is catered by suggesting trending articles while long-term interest is catered by observing what kind of content the user prefers to read and by finding out similar users and recommend what they are reading. The model makes the recommendation based on tags assigned to each article and knowledge of articles read by each user. This model doesn't require ratings of articles by each user as generally users usually don't rate article after reading them as compared to giving rating to movies after watching. The model built takes into consideration many aspects including the trend emerging at current time as well the interest of the user, the time period, geographical location, browsing history etc. then make recommendations accordingly.

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#### Introduction:-

Articles in huge numbers are published every day across different categories. The information portal sites include articles of categories like stock markets, finance, banking, insurance, entertainment, social feeds etc.

Web sites are deploying recommendation systems for suggesting articles to users according to their taste. A key part of the news is that user has a long-term interest in certain categories and short-term interest in recent happenings. The short-term interest of user about some recent event can be dealt by recommending the trending article of that time on the basis of view counts of articles within a particular timeframe. As far as the long-term interest of the user is concerned, the recommendation can be done on the basis of user behavior and preferences. For this purpose, content-based filtering and collaborative filtering techniques are used to generate the recommendation.

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Content-based filtering finds articles which are similar on the basis of tags assigned to each article. Each article is assigned weights on the basis of term frequency and inverse document frequency of each tag. After which user probability of reading an article is calculated. On the other hand, collaborative filtering uses the correlation between the articles on the basis of the ratings given to article by different users.

The disadvantage of content-based filtering is that it leads to over-specialization that is the recommended article is similar to already read article and may not be useful for the user. This method does not use the interaction information between users to generate recommendations.

Collaborative filtering relies on past preferences or rating correlation between users. However, this technique can lead to bad prediction if the article is unpopular and very few users have given feedback about them.

To overcome these difficulties, a hybrid model is proposed that takes into account all the possible aspects that contribute towards making the most relevant recommendation to the user.

**In this paper, we have developed a hybrid intelligent model, in which users are suggested articles on the basis of following factors:-**

**Directional Variables:-**

1. Trending Articles for a particular time period
2. Reader's interest (based on browsing history)
3. Geographical Location
4. Time Period
5. Reader's specifications (gender, age etc.)
6. Reader's behavior.
7. Other Parameters like time of log-in etc.

Considering all the above mentioned aspects and applying appropriate filtering, the most relevant recommendation is generated.

**Related work:-**

The related work done in this either uses collaborative filtering or content-based filtering for recommendations. The other factors that contribute to the recommendations is ignored, as a result of which irrelevant recommendations are made in many cases. For example if the geographical location of the reader is not considered, then he'll be recommended articles of a different nation, to which he has nothing to do. In our project, we made use of all the possible information of the user as well as of the articles to make recommendations. The most appropriate and relevant tags were assigned to the articles that considered all the data that can be extracted from the articles and summarized it. All the user attributes are considered to make the most suitable recommendation of his interest.

In Item-Based Collaborative Filtering Recommendation Algorithms [1], only collaborative filtering approach is used for recommendations that only considers the article's similarity irrespective of trending articles and other parameters.

In Personalized News Recommendation Based on Click Behavior [2], again the user behavior is considered and on the basis of past browsing history, the recommendations are made.

In Content based recommender systems [3], the ratings given by the reader is considered as an important parameter in-order to make appropriate recommendations. The interests of the reader that do not give rating to the article are left unconsidered in this case.

In order to build an intelligent system, all the possible parameters should be considered along with their weights (impact factors), that generates the most relevant recommendation for the user.

**Information Retrieval:-**

For the purpose of the recommendation of articles, a lot of data on user's reading habit and clicks counts of the article have to be extracted beforehand. In this paper, article attributes such as click counts (number of times

article is read), time-stamp (time at which article is read), article tags (different genres which tells what the article is talking about, for e.g. an article can have tags such as Stocks, Finance, Markets, Demonetization, Sports etc.) are known.

The Intelligent System developed by us was for a leading publishing house of Asia. The publishing house provided data that consisted of the following information:

1. Articles' Content
2. Articles' Ratings
3. User browsing history
4. User details
5. Article's Tags

The tags were assigned to the articles by implementing an unsupervised algorithm that assigned the most relevant tag to the articles. The algorithm implemented segmentation of Chinese characters, removal of stop words, preparation of dictionary, implementing TF-IDF concept and finally multi-stage tagging that generated the relevant tags for articles.

The information on user reading habit was provided in the form of articles read by different users. The sample dataset containing attributes of articles is shown in Table 1, dataset containing attributes of users is shown in Table 2, and dataset containing details of user is shown in Table 3.

User-ID	Login time	Articles read
U1	Male	A1,A7
U2	Female	A100
U3	Male	A12,A3

**Table 1:-** Article Attributes

Article-ID	Tags	Time of publishing	Click-count
A1	Finance, Stocks, Economy	3 <sup>rd</sup> January 2017	678
A2	Wine, Finance, Trading	8 <sup>th</sup> March 2012	8753
A3	Sports, Basketball	6 <sup>th</sup> April 1992	5300

**Table 2:-** User Attributes.

User-ID	Gender	Age	Location
U1	Male	30	G1
U2	Female	31	G2
U3	Male	45	G3

**Table 3:-** User Specifications

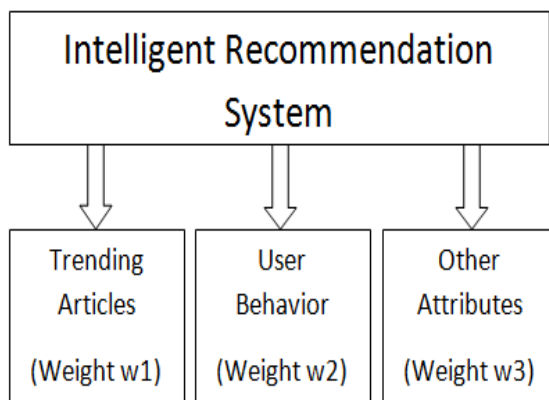
### Proposed Methodology:-

Hybrid Recommender System (HRS) suggests articles to user considering the short-term as well as the long-term interests. The different techniques that Hybrid Recommender System uses are as follows [4]:

1. For short-term interest of the user, trending articles are recommended.
2. For long-term interest of user, articles are recommended on the basis of articles read by user.
3. Other important parameters (user attributes) are considered to make recommendations.

### The following different approaches are used for the purpose of recommendation:-

- a. Content-based filtering.
- b. Item-Item Collaborative filtering.
- c. User-User Collaborative filtering.



**Figure 1:-** Recommender System Block Diagram

### **Recommending Trending Articles:-**

Recommending trending articles imply recommending the latest trending articles that has got maximum views in a given time-frame and are the most trending topics of interest. The following methods were used for recommending trending articles to the user:

Firstly, on the basis of the views (click-count) and time of publishing of the article, the trending article of last months, 30 days, 7 days, and 1 day was selected for recommendation. The first step in this is the categorization of the articles. The articles are categorized in to different categories like Business, Art, Entertainment, Education, History etc. This categorization is done on the basis of tags of articles. After the categorization is completed, the time-frame for which the trending articles will be selected is decided, that varies from category to category. For example, for the “News” category, the trending article of last 1 or 2 day is selected, for entertainment, the trending article of last 30 days can be selected, for stock market, the trending article of last 1 or 2 hour will be a relevant recommendation. The final recommendation is built after sorting of the selected categorized articles for a given time-frame, on the basis of click-counts (number of views of article) and determining article which has highest click counts in each category in given time-frame. The time-frame chosen can be last 3 months, last 30 days, last 15 days, last 7 days, last 1 day, last 1 hour etc. This technique recommends articles to users which can cater to their short-term interest.

The trending articles in Twitter as well as in other networking sites was determined for recommendation.

The trending article was further determined on the basis of user behavior. This is done by observing user's hourly, daily and weekly interests, that is, the type of article user reads at a particular time of the day, on weekdays and weekends etc. For example, if user watches news at night on weekdays, and entertainment articles on weekends, then the recommendation at these instances (that is at night on weekdays and on weekends) is built around news and entertainment. Similarly other behavior of users is observed and recommendations are built on the basis of this. In the same manner, user-user matching can also be implemented, that is recommending articles read by 1 user at a particular instant to other user that has read one or more articles in common with the 1st user but has not read other articles read by 1st user.

The trending articles obtained in step-1, step-2 and step-3 are taken and are assigned some weights ( $w_1$  to articles from step-1,  $w_2$  to articles from step-2 and  $w_3$  to articles from step-3),  $w_2$  chosen to be maximum and  $w_3$  minimum. On the basis of these weight-ages, number of recommendations and the order of these recommendations is developed.

### **Content-based filtering of Articles:**

A content-based filtering system selects items based on the correlation between the content of the items and the user's preferences as opposed to a collaborative filtering system that chooses items based on the correlation between people with similar preferences [4][5]. A genre matrix is built in which each row tells which tags a specific article contains. It can be compared as specific row of the genre matrix signifying an article 'A001' is a

k-dimensional vector, where each dimension corresponds to distinct tags and 'k' is the total number of tags in document. The dimension of matrix is  $m * k$ , where m is number of articles and k is number of distinct tags in all the m articles. A sample Article-Genre matrix is shown in Table 4.

**Table 4:-** Article Genre Matrix

Article	Chemicals	Equipment	Wine	Trading	Finance
A1	1	1	0	0	0
A2	0	0	0	0	1
A3	0	0	0	0	1
A4	0	0	0	0	1
A5	0	0	0	0	1

Another matrix 'IsRead' is built which tells whether a particular user has read the particular article or not. This matrix is given in Table 5. The dimension of the matrix is  $n * m$ , where n is the number of users and m is the number of articles. The 'User Profile' is generated from 'Genre' and 'IsRead' matrix by taking their matrix multiplication. This generated user profile gives the information of inclination of user towards particular tags. Thus each row of user profile signifies specific user's interest in various tags. The user profile matrix is  $n * k$  dimensional matrix, where n is number of users and k is number of distinct tags. The greater score of any tag against specific user signifies that the user has interest in that tag or article containing that tag as compared to article containing different tag. A sample user profile is shown in Table 6.

**Table 5:-** User Article 'Is-Read' Sample.

User-Article ID	A1	A2	A3
U1	0	1	1
U2	1	0	0

**Table 6:-** User Profile

User-ID	Automobile	Share	Wine	Finance
U1	9	5	6	10
U2	16	1	12	9
U3	12	0	0	7

For recommending articles to test user, a dot product of k-dimensional vector in user profile  $U_i$  and k-dimensional vector in genre matrix  $M_i$  is taken for test user and each article. This assigns a score to all article for particular user entirely on the basis of the tags of the article. The higher score is generated for articles which contains tags towards which test user is more inclined. The articles are sorted on the basis of score and the top articles are recommended.

**Score:** The score of every article  $m_i$  for given test user  $u_i$  is given by (1):  

$$\text{Score}(U_i, M_i) = u_i \cdot m_i \tag{1}$$

Where  $u_i$  and  $m_i$  are the k-dimensional vectors from user profile and article-genre matrix and k is the total number of distinct tags.

**Item-Item Collaborative Filtering:-**

Item-based collaborative filtering uses interaction between users to recommend articles. In the algorithm, the similarities between different items in the data-set is calculated by using one of the similarity measures, and then these similarity values are used to generate recommendation for users [6][7]. The similarity value between any two articles is measured by observing all the users who have read both the article. The similarity measure used in this paper is Pearson (correlation) based similarity. This measure is based upon how much the articles read by common user for pair of articles deviate from average times each article is read. The Pearson similarity score between article  $M_i$  and article  $M_j$  is given by (2).

$$sim(i, j) = \frac{\sum_{u \in U} (M_{u,i} - M_i)(M_{u,j} - M_j)}{\sqrt{\sum_{u \in U} (M_{u,i} - M_i)^2} \sqrt{\sum_{u \in U} (M_{u,j} - M_j)^2}} \quad (2)$$

The similarity score between any two pair of articles is calculated by calculating Pearson correlation score between the respective columns of article in user-article 'IsRead' matrix[8].

For a test user for whom we want article recommendation, similarity score of all the articles corresponding to every article read by user is added up and top-N article after sorting is recommended to the test user. This method is iterated for each user to generate the recommendation for each user. For user U1, similarity score of read articles A1, A2 and A3 given in Table 7 is added up column wise to get the score of each article. The following score is given to each article after adding up A1: 2.5, A2: 2, A3: 2, A4: -2.5, A5: -2.5. As the unread articles A004 and A005 get negative score imply that they are not similar and hence not recommended.

**Table 7:-** Similarity Scores

	A1	A2	A3	A4	A5
A1	1	0.5	1	-1	-1
A2	0.5	1	0.5	-0.5	-0.5
A3	1	0.5	1	-1	-1
A4	-1	-0.5	-1	1	1
A5	-1	-0.5	-1	1	1

#### **User-User Collaborative Filtering:-**

User-User collaborative approach applies the same idea as that of item-item collaborative filtering, but it calculates the similarity between users rather than calculating similarity score between articles [9]. A Pearson's correlation matrix of users is built based on 'IsRead' matrix i.e. on the basis of m-dimensional vector of two users in IsRead matrix, where m is total number of articles. The similarity is calculated between rows of User-Article 'Is read' matrix in Table 5. The similarity score obtained is shown in Table 8.

It is calculated using the same Pearson similarity equation (2).

**Table 8:-** User-User Correlation Matrix.

User	U1	U2	U3
U1	1	0.667	-1
U2	0.667	1	0.667
U3	-1	-0.667	1

On the basis of similarity score of users, top-N similar users of test user is generated. The articles read by all these similar user is used for building recommendation to test user. The articles read by similar user of test user for the purpose of recommendation to test user can be sorted in order by popularity using click counts of article.

#### **Other Attributes Filtering:-**

**The recommendations obtained from the aforementioned methods are further filtered on the basis of following factors:-**

1. Geographical location
2. Date and Time
3. User Attributes (Age, Gender etc.)

#### **Observations and Results:-**

The different recommendations generated using A,B,C,D are further assigned different weights and then the overall recommendation is generated considering all the possible factors. The weights to each article obtained through different steps are assigned according to "Design of Experiments" principle.

**Table 9:-** Weighted Recommendation Table

Recommendations	Weight
Step-A recommendations	0.42
Step-B recommendations	0.42
Step-C recommendations	0.08
Step-D recommendations	0.08

The final recommendation is made on the basis of the obtained weights for each recommendation obtained using the proposed algorithm.

The response rate obtained in case of Hybrid system is much better as compared to that obtained in case of collaborative and content-based filtering individually.

Response rate is given by (3):

$$\text{Response Rate} = \frac{\text{No. of relevant recommendations}}{\text{Total no. of recommendations}} \quad (3)$$

The number of relevant recommendations included the number of articles (from the set of recommended articles) that were read (clicked) by the user.

In order to test our hybrid model and make comparison, the experiment was performed for 100 users. A set of these 100 users was taken, and all the data related to the user was considered. The user attributes were collected as well as the articles read by user was found out. After this we made 5 recommendations each using content-based filtering, collaborative filtering and the using the hybrid model. Then we observed the clicks by user within next 24 hours span of time.

In order to obtain a comparison a design of experiments model was constructed and following steps were implemented:

1. Firstly the recommendations were generated by applying content-based filtering on the articles and then the response rate was calculated. This was done by observing the number of articles (from the set of recommended articles), that was read (clicked on) by the user.
2. Secondly the response rate was calculated by generating recommendations on the basis of collaborative filtering.
3. Finally the response rate was calculated for the recommendations generated on the basis of the Hybrid model and the result obtained in all the 3 cases was tabulated in Table 10.
4. For the 5 recommendations made in case of content-based filtering, the user clicked on 2 recommendations giving response rate of 40%.
5. For the 5 recommendations made in collaborative filtering, the user clicked on 2 recommendations again giving response rate of 40%.
6. In case of hybrid model, the user clicked on 4 recommendations out of 5 made, giving the highest response rate of 80%.
7. The similar procedure was followed for all the 100 users and average response rate was calculated for each category, the results are tabulated in Table 10.

**Table 10:-** Comparison Table.

Approach	Response Rate
Content-based	0.44
Collaborative	0.48
Hybrid Model	0.85

**Conclusion:-**

The model proposed in this paper is a hybrid one, that has made improvements in different sections for generating overall relevant recommendations, taking into account all the factors that can contribute to the same. In this paper, implicit feedback of user for an article is used, which observes action of users whether or not user has read that article. If user gives an explicit feedback such as rating an article, liking an article or sharing an article, it would generate better recommendation as compared to implicit feedback. Another way of tracking user behavior is by storing the time spent by user on every article that he read.

Also, if there exist term frequency of every tags, TF-IDF (Tag Frequency-Inverse Document Frequency) method can be used. In this method, weights of each article according to frequency a particular tag in that article and IDF (inverse document frequency) which tells how frequent that tag has occurred in all articles. The product of k-dimensional vector of user profile and k-dimensional weights of each article is calculated to generate similar article based on content. In the method of collaborative filtering, Pearson correlation matrix is used for calculating similarity between articles and between users. As the variable is dichotomous, other methods of similarity such as Jaccard-Needham, Yule, and Kulzinsky give a better result as compared to Pearson correlation coefficient [9].

The exclusion of the articles for recommendation that has already been read by user also varies according to the category of the article. There can be some articles that the user will want to read more than once for example if it is a lengthy article, or some historical one or else of deep interest or Education related and need to read more than once for grasping completely.

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### RESEARCH ARTICLE

#### A COMPARITIVE STUDY ON EFFECTS OF RADIO CONTRAST ENHANCED COMPUTED TOMOGRAPHY OF THE RENAL SYSTEM BETWEEN CONTROLLED, DIABETIC AND HYPERTENSIVE PATIENTS.

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#### Manuscript History

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#### Abstract

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#### Introduction:-

Contrast media are increasingly used in diagnostic imaging procedures. This result in the rising incidence of iatrogenic renal function impairment caused by the exposure to CM, a condition known as "contrast-induced nephropathy" (CIN). Patients with an acute deterioration in renal function after contrast administration are at risk for chronic kidney disease as well as renal failure requiring dialysis. Radiographic CM is responsible for 11% of cases of hospital-acquired renal insufficiency, the third most common cause of renal failure. There is need to study the differential affect of contrast media in different patient population especially in diabetics and hypertensive's. The result of the study may share light on incidence of CIN, its prognosis and identification of risk factors in study population.

#### Aims & Objectives:-

1. To study the effect of contrast agents on renal function based on serum creatinine and creatinine clearance in patients without a pre-existing renal disease.
2. To evaluate the effect of contrast agents on renal functions based on serum creatinine and creatinine clearance in patients with diabetes who are well controlled on medications.
3. To evaluate the effect of contrast agents on renal functions based on serum creatinine and creatinine clearance in patients with hypertension who are well controlled on medications.

#### Materials & Methods:-

After prior approval from institutional ethical clearance committee, the study is conducted in department of pharmacology, D Y Patil University in the patients who are going for use of contrast media and CT scan of renal system.

#### Study design:-

It is a prospective longitudinal comparative study conducted in patients assigned in three groups controlled, diabetic and hypertensive.

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**Inclusion criteria:-**

- All patients without a pre-existing renal disease
- Diabetic patients well controlled with oral medications
- Hypertensive patients well controlled with oral medications.

**Exclusion criteria:-**

- Un co-operative patients
- Patients with pre-existing renal disease if creatinine more than 1.6 mg%.
- Patients allergic to contrast media
- Pregnant patients

**Data collection:-**

Patients who would be satisfying inclusion and exclusion criteria and willing to give informed consent would be included for the research. History would be taken as per the data recording sheet, investigations would be done to assess contrast induced nephropathy and before the procedure blood urea levels and serum creatinine levels would be measured then patient would be injected low osmolar nonionic contrast media intravenously in the dose of 1.5 ml/kg body weight. After the 48-72 hrs procedure repeat creatinine and creatinine clearance would be measured.

**Result and Conclusion:-**

Study is going on and patients are included as per the criteria. Data would be analyzed and part of the study would be presented at the time of presentation.



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**RESEARCH ARTICLE**

**STRAIN SUPERVISION THROUGH YOGA.**

**Kiran Singh.**

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**Abstract**

Thousands of years ago originated in India and in present day age, awareness was observed in health and natural remedies along people by yoga and pranayama which has been proven and effective method for improving health in addition to prevention and management of diseases, with increases scientific research in yoga. Its therapeutic aspects are also in explode. Yoga is reported to reduce stress and anxiety, improves autonomy function by triggering neuro hormonal by supersession sympatric activity and even, ow-a-days several reports suggested yoga is beneficial for physical health of cancer patients , such global reorganization of yoga also testifies to India's growing culture influence.

Today, yoga beginning a subject of various interests as gained worldwide popularity. It can serve as an applied science in a number of fields such as education, physical education and sports. Health and family welfare , psychology and medicine and also one of the valuable means for the development of human resources for better performance and productivity, however, there exists controversy in accepting yoga as medicine and therapy because it has generally believed that yoga is a spiritual science having emancipation as goals and hence cannot be treated only as a therapy.

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**The Eight Limbs Of Yoga:-**

1. YAMA
2. NIYAM
3. ASAN
4. PRANAYAM
5. PRATYAHAR
6. DHARANA
7. DHYAN
8. SAMADHI

**Yama:-**

Five ethical guidelines regarding moral behavior towards others.

1. Ahinsa –nonviolence
2. Satya-Truthfulness
3. Asteya-Nonstealing

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4. Brahmacharya- No lust or sexual activity within marriage .
5. Aparigraha- Don't collect things that are not necessary.

**Niyam:-**

Five ethical guidelines regarding moral behavior towards others.

1. Sauch- clearliness
2. santosh- contentment
3. Tapsya- sustained practice
4. Svadhyay – self study
5. Ishvara prindhan- surrender to god.

**Asana:-**

Practice of yoga postures.

**Ayampran:-**

Practice of breathing exercises.

**Pratyahar:-**

Withdrawl of the senses, meaning that the exterior world is not a distraction from the interior world within oneself.

**Dharana**

Concentration , the ability to focus on something uninterrupted by external or internal distraction.

**Dhyana:-**

Meditation.

**Samadhi:-**

Bliss building upon dhyana, the transcendence of the self through meditation. The merging of self with the universe.

**Strain:-**

- The wear and tear our bodies experience.
- The state of threatened homeostasis.
- Stressors cause imbalance.
- Body tries to balance.
- Yoga can be great help balance the imbalance.

**Stressors:-**

- Can be positive and negative.
- Positive stressors can help compel us to action, can result in a new perspective. Eg. Birth of a new baby, a job promotion.
- Negative stressor can result in feeling of distrust, rejection, anger etc. eg. Loosing a job.

**Clinical significance of yoga:-**

- Reduced stress
- Spiritual growth
- Sense of well being
- Reduced anxiety and muscle tension
- Increased strength and flexibility
- Slowed aging
- Sound sleep
- Improve many medical condition
- Lower heart rate
- Lower blood pressure
- Allergy and asthma symptom relief
- Smoking cessation help

**Strain and healthcare providers:-**

- Providing care to others is a rich and rewarding experience.
- Often feel improved self esteem and confidence.
- No wonder they live under tremendous stress.
- Continuous exposure to suffering.
- Decreased sleep and food.
- Long hours of work.
- Constant worry about law suits.

**How yoga can help:-**

- Practicing yoga can be a best thing a provider can do for himself/ herself.
- Doing simple pranayam(breathing technique) in breaks can calm their mind.
- Practicing yoga for ½ hr. a day can make their body fit to take care of others.
- Yogic thought process will teach not to work only for money.

**Conclusion:-**

- A body with a stressful mind cannot be healthy body.
- Off course , to do so , first they need healthy body without a stressful mind.
- Yoga helps the mind to become clear and pure and clear mind is not affected by strain.

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### RESEARCH ARTICLE

#### ANALYSIS OF STOCK SPLIT AND CORPORATE FINANCIAL PERFORMANCE IN INDONESIAN STOCK EXCHANGE.

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#### Manuscript Info

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##### Key words:-

share solution, earning per share.

#### Abstract

Stock split solution is one of the capital restructure forms which was executed by a company caused split effect, that is a company execution which caused the rise of stock amount which spread proportionally more than the rise of company wealth. The research purpose is to analyze finance performance and the expensive share cost in the decision of stock split. Emiten which was included sample clasified to two, namely one executed stock split in the term of Januari 2011-December 2012 and one did not execute share solution in the term. The number of sample emitten is 13 emitten cosisted of 6 emiten which executed stock split, have net profit data, earning per share (EPS), price to book value (PBV), and price to earning ratio (PER). Analysis device was ANOVA. The research result showed that there was no significant difference finance performance between company which executed share solution and company did not execute stock split, and no significant differenece expensive share price between company which executed stock split and company which did not execute stock split.

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#### Background:-

Competitive conditions currently require companies to constantly develop the company through certain strategies. This is to support the improvement of performance and maintain the existence of the company in the community. One of the efforts to become the bigger and stronger company is through expansion. The company as an entity, generally, oriented towards achieving maximum profit. The right and good setting the management of capital structure will help the course of the activity. Capital structure has an important role for the company both in a critical condition and in a healthy condition to finance its operations. The decision to increase or decrease the capital structure carries different consequences on the profit of companies in the future (Smith, 1990). The company's ability to achieve the maximum profit is only enabled if the company's performance is getting better. Investors or potential investors will be interested in return (rate of profit) expected for the future relative to the risk of the company, and the benefits can compensate for the additional risk that arises (Myers, 1984). The increased performance of the company is expected to maximize the wealth of shareholders, in this case there are two approaches in describing the purpose of shareholder wealth maximization into more detailed objectives, namely through the risk-sharing approach and the liquidity-profitability approach (Hampton, 1989). Capital market, in its operation, provides the opportunity for a company that has grown well to issue securities. In this case the company will get additional funds from the public for the company's development as well as to improve the company's capital structure. The increase of financial funding sources will increase the company size, the larger the size of the company will be more and more

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alternatives the company can choose in order to optimize its performance. Large-scale enterprise has several advantages. First, the securities of large companies reflects the assets easily traded so that more liquid and have low risk (Crutchley and Hansen, 1989); second, the size of a large company happens due to the process from time to time that reflect the success of the company's performance in the past and are also useful as an indicator on the performance of the company in the future so that the relatively lower risk of bankruptcy; third, large companies have economies of scale that allow it to operate more efficiently.

### **Matherials And Methods:-**

Stock split can be meant as splitting a sheet of stock into several sheets of shares. Stock split resulted in the increase in the number of shares outstanding without a sale and purchase transactions that change the amount of capital, the price per share is equal to  $1/n$  of the price before splitting. With the stock split, the number of shares increased through a reduction in the value of shares proportionally. The main purpose of stock splits is to put stock in a more attractive trading range, which is expected to attract more buyers (Van Horne and Wachowicz, 2012). Action of stock split takes effect for investors, because they will feel as though become more prosperous due to they hold shares in more number, so the stock split is actually an act of a company that does not have economic value (Ikenberry *et. al.*, 1996). YulongMa *et al* (2000), Tawatnuntacahai and D'Mello (2002) stated that the company make a stock split was due to anticipation of a decrease in earnings volatility. Although theoretically the stock split had no economic value, but many events of stock split in the capital market gives an indication that the stock split is an important tool in the capital markets practice, which is used by management to establish a market price of shares of the company. David, O'hara, and Saar (2001), Griffin (2010), and Tabibian (2013) stock split of the company can deliver value to the company, while investors see the stock split positively as a good investment. The announcement of a stock split is considered as a signal given by the management to the investment or potential investment that the company has performed well and has good prospects in the future (Aigbe *et al*, 1995, and Brealey *et. al.*, 2007).

Ikenberry *et. al.* (1996) found evidence that the stock split resulted in the re-arrangement of share price at the lower range, so the company conducts a stock split due to view that its stock price is too high. In other words, the stock price that too high is the impetus for company to conduct stock split. Hua and Ramesh (2013), Jennifer Koski (2007) said that the volatility decreases after the stock split carried out, in particular, for the lower stock price, finally there is a significant correlation between changes in the amount of change in the volatility of trading after the stock split. Vafeas(2001) stated that the stock split was preceded by their small income significantly, and has a significant relationship of incomes rise after the stock split that benefits the market participants. While Jain and Robani (2014) stated that if the company conduct stock split when economic conditions are in crisis, then the market reaction will be negative and decreased if compared to the normal economic conditions. Marwata (2001) found that the differences in financial performance and in level of expensiveness of share price measured the net income and earnings per share are not higher if compared to those of companies that do not do stock split.

### **Variable used in this analysis are:-**

#### ▪ Financial Performance

It is the financial data that the company had achieved in a certain period of time. The financial performance of companies that perform the stock split and the company does not do a stock split is measured by:

- Net Profit or Earnings after Tax(EAT) is an annual net profit of the period ended in December 31 of year before the stock split done. The variable data is measured in rupiahs unit.
- Earning per share (EPS) is a ratio used to measure a profit level of the company. The results of the calculation of this ratio can be used to estimate the increase or decrease in the stock price of a company on the stock exchange. The EPS used is the EPS at the end of the period prior to the stock split carried out.

$$EPS = \frac{\text{Net Profit}}{\text{Number of Shares}}$$

#### ▪ Expensiveness of stock price is the nominal price of shares traded on the capital market. Expensiveness stock price of the company conducting stock split and the company do not do a stock split is measured by:

- Price to Book Value (PBV) is a price ratio calculated by dividing the current stock price and the book value, the book value itself is a ratio calculated by dividing total net assets(asset-debt) to the total shares outstanding. PBV used is the PBV of end year before the stock split year.

$$\text{Book Value} = \frac{\text{Total Equity (Asset-Debt)}}{\text{Number of Shares Outstanding}}$$

$$PBV = \frac{\text{Stock Price}}{\text{Book Value}}$$

- Price to Earnings Ratio (PER) is the ratio of the price which is calculated by dividing the current stock price by the earnings per share (EPS) is a ratio that indicate show much profit is obtained by investors or share holders of pershare. PER used is the end year PER before the stock split year.

$$PER = \frac{\text{Stock Price}}{\text{EPS}}$$

**The dependent variables:-**

Stock split is the replacement of the number of shares outstanding by the number of new shares, without changing the total nominal value. Stock split is aqualit ative variable, so in this test the variable is categorical, namely:

- a. For companies that perform the stock split it will be rated 1.
- b. For companies that do notdoastocksplitit will be rated0.

**Sampling Method:-**

The populationstudiedwas takenfrommanufacturingcompanies thatgo publicin Indonesian Stock Exchange. Selection ofthe sample usedisissuerslistedonthe Jakarta Stock Exchangeat 31 December 2012wereincluded in thegroupofmanufacturing industry. Issuersincluded in the samplearegroupedinto two, namelythose who conducted thestocksplitintheperiodofJanuary 2011to December2012andthosewhodid not doa stock splitintheperiod.The number of issuerswhobecamea sample were of13issuerswhichconsists of6issuers thatdostocksplitwhichhavedataofnet profit, EPS, PBVandPERduringJanuary 2011-December 2012and7issuers thatdidnotperformthe stock split,randomlyselectedbycriteriaofissuers thathavedataofnet profit, EPS, PBVandPERduringthe study period.

**Data Analysis:-**

Testing was done bycomparingthevarianceand the averageofthe two groupsusingindependentsamplettest(t testfortwo independent samples) which includetesttheLevenetest.To find attestortcount it can bedone by means of:

$H_{0Ai}$  : Bothvariancesamples(net profit, EPS, PBV, andPER) areidentical(variance samples of companies that dostocksplitandthat do not dostocksplitis the same).

$H_{1Ai}$  : Bothvariancesamples(net profit, EPS, PBV, andPER) are notidentical(variancesamples of companies that dostocksplitanddo not do thestocksplitisdifferent).

Where : if the probability > 0,05 then  $H_{0Ai}$ accepted and  $H_{1Ai}$ rejected

If the probability < 0,05then  $H_{0Ai}$ rejectedand  $H_{1Ai}$ accepted

To carryoutthedifferent testof two averagesby F testis usedthe following formula:

$$F_{count} = \frac{\text{Mean Square Between Groups}}{\text{Mean Square Within Groups}}$$

**Results And Discussion:-**

**Test of Data Homogeneity:-**

The testusedis thetestofhomogeneityofvariancethatis by Levene test, fromthe calculation results is obtainedasfollows:

**Table 1:- Test of Homogeneity of Variances**

	Levene Statistic	df1	df2	Sig.
Net profit (X1)	2.590	1	18	.125
EPS (X2)	1.470	1	18	.244
PBV (X3)	.245	1	18	.627
PER (X4)	.206	1	18	.655

**Source:** Data processed

The calculation results in the table above for the financial performance which consists of net profit and earnings per share have the probability value or the significance greater than 0.05. This means that the data of the variables of net profit and earnings per share have the uniform or equalvariances. Expensivenessofstock pricewhichconsistsofprice to book valueandprice earnings ratiohasaprobabilityorsignificancegreaterthan0.05, whichmeansthatthedataofthe price to bookandprice-earnings ratio variables havethesamehomogeneity.



**Hypothesis Testing:-**

Hypothesis testing in this study used the different test of two averages for the samples that disjoint. The research result shows the values as presented in the table below:

**Table 2:- Hypothesis Testing Results**

Variables	Mean		F value	$\rho$ value
	Do not dostock split	Performstock splits		
Net profit	216085.21	69114.50	0.443	0.514
EPS	74.0714	48.333	0.101	0.757
PBV	4.3621	1.9350	0.512	0.483
PER	23.37	9.225	0.343	0.565

**Source:** Data processed

Based on the table 2 above, it was found that the mean of net profit of the companies that do not conduct a stock split is greater than the mean of the companies that conduct a stock split. F value = 0.443 with probability ( $\rho$  value) of 0.514 is for a net profit, due to the probability value greater than 0.05 then it can be stated that there is no significant difference between the net profits of companies that perform the stock split and the companies that do not perform the stock split.

The value of earnings per share of companies that do not conduct a stock split is greater than the earnings per share of companies that perform the stock split, of the calculation of F value = 0.101 with the probability ( $\rho$  value) of 0.754, due to the probability value ( $\rho$  value) greater than 0.05 then it can be stated that there is no significant difference between the earnings per share of companies that do a stock split and companies that does not perform the stock split.

Based on the table 2 above, the mean of price to book value of the companies that do not do the stock split is greater than companies that perform the stock split. From the calculation of F value = 0.512 with the probability ( $\rho$  value) of 0.483, due to the probability value ( $\rho$  value) greater than 0.05, it can be stated that there is no significant difference between the price to book value of companies that perform the stock split and companies that do not do stock split.

Based on the table 2 above, mean of the price earnings ratio of companies that do not conduct a stock split is greater than companies that perform the stock split. From the calculation of the F value it is obtained F value = 0.343 with the probability ( $\rho$  value) of 0.565, due to the probability value ( $\rho$  value) greater than 0.05, then it can be stated that there is no significant difference between the price earnings ratio of companies that conduct a stock split and companies do not conduct stock split.

Stock split has become a tool used by management to establish the market price of company shares. Stock split is the splitting of a number of shares into more number of shares with a reduction of nominal price of per share proportionally. According to signaling theory, a stock split is an effort to give a signal about the owned information by management about the financial condition of the company, so it can be hypothesized that companies that perform the stock split had the better financial performance than companies that do not do a stock split, this meant that companies with not good condition cannot perform stock splits. The market will respond positively if the signal giver is credible, therefore, the company must demonstrate its credibility.

The first hypothesis states there is a difference in net profit after tax between companies that carry out the stock split and companies do not do a stock split. Based on the test results, this hypothesis is not verified.

The second hypothesis states that there are differences in earnings per share (EPS) between companies that carry out the stock split and companies do not do a stock split. Based on test results, this hypothesis is not verified. These results do not support the signaling theory that explains that the stock split was an effort to give a signal about the owned information by management about the financial condition of the company, so it can be hypothesized that the companies that do the stock split have better performance than companies that do not do stock split. But in this study did not be proven that the companies that did stock split had better financial performance than companies that did not do stock split. These results are consistent with the research conducted by Marwata (2001) which concluded that the financial performance of companies that do stock split and companies that do not do stock split is indifferent. The stock price is too high (over price) causes less active shares traded, given the stock split, the share price becomes too

high, so that will more investors who can afford to buy the shares, the more the investors numbers would increase the liquidity of shares in the exchange.

The third hypothesis states that there is a difference of price to book value (PBV) between companies that carry out the stock split and companies do not do a stock split. Based on test results, this hypothesis is not verified.

The fourth hypothesis states that there is a difference of price earnings ratio (PER) between companies that carry out the stock split and companies do not do a stock split. Based on test results, this hypothesis is not verified. The results of this study do not support the theory of trading range hypothesis in explaining the occurrence of stock split. Theoretically, a stock split occurred due to stock prices are considered too expensive, so the stock split is an effort to drive the stock price at a specific range that is not too expensive, so it can be hypothesized that the companies that perform stock splits have the price that relatively more expensive than companies that do not perform stock splits.

### Conclusions:-

From the analysis and hypothesis testing above, it can be concluded as follows:

a. For financial performance

- There is a difference in net profit between companies that carry out the stock split and companies do not do the stock split is not verified.

- There is difference in earnings of per share between companies that perform the stock split and companies that do not do a stock split is not verified.

b. Expensiveness of share prices

- There is difference of price to book value (PBV) between companies that carry out the stock split and companies that do not do stock split is not verified.

- There is difference in price to earnings ratio (PER) between companies that perform stock split and companies that do not do stock split is not verified.

From the analysis results and conclusions above, the the suggestions can be submitted are as follows:

1. This study does not escape from the limitations, where the period of observation only covers the period consisting of the two financial statements alone. Further research should be encouraged to further expand the observations samples or periods of financial statements, so that the research results better reflect the performance and level of stock prices expensiveness in real.
2. Some things to consider to develop this research is the need to extend the observation period of studies in several periods before the splitting is done, tests performed on various industrial objects to expand the research observations.

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### RESEARCH ARTICLE

#### CASE REPORT : ORBITAL CELLULITIS IN OLD PATIENT WITH HISTORY OF OCULAR INTERVENTION.

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orbital cellulitis , periosteal abscess ,  
 proptosis , sinusitis associated  
 ophthalmomology

#### Abstract

Orbital cellulitis is considered as an ocular emergency which needs urgent evaluation and proper quick action to save the patient vision or even life

The aim of this report is to present a case about orbital cellulitis with the presence of multiple risk factors as sinusitis and ocular intervention and how to approach such patients

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#### Introduction:-

Orbital cellulitis is an inflammation of the soft tissues of the eye socket posterior the orbital septum,It most commonly occurs when bacterial infection spreads the adjacent paranasal sinuses or other nearby structures such as the face , eyelids or the lacrimal drainage system through the blood streamAlso , It can be caused by a direct trauma to the orbit ,in which traumas may introduce an infectious materials into the orbitother causes were reported such as direct inoculation of the orbit from surgery or Hematogenous spread from bacteremiaOrbital cellulitis is an ocular emergency that not only threatens vision but also can lead to life-threatening complications if left untrated such as cavernous sinus thrombosis, meningitis, and brain abscess.'Careful history taking and physical examination must be done for fast disease recognition and proper management

#### Case Report:-

86 years old Female presented to our hospital ER , complaining of right eye Pain , Redness and Swelling of the eyelid for 3 daysIt was gradual in onset , Progressed rapidly within these 3 days with significant decrease of vision .

Regarding her Past history the patient is Known hypertensive for long time on antihypertensive medication with regular follow ups in PHC .

Also ,she reported History of chronic arthritis .

Regarding her Past ocular history , she was diagnosed with nasolacrimal duct obstruction in a previous visit and She underwent right syringing probing in our hospital 5 days prior to the admission .

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**The patients Clinical findings were as follows:-**

Her Vision in the Right Eye was counting fingers at 2 METERS and the left eye 0.5 both without correction  
Intraocular pressure was normal in both eyes Right eye examination revealed Upper and lower eyelid tender swelling along with conjunctival congestion and Chemosis.

There was also Non axial proptosis pushing the globe slightly outward and downwards with restriction of ocular movements in all directions .

**On slit lamb Anterior segment examination:-****Right Eye:-**

There was Grade 1 RAPD  
Immature cataract

**Fundus:** WNL

**Left Eye:-**

Anterior segment-  
Immature cataract

**Fundus:** within normal level

**The patient was admitted to the hospital:-****Investigations:-****CT-scan:-**

Axial and coronal CT scan was done with and without contrast done , revealed sub periosteal abscess in the upper medial wall of the orbit originating from the ethmoid sinus which showed signs of sinusitis.

**The patient was given the following Treatment:-****Medical treatment in the form of:**

Injection IV Ceftriaxone 1 gm BID  
Ciprofloxacin Eyedrops q4 hourly  
Chloramphenicol Eye ointment HS  
Tablet Brufen 400 mg BID  
Tablet Ranitidine 150 mg BID

**After the CT scan results came, Surgical treatment started:-**

The sub periosteal abscess was drained under general anesthesia through the caruncular approach and the pus was sent for culture and sensitivity.

A swab was also taken.

Postoperative treatment:

Injection IV Ceftriaxone 1gm BID  
Injection Vancomycin 500mg q6hrs  
Injection Flagyl 500mg TID  
Tab Prednisolone 50 mg PO OD  
Tab Brufen 400 mg BID  
Tab Ranitidine 150 mg BID

**Postoperative picture:-****1<sup>ST</sup> post operative day**

the general condition of the patient improved

Vision: counting fingers 3 meters

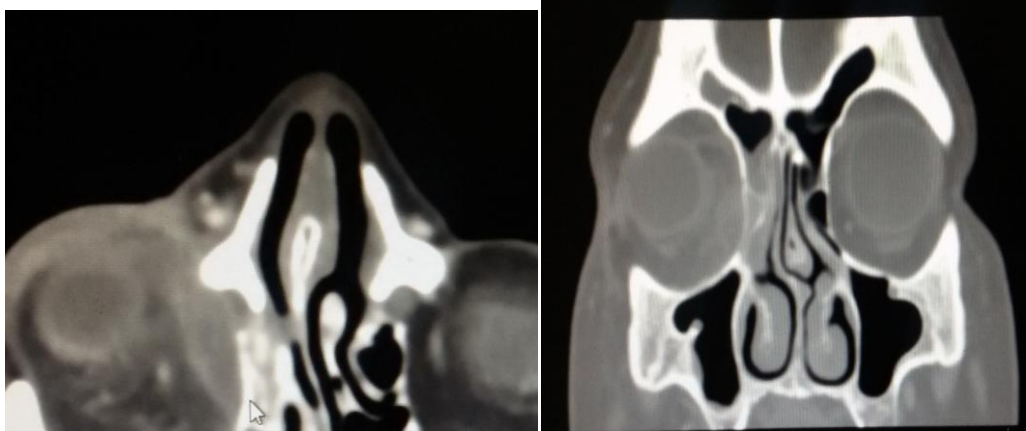
The pain was relieved

The lid edema and the chemosis were reduced

The ocular movements had improved



Right eye examination revealed Upper and lower eyelid tender swelling along with conjunctival congestion and Chemosis .



CT Scan without contrast revealed sub-periosteal abscess in the upper medial wall of the orbit originating from the ethmoid sinus which showed signs of sinusitis

### Discussion:-

Displacement of the globe may be due to an increase in the orbital contents. the orbit has rigid bony walls except its anterior wall , such displacement usually manifests predominantly as forward protrusion of the globe which is called proptosis , which is the hallmark of orbital disease.

orbital cellulitis may due to an injury perforating the orbital septum.

The Inflammation process can be noticed within the first 48-72 hours after injury, it may be delayed for several months if retained orbital foreign body.

Some orbital cellulitis cases were reported after surgical procedures, such as orbital decompression, DCR, blepharoplasty, squint surgeries, retinal surgery, and glaucoma surgery.

The diagnosis of orbital cellulitis is usually based on clinical findings with the aid of radiological findings sometimes

Usually , The presence of orbital signs such as proptosis, pain during eye movements , ophthalmoplegia, optic nerve involvement as well as fever and high WBC count confirm the diagnosis. Age, medical history , the presence of trauma and the mechanism of injury play an important role in determining the causative organism of orbital disease. Staphylococcus species, Streptococcus species and Bacteroides species are the most common organisms detected in adult orbital cellulitis , while unvaccinated children can present with sequelae from Haemophilus influenzae. To be noticed , some organisms can be detected In all age groups with specific conditions , for example , dental abscess with mixed, aggressive aerobic and/or anaerobic infection must be considered if a suggestive history is elicited. Gram-negative rods are likely to be the causative organism recovered in abscesses

secondary to trauma. Fungal infections, including mucormycosis/zygomycosis and aspergillosis , especially in diabetic or immunocompromised hosts.

Age of the patient	Microbiology results	Surgical management
Less than 9	No growth or one anaerobic microorganism	Not indicated
From 9 to 14	Mixed aerobic and anaerobic microorganism	Possible
More than 14	Mixed or only anaerobics	Indicated

### Conclusion:-

Orbital cellulitis due to Subperiosteal abscess is a well-described infectious process that affects the bones supporting the globe. It can cause rapid clinical deterioration of the bone and intracranial extension. Careful clinical monitoring, serial ophthalmologic examinations and comparative radiologic screening of persons must be done , followed by prompt and appropriate treatment. Thses details are necessary to decrease the risk of complications, such as permanent vision loss, cavernous sinus thrombosis and cerebral abscesses.

Orbital cellulitis is considered as an ocular emergency which needs urgent evaluation and proper quick action to save the patient vion or even life.

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### RESEARCH ARTICLE

## CURRENT CONCEPTS IN THE PATHOGENESIS AND MANAGEMENT OF VASCULAR LESIONS - A BRIEF REVIEW

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#### Abstract

Hemangiomas are considered to be benign tumors of infancy which show a rapid growth phase marked by endothelial cell proliferation, followed by gradual involution. On the other hand, vascular malformations are structural anomalies of blood vessels without endothelial cell proliferation. The pathophysiology of these lesions is still shroud in mystery. One etiologic hypothesis speculates that cells are “embolized” from the placenta. Another suggests that hemangiomas result from somatic mutations in a gene mediating endothelial cell proliferation. Recent data suggest an endothelial progenitor cell as the source of origin of the tumors. It has been speculated that hypoxia, either systemically (e.g., due to placental insufficiency) or in a specific “niche” area of poorly perfused tissue stimulates endothelial progenitor cells to proliferate inappropriately. The fetal endothelial cell precursor cells, possess specific histochemical markers (GLUT-1, Lewis Y Antigen, merosin), similar to those on placental blood vessels. Abnormal levels of matrix metalloproteinases (MMP-9) and proangiogenic factors (VEGF, b-FGF, and TGF-beta 1) play a crucial role. Genetic errors in growth factor receptors have also been shown to affect development of hemangiomas. Recent discoveries concerning hemangioma pathogenesis provide both an improved understanding and more optimal approach to workup and management like corticosteroid or propranolol therapy. Important detrimental associations can be seen with hemangioma, such as significant structural anomalies. Standards of care have dramatically changed evaluation and management of hemangiomas. Herein, we have briefly discussed the factors that contribute to the formation of hemangiomas and vascular malformations in general along with their management.

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#### Introduction:-

Vascular anomalies are congenital lesions of abnormal vascular development. Previously referred to as vascular birthmarks, vascular anomalies are now classified based on a system developed in 1982 by Mulliken and Glowacki that considers histology, biological behavior, and clinical presentation of these entities. <sup>(1)</sup> A primary distinction is made between a vascular tumor, which grows by cellular hyperplasia, and a vascular malformation, which represents a localized defect in vascular morphogenesis. <sup>(2)</sup>

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Both vascular tumors and malformations may occur anywhere on the body. In brief, hemangiomas are vascular tumors that are rarely apparent at birth, grow rapidly during the first 6 months of life, involute with time and do not necessarily infiltrate but can sometimes be destructive. Vascular malformations are irregular vascular networks defined by their particular blood vessel type. In contrast to hemangiomas, they are present at birth, slow growing, infiltrative, and destructive. <sup>(3)</sup>

Hemangiomas are categorized into two types: “infantile” or “congenital.” The rare “congenital” hemangioma is less understood and present at birth. Congenital hemangiomas either rapidly involute (rapidly involuting congenital hemangioma (RICH)) over a very brief period in infancy or never involutes (noninvoluting congenital hemangioma-NICH). <sup>(3)</sup>

The pathogenesis of hemangioma-one of the key and fascinating aspects; is still not properly understood. Although growth factors and hormonal and mechanical influences have been postulated to affect the abnormal proliferation of endothelial cells in hemangioma, the primary, causative defect in hemangiogenesis remains unknown and no genetic alteration has been implicated.

The dearth of molecular details is striking, considering the growing list of germline mutations in genes causing specific inherited syndromes involving vascular malformations, including hereditary hemorrhagic telangiectasia ,cutaneous venous malformations, cerebral cavernous malformations, and hyperkeratotic cutaneous Capillary-venous malformation. <sup>(4)</sup>

Although many of these lesions resolve spontaneously without concern, a significant proportion leads to function threatening and cosmetically disfiguring consequences. For functionally significant or potentially deforming lesions, timely intervention is important to minimize the possibility of a poor outcome and permanent scarring. Many important and management-altering discoveries have occurred regarding hemangiomas in the past decade. <sup>(5)</sup>

The goal of timely recognition and therapy is to minimize or eliminate long-term sequelae. Standards of care have dramatically changed evaluation and management of hemangiomas. New modalities, such as oral propranolol, provide the caregiver with better therapeutic options, which can prevent or minimize medical risk or scarring. <sup>(6)</sup>

Here, we are presenting the various theories involving the pathogenesis of hemangiomas with a view to enrich its treatment and management modalities.

### **Overview of Hemangioma:-**

Vascular tumors and malformations may occur anywhere on the body. In brief, hemangiomas are vascular tumors that are rarely apparent at birth, grow rapidly during the first 6 months of life, involute with time and do not necessarily infiltrate but can sometimes be destructive. Vascular malformations are irregular vascular networks defined by their particular blood vessel type. In contrast to hemangiomas, they are present at birth, slow growing, infiltrative, and destructive and persist throughout the life of the patient. Due to their complexity, a multidisciplinary approach is frequently necessary in managing these lesions and includes a team of specialists in pediatric otolaryngology, dermatology, hematology, interventional radiology, surgery, orthopedics, and sometimes psychology. <sup>(7)</sup>

### **Pathophysiology:-**

The pathophysiology associated with the unique natural history of these lesions, with initial rapid proliferation followed by gradual involution and regression, has not been completely elucidated.

One theory suggests that hemangioma endothelial cells arise from disrupted placental tissue imbedded in fetal soft tissues during gestation or birth. Histochemical markers of hemangiomas, such as GLUT-1, Lewis Y antigen, FcyRII, and merosin have been shown to coincide with those found in placental tissue. This is further supported by the fact that they are found more commonly in infants following chorionic villus sampling, placenta previa, and preeclampsia. <sup>(8)</sup> A different theory arose from the discovery of endothelial progenitor and stem cells in the circulation of patients with hemangiomas. <sup>(9)</sup> The development of hemangiomas in animals from stem cells isolated from human specimens supports this theory. However, infantile hemangiomas most likely arise from hematopoietic

progenitor cells (from placenta or stem cell) in the appropriate milieu of genetic alterations and cytokines.<sup>(10)</sup> Abnormal levels of matrix metalloproteinases (MMP-9) and proangiogenic factors (VEGF, b-FGF, and TGF-beta 1) play a role in hemangioma pathogenesis.<sup>(11)</sup> Genetic errors in growth factor receptors have also been shown to affect development of hemangiomas.<sup>(11)</sup> It has been speculated that hypoxia, either systemically (e.g., due to placental insufficiency) or in a specific “niche” area of poorly perfused tissue stimulates endothelial progenitor cells to proliferate inappropriately.<sup>(12)</sup>

**IHs are vascular tumors that involve the proliferation of benign endothelial like cells that possess histochemical markers (GLUT-1, Lewis Y antigen, FcγRII, and merosin); these markers are also present on placental blood vessels.**<sup>(13)</sup> The immunohistochemical profile differentiates infantile hemangiomas (IH) from other vascular birthmarks or tumors. Hemangiomas display high levels of immunostaining for the GLUT1 glucose transporter<sup>(14)</sup>, a surface protein that is highly expressed in most embryonic and fetal endothelial cells but is lost in most tissues except at the blood-tissue barriers, including micro vessels in the central nervous system and the placenta.

#### **Various theories regarding pathogenesis of hemangioma:-**

**The placental theory** is attractive because it would explain the programmed life cycle of infantile hemangioma (IH). Subsequent to North's discoveries regarding the histochemical similarities of IH and placenta,<sup>(4)</sup> Barnes et al noted that placenta and hemangioma have high levels of genetic similarity when compared with other vascular tumors and normal structures. Waner et al noted that IH tend to develop along embryonic fusion lines of the facial placodes.<sup>(15)</sup> Piecing these 2 seemingly disparate facts together, Mihm et al suggested that hemangioma might represent “benign metastases” originating from the placenta or other cells that proliferate in areas of low oxygen tension, such as the “end artery, vascular dead end” sites occurring in embryonic fusion planes.<sup>(8)</sup> Pittman et al were unable to detect the presence of maternal-fetal chimerism in lesional tissue, but this does not rule out the possibility of the placental origin of hemangioma tissue because the placenta is predominantly fetal in origin.<sup>(16)</sup> Embolic placental endothelial cells could reach fetal tissues from chorionic villi through right-to-left shunts characteristic of the normal fetal circulation. The embolus might possess a single endothelial cell or only a small number of endothelial cells.<sup>(17)</sup>

It has also been hypothesized that **immature endothelial cells and pericytes**, which coexist in the late stages of fetal development, perhaps maintain persistent proliferative properties for a period of time postnatally, leading to the development of IH.<sup>(18)</sup> However, Boye et al demonstrated the clonality of IH cells, making it less likely that a disparate group of cells serve as the source of this tumor.<sup>(17)</sup>

**Hypoxia** has been proposed as a driving factor for the pathogenesis of vascular proliferation in general. Vascular proliferation may be a homeostatic attempt to normalize hypoxic tissue. Epidemiologic findings support this hypothesis, given that factors that are thought to be linked to hypoxia, such as low birth weight and advanced maternal age, are overrepresented in hemangioma populations.<sup>(12)</sup> Another supportive finding is the association of IH with retinopathy of prematurity, a condition known to be linked to ischemia.<sup>(19)</sup> GLUT-1, present on IH tissue, is a facilitative glucose transporter that is an important sensor for hypoxia.<sup>(20)</sup>

The growth of IH likely **involves angiogenic peptides**, such as vascular endothelial growth factor (VEGF) and basic fibroblast growth factor, which induce proliferation of blood vessels. Receptors for these growth factors are also crucial in endothelial cell regulation, and a misbalance of VEGF receptor- 1 expression with consequent hyperactivity of VEGF-receptor-2 function has been noted in IH tissue.<sup>(21)</sup> The suppressive effect of glucocorticoids may be mediated through VEGF-A. Additionally, insulin like growth factor-2, which stimulates angiogenesis, is upregulated in proliferating but not involuting blood vessels.<sup>(22)</sup>

**Endothelial progenitor cells (EPCs) are vascular stem cells** with the capacity to contribute to postnatal vascular development. There is now compelling evidence that these EPCs play an etiologic role in the development of IH. A subset of progenitor cells isolated from IH tissues, which possess the surface markers CD34+ CD133+, are of particular interest. These EPCs have been shown to differentiate into endothelial cells in vitro<sup>22</sup> and are increased 15- fold in IH compared with controls.<sup>7</sup> Cultured EPCs from patients with IH stain positively for known hemangioma markers GLUT1, CD32, and merosin.<sup>(23)</sup>

**Boye and colleagues show how the Cell autonomous defects in hemangioma take place-** In an experiment, endothelial cells they isolated from hemangiomas exhibit enhanced proliferation and migration, in keeping with the rapid growth of the vascular lesion in the neonate. However, there was one surprise: In the presence of the angiogenic inhibitor endostatin, migration of these cells was not inhibited but rather stimulated, suggesting a radically altered cellular phenotype. One possible explanation, favored by the authors, is that a precursor endothelial cell had undergone a mutation in a gene regulating angiogenesis, resulting in clonal expansion.<sup>(17)</sup>

**Several mediators of EPC trafficking and vasculogenesis,** such as VEGF-A and hypoxia inducible factor-1 alpha (a transcription factor that regulates the formation of new blood vessels by EPCs), were found to be elevated in blood and IH specimens taken from children with proliferating IH.<sup>(24)</sup>

A major breakthrough occurred when Khan et al were able to **successfully inject CD133+ EPCs from human hemangioma tissue** into immunodeficient mice. These mice then developed GLUT1 vascular tumors, which recapitulated the development of human IH, providing investigators with the first viable IH animal model. These studies highlight the importance of CD133+ EPCs in the pathophysiology of IH and provide a means of testing putative therapies in this animal model.<sup>(25)</sup>

The pathogenesis of Arterio venous hemangiomas originates with **fetal endothelial cell precursors.** During development, one or few of these cells lose their **ability to produce or secrete platelet derived growth factor(PDGF) and transforming growth factor beta 1 (TGF  $\beta$ 1)**, which are required to recruit adventitial cells around developing vessels. Consequently, the daughter cells and eventually the vessels that arise from these original cells develop as single cell lined vessels (arteriole, venule, vein etc). During pre-puberty there is usually insufficient pressure to cause these structurally unsupported vessels to expand and produce symptoms. However, beginning at 10 years age, the maturity of the cardiovascular system and the increased systemic pressure causes these single cell lined vessels to expand. As the vessel expands, it creates turbulence and a negative pressure that alters the localized hemodynamics of the blood flow to feed blood into the expanded lumen and can recruit new feeder vessels. This process is known as Black-hole phenomenon. The earlier in fetal development, that the loss of growth factors such as PDGF and TGF $\beta$ 1 occur, the larger the vascular territory that will be involved.<sup>(26)</sup>

Hemangiomas pose other perplexing questions that will only be answered as the events that initiate hemangiogenesis are elucidated. For example, the strong gender predilection of hemangioma toward female over male infants (3:1 or more) **suggests hormonal effects** in hemangiogenesis. In addition, the anatomical predilection for the head and neck region of juvenile hemangioma must be explained. Perhaps most intriguing from a therapeutic stand point is the spontaneous involution of the lesion. This distinguishing characteristic has been shown to **be due in part to apoptosis of the endothelial cells**, but the trigger for this process remains unknown.<sup>(27)</sup>

### **Management:-**

Although most hemangioma proliferates and involute without functional impairment, a significant minority requires some form of intervention. It is important to consider the psychological as well as medical impact of hemangioma, particularly when located on the face. Many central facial lesions leave residual scars or structural deformities, which may have lifelong effects. In the past, treatment options for hemangioma were limited and their potential side effects considerable. Although most hemangioma do not pose significant risks, and careful observation is still the appropriate management option for many lesions, the introduction of relatively safer topical and systemic agents now allows earlier and easier intervention in appropriate cases.<sup>(28)</sup>

Until recently, intralesional and systemic corticosteroids, which were the mainstay of treatment in cancer chemotherapy, has been proven efficacious for life-threatening hemangioma but also has limited use due to the strong vesicant qualities of the drug, with need for central line access for chronic administration as well as potential peripheral mixed sensory-motor neurotoxicity.<sup>(29)(33)</sup> In recent years, propranolol therapy has become increasingly more useful in the management of hemangioma that require intervention. Leaute-Labreze et al first fortuitously discovered the efficacy of b-blockers for the treatment of hemangioma in 2008.<sup>(30)</sup>

Theories regarding propranolol's mechanism of action include an initial capillary vasoconstrictive effect, suppression/blockade of growth factors with induction of apoptosis of endothelial cells and blockade of GLUT1 receptors. CD34+ endothelial progenitor cells in hemangioma express factors influencing the renin-angiotensin system.<sup>(31)</sup> Because the renin-angiotensin system can stimulate angiogenesis, Itinteang et al suggested

that propranolol's inhibitory effect on the renin-angiotensin system might account for propranolol induced involution.<sup>(32)</sup>

Angiogenesis inhibitors are theoretically a natural choice for the treatment of hemangiomas. Sirolimus (also known as rapamycin), an inhibitor of mTOR, negatively affects cell proliferation and metabolism as well as angiogenesis. Lasers such as flashlamp pulsed dye lasers have also been used.<sup>(34)</sup>

Occasionally, selective embolization techniques followed by surgical excision is the optimal therapeutic intervention. The goal is to obstruct or reduce the blood flow to the lesion-so that it can be excised with minimal blood loss. For this, various embolization techniques, such as 100% alcohol, polyvinyl alcohol beads or sodium morrhuate can be used.<sup>(35)</sup>

### Summary and Conclusion:-

Recent discoveries have led to an improved understanding of the pathogenesis and clinical behavior of IH. The best scientific evidence to date supports the hypothesis that IHs originate from a subset of endothelial progenitor cells (CD133+) that are stimulated and proliferate under hypoxic conditions. These cells theoretically "hone" to areas of relative hypoxia, such as embryonic fusion planes.<sup>(36)</sup>

Whatever mechanisms are identified in hemangiogenesis, we have come a long way from the descriptive phase of hemangioma research. The intriguing data of Boye and colleagues suggest one mechanism for hemangioma formation and bring the field a step closer to understanding the molecular etiology of this common tumor.<sup>(17), (37)</sup>

Newer treatment options for hemangioma may well pose less risk for the patient, allowing the practitioner to intervene in a relatively safe, and more timely manner. Propranolol is now first-line therapy for many practitioners, and it is hoped that future studies will confirm its efficacy and safety. Pulsed dye and other laser modalities may be useful as adjunctive or "mopup" therapy. Other antiangiogenic agents may prove to be more effective in the future. The risk-benefit ratio of any therapy must be scrutinized, keeping in mind that "watchful waiting" may often be appropriate, but timely intervention is sometimes crucial in minimizing long-term sequelae such as functional deformity or permanent scars.<sup>(38)</sup>

Treatment of vascular anomalies is complex and often involves multiple disciplines and therapeutic options. Referral to a vascular anomalies team is recommended when considering therapy for "problematic" hemangiomas and vascular malformations.

Thus, the entire gamut of pathogenesis of hemangioma with a view to enrich its treatment modalities is discussed herewith.

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### RESEARCH ARTICLE

#### HEAVY METAL TOLERANCE BY *Vetiveria Zizanioides* (L.) NASH FROM SOLID WASTE AT AMBERNATH DUMPSITE AND RELATED HEALTH EFFECTS.

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#### Abstract

Urbanization and industrialization has given rise to large quantities of solid wastes. Due to resource crunch or inefficient infrastructure, not all of this waste gets collected and transported to the dumpsites. Phytoremediation is energy efficient, aesthetically pleasing method of remediating sites with low-to-moderate levels of contamination and it reduces the mobility of heavy metals and prevents migration to the groundwater and soil of the dumpsite. The present study involves study of uptake of heavy metals by the plant *Vetiveria zizanioides* (L.) Nash., and estimation of the Phytoremediation Indices of Transfer factor, Bioconcentration factor, Translocation factor and Translocation Index. Hence in the present study, an attempt has been made to analyze the uptake of metals present in the dumpsite wastes from Ambernath dumpsite (Maharashtra State), which are amended with garden (Control) soil on Vetiver. There is an increasing trend of uptake and accumulation of Cadmium (Cd), Chromium (Cr) and Zinc (Zn), with increasing ratio of control soil to dumpsite soil (Cr>Zn> Cd). The low values of Transfer factor, Bioconcentration factor and translocation factors (<1), indicates that Vetiver is a hypoaccumulator for all selected heavy metals. The higher transfer factor values when compared to the lower translocation factor values indicates that the accumulation of metals is in the order of root>leaves.

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#### Introduction:-

Open dumpsite approach as solid waste disposal method is a primitive stage of solid waste management in many parts of the world. It is one of the most poorly rendered services by municipal authorities in developing countries as the systems applied are unscientific, outdated and in-efficient. Solid waste generation is a continuously growing problem at global, regional and local levels (Rode, 2011). With increase in the global population and the rising demand for food and other essentials, there has been a rise in the amount of waste being generated daily by each house- hold. This waste is ultimately thrown into municipal disposal sites and due to poor and ineffective management, the dumpsites turn to sources of environmental and health hazards to people living in the vicinity of such dumps. The present study involves study of uptake of heavy metals by *Vetiveria zizanioides* (L.) Nash., commonly known as Vetiver. These plants may are capable of accumulating many of these metals due to their quick growth, deep roots and tall aerial organs (Manios et.al, 2003). An attempt has been made to analyze the uptake of metals present in the dumpsite wastes from Ambernath dumpsite in Thane District, which are amended with garden

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(Control) soil on Vetiver. The three metals Cadmium, Chromium and Zinc are studied for their initial concentrations in the dumpsite soil. *Vetiveria zizanioides* (L.) Nash was then exposed to these soils. Pollutants especially metals deposited on land usually enter the human body through the medium of contaminated crops, animals, food products, or water. Also, the dumpsite has smelly and unhealthy conditions. These conditions are worse in the summer because of extreme temperatures, which speed up the rate of bacterial action on biodegradable organic material. Disposal sites can also create health hazards for the neighborhood. In a number of health surveys a wide range of health problems, including respiratory systems, irritation of the skin, eyes and nose, gastrointestinal problems, psychological disorders, and allergies, have been discovered.

### Materials and Methods:-

The Sampling of solid waste is done by 'Cone and Quarter' method at the site from different locations of the dumpsite. The soil is then air dried of from solid waste. The soil is then sieved through 0.5 mm sieve. 3 replications of one month old vetiver plant is made and acclimatized for one month. Pruning is done to 20 cm and 10 cm slips respectively. The different ratios are prepared as Control soil: Landfill waste soil (C:L), i.e.1:1, 1:2, 1:3 and 1:4 respectively, along with 100 % each of garden and landfill waste soil respectively. Metal Analysis is performed by standard procedures prescribed (APHA, 1998; Behera 2006; Maiti 2003).

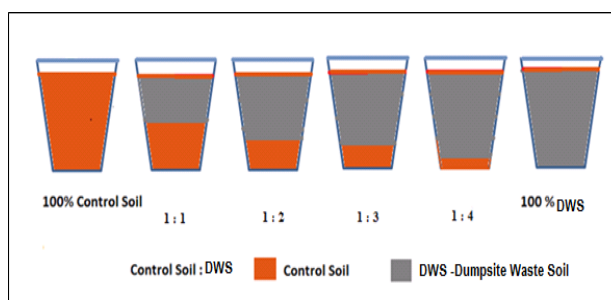


Fig 1:-Diagrammatic representation of pot experiments for selected ratios of dumpsite waste amended soils.

Following factors are estimated:

**i. Transfer Factor =**

$\frac{\text{Concentration of metal in root/leaves}}{\text{Concentration of metal in soil}}$

Concentration of metal in soil

**ii. Bio Conc. Factor =**

$\frac{\text{Conc. of metal in plant tissue (roots+leaves)}}{\text{Concentration of metal in soil}}$

Concentration of metal in soil

**iii. Translocation Factor =**

$\frac{\text{Metal concentration in leaves}}{\text{Metal concentration in root}}$

Metal concentration in root

**iv. Translocation Index =**

$\frac{\text{Metal conc. in leaves ( mg/gm) X 100}}{\text{Metal conc. in roots (mg/gm)}}$

Metal conc. in roots (mg/gm)



**Observations and Results:-****Table 1:-** Phytoremediation ability of Vetiver at different ratios of control soil: landfill waste soil in terms of Cadmium (Cd).

Trtmnt	Replicate	Cd Conc. in Roots+Leaves* mg/Kg	Transfer Factor Root	Transfer Factor Leaves	BCF	TF (leaf /root)	TI
C:L 1:1	R1	19.32	1.15	0.97	2.12	0.84	84
	R2	19.92	1.08	0.86	1.94	0.79	79.46
	R3	18.51	0.8	0.73	1.53	0.91	91.02
<b>Mean ± SD</b>		<b>19.25 ± 0.71</b>	<b>1.01 ± 0.19</b>	<b>0.85 ± 0.12</b>	<b>1.86 ± 0.30</b>	<b>0.85 ± 0.06</b>	<b>84.82 ± 5.82</b>
C:L 1:2	R1	24.36	0.71	0.54	1.25	0.75	75.13
	R2	23.44	0.7	0.46	1.11	0.7	70.1
	R3	23.62	0.68	0.48	1.15	0.7	70.05
<b>Mean ± SD</b>		<b>23.81 ± 0.49</b>	<b>0.7 ± 0.70</b>	<b>0.49 ± 0.04</b>	<b>1.17 ± 0.07</b>	<b>0.72 ± 0.02</b>	<b>71.76 ± 2.92</b>
C:L 1:3	R1	26.04	0.54	0.39	0.93	0.71	70.64
	R2	26.04	0.57	0.41	0.98	0.71	71.77
	R3	26.61	0.53	0.4	0.93	0.74	74.72
<b>Mean ± SD</b>		<b>26.23 ± 0.33</b>	<b>0.55 ± 0.55</b>	<b>0.4 ± 0.01</b>	<b>0.95 ± 0.02</b>	<b>0.72 ± 0.72</b>	<b>72.28 ± 2.11</b>
C:L 1:4	R1	30.03	0.52	0.44	0.95	0.84	84.46
	R2	29.64	0.55	0.46	1.01	0.84	84.21
	R3	29.77	0.52	0.44	0.95	0.84	84.22
<b>Mean ± SD</b>		<b>29.81 ± 0.20</b>	<b>0.53 ± 0.53</b>	<b>0.45 ± 0.01</b>	<b>0.97 ± 0.03</b>	<b>0.84 ± 0</b>	<b>84.3 ± 0.14</b>
100% LWS	R1	49.71	0.56	0.4	0.96	0.71	71.47
	R2	49.84	0.93	0.67	1.6	0.72	71.57
	R3	49.86	0.4	0.29	0.69	0.71	71.4
<b>Mean ± SD</b>		<b>49.8 ± 0.08</b>	<b>0.63 ± 0.63</b>	<b>0.45 ± 0.2</b>	<b>1.08 ± 0.5</b>	<b>0.71 ± .005</b>	<b>71.48 ± 0.09</b>

**Table 2:-** Phytoremediation ability of Vetiver at different ratios of control soil: landfill waste soil in terms of Chromium (Cr)

Treatment	Replicates	Cr Conc. in Roots+Leaves* mg/Kg	Transfer Factor Root	Transfer Factor Leaves	BCF	TF (leaf /root)	TI
C:L 1:1	R1	75.99	0.13	0.13	0.63	0.25	25.13
	R2	76.01	0.12	0.12	0.62	0.25	25.08
	R3	76.03	0.13	0.13	0.63	0.25	25.19
<b>Mean ± SD</b>		<b>76.01 ± 0.02</b>	<b>0.13 ± 0.005</b>	<b>0.13 ± 0.005</b>	<b>0.63 ± 0.005</b>	<b>0.25 ± 0</b>	<b>25.13 ± 0.06</b>
C:L 1:2	R1	105.67	0.35	0.12	0.47	0.34	34.12
	R2	105.63	0.35	0.12	0.47	0.34	34.1
	R3	105.66	0.35	0.12	0.47	0.34	34.15
<b>Mean ± SD</b>		<b>105.65 ± 0.02</b>	<b>0.35 ± 0</b>	<b>0.12 ± 0</b>	<b>0.47 ± 0</b>	<b>0.34 ± 0</b>	<b>34.12 ± 0.03</b>
C:L 1:3	R1	133.35	0.29	0.17	0.46	0.57	56.81
	R2	133.48	0.3	0.17	0.48	0.57	56.8

	R3	133.44	0.28	0.16	0.44	0.57	56.75
<b>Mean ± SD</b>		<b>133.42 ± 0.06</b>	<b>0.29 ± 0.01</b>	<b>0.17 ± 0.005</b>	<b>0.46 ± 0.02</b>	<b>0.57 ± 0</b>	<b>56.79 ± 0.03</b>
C:L 1:4	R1	170.43	0.3	0.21	0.51	0.69	69.25
	R2	173.47	0.31	0.21	0.52	0.67	67.21
	R3	174.2	0.31	0.21	0.52	0.67	66.63
<b>Mean ± SD</b>		<b>172.7 ± 1.99</b>	<b>0.31 ± 0.005</b>	<b>0.21 ± 0</b>	<b>0.52 ± 0.005</b>	<b>0.68 ± 0.01</b>	<b>67.7 ± 1.38</b>
100% LWS	R1	244.39	0.25	0.15	0.39	0.59	58.93
	R2	244.3	0.26	0.16	0.39	0.59	58.86
	R3	244.27	0.3	0.18	0.49	0.59	58.91
<b>Mean ± SD</b>		<b>244.32 ± 0.06</b>	<b>0.27 ± 0.015</b>	<b>0.16 ± 0.02</b>	<b>0.42 ± 0.06</b>	<b>0.59 ± 0</b>	<b>58.9 ± 0.04</b>

**Table 3:-** Phytoremediation ability of Vetiver at different ratios of control soil: landfill waste soil in terms of Zinc (Zn)

Treatment	Replicates	Zn Conc. in Roots+Leaves* mg/Kg	Transfer Factor Root	Transfer Factor Leaves	BCF	TF (leaf /root)	TI
C:L 1:1	R1	74.48	0.6	0.11	0.72	0.19	18.52
	R2	73.98	0.6	0.11	0.71	0.19	18.63
	R3	73.49	0.6	0.11	0.71	0.19	19.17
<b>Mean ± SD</b>		<b>73.98 ± 0.50</b>	<b>0.6 ± 0.0</b>	<b>0.11 ± 0.0</b>	<b>0.71 ± 0.006</b>	<b>0.19 ± 0.0</b>	<b>18.77 ± 0.35</b>
C:L 1:2	R1	91.94	0.24	0.05	0.29	0.21	21.39
	R2	91.53	0.22	0.05	0.27	0.21	21.39
	R3	92.17	0.23	0.05	0.28	0.21	21.37
<b>Mean ± SD</b>		<b>91.88 ± 0.32</b>	<b>0.23 ± 0.01</b>	<b>0.05 ± 0.0</b>	<b>0.28 ± 0.01</b>	<b>0.21 ± 0.0</b>	<b>21.38 ± 0.01</b>
C:L 1:3	R1	111.39	0.18	0.05	0.23	0.26	25.75
	R2	111.46	0.19	0.05	0.24	0.26	26.03
	R3	111.52	0.18	0.05	0.23	0.26	26.08
<b>Mean ± SD</b>		<b>111.46 ± 0.07</b>	<b>0.18 ± 0.006</b>	<b>0.05 ± 0.0</b>	<b>0.23 ± 0.006</b>	<b>0.26 ± 0.0</b>	<b>25.95 ± 0.18</b>
C:L 1:4	R1	130.61	0.17	0.05	0.23	0.29	29.46
	R2	130.47	0.18	0.05	0.23	0.29	29.49
	R3	130.03	0.17	0.05	0.22	0.3	29.7
<b>Mean ± SD</b>		<b>130.37 ± 0.30</b>	<b>0.17 ± 0.006</b>	<b>0.05 ± 0.0</b>	<b>0.23 ± 0.006</b>	<b>0.29 ± 0.006</b>	<b>29.55 ± 0.13</b>
100% LWS	R1	146.37	0.11	0.04	0.16	0.4	36.63
	R2	145.87	0.16	0.06	0.21	0.37	36.99
	R3	146.71	0.13	0.05	0.18	0.37	36.6
<b>Mean ± SD</b>		<b>146.32 ± 0.42</b>	<b>0.13 ± 0.02</b>	<b>0.05 ± 0.0</b>	<b>0.18 ± 0.03</b>	<b>0.38 ± 0.02</b>	<b>35.74 ± 0.21</b>

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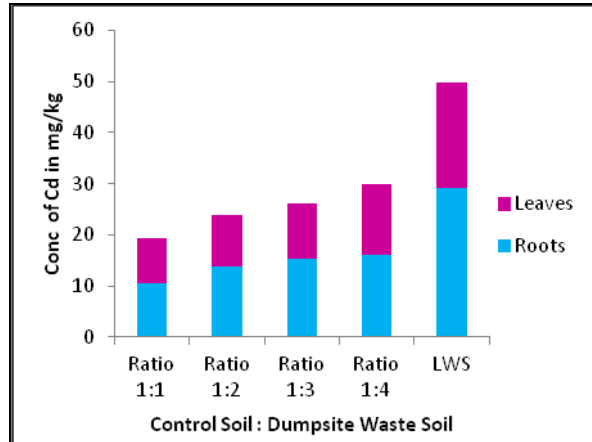


Fig 2:- Uptake of Cadmium (Cd) in different ratios by Vetiver in roots and leaves

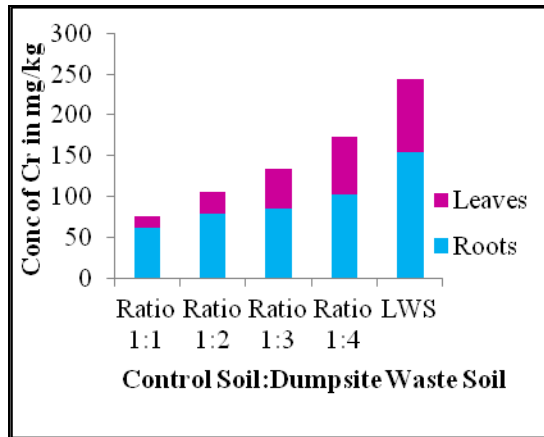


Fig 3:- Uptake of Chromium (Cr) in different ratios by Vetiver in roots and leaves

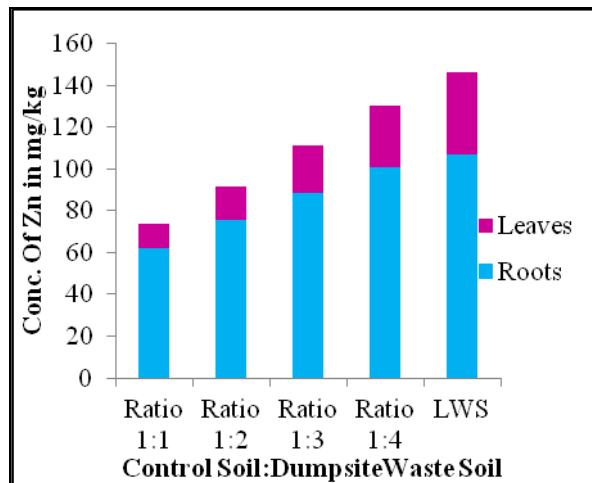


Fig 4:- Uptake of Zinc (Zn) in different ratios by Vetiver in roots and leaves

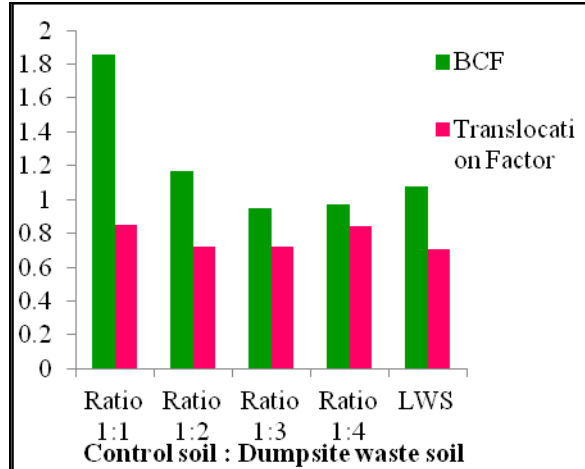


Fig 5:- Comparison of BCF and translocation factor of Cadmium (Cd) by Vetiver

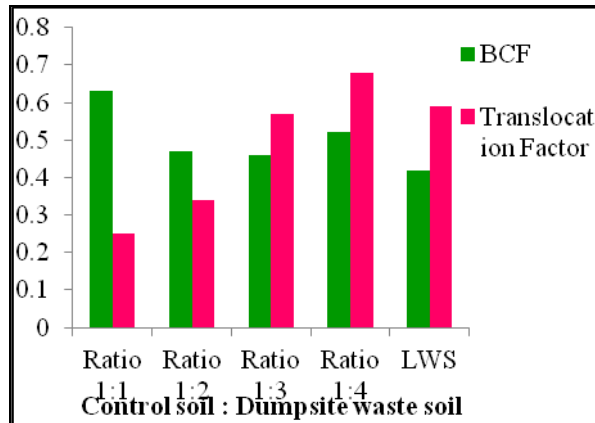


Fig 6:- Comparison of BCF and translocation factor of Chromium (Cr) by Vetiver

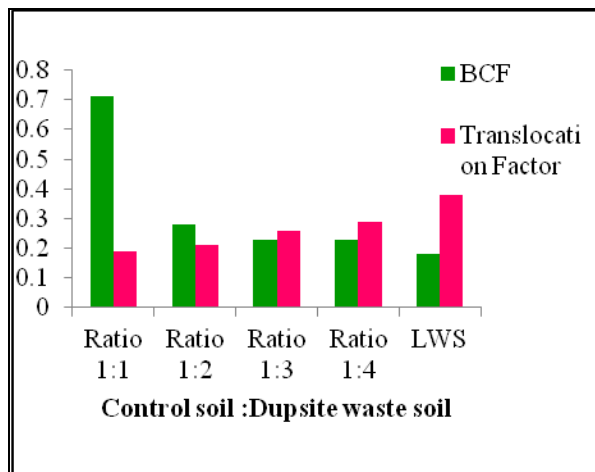


Fig 7:-Comparison of BCF and translocation factor of Zinc (Zn) by Vetiver

**Discussion:-**

**Effects of Dumpsite:-**

The negative effects are most commonly placed into two distinct categories: atmospheric effects and hydrological effects.

**Atmospheric Effects:-**

According to the EPA, the methane produced by the rotting organic matter in unmanaged landfills is 20 times more effective than carbon dioxide at trapping heat from the sun. Not only does methane get produced by the various forms of rotting organic matter that find their way into landfills, but household cleaning chemicals often make their way here as well. The mixture of chemicals like bleach and ammonia in landfills can produce toxic gases that can significantly impact the quality of air in the vicinity of the landfill.

**Hydrological Effects:-**

Landfills also create a toxic soup of industrial and home-cleaning chemicals. People throw away everything from industrial solvents to household cleaners in landfills, and these chemicals accumulate and mix over time. A more immediate concern is for the welfare of the wildlife that comes into contact with these chemicals, and it is not uncommon for animals to suffer inconceivably painful deaths resulting from chemical contamination (Zu et al, 2005). The three most important are toxins, leachate and greenhouse gases.

**Toxins:-**

Many materials that end up as waste contain toxic substances. Over time, these toxins leach into our soil and groundwater, and become environmental hazards for years. Electronic waste is a good example. Waste such as televisions, computers and other electronic appliances contain a long list of hazardous substances, including mercury, arsenic, cadmium, PVC, solvents, acids and lead. It's called Methylmercury and it is a highly toxic agent. In nature, methylmercury forms in aquatic systems when anaerobic organisms (organisms that don't need oxygen) feed on it. Unfortunately, landfills often imitate the same conditions. The result can be concentrations of methylmercury in our environment up to 100 times the normal levels (as was the case with a landfill in Florida). That's pretty toxic. Methylmercury is a bioaccumulant, which basically means it builds up in our food chain, and it's most commonly ingested by eating fish. Methylmercury is so dangerous; it can even impede the development of a child's nervous system. E-waste is a very toxic problem. A mixture of different chemicals goes into making electronics, and these leach into our soil and groundwater as the products degrade. Some of these chemicals are lead brominated flame retardants, antimony oxide, cadmium and beryllium. They all end up in our environment and potentially affecting our public health.

**Leachate:-**

Leachate is the liquid formed when waste breaks down in the landfill and water filters through that waste. This liquid is highly toxic and can pollute the land, ground water and water ways.

**Greenhouse gas:-**

When organic material such as food scraps and green waste is put in landfill, it is generally compacted down and covered. This removes the oxygen and causes it to break down in an anaerobic process. Eventually this releases methane, a greenhouse gas that is 21 times more potent than carbon dioxide. The implications for global warming and climate change are enormous. Methane is also a flammable gas that can become dangerous if allowed to build up in concentration. Composting your food scraps and green waste in a compost bin eliminates many of these problems.

**Health Effects of Dumpsite:-**

A few studies that have attempted to measure certain chemicals in blood and urine of populations near waste sites have generally not found increased levels of volatile organic compounds (VOCs) (Hanar et al. 1996) mercury (Reif et al. 1993), or PCBs (Stehr et al. 1998). Landfill sites may be a source of airborne chemical contamination via the off-site migration of gases and via particles and chemicals adhered to dust, especially during the period of active operation of the site. Very little is known about the likelihood of air exposure from landfill sites through landfill gases or dust. At some of the sites described below, low levels of volatile organic chemicals have been detected in indoor air of homes near landfill sites (Clark 1982, Goldman 1985) in outdoor air in areas surrounding sites (Deloraine 1995, Zmirou 1994) or in on-site landfill gas.

**Conclusions:-**

The tolerance of Vetiver to the selected three heavy metals at various concentrations in control soil and in landfill waste amended soils, reveals the survival potential at high toxic heavy metal range.

Vetiver accumulates large range of selected heavy metals in roots with low translocation to leaves. The order of metal uptake is roots>leaves.

The risk of biomagnification of the metals through the food chain can be reduced using vetiver system at the landfill sites as the Metal Removal Efficiency in the range of 70- 88%, TF<1, and BCF<1, thus indicating the reduction in metal toxicity of the soil at the site, by adoption of exclusion strategy and suitability of the plant for phytostabilization.

The important implications of these findings are when vetiver is used for the rehabilitation of landfill sites contaminated with high levels heavy metals namely, Cadmium, Chromium, and Zinc, its leaves can be safely grazed by animals or harvested for mulch as very little of these heavy metals are translocated to the leaves (Ghosh 2005).

Thus from the present study it can be concluded that *Vetiveria zizanioides* (L.) Nash, owing to its good metal removal efficiency from the landfill waste soils and uptake of metals, can be used as an ecotechnological tool to manage the problem of solid waste at landfill site.

Research into the health effects of landfill sites is relatively immature, and further research could improve our current understanding. Future studies of landfill sites would greatly benefit from a more interdisciplinary approach, drawing from the fields of landfill engineering, environmental sciences, toxicology, and epidemiology.

Johnson. B.L, et al, 1997, in a recent review of toxicological hazards of Superfund waste sites, conclude that although a large body of toxicological research is under way to assess the toxicity of chemicals commonly contaminating the environment surrounding waste sites, equally significant work is still to be done before these chemicals have adequate toxicity profiles that can be used by health and risk assessors.

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### RESEARCH ARTICLE

#### COMPARATIVE STUDY OF INTRAOPERATIVE COMPLICATIONS IN PSEUDOEXFOLIATION SYNDROME WITH NORMAL PATIENTS IN CATARACT SURGERY.

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##### Key words:-

Pseudoexfoliation syndrome, Manual Small Incision Cataract Surgery, Intraoperative Complications and Postoperative Complications.

#### Abstract

**Background And Objective:** Pseudoexfoliation syndrome is an age-related systemic disease manifesting itself primarily in the eyes which is characterized by the accumulation of microscopic granular amyloid-like protein fibres. Studies have shown that these patients have higher rates of intraoperative complications compared to the patients without the condition. This study was undertaken to determine and compare the intraoperative complications in Pseudoexfoliation patients with Normal patients in cataract surgery.

**Methods:** It's a hospital based Prospective observational study of 100 patients, 50 patients having Pseudoexfoliation syndrome and 50 patients without Pseudoexfoliation syndrome attending department of Ophthalmology, D. Y. Patil hospital and Research Institute, Kolhapur, between May 2014-April 2016.

**Results:** The average age of patients was 66 years, with male predominance and with a higher incidence of bilateral involvement. 13 (26%) patients with Pseudoexfoliation syndrome had intraoperative complications while 4 (8%) patients without Pseudoexfoliation syndrome had intraoperative complication. Among all complications, the incidence among patients with Pseudoexfoliation syndrome and patients without Pseudoexfoliation syndrome were 6 (12%) and 2 (4%) for Zonular dehiscence, 4 (8%) and 1 (2%) patient for Posterior Capsular Rent and 3 (6%) and 1 (2%) patient for Vitreous loss respectively.

**Conclusion:** Inadequate mydriasis is one of the major preoperative complication with Pseudoexfoliation syndrome which has a bearing on the intraoperative complications. With proper preparation, Small Incision Cataract Surgery can be performed in this group of patients. In conclusion, with appropriate preoperative, intraoperative and postoperative care the risks of complications can be minimized and favorable outcomes can be achieved in cataract surgery with Pseudoexfoliation syndrome.

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#### Introduction:-

Pseudoexfoliation Syndrome is an age related generalized disorder involving abnormal production or turnover of extra-cellular matrix in ocular tissues, orbital tissues, skin and visceral organs. The exact etiopathogenesis of this condition and chemical composition of the material still remains unknown.

In the eye, Pseudoexfoliation syndrome is characterized clinically by small white deposits of material in the anterior segment, most commonly in the pupillary border and the anterior lens capsule. The most consistent diagnostic feature is three distinct zones of Pseudoexfoliation material seen on the lens capsule after full dilatation.

Additional subtle clinical signs that help in early diagnosis are loss of pigment from peri-pupillary area producing trans illumination defects, insufficient mydriasis, and pigment dispersion into anterior chamber after mydriasis, deposition of melanin over trabecular meshwork and Schwalbe's line. The existence of posterior synechiae without any other cause and hemorrhage in the iris stroma after mydriasis are also suggestive of Pseudoexfoliation syndrome. Deposition of material on the zonular fibres weakens it leading to Phacodonesis, subluxation and dislocation of lens. The presence of secondary open angle glaucoma is known as glaucoma capsulare. This glaucoma has more serious clinical course and worse prognosis than primary open angle glaucoma, often not responding to medical therapy and requiring early surgical intervention. An increased incidence of nuclear cataract is seen. Pseudoexfoliation syndrome frequently goes undiagnosed leading to unexpected problems in management and during surgery. Therefore, making the diagnosis often requires a careful slit-lamp examination after pupillary dilatation.

Due to involvement of virtually all structures by Pseudoexfoliation material, patients have a significantly greater risk for a variety of complications during cataract surgery. Poor mydriasis, pigment dispersion, combined with Phacodonesis and zonular dialysis predisposes to posterior capsular rupture and vitreous loss. Intra operative modifications like sphincterotomy can lead to post-operative irregular pupil and iris pigment dispersion.

Possible pre-operative, intra-operative and post-operative measures to avoid or minimize these complications include an increased awareness of Pseudoexfoliation syndrome, a careful slit lamp examination after full pupillary dilatation, adequate control of intra-ocular pressure pre-operatively, avoidance of iris manipulation, adequate pupillary dilatation, use of heparin coated intra-ocular lenses, use of capsular tension ring in selected cases and judicious use of steroids post-operatively.

### **Materials and Methods:-**

A total number of 100 cases (50 patients with Pseudoexfoliation and 50 normal patients as control) attending D. Y. Patil Hospital Kadamwadi Kolhapur fulfilling the inclusion and exclusion criteria will be studied. Inclusion criteria followed were: 1) Patients 50 years and above of age belonging to either sex diagnosed to have cataract with Pseudoexfoliation on the basis of slit lamp examination before and after pupillary dilatation. 2) Patients above 50 years of age belonging to either sex diagnosed to have cataract without Pseudoexfoliation on the basis of slit lamp examination before and after pupillary dilatation. Exclusion criteria for the study was: 1) Patients less than 50 years of age. 2) Patients with traumatic cataract. 3) Patients with history of exposure to intense infrared lights i.e. glass blowing. 4) Patients with eye diseases other than Pseudoexfoliation or early cataract. 5) Patients with Diabetes Mellitus.

Pre-operative evaluation was done which included: 1) Visual acuity testing for distance and near using Snellen's distant chart and near vision chart respectively. 2) Refraction and correction where required. 3) External ocular examination. 4) Slit lamp bio microscopic examination for evidence of the following findings: Pseudoexfoliation material in the pupillary margins, Morphological alterations of the cornea, Anterior chamber depth and pigment dispersion in the anterior chamber, Iridodonesis, Presence of posterior synechiae, Zones of Pseudoexfoliation on the anterior surface of the lens capsule, Phacodonesis or frank subluxation/dislocation of lens, Measurement of pupil size before and after dilatation of pupil and Pupillary reactions. 5) Intraocular pressure using Goldmann tonometer. 6) Gonioscopy with Goldmann three mirror lens in all patients with Pseudoexfoliation syndrome. 7) The pupils were then dilated with a combination of 10% phenylephrine and tropicamide 1%, 1 drop was instilled every 5 minutes over a 15 minute interval. 8) This was followed by slit lamp examination for measuring pupil dilatation, examination of lens capsule for central and peripheral zones of Pseudoexfoliation material deposition and evaluation of lens for the type of cataract. 9) Fundoscopy. 10) Lacrimal patency test. 11) Keratometry. 12) A-scan and Intraocular lens power calculation by SRK-2 formula.

Other investigations included urine examination for detection of sugar and albumin. All patients were given systemic antibiotics (tablet ciprofloxacin 500mg b.d.) on the preoperative day. On the day of surgery pupils were dilated adequately using instillation of 1% tropicamide and 10% phenylephrine eye drops every 10 minutes before surgery. Selected Patients who had high intraocular pressure were given intravenous mannitol 20% one gram per



kilogram bodyweight and oral Acetazolamide 250 milligram 2 times a day depending on level of intraocular pressure preoperative day and also 1 hour prior to surgery.

### Results:-

In this study of 100 cases, we studied many different parameters in patients with Pseudoexfoliation syndrome and control group. The age distribution (as seen in Table 1) shows 6 (12%) patients of age group 50 – 59 years, 37(74%) patients of age group 60 – 70 years and 7 (14%) of age group 71- 80 %. The average age of patients was 66.28 years and about 37 (74%) of patients were above 60 years of age. 30 (60%) were males and 20 (40%) were females. 31 (62%) of the patients had clinical bilateral involvement of Pseudoexfoliation syndrome and 19 (38%) had unilateral involvement. 36(72%) of the patients had Pseudoexfoliative materials present on the pupillary margin, 9 (18%) of the patients had pseudoexfoliative materials present on the iris surface, 2(4%) of the patients had Iris Atrophy, 1(2%) of the patient had Iridodonesis and 2 (4%) of the patients had posterior synechiae in this study group.

Out of the 50 patients, 43(86%) of the patients had open angles and 7(14%) of the patients had narrow angles as compared to patients without Pseudoexfoliation syndrome, 49 (98%) had open angles and 1(2%) patient had occluded angle. 18(60%) had peripheral zone, 12(40%) had both peripheral zone and centralzone and none of them had only centralzone. 19(38%) of the patients had Mature Cataract and 31(62%) of them had Immature cataract with Pseudoexfoliation syndrome compared to 16(32%) of the patients had Mature Cataract and 34(68%) of the patients had immature cataract without Pseudoexfoliation syndrome

The intraocular pressure distribution in patients with and without Pseudoexfoliation syndrome. 28 (56%) of the patients had sufficient mydriasis, and 22(44%) of the patients had insufficient mydriasis as compared to patients without Pseudoexfoliation syndrome 48 (96%) of patients had sufficient mydriasis, and 2(4%) of the patients had insufficient mydriasis(as seen in Table 2a and b). 13 (26%) of the patients with Pseudoexfoliation syndrome had intraoperative complication while 37 (74%) patients did not have any complications. 4 (8%) of the patients without Pseudoexfoliation syndrome had intraoperative complication while 46 (96%) patients did not have any complications. (as seen in Table 3a and b) While comparing the intraoperative complications in patients with and without Pseudoexfoliation syndrome it shows statistically significant difference ( $p < 0.05$ ).

As seen in table 4, 6(12 %) of patients had Zonular dehiscence while this complication was seen in 2(4%) patients without Pseudoexfoliation syndrome, 4(8%) of the patients had Posterior Capsular Rent while 1(2%) patient without Pseudoexfoliation syndrome had this complication and 3(6%) of the patients had Vitreous loss while 1(2%) patient without Pseudoexfoliation syndrome had this complication.

All patients were implanted with intraocular lens after employment of various surgical modifications like, Sphincterotomy, Synecholysis and Posterior Capsular Ring. Out of the total 50 patients, 8(26.67%) patients who had one intraoperative complications, 5(62.5%) of them had insufficient mydriasis and 3(37.5%) of the patients had adequate mydriasis. 6 patients (12%) had sphincterotomy, 5 patients(10%) had synechiolysis and 2 (4%) underwent both during cataract surgery. 2(4%) patients had capsular tension ring.

**Table 1:-** Age Distribution In Patients With Pseudoexfoliation Syndrome (N=50).

Age	Number Of Patients	Percentage
50-59 YEARS	6	12
60-70 YEARS	37	74
71-80 YEARS	7	14
TOTAL	50	100

**Table 2a:-** Intraocular Pressure In Patients With Pseudoexfoliation Syndrome (N = 50)

Iop	Number Of Patients	Percentage
10- 20mm Hg	37	74
21 – 30 Mm Hg	12	24
>30mm Hg	1	2
Total	50	100.

**Table 2b:-** Intraocular Pressure In Patients Without Pseudoexfoliation Syndrome (N = 50)

Iop	Number Of Patients	Percentage
10-20mm of Hg	46	92
21-30mm of Hg	3	6
>30mm of Hg	1	2
Total	50	100

**Table 3 A:-** Intraoperative Complications In Pseudoexfoliation Syndrome (N = 50)

Complications	Number Of Patients	Percentage
Occurred	13	26
Not Occurred	37	74
Total	50	100

**Table 3 B:-** Intraoperative Complications In Patients Without Pseudoexfoliation Syndrome (N = 50)

Complications	Number Of Patients	Percentage
Occurred	4	8
Not Occurred	46	92
Total	50	100

**Table 4:-** Intraoperative Complications In Patients With And Without Pseudoexfoliation Syndrome

Complications	Number Of Patients Having Pseudoexfoliation Syndrome	Number Of Patients Without Pseudoexfoliation Syndrome
Zonular Dehiscence	6	2
Posterior Capsular Rupture	4	1
Vitreous Loss	3	1

### Discussion:-

This study consisted of 50 eyes of 50 patients with Pseudoexfoliation syndrome and 50 eyes of 50 patients without Pseudoexfoliation syndrome who underwent manual small incision cataract surgery. The average age of patients was 66.28 years and about 37 (74%) of patients were above 60 years of age. Pseudoexfoliation syndrome usually occurs between 60 to 80 yrs, the average age being 70 yrs. Studies regarding the sex distribution of Pseudoexfoliation syndrome are conflicting. Women have predominated in some series while other studies have found equal or greater prevalence in men. In this study, males were more affected than females. 31 (62%) of the patients had clinical bilateral involvement of Pseudoexfoliation syndrome and 19 (38%) had unilateral involvement. A review of literature comparing the frequency of monocular versus binocular involvement in various series is not conclusive.<sup>1</sup>

36(72%) of the patients had Pseudoexfoliative materials present on the pupillary margin, 9 (18%) of the patients had pseudoexfoliative materials present on the iris surface, 2(4%) of the patients had Iris Atrophy, 1(2%) of the patient had Iridodonesis and 2 (4%) of the patients had posterior synechiae in this study group. A study by Ritch Schlotzer.

Scherhardt<sup>2,3</sup>(2001) stated that deposits of Pseudoexfoliation material on the iris sphincter and pupillary margin are seen in 84% patients. Thus, the most prominent and consistent clinical finding is the Pseudoexfoliation material at the pupillary border. 20 (40 %) had peripheral zone, 30 (60 %) had both peripheral zone and central zone and none of them had only central zone. The peripheral zone of pseudoexfoliation material is a consistent finding and the central zone is not always apparent.<sup>4</sup>Tarkkanen found the central zone absent in 18% of cases in his study while Ritch, Schlotzer – Scherhardt found it absent in 20– 60% of their cases. 9(30%) of the patients had Mature Cataract and 21(70%) of them had Immature cataract.<sup>5,6</sup>All of them, i.e. 100%, had Nuclear Cataracts. Cortical Cataract was present along with advanced nuclear cataract and none of the patients had isolated cortical cataract. Seland et al have reported a higher incidence of nuclear cataract in eyes with pseudoexfoliation syndrome with fewer cortical cataracts.<sup>7</sup>Hietanen J et al have also reported nuclear cataract to be the predominant type of cataract in Pseudoexfoliation syndrome.

Out of 50 patients in the present study group 37 (74%) of the patients had IOP in the range 10- 20 mm Hg, 12 (24%) of the patients in the range of 21-30 mm Hg and 1(2%)of the patient had IOP more than 30 mm Hg as compared to

50 patients without Pseudoexfoliation syndrome, 46(92%) of the patients had IOP in the range 10- 20 mm Hg, 3(6%) of the patients in the range of 21-30 mm Hg and 1 (2%) of the patient had IOP more than 30 mm Hg. Overall 17 patients who had raised IOP were managed by either by giving intravenous Mannitol 20% one gram/kilogram body weight over a period of 30 minutes to one hour, along with oral acetazolamide 250 milligrams twice a day on preoperative day and intravenous Mannitol 20% one gram/kilogram body weight given one hour prior to surgery or only oral acetazolamide 250 milligrams twice a day for 3 days.

In other studies, with pseudoexfoliation syndrome, 20% had glaucoma and increased IOP at the time of diagnosis, as compared to our study where 17% of patients had raised IOP. This underscores the need for careful follow-up in patients who have pseudoexfoliation syndrome. Pseudoexfoliation syndrome accounts for 15-20% of cases of open angle glaucoma.

1(2%) of the patients had iridodonesis. This is because the iris in Pseudoexfoliation syndrome is more rigid due to vascular compromise and various other changes like deposition of Pseudoexfoliation material, Atrophy, Loss of iris stroma.

As part of management of rigid undilating pupil, 6 patients (12%) had sphincterotomy, 5 patients (10%) had synechiolysis and 2 (4%) underwent both during cataract surgery. 2(4%) patients had capsular tension ring. Alfaite et al in their study of 31 eyes of Pseudoexfoliation syndrome undergoing ECCE noted a statistically significant increase (p value <0.01) in the need to perform sphincterotomies. Kuchle et al noted 3.4% of their 76 patients to require surgical Synechiolysis and/or mechanical dilatation of pupil intraoperatively.<sup>13</sup>

Amongst 50 patients with Pseudoexfoliation syndrome 13(26%) had intraoperative complication while 37 (74%) patients did not have any complications compared to 4 (8%) of the patients without Pseudoexfoliation syndrome had intraoperative complication while 46 (96%) patients did not have any complications. 6(12 %) of patients had Zonular dehiscence while this complication was seen in 2(4%) patients without Pseudoexfoliation syndrome, 4(8%) of the patients had Posterior Capsular Rent while 1(2%) patient without Pseudoexfoliation syndrome had this complication and 3(6%) of the patients had Vitreous loss while 1(2%) patient without Pseudoexfoliation syndrome had this complication.

### **Conclusion:-**

Small incision cataract surgery in eyes with Pseudoexfoliation syndrome is associated with an increased incidence of complications both preoperatively and intraoperatively. Inadequate mydriasis is one of the major preoperative complications in eyes with Pseudoexfoliation syndrome which has a bearing on the intraoperative complications like posterior capsular rent and vitreous loss. Adequate surgical modifications such as Sphincterotomy and/or Synechiolysis in these eyes with inadequate mydriasis reduce the intra operative complications. These pupil enlargement procedures are advocated during cataract surgery.

All though cataract surgery in Pseudoexfoliation syndrome is challenging, if the surgeon is aware of the condition preoperatively and pays meticulous attention to the surgical technique, a good outcome can be expected.

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### RESEARCH ARTICLE

#### “CONSUMER ATTITUDE TOWARDS BRIQUETTE COOKING STOVE”- AN ANALYTICAL APPROACH.

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#### Abstract

Briquette cooking stoves are the new generation cooking stoves, which can be used to replace the conventional LPG cooking system that is generally used in corporate hostels, hospitals, restaurants, jails, function halls, caterers. And the Briquettes are used as economic fuel in stoves and as an alternative fuel for industrial boilers, furnaces and other industrial applications. Biomass briquettes, mostly made of green waste and other organic materials, are commonly used for electricity generation, heat and cooking fuel. These compressed compounds contain various organic materials, including rice husk, biogases, ground nut shells, municipal solid waste, and agricultural waste. The composition of the briquettes varies by area due to the availability of raw materials.

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#### Introduction:-

Biomass is a renewable and carbon neutral energy source. In times of rising energy cost, petroleum and gas reserves diminishing, and a world focus on environmental impact, alternative energy forms have become increasingly important. It makes sense to use energy resources that are readily available, plentiful, renewable and sustainable. Biomass provides one of the most environmentally friendly energy sources to meet the world's growing energy needs. Due to the increasing need for alternative fuel, briquettes have come into existence as an affordable and economical alternative to traditional forms of fuel such as charcoal and wood. They are suitable for cooking and water heating in households, and for use in drying; firing ceramic products, powering boilers to generate steam, and fuelling gasifiers.

Briquette is the substitute of firewood and so trees are saved and problems like soil erosion and desertification are prevented. It improves health by providing a cleaner burning fuel. It creates micro enterprise opportunities like making the briquette machine from locally available materials, supplying the materials, making the briquettes and selling and delivering the briquettes.

Many concessions are offered by the government.

Worldwide biomass currently provides more than 10 percent of our energy needs. Biomass may become an increasingly important energy source rising to 30 percent globally by 2050.

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**Statement Of The Problem:-**

The mission of the Harvest Fuel Initiative is to facilitate the market-based approach to the large-scale and widespread use of efficient technologies and sustainable solid biomass fuel alternatives that can help alleviate poverty, improve health, and protect the environment. Today's world high quality products that socially and economically benefit low and middle-income households and organizations looking for energy and cost saving solutions need to be focused. More than two billion people use bio-fuels such as wood, crop residue, and dung as their primary energy source for domestic needs such as heating and cooking. Bio-fuels are carbon neutral sources of renewable energy, but, the inefficient burning of wood is responsible for a significant fraction of global black carbon. Solutions such as solar stoves and ovens have great limitations regarding low energy, blackout times, and size.

The briquette cooking stove is a wonderful invention that has saved the cooking time for millions of people and organization. It has become a prestigious product in the new era of modernization. A large percentage of world population continues to use biomass in traditional cook stoves for cooking needs, low efficiency and high emissions from this result in adverse health and socio-economic impact. Though improved cook stoves have been developed, the environmental impact was not reduced. So, there is a need for a new innovation which can be accomplished with the help of the briquette cooking stove. Hence, the study is taken up.

**Objective Of The Study:-**

The main objectives of the study is to analyse the consumer attitude towards briquette cooking stove.

**Scope Of The Study:-**

The scope of the study is to analyse the consumer preference of briquette cooking stove among the hotels in Madurai city. The study encompasses and analysis of the level of satisfaction, reason for preferring and also the reason for switching over.

**Research Design and Methodology:-**

The study includes only primary data. The data have been collected from 100 respondents through questionnaire method in Madurai city on the basis of convenience sampling method.

**Frame work of analysis:-**

Percentage analysis, ANOVA, Chi-square test, Garrett's Ranking Technique, Intensity value is used to analyze the primary data.

**Type of fuel previously used:-**

In earlier days, people used various types of fuel for their heating and cooking processes. The types of fuel previously used are analysed by using Garrett's Ranking techniques and given in Table 1.

**Table 1:-** Type of fuel previously used.

Type of fuel	Ranks							Garret's Score	Mean Score	Rank
	1	2	3	4	5	6	7			
Fire wood	15	23	21	23	9	3	6	5671	56.71	2
Charcoal	10	9	19	18	29	13	2	5107	51.07	3
Groundnut Shells	7	4	13	24	17	22	13	4516	45.16	5
Cashew Shells	7	21	16	10	20	13	13	4935	49.35	4
Cow dung	31	22	12	10	13	7	5	5968	59.68	1
Kerosene	6	13	11	10	9	36	15	4390	43.9	6
Liquid Petroleum Gas	23	8	8	6	3	6	46	4385	43.85	7

**Source:** Primary data

From table 1, it is noted that, cow dung has become the first type of fuel used previously and is proved with the garret's score of 59.68. Firewood is the second fuel mostly used by the respondents (Garrets score 56.71). The third fuel cited by the respondents is the charcoal (Garrets score 51.07). Cashew shells have got the fourth rank (Garrets score 45.16). Groundnut shells and kerosene has got the fifth and six ranks respectively. Liquid petroleum gas has been cited lastly by the respondents with the garret score (43.85).

**Reasons for switching over to briquette cooking stove:-**

Briquettes are a common type of solid fuel, largely replacing sodas of raw peat as a domestic fuel. These briquettes consist of shredded peat, compressed to form a virtually smokeless, slow burning, easily stored and transported fuel. Although often used as the sole fuel for a fire, they are also used to quickly and easily light a coal fire. Biomass briquettes are made from agricultural waste and are a replacement for fossil fuels such as oil or coal, and can be used to heat boilers in manufacturing plants, and also have applications in developing countries. Biomass briquettes are a renewable source of energy and avoid adding fossil carbon to the atmosphere. The reasons for switch over to briquette cooking stove are presented in Table 2

**Table 2:-** Reasons for switching over to briquette cooking stove

Reasons	Ranks					Garret's Score	Mean Score	Rank
	1	2	3	4	5			
Reduce cooking time	7	53	31	5	4	5711	57.11	II
No fly ash	6	8	14	36	36	5374	53.74	IV
Reduce cooking fuel cost	75	16	2	3	4	7061	70.61	I
Safety	1	10	23	32	34	5281	52.81	V
Easy to handle	11	13	30	24	22	5473	54.73	III

Source: Primary data

From Table 2, it is inferred that, briquette cooking stove reduces cooking fuel cost is the first reason represented by the respondents with the garret's score of 70.61. Secondly, the respondents switch over to briquette cooking stove as it reduces cooking time (garrets score 57.11). The third reason cited by the respondents is the easy handling of briquette stove (garrets score 54.73). The respondents have given the reason of No fly ash (garrets score 53.74) as the fourth reason. Safety is chosen as the fifth reason felt by the respondents with garret's score of 52.81.

**Sources of information:-**

Sources are the main thing which can give information about everything or anything. Information search is one of the important process of consumer's buying decision. Sources are nothing but the elements through which one can get the information for satisfying themselves. The sources of information about the briquette cooking stove are given in Table 3

**Table 3:-** Sources of information

Sources of information	Ranks				Mean Value
	1	2	3	4	
Advertisement	11	25	24	15	3.26
Agents	21	24	31	24	2.73
Focus groups	25	29	16	30	2.89
Pamphlets	41	12	18	29	3.16
Neighbors	27	16	12	24	2.96

$H_0$ – There is no significant relationship in ranks assigned by different respondents regarding the sources of getting information about briquette cooking stove.

Since the calculated value of  $\chi^2$  (2.345) at 5 percent level of significance (d.f=3) is greater than table value (9.49) the alternative hypothesis is accepted. Hence it is concluded that there is no significant relationship between sources of getting information about briquette cooking stove.

**Size of briquette cooking stove:-**

Briquette cooking stoves are new generation cooking stoves which are used to replace the conventional cooking stoves. The biomass briquette cooking stoves which are considered an economic fuel is available in small, medium, and large size. Table 4 shows the size of briquette cooking stove.

**Table 4:-** Size of briquette cooking stove

Size of briquette	Number of respondents	Percentage
Small	42	42
Medium	29	29
Large	29	29
Total	100	100

**Source:** Primary data

From the Table 4 it is inferred that 42 per cent of the respondents use small size briquette stoves. Almost, 29 per cent of the respondents equally use medium and large size briquette cooking stoves.

#### **Relationship between the income and the size of briquette cooking stove.**

To find out the relationship between the income and the size of briquette cooking stove Chi-square test is applied. Table 5 shows the income and the size of briquette cooking stove.

**Table 5:-** Income and size of briquette cooking stove

Income	Size of briquette cooking stove			Total
	Small	Medium	Large	
Up to 20,000	35	12	2	49
20,000-40,000	7	12	19	38
40,000-60,000	0	5	5	10
Above 60,000	0	0	3	3
Total	42	29	29	100

**Source:** Primary data

**H<sub>0</sub>:** There is no significant relationship between the income and the size of the briquette cooking stove.

Since the calculated value of  $\chi^2$  (46.421) at 5 percent level of significance (d.f=6) is greater than table value (12.6) the null hypothesis is rejected. Hence it is concluded that there is a significant relationship between the income and the size of the briquette cooking stove.

#### **Relationships between occupation and size of briquette cooking stove.**

To find out the relationship between the occupation and the size of briquette cooking stove Chi-square test is applied. Table 6 show the occupation and size of briquette cooking stove.

**Table 6:-** Occupation and size of briquette cooking stove

Occupation	Size of briquette			Total
	Small	Medium	Large	
Households	11	4	1	16
Canteen	27	9	8	44
Restaurants	4	10	11	25
Mess / Catering	0	6	9	15
Total	42	29	29	100

**Source:** Primary data

**H<sub>0</sub>:** There is no significant relationship between the occupation and the size of briquette cooking stove.

Since the calculated value of  $\chi^2$  (31.385) at 5 percent level of significance (d.f=6) is lesser than table value (12.6) the alternative hypothesis is rejected. Hence it is concluded that there is a significant relationship between the occupation and the size of briquette cooking stove.

#### **Relationship between the daily schedules of cooking process and the size of briquette cooking stove.**

To find out the relationship between the daily schedule of cooking process and the size of briquette cooking stove Chi-square test is applied. Table 7 shows the daily schedule of cooking process and the size of briquette cooking stove.



**Table 7:-** Daily schedule of cooking process and size of briquette cooking stove

Daily schedule of cooking process	Size of briquette cooking stove			Total
	Small	Medium	Large	
Morning	14	4	1	19
Afternoon	11	11	6	28
Evening	0	2	1	3
Night	1	2	0	3
All	16	10	21	47
Total	42	29	29	100

**Ho:** There is no significant relationship between the daily schedule of cooking process and the size of briquette cooking stove.

Since the calculated value of  $\chi^2$  (21.070) at 5 percent level of significance (d.f=8) is greater than table value (15.5) the null hypothesis is rejected. Hence it is concluded that there is a significant relationship between daily schedule of cooking process and the size of the briquette cooking stove.

#### Frequency of usage:-

Consumers use briquette stove according to their needs and requirements depending upon the nature of application. Table 8 shows the frequency of usage.

**Table 8:-** Frequency of usage

Frequency of usage	Number of respondents	Percentage
Regularly	66	66
Once in a few days	10	10
Festivals	15	15
Occasionally	4	4
Functions	5	5
Total	100	100

**Source:** Primary data

From table 8 it's obtained that, 66 per cent of the respondents are using briquette cooking stove regularly. Nearly 1.5 percent of the respondents use the briquette stove during festivals seasons. The percentage of respondents using the stove once in a few days is 10. Only 5 per cent of the respondents use briquette cooking stove during the functions and 4 percent of the respondents are occasional users.

#### Size and frequency of usage:-

To analyse the relationship between the size of briquette cooking stove and the frequency of usage one way ANOVA is applied.

**Table 9:-** Size and frequency of usage

Size	Frequency of usage					Total
	Regularly	Once in a few days	Festivals	Occasionally	Functions	
Small	24 (36.4)	6(60)	6(40)	4(100)	2(40)	42
Medium	20 (30.3)	4(40)	4(26.7)	0(0)	1(20)	29
Large	22(33.3)	0(0)	5(33.3)	0(0)	2(40)	29
<b>Total</b>	<b>66</b>	<b>10</b>	<b>15</b>	<b>4</b>	<b>5</b>	<b>100</b>

**Source:** Primary Data.

**Ho:** There is no significant relationship between the size and the frequency of usage.

**Table 9**

Sources of Variance	Sum of Squares	Degree of freedom	Mean Square	F
Between group	2.541	2	1.270	1.270 F = ----- 1.357
Within group	131.619	12	1.357	= 0.936
<b>Total</b>	134.160	14		

Since as the calculated value (0.936) is less than the table value of f for  $v=2$   $v_2=12$  at 5% level of significance (3.88), so the null hypothesis is accepted. Therefore it is inferred that, there is no significant relationship between the size and the frequency of usage briquette cooking stove.

#### Relationship between the occupation and the frequency of usage

To find out the relationship between the occupation and the frequency of usage Chi-square test is applied. Table 10 shows the occupation and the frequency of usage of briquette cooking stove.

**Table 10:-** Occupation and frequency of usages

Occupation	Frequency of usages					Total
	Regularly	Once in a few days	Festivals	Occasionally	Function	
Households	13	2	0	1	0	16
Canteen	27	5	6	3	3	44
Restaurants	15	3	5	0	2	25
Catering	11	0	4	0	0	15
Total	66	10	15	4	5	100

**Source:** Primary data

**H<sub>0</sub>:** There is no significant relationship between the occupation and the frequency of usage of briquette cooking stove.

Since the calculated value of  $\chi^2$  (11.947) at 5 percent level of significance (d.f=12) is lesser than table value (21.0) the null hypothesis is accepted. Hence it is concluded that there no a significant relationship between the occupation and the frequency of usage of briquette cooking stove.

#### Benefits brought by briquette cooking stove.

The negative impacts are reduced by using improved cook stoves and fuels. Briquette cooking stoves bring change to the environment and changes to the users. The benefits are shown in Table 11.

**Table 11:-** Benefits

Benefits	Ranks					Mean Rank
	1	2	3	4	5	
Meals ready earlier	41	26	17	11	5	2.13
Do not have to watch the fire	16	15	26	22	21	3.17
Less chance for injuries	33	24	18	23	2	2.37
Fewer respiratory diseases	6	22	22	18	32	3.48
More time to do other activities	4	13	17	26	40	3.85

**Source:** Primary data

**H<sub>0</sub>-** There is no significant relationship in ranks assigned by different respondents regarding the benefits that are brought by briquette cooking stove.

Since the calculated value of  $\chi^2$  (85.424) at 5 percent level of significance (d.f=5) is greater than table value (11.1) the null hypothesis is rejected. Hence it is concluded that there is a significant relationship in ranks assigned by different respondents regarding the benefits that are brought by briquette cooking stove.

#### Reasons for preferring briquette cooking stove:-

Briquette cooking stove support sustainability and is a viable alternative to the stoves. These stoves are specially designed and are named for durability and can with stands 300kgs of weight. Depending on the holding capacity of

briquettes are prepared from the minimum to the maximum. As it is eco-friendly it is free from fumes. Briquette cooking stoves are available at affordable prices depending on the needs of the consumers. The reasons for the preference of briquette cooking stoves are shown in table 12.

**Table 12:-** Reasons for preferring briquette cooking stove

Reasons	Rank					Intensity value	Rank
	1	2	3	4	5		
Affordable price	3	3	3	53	38	180	III
Attractive models	7	3	15	38	37	174	V
Energy saving	1	4	16	59	20	207	I
Nature saving	-	8	7	52	33	190	II
Eco friendly	2	2	4	57	35	179	IV
Durability	-	1	8	46	45	165	VI

**Source:** Primary data

Table 12 it is understood that energy saving is the first reason cited by the respondents with the intensity value of 207. Nature saving have got the second rank with the intensity value of 190. The respondents have considered affordable price as the third reason. Eco-friendliness and attractive models are the fourth and the fifth reason expressed by the respondents. Durability has got the six ranks with the intensity score of 165.

#### **Relationship between the income and the reasons for preferring of briquette cooking stove.**

As the income is the significant determine, to find out whether the income has any influence on the reasons for preferring briquette cooking stove, the income and the reasons for preferring briquette cooking stove is given in Table 13

**Table 13:-** Income and reasons for preferring briquette cooking stove

Income	Reasons for preferring			Total
	Low	Medium	High	
Up to 20,000	5	38	6	49
20,000-40,000	8	24	6	38
40,000-60,000	1	7	2	10
Above 60,000	1	2	0	3
Total	15	71	14	100

**Source:** Primary data

**Ho:** There is no significant relationship between the income and the reasons for preferring the briquette cooking stove.

Since the calculated value of  $\chi^2$  (4.025) at 5 percent level of significance (d.f=6) is lesser than table value (12.6) the null hypothesis is accepted. Hence it is concluded that there is no significant relationship between income and reasons for preferring of briquette cooking stove.

#### **Relationship between the occupation and the reasons for preferring of briquette cooking stove.**

To find out the relationship between the occupation and the reasons for preferring of briquette cooking stove Chi-square test is applied. Table 14 shows the occupation and the reason for preferring of briquette cooking stove.

**Table 14:-** Occupation and reasons for preferring briquette cooking stove

Occupation	Reasons for preferring			Total
	Low	Medium	High	
Households	0	13	3	16
Canteen	4	34	6	44
Restaurants	9	12	4	25
Mess /catering	2	12	1	15
Total	15	71	14	100

**Source:** Primary data

**Ho:** There is no significant relationship between the occupation and the reasons for preferring briquette cooking stove.

Since the calculated value of  $\chi^2$  (14.226) at 5 percent level of significance (d.f=6) is greater than table value (12.6) the null hypothesis is rejected. Hence it is concluded that there is a significant relationship between the occupation and the reasons for preferring of briquette cooking stove.

### **Suggestions:-**

- ❖ Campaign can be organised by the manufacturer to bring awareness about the reduction in cooking fuel cost.
- ❖ Small size specially made briquette cooking stoves are available and the households can be encouraged to use such stoves for their daily cooking.

### **Conclusion:-**

A detailed analysis of the respondents shows the general attitude in relation to their choice of briquette cooking stove and highlighted reasons for preferring briquette cooking stove. In the near future people may prefer to use fumeless , eco-friendly briquette cooking stoves for their daily use.

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### RESEARCH ARTICLE

#### STUDY OF SUSTAINABLE DEVELOPMENT OF PUBLIC TRANSPORT SYSTEM IN MALANG, INDONESIA.

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#### Abstract

Malang is a college city and inhabited of approximately 1 million dwellers, dominated by productive ages. The domination of the productive age makes the movement of people in Malang is quite active. The thing is, Malang is not provided adequate public transportation system to support the movement of people. The available systems which are still use are the old systems which developed in the 90s. It affected on the surge of private vehicles as a mode of transportation. The effects of private vehicles use are the traffic jam, inefficient fuel consumption, health problems, the increase of accidents number, and the high-cost economy. Therefore, Malang needs to develop better public transportations, which can resolve the problems. Moreover, the development of public transportation system needs to consider several problems which may arise such as the refusal by public transportation entrepreneurs that already exist, the drivers or people who feel aggrieved. Then the development must be sustained, accommodate the needs of stakeholders, and involves all of them. The expectation is, with the better public transportation system, Malang will become a comfortable city, healthier, safer, and the economic is increasing.

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#### Introduction:-

Malang is located in mountainous areas with varied contour and a total area of 252.1 km<sup>2</sup>. In Figure 1, Malang is the center of Malang Raya which included the city of Malang, Malang regency and Batu. As the central region, Malang is known as the city of education with more than 62 Universities and Academy schools, and hundreds of elementary, junior, and high school of public and private. It affects the rate of population growth in Malang and the people mobility.

As we see the development of the population in Malang during 2000 is inhabited by approximately 756.982 residents with the growth rate of the population of 0.86% per year since 1990. About 317.283 people or 42% are in the age between 20 to 49 years which have high mobility rate. Though the population distribution in each sub-district is considerably high, ranging from 126,000 to 182,000 (Statistics, 2008). The number of Malang population grew to 820.243 in 2010 and projected to reach 845.973 in 2014, with a growth rate of 0.31% between 2010 and 2013 and 0.64 in 2013 and 2014 (Statistics, 2012) (Statistics, 2015). Nevertheless, it is not the absolute number, because the total students in both public and private universities in Malang, has reached approximately 300.000

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which the majority are not Malang natives. It gives a huge contribution towards the level traffic jam in Malang, especially as the center region, a lot of comer work in Malang.

Now the transportation needs in Malang are facilitated by the government, even the facilities in the road and public transportation. However, from year by year, there is a tendency that the use of private cars as the main transportation has increased. As shown in Figure 2, In 2007 the number of private vehicles are 255.485, and increased to 279.606 in 2008, then to 291.404 in 2010, to 463.785 in 2014, and become 487.859 in 2015. In each of period, the number of motorcycles has always been a majority in comparison with the car about 5:1. In Figure 2, it illustrates the public transportation, the total is 2.758 in 2007, decreased to 2.466 in 2008, then slightly up to 2,527 in 2010, increased again to 2,659 in 2014 and eventually fell to 2,606 in 2015 (Statistics, 2008) (Statistics, 2013) (Statistics, 2015). Furthermore, based on the interview result with the Department of Transportation, in 2016, from 2.606 vehicles, only 70% of them are active, while the rest are not operating due to regulatory and feasibility reasons. Based on the existing data, it may indicate that the concern towards the public transportation has not been the main priority. Instead of increasing the number of fleets, the fact is if it compares in between 2007 and 2015 the fleets are decreased. Another problem is, the road length and the type of class road in Malang are tend to remain constants. For comparison, in 2007 the length roads of Class I was 29.77 km and the roads in good condition are 119,7 km, while in 2014 the roads of class I reminded 29,77 and roads in good condition are 137.3 km (Stats 2008) (Statistics, 2015).

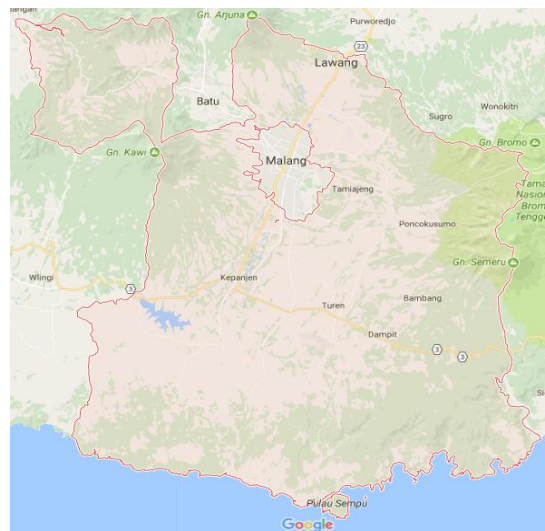


Figure 1:- Local Map of Malang (source: maps.google.com).

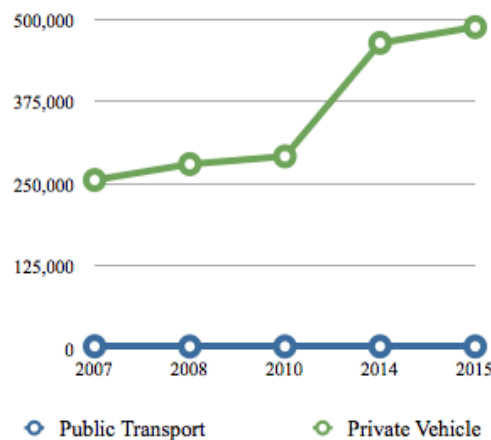


Figure 2:- The growth rate of private vehicles and public transportation.

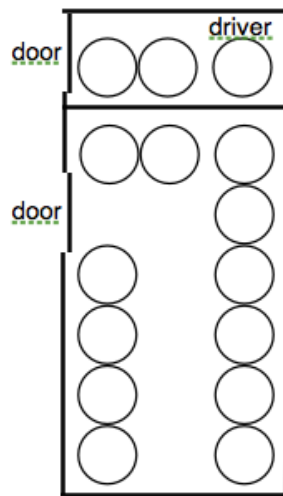
Along with these conditions, then the government is unavoidably obliged to organize a transport system which effective and efficient. Based on the explanation above, it requires a study of the development strategy in public transportation system in Malang. This paper will explain the condition of public transportation in Malang, from law and public policy of public transport perspective, the impact of public transportation, the stakeholder's need and recommendation of the development plan.

**Existing Public Transport Systems in Malang:-**

The public transportation in Malang is a minivan called microbus (mikrolet) with passenger capacity of 11 up to 14, see Figure 3 as an illustration. There are two sit positions in a microbus, the first is one chair next to the driver, while the rest sitting face to face behind the driver chair as illustrated in Figure 4. The small size of the microbus allows it to sneak to narrow streets in Malang but the small room capacity for passengers make the loading and unloading process quite difficult and it makes the microbus inefficient as mass transit. Another disadvantage of microbus is related to the passengers' safety and comfort.



**Figure 3:-** Public transportation in Malang (Microbus/Mikrolet).



**Figure 4:-** Microbus seats layout

In accordance with the rules of government, public transportation can be managed by state-owned enterprises, region-owned enterprises, joint-stock company, and a cooperative only. In Malang, the management of public transport is coordinated by several cooperatives owned by Department of Cooperatives. Under these cooperatives, there are microbus owners who employ drivers to run the microbus.

The supervision of the functions of microbus is conducted periodically by the Department of Transportation of Malang. Elements such as comfort and roadworthiness are examined through this supervision. Types of the test conducted are such as gas superficial, lamps, side slip, head light, brake, and speedometer. According to Sugianto et al., 2013, Department of Transportation of Malang already has professional staffs and adequate equipment. Meanwhile, the problem is there are no enough workers, so the testing process tends to delayed. The delayed of this

testing process resulted in microbus touts who attempt to quicken and manipulate the test process. This issue will definitely harm the users of public transportation and others drivers in terms of comfort and safety.

In Malang, the microbus divided into 25 routes, where each route connects a terminal with another terminal or certain area with another area. The path of each route may intersect each other, so the changing of the path may occur. The presence of terminals is intended as a place for microbus and public transport users. However, sometimes the development of infrastructure such terminals are not considered properly which resulted in the minimum providing of benefits. Take example the construction of Hamid Rusdi terminal which not functions properly because of its location which quite far from settlements and public service area. Furthermore, Hamid Rusdi terminal is indicated as one of traffic jam causes in other areas (Adhitama& Hanafi, 2014).

To provide the guarantee of comfort, aside from periodic testing, Malang government also seeks to improve the condition of existing microbus. It is secured by the Regional Regulation no. 5 of 2011 on the rejuvenation of public transport. This is reasonable because the public transportation which operates is from 90's era, it is not convenient to use and the operational cost tends to high. Nevertheless, the process of rejuvenation did not take place until today because the financing is fully borne by the owners of public transport and it is disadvantaging them economically (Putri, 2013).

Under these conditions, for the purposes of the development of public transport in Malang, it is necessary to do a comparative study to determine the condition and the proper strategy. One of the studies which can be used a reference is the development of marine transportation system in Nusa Peninda, where their development objectives are to facilitate tourism activities in Bali and increasing the income of local people. In order to success in the development, it is necessary to involve local people and relevant institutions, infrastructure development, network, and transport support (Adnyana, 2016).

Furthermore, another study which can be used as a reference is a research by Rahma, 2013, about the performance of Department of Transportation of Malang and its functions as a regulator, facilitator, and evaluator of public transport systems, as well as the support factors and inhibiting factors of public transport in Malang. In the research, the evaluative and quantitative studies were conducted in order to get feedback from people about the level of satisfaction and dissatisfaction toward the performance of provided parameters.

Another similar study in a more comprehensive analysis is The Characteristics of the development challenge of public transportation in the Federal Capital Territory (FCT), Nigeria (Femi, 2012). Problem encountered in the FCT is the lack of government participation in performing the managerial function of the transport system. In the study, is advisable to establish a special authority to regulate the transport system in the FCT.

#### **Finding:-**

In the development of the public transportation system, the replicated on many factors is needed such from law, public policy, the impact of public transport, social and societal. All these factors are critical for ensuring the development plan made can be carried out smoothly without any conflict and other obstacles. The following is a discussion of these factors.

#### **The Warranty Law of Public Transport System:-**

Due to the traffic jam problem in Malang, serious efforts of Central and Local Government are crucially needed in the attempt to develop and plan the public transportation for mobilization of citizens. One of the efforts which already realized by the Central Government through Regulations No. 22 year 2009 until this time only in terms of signs for existed system settings which are about stations, the registration for public transports, and its treatment. There are no special instructions for plan and development toward the better way. Likewise, Malang Government did the similar efforts by means of Malang City Local Regulation No. 9 year 2006 which is replaced by Malang City Local Regulation No. 5 year 2011. The regulation only covers about the definition of public transportation, the requirements, and responsibility of its executant, transport procedures, and the responsibility of Government only on the surveillance level and taking action on any possible violation. In that regulation, Local Government does not indicate anything about how public transportation in Malang City will be developed.

The Warranty Law is vitally needed in order to provide certainty of the implementation of the developed public transportation. In that law, instruction related to the development of public transportation system which fulfills the



principle of punctuality, low-cost, and has high certainty is being proposed. The pattern of Malang public transportation development is indeed has to consider the condition of Malang Raya and all the involved stakeholders. Direct adoption of deemed successful system in other cities such as Jakarta and Surabaya is uncertain of success if it is applied in Malang.

#### **The Transportation Policy in Malang City Analysis of Public:-**

As explained previously, public transports in Malang are subject to regulation defined in Local Regulation No.5 year 2011 about transportation in street with public motor vehicles. The regulation is organized into 2 parts, 13 chapters, and 32 subsections, and filled with signs and rules about:

1. Executant and public transportation service,
2. The permit of transportation business,
3. Routes,
4. Opening, modification, nullification of routes,
5. Driver liability,
6. Rights and obligations of passengers,
7. Technical requirements and roadworthy,
8. Provision of Retribution,
9. Surveillance,
10. Criminal provision,
11. Transitional provision,
12. Closing provision,

In this regulation, there are no explanations related to the plan and development of public transportation in Malang. It is mostly about the procedures of public transports management and penalties which will be given if rules are violated. Modes of arranged transportation are also limited to public transports with the maximum capacity of 8 passengers. Rights and obligations of both passengers and drivers are just set up a little. Ironically in that regulation, no warranty towards the rights of passengers is stated, because of the existed penalties are only on the matter of licensing administratively, incompatibility of vehicle condition by means of regulations. Whereas Government only steps in just to keep an eye on and assigns punishment if a violation happened. The government has no rights on settings and development on that regulation.

Furthermore, basically, Local Government through Department of Transportation has already stated Strategic Plan (Renstra) year 2014-2018 in which it is refined with Strategic Plan Alteration (Renstra) year 2014-2018 (Perhubungan, 2015), and one of the discussion is about public transportation. In this regard, Department of Transportation has identified the possibility of service development in form of mass transports like a city bus, school bus along with the increase of public transport safety factor. Moreover, management of traffic engineering and highway facility in every District in an attempt to make the highway users feel comfortable and safe has been planned as well. However, there is no strategic and tactical plan about how the development will be done and how the safety will be increased. The program of Department of Transportation related to public transports only covers the improvement of public transport service which involves:

1. Quality improvement of safe and comfortable service,
2. The improvement of coordination towards public transport businessman / Organda (Organization for public transport),
3. Socialization on public transport businessman on route,
4. Socialization on public transport drivers and pedicaps (becak),

Along with this condition, it can be predicted in coming years, the traffic conditions and public transport service will not have any improvement. Therefore, Local Government needs to realize the importance of development in this sector.

#### **The Impact Analysis of Public Transport System:-**

Nowadays, it can be said that the availability of public transport system in Malang does not fulfill the needs of transport maximally. It affects the increase of number and user of private vehicles as the main transportation. The direct consequences of this problem are the more severe traffic jam and the emergence of problems in safety sector.

Traffic jam is a common issue which happened these recent years. The effort of government in the attempt to fix the quality and highways area will not be able to compensate the growth of private vehicle users. The direct consequence of this condition is in the environment problem, where the quantity of fuel consumption will always increase and the quality of life of society will go down. Traffic jam is also influenced by the driving characteristic of two-wheeled vehicle users which are dominated by young population. Indiscipline of this group towards the traffic regulations is frequently worsening the traffic jam. Another factor which is not directly linked to the public transport system but contributed in traffic jam is the lack of availability of pedestrian. People tend to use private vehicle rather than walking for short distance transport for safety reason.

In safety sector, there is an issue of thuggery which associated with the parking area. The number of vehicles which increase every year is not balanced with the adequate parking area. This cause the parking of private vehicles placed along the roadside which impact on the highway area. Parking areas along the roadside are generally managed by non-government parties that dominate particular areas illegally. As an illustration, illegal parking in Malang is shown by Figure 5.



**Figure 5:-** Illegal Parking

The issues that exist today will be addressed with little conflict by a good public transport system. Firstly, the good public transportation will reduce the number of private vehicles. This will have a positive impact on environmental issues and reduce stress levels of people because of the traffic jam. Secondly, the decreasing number of private vehicles will reduce parking problems. It is possible that the area of the highway which decreases because of illegal parking will not occur again and the issue of safety which causes by the seizure of parking territory will be resolved.

#### **Needs Analysis of the Stakeholders:-**

The needs of stakeholders need to be considered with the aim to develop public transport policy in Malang. Malang is a unique city, in contrast with other major cities in Indonesia. Today, Malang has approached the concept of a metropolitan city which needs different considerations in developing the public transportation. The needs of stakeholders such Government, entrepreneurs, public transport drivers, and the users of public transport will be explained below.

#### **Government of Malang needs:-**

Based on the Strategic Plan 2014 - 2018 Department of Transportation (Transportation, 2015), Malang faces traffic problems that quite complicated. The details of these problems are:

1. The rapid population growth.
2. The traffic jams in almost every roads.
3. High air pollution due to the large volume of vehicles.
4. Parking structuring which uncontrolled and less secure.
5. The undisciplined drivers.
6. Supporting facilities of the highway are inadequate.
7. Roads that not increase, while the number of vehicles increases rapidly.
8. Low coordination between SKPD (Work Unit area) which associate with the transportation.
9. Limited budget funds of the development and provision of facilities and infrastructure.

In this case, we can conclude that the most important needs of Government of Malang which relate to the development of public transportation are:

1. Availability of integrated plan of public transportation development which can guarantee the people needs on public transportation.
2. The conducted development must consider the stakeholders needs so that there will be no party that feels aggrieved.
3. The development costs should be minimized, yet can provide effective and efficient results.

#### **The needs of entrepreneur and the driver of public transportation:-**

Public transport entrepreneurs are the owners of public vehicles which have a business license and appropriate route which compatible with the type of the public vehicles. In general, the driver can be included as the stakeholder because they work as employees of public transports entrepreneurs or the entrepreneurs may double as a driver too. Thus, the needs of public transport entrepreneurs and their drivers in the development of the public transportation system are:

1. The guarantee of business so that the income of the entrepreneurs of public transportation will not be disrupted.
2. The guaranteed job for drivers so that the income can be guaranteed as well.
3. Entrepreneurs of public transport need to be involved in the rejuvenation of public transportation or even the provision of new transportation modes.
4. The ease in administrative matters.

With the fulfillment of these requirements, then the possibility of rejection of the new system can be minimized.

#### **The Needs of Public Transport Users:-**

The people needs of public transportation are quite simple, which is convenient, on time and predictable, fixed path and cheap. If those requirements can be fulfilled, it is possible that the private vehicle users will switch to public transport.

The concern in Malang is the cost of public transportation which relatively high is indicated as the cause of the switching users from public transportation to private transportation. Today, public transport fare is Rp. 4.000,- for one route, so the return trip would cost Rp. 8.000,-. However, if the public transport users must change some routes, then the cost of round trip could reach Rp. 16.000,- or more. The use of private vehicles such as motorcycles are definitely cheaper, with the same expenditure can be used for two or more roundtrip.

Another need is on time and predictable schedule. In general, the public transport depart from the origin terminal to the destination terminal with two patterns, leaving with full of passengers or no passengers at all. For vehicles which depart in full of passengers, they will wait until the vehicle completely filled with passengers at the origin terminal without specified time limit. While the vehicle which departs with small occupancy will run on low speed for transporting the passengers along the way. Sometimes they will also stop at a certain location to wait for passengers and this cause on uncertainty on travel time and it is impossible to predict the travel time.

Another problem faced by users of public transport is, there is no guarantee of the availability of public transportation and arrive at the destination. At certain hours, public transportation decided to not operating because of the passengers is minimum. Public transportation may also do not pass the proper path in order to save the fuel and avoid the traffic jams or even because unwilling to take passengers to the destination terminal for the same reason.

The switching of public transportation users to private vehicles might also cause by the convenient factor. Some factors such as small size and difficult in access make public transportations give a less comfortable feeling.

#### **Result and Discussion:-**

By doing an analysis of the condition about the constant availability of roads while the number of private vehicles users is increased rapidly and the number of public transportations which tend to decrease, then in the future, Malang will certainly be trapped on the chaos traffic system. Before that problem occurs, it is better for the Government of Malang to start to make a plan for the development of public transportation which can mobilize the people quickly in large number yet low cost. Be aware that the current modes of transportation are inadequate and cannot fulfill the needs of people. Indeed the development is expensive, yet needs to find an effective way which involves all the stakeholders so that the usage of government funds can be minimized. Besides, the government of

Malang and also the regional council of Malang are obligate in making rules & laws to ensure the implementation of plan of the public transportation developments.

Another important thing that should be considered is the participations of the owners of public transportation and the drivers in the development's plans. Hopefully, the development will not make drivers lose their job and their income while the owners lose their business, and even better if the development could increase their income. Basically, the increasing of income is not an impossible thing because the potential of public transportation users is in massive number. The policy which involved the public transportation owners and the drivers could avoid the disapproval and social problem.

All of this means nothing if the needs of public transportation users are not accommodated as well. When the users satisfied with the quality of the service, where they can predict the duration of the trip, the punctuality, departure, and the arrival, the cost and also the convenient, then it is clear evidence of the governments' successes. Another success indicator is if the number of public transportation users could rapidly increase and the number of private vehicle users is decreased along with the decreasing of traffic jam ratio.

Therefore, the two scenarios that could be done in order to implement the development of public transportation successfully as well as satisfy all of the stakeholders are:

**Scenario 1:- Types of public transportation nowadays:-**

1. Private transportation revitalization, so all 2.606 minibuses could be operated
2. Adding of vehicles in every path
3. Extra subsidies for rejuvenation of vehicles
4. Adding of vehicles might result in decreasing of drivers' income, so there should be a subsidy for free hours.
5. The subsidy given is for on time public transportation on the departure and the arrival. It is important to give guarantee of duration for users.
6. There must be users' cost subsidy, so they will attracted to use public transportation
7. It is necessary to consider about the price for the duration trip rather than the amount of route which is used. For example, price for 2-hour trip is Rp. 4.000, if the public transportation users move the route within those 2 hours, there will be no additional cost. This idea could be use in electronic recording and payment system.
8. It is necessary to implement the application such as, Near Angkot (Hariyanto, 2015) which used by the users for monitoring public transportation that they want to use. Toward this application, the users could choose which route they want, see the amount of passengers, and monitoring its position. Meanwhile, the drivers may see the position of their passengers. Further, this application could be use as performance report of public transportation.

**Scenario 2: Type of public transportation which modified into bigger capacity:-**

1. There must be infrastructure which support the new type of transportation  
It is necessary to prepare a fixed bus stops and special system that can guarantee the passengers load and unload in the specified the bus stops.
2. The public transportation owners are associated in a company with share investment system, so that they could see their involvement in public transportation business
3. It is necessary to do data collection of drivers and make them as the employee of the company. This idea will advantage in reducing all sorts of upheavals that may arise and provide solutions on their income source.
4. The new transportation modes should have fixed schedule and also able to provide certain duration trip and departure.
5. The cheap cost should be the main priority, the convenient of the passengers and also sufficient quantities of passengers

The transportation modes which not expensive is a medium bus with 28 passengers or a bigger bus with 40 passengers. Better if using the Bus with electrical power like a tram, because it does not produce gas emissions.

**Conclusion:-**

Today, the government of Malang does not have plans to develop the public transportation system yet. Whereas in the short future, the traffic jam in Malang could be worst because the increasing of private vehicle users while the number of roads are constant. Therefore, the government of Malang needs to make a strategic plan to develop the public transportation which is boosted by regional regulations which binding. In the implementation, this

development must consider the needs of all stakeholders and involved all stakeholders. There are two suggestions development, those are; maintain or remodel the types of the transportation. Yet both of it have the same goals which are given the service guarantee toward public transportation users as well as involved the owners of public transportation and the drivers also. All in all, this idea will solve the traffic jam in Malang as well as avoid the possibilities of conflict.

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### CASE REPORT

**Dysgerminoma stage IA.**

**Soheir Omran.**

#### Manuscript Info

##### Manuscript History

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#### Abstract

Virgin 20 years old patient 46 kg 156 cm BMI 19kg/m Has Regular cycle with monarch at 13 year old her medical and surgical history free family history she has diabetic mother the patient came complaining of dull aching abdominal pain and progressive enlargement for 7 months ago complain also from diarrhea no history of weight loss no urinary symptoms or abnormal discharge local examination shows large pelvi abdominal fixed slightly tender mass about 34 week in size.

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#### Pelvi abdominal ultrasound:-

Large heterogeneous pelvi abdominal mass..partially cystic 21×16 cm mostly ovarian ..with minimal ascites

Uterus is average sized with homogeneous echo pattern and focal lesion ..both ovaries can't assessed

#### MRI:-

Shows Large Pelvi Abdominal Mass With Solid/Cystic Component With Calcification Extending Ascites. No Pelvic Lymphadenopathy

#### Laboratory investigation:-

CA125=81.58u/ml it is high

So patient is planned for exploratory laprotomy .

Exploratory laprotomy midline incision and left adnexectomy done with intact capsule. Mass was adherent to uterus and colon

Then peritoneal implantation were excised biopsy, small biopsy from right ovarian tissue was sent for histo pathology with the dissected mass [Possibility Of Malignant Ovarian Mass Lesion Germecelltuumor]

#### Histo pathology Examination:-

Malignant Germ Cell Tumor Of Ovary – Dysgerminoma

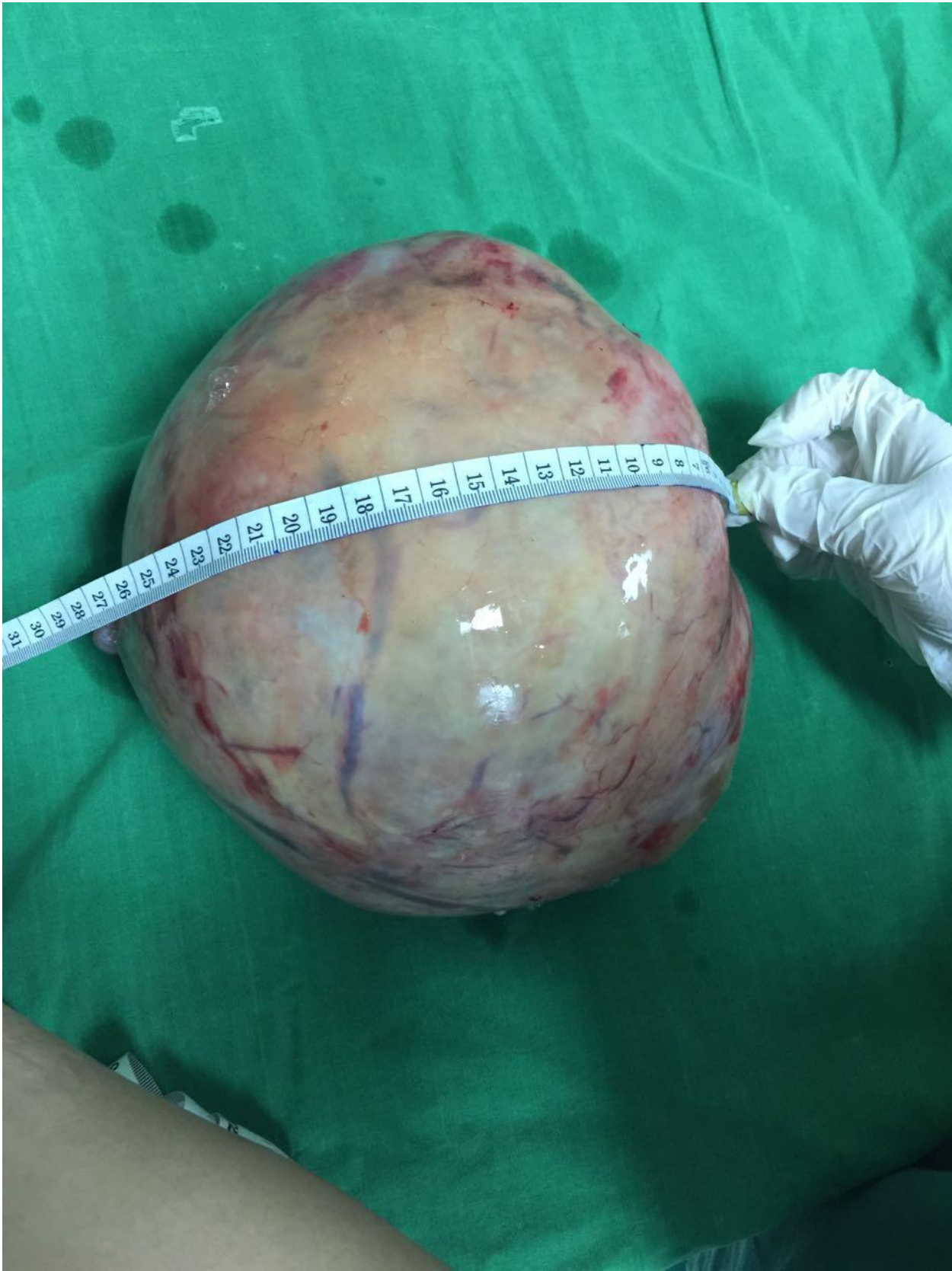
#### Pathological staging:-

Stage [ IA ]

#### Management:-

With This IA STAGE Ovary – Dysgerminoma No Need For Any Chemotherapy Or More Surgical Treatment, Only For Closely Observation.









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### RESEARCH ARTICLE

#### FACTORS AFFECTING GROWTH OF SMALL AND MEDIUM ENTERPRISES IN SRI LANKA.

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##### Key words:-

Sri Lanka, SMEs, Growth, Technology,  
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#### Abstract

Small and Medium scale Enterprises (SMEs) play an important role in promoting inclusive growth in the contemporary economy of Sri Lanka. However, the growth and expansion of SMEs are controlled by some unknown factors and those are yet to be revealed. Hence, the main objective of this study was to recognize the factors that influence the growth of SMEs in Sri Lanka. The present study was based on a sample of fifteen SMEs which may have positive or negative growth in sales. The study revealed that the growth of SMEs is constrained by financial inadequacy, the lack of access to new technology, and regulations imposed by the government. Moreover, it was revealed that the level of education of the owner of the enterprise has a direct impact on the growth of SMEs.

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#### Introduction:-

Small and Medium scale Enterprises (SMEs) make up a large part of many economies. They are considered as the backbone of an economy given the fact that in some economies SMEs contribute to more than 50% of Gross Domestic Product (ACCA, 2010). Particularly in the European Union, SMEs constitute 99.8% of all firms and employ around 76 million people representing around 67.4% of total employment in 2010 (Ayyagari et al. 2011). In the US, SMEs constituted more than 50% of the non-farm private GDP and created 75% net new jobs in the economy (ACCA, 2010). Therefore, it is clear that SMEs play an important role in promoting inclusive growth in countries.

The issue of whether small businesses can be considered as beneficial to economic growth must be examined from several different perspectives. As the theory of scale of economies emphasizes, large-scale firms enjoy advantages derived from their economies of scale in production and also from having crossed the threshold of innovative activities, thereby predicting that the resultant increase in the share of large-scale firms will drive economic progress. According to this conventional wisdom which originated back in the days of the industrial revolution, only large firms can meet the requirements of scale efficiency, thus outperforming small firms. It is therefore hypothesized that there is no room for SMEs in those economies pursuing growth, and their future role is expected to diminish (ACS, 1996).

Although precise, up-to-date data are difficult to obtain, estimates suggest that more than 95% of enterprises across the world are SMEs, accounting for approximately 60% of private sector employment (Ayyagari et al. 2011). Japan has the highest proportion of SMEs among the industrialized countries, accounting for more than 99% of total enterprises (EIU, 2010). According to the Ministry of Micro, Small and Medium Enterprises of India, 13 million SMEs were operating in India by 2008, equivalent to 80% of all the country's businesses (Ghatak 2010). In South

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Africa, it is estimated that 91% of the formal business entities are SMEs (Abor and Quartey, 2010). Estimated data for the 27 countries in the European Union (the EU-27) for 2012 also illustrate the importance of SMEs.

The contribution made by SMEs does vary widely between countries and regions. Nevertheless, they play a particularly key role in high-income countries and sometimes even in low-income countries, making significant contributions to both GDP and employment (Dalberg, 2011). They are also major contributors to innovation in economies, partly through collaboration with the larger corporate sector. SMEs that become embedded in the supply chains of larger businesses can be spurred on to improve their own human and technological capital (ACCA, 2010), thus improving their own productivity and performance.

The contribution of SMEs to economic fundamentals nonetheless varies substantially across countries: from 16% of GDP in low-income countries (where the sector is typically large but informal) to 51% of GDP in high-income countries. History and legal tradition can also play a very important role for the development of SMEs. For instance, countries that were in the former Soviet Union tend to have disproportionately small SME sectors, even when controlling for per capita income (Ayyagari et al. 2003).

In developing countries, by contrast, over 90% of all firms outside the agricultural sector are SMEs or micro-enterprises. These firms produce a considerable part of the GDP. In Morocco, for example, 93% of industrial firms are SMEs accounting for 38% of the production, 33% of investment and 30% of exports. The contribution of SMEs is considerably higher in South Africa. The estimated 91% of the formal business entities in South Africa that are SMEs contribute 52–57% to the GDP. In Ghana, SMEs are even more prominent in the local economy, representing about 92% of Ghanaian businesses and contributing about 70% to Ghana's GDP (Abor and Quartey, 2010). Overall, statistics can sometimes mask the particular contribution made by individual sectors. For example, in 2006/7, the contribution made by micro and small businesses to India's GDP was only around 6%. Even so, manufacturing SMEs accounted for around 40% of industrial output, and 40% of all exports (Ghatak, 2010). Similarly, the United States International Trade Commission (2010) reports that SMEs contributed to roughly 50% of the US private nonagricultural GDP in 2004, a share that had remained relatively stable from 1998 to 2004. The service sectors are by far the most important contributors, accounting for 79% of SMEs' contribution to GDP. When compared with larger businesses, SMEs' contribution to output tends to be lower per firm because they tend to be more labour intensive than larger firms and concentrated in service sectors. They therefore typically achieve lower levels of productivity, though they do contribute significantly to employment (Wymenga et al. 2011). SMEs' greater labour intensity means that job creation entails lower capital costs than in larger firms (Liedholm and Mead, 1987) which is particularly important for developing countries and economies with high unemployment. Moreover, SMEs are generally more common in rural areas than larger businesses. Especially in developing countries, SMEs thus provide much-needed employment in rural areas. SMEs can in fact become the engines that sustain growth for long-term development in developing countries. When growth becomes stronger, SMEs gradually assume a key role in industrial development and restructuring. They can satisfy the increasing local demand for services, which allows increasing specialization, and furthermore, support larger enterprises with services and inputs (Fjose et al. 2010).

#### **Literature:-**

Chaston (1995) reported on a 'networking model' for the promotion of the survival and growth of SME sector firms in the UK. The model had been transferred from the Danish Technological Institute, and involved the concept of inter-firm cooperation through the creation of trading networks of SME sector firms. The absence of large firms to initiate and develop the 'trading network' structure was seen as a barrier to the development and growth of firms in the SME sector. O'Gorman (2001) reports on research into the sustainability of growth in SME sector firms and explores the debate between the strategic choice of entrepreneurs which explains SME growth and the industry structure. The author then goes on to consider the cases of two companies in the same industry sector, cash and carry food wholesaling. These companies served the Irish market and their growth and development over a period of 20 years were compared. The study concludes that the strategic choices of entrepreneurs and industry structures are complex and that interaction between the two variables results in combinations that may produce sustained growth. Sparkes and Thomas (2001) investigated the importance of internet developments to the Welsh agro-food sector and concluded that because of peripheral location on the 'Celtic fringe' (some areas in Europe are known as the 'Celtic fringe'), the development and growth of the industry will depend on the ability to take up the marketing opportunities presented by internet technologies. The paper concludes by calling for intervention and support of mechanisms that ought to be deployed in order to enable the industry to appreciate the marketing benefits of adopting e-commerce marketing solutions.

Choeke and Armstrong (2000) reported on the initial results of a study aimed at investigating the reasons for organizational growth and business success in the SME sector. This work eventually focused on the issue of organizational culture as a factor influencing performance and growth. Empirical evidence is reported from samples in Northwest England and Scotland. The authors' conclusions include suggestions that this research may point to the need to revisit the policy agenda and refocus the nature of advice and assistance initiatives to take into account the influence of organizational culture on SME growth and development.

McLarty (1998) looks at a particular individual case study and examines the characteristics of a successful retail company that have enabled it to enjoy success. The paper concludes that the presence of a marketing approach characterized by marketing planning, the correct marketing mix, the firm's strategic approach and in particular, value chain management have led to the firm's financial success. Within the paper, it is noted that the growth and success is also characterized by reduced turnover per employee and reduced sales per square meter.

Vickers and North (2000) examine the role of a particular intervention, regional technology initiatives on SME sector firms in the English regions. The aim of these initiatives was to enable innovation and technology transfer in the regions and thereby encourage economic development. The initial ideals involved long term strategic partnerships for innovation and technology transfer. However, the reality was that many SMEs really wanted short-term problem solving assistance rather than to avail themselves of long term innovation and technology transfer opportunities. Thus, a number of researchers have reported on work in the SME sector and have sought to diagnose the extremely important areas that SME managers may look to for success. Policymakers have also been involved in interventions to encourage SME development and growth. This activity has been a widespread and global phenomenon.

#### **Small and Medium Enterprises in Sri Lanka:-**

SMEs encompass establishments operating in agriculture, mining, manufacturing construction and service sectors. However, its relative significance in the national economy cannot be estimated due to lack of information. With respect to SMEs however the existing database is more reliable and hence it is possible to give some indication of the size of the sector on comparative basis.

Although SMEs in Sri Lanka contributed an estimated 40% to the GDP during the period from 2010 to 2012, it is likely that the potential negative impact on GDP growth stemming from the high borrowings in SMEs was significant (CBSL, 2012). Sometimes high borrowings are a consequence of high growth in business. As a result of high borrowings, during 2010 and 2011, the Sri Lankan economy grew by 8% and 8.2 % respectively and that was the highest GDP growth rates recorded in over three decades. During that period, loans to SMEs grew by 68.3% in 2011 (CBSL, 2012). Such an increase in borrowing needs to be supported with equity to make sure growth is sustainable but it was not the case in Sri Lanka. As a result of high borrowings, during the 2010-2011 period, the growth records of Sri Lankan SMEs were lagged. According to the Sri Lankan Enterprise Survey, the growth rate of Sri Lankan SMEs was 2.9% and it is very low compared to the world 5.2 % (Hettiarachchi, 2013). Many investigations into SMEs prove that high proportions of new ventures have closed down during their first years of life. This indicates that these firms were not able to maintain the position with their environment or never achieved it. So, it is clear that even though business owners start their ventures with the best of intentions and work long, hard hours, some of the businesses survive but others fail.

There is no recently conducted industrial survey to identify the strengths, weaknesses, threats and opportunities of SMEs. The Department of Census and Statistics of the Ministry of Finance and Planning has been conducting annual industrial surveys but it has not covered the establishments with less than 5 persons engaged. Subject to that limitation, the most recently conducted industrial survey dates back to 1997. According to the Annual Survey of Industries (1998) conducted by the Department of Census and Statistics of Sri Lanka, the majority of establishments stem from small businesses but their contribution to the economy is very low (about 6%). On the other hand, there are only 2% of large scale establishments and their contribution is much higher which accounts to more than 50% of output. Therefore, it is clear that although there are large numbers of SMEs in Sri Lanka, their contribution to the national economy in terms of output and share in employment has been very low. It is essential to recognize the contribution of SMEs in other developing and developed countries to come up with a proper conclusion.

Therefore it is clear that in other developing or developed countries, the SME sector contributes to a large proportion of the country's GDP whereas in Sri Lanka it has not achieved its anticipated results. Hence, it is clear that there is a

need for the future improvement of this sector in Sri Lanka and it is also essential to identify the ways to harness the full potential of this sector.

Unfortunately, there is no commonly accepted definition for SMEs. Different countries use different parameters to define SMEs such as number of employees, amount of capital invested, amount of turnover, etc. Different definitions are also used by different organizations within the same country to define SMEs for different purposes and this is common in Sri Lanka as well. Table 1 shows definitions of SMEs in Sri Lanka by different authorities.

**Table 1:-** Definitions of SMEs in Sri Lanka

Institution	Criterion	Medium Scale	Small Scale
Sri Lanka Standards Institution (SLSI)	No. of Employees	Between 50 - 249	Less than 50
Industrial Development Board (IDB)	Value of Machinery	Between Rs. 4 Million to 10 Million	Less than Rs. 4 Million
Ministry of Industry, Tourism and Investment Promotion	Value of fixed assets other than land and buildings	Up to Rs. 16 Million	Less than Rs. 16 Millions
Federation of Chambers of Commerce and Industry of Sri Lanka	Capital employed	Between Rs.2 Million to 20 Million	Less than Rs. 2 Million
Ministry of Small and Rural Industries	Total Investment	Between Rs. Million 20 to 50 Million	Between Rs. 1 Million to 20 Million
Ceylon National Chamber of Industries	i) Value of assets other than buildings and lands. ii) No. of employees	Between Rs. 4 Million to Rs. 20 Million Between 10 -50	Less than Rs. 4 Million Less than 10
Sri Lanka Export Development Board (EDB)	i) Capital investment excluding lands and building ii) Annual export turnover	More than Rs. 40 Million More than Rs. 100 Million	Less than Rs. 20 Million Less than Rs.100 Million
World Bank (for Sri Lankan country studies and loan programmes)	No. of employees	Between 50-99	Less than 1- 49
Dept. of Census and Statistics	No. of Employees	More than 25 (Year 2000) More than 10 (Year 2003/04)	Less than 25 (Year 2000) Less than 10 (Year 2003/04)
Task Force for SMEs Development in Sri Lanka (2002)	Asset Value excluding land and buildings value	Not exceeding more than Rs. 50 Million	Not exceeding more than Rs. 20 Million
Sri Lankan Apparel Industry, Task force on five year strategy (2002)	i) Export value ii) No. of Employees	Rs. 101 Million to 250 Million 1 - 100	Rs. 0.25 Million to 100 Million 101 - 250
The Dept. of Small Industries	i) Capital investment ii) No. of Employees	Between Rs. 25 – 5 million Between 100 - 50	Less than Rs. 5 Million Less than 50 employees

**Source:**Dasanayaka, S.W.S.B.(2009).*Measuring the Informal Economy in Developing Countries.*

SMEs are considered as the heart of the economy. Therefore many successive Sri Lankan governments have taken steps to develop this vital sector. However, when analyzing the present contribution of this sector to the national economy it seems that it has not produced the desired results. The reasons for this have been identified by conducting several surveys. The banking survey of the SME market in Sri Lanka (2006-07) of the International Finance Corporation (IFC) listed five principal constraints of the SME factor. They were (a) difficulties in obtaining finance (b) absence of technical and management skills (c) marketing constraints (d) inadequate infrastructure facilities for production and (e) outdated technology. According to the survey, one of the most common constraints to growth was the requirement of banks of collateral when providing credit facilities.

It concludes that the main reason for the lack of growth in SMEs is the shortage of capital due to a number of reasons such as the lack of access to banking facilities, the lack of knowledge on banking procedures and the inability to provide guarantees. Hence, this investigation will analyze the capital structures of SMEs and the factors influencing the growth of SMEs in Sri Lanka. By examining the problems associated with the development of this sector, this study will also attempt to identify the measures that can be taken to mitigate the identified problems.

## **Methodology:-**

### **Measuring the Growth:-**

The growth of SMEs can be measured in various ways. In accordance with government policy research as well as many management and economic sources, growth is measured in terms of increase in the number of employment in the SME sector. This measure has been of the most relevance to many government policy makers since SME growth has been seen as an important way of reducing unemployment. Nevertheless, owners and managers of SMEs are usually interested in financial performance rather than in employment growth. This can be measured by the growth of sales or turnover growth and profitability.

Various measures of profitability can be used such as absolute profitability, profitability per employee, profitability as a percentage of turnover or percentage change in profitability. Profits are necessary for survival in the long run in a competitive environment, but SME management may choose not to grow. Long-term profitability derives from the relations between cost and revenue. It is a necessary but insufficient condition for growth. Revenues may be held up by entry barriers and costs pushed down by management skills. A low-profit firm will lack the finance for expansion, but a high-profit business may conclude that when taking into consideration the risks of expansion, its rewards are inadequate. In a 'life style' SME, an owner may trade profitability today against profitability tomorrow. Dynamic pricing or sequential investment projects may initially require lower profits in order to obtain higher future pay-offs from greater market penetration. Therefore profit performance must be standardized against the size of the operation or the resources employed.

In this research used a measure of SME growth which is percentage change in SME turnover. Other measures of firm growth that could be used are market share, percentage change in employment, return on capital employed and measures of productivity. Growth can also take the form of personal development of managers and employees, technology innovation and professional recognition.

### **Population and the Sample:-**

The population of this study is based on SMEs in different sectors such as food, garments, metal and machinery etc. in the Gampaha District in the Western Province of Sri Lanka. The Western Province was chosen for this study since it has a large number of SMEs. The survey sample includes 100 enterprises. As the study is only related to the small and medium sized category, the enterprises that belong to the large category were excluded. The sample was selected with the use of the stratified sampling method.

### **Data and Sources of Data:-**

An amalgamation of primary and secondary data used in the analysis. Primary data were collected through a questionnaire and face to face informal interviews with SME owners. Secondary data were collected through research articles, Census and Statistics Department publications, debt financing institutions, CBSL annual reports and the internet.

### **Analytical Tools and Techniques:-**

Statistically testable hypotheses were developed to test the independence and the correlation of variables which have identified as the influential variables on the growth and expansion of SMEs by the previous studies. Thus, it is important to have a knowledge of the statistical methods used in prior researches in this area in order to select the most effective method to be used in the above study.

### **Variables and Definitions of Variables:-**

The factors affecting the growth of SMEs have been identified by the previous research. The variables and definitions of those variables are given below.

*Size of the firm:* Firm size is determined by the number of employees of a firm. Small enterprises have been defined as those with fewer than 20 employees. Medium size enterprises comprise of 20-99 employees.

*Age of the firm:* The number of years in business has been identified as an important variable in previous studies as it determines the credit-worthiness of the business. The information required by the lenders at the time of granting credit may be limited for younger firms due to the lack of an established track record. Hence, the transaction costs associated with lending to younger firms are likely to be relatively high. Furthermore, the younger firms may not be able to offer collaterals acceptable to the banks as those firms have not accumulated sufficient fixed assets.

*Sector:* The sectors were classified into five categories namely food, garments, metal and machinery, non-metallic and plastic materials and textiles. If a business does not fall into one of the above categories it can specify its business.

*Ownership type:* Firms were classified into six organizational types in the survey: sole proprietorships, partnerships, private-held limited company, and publicly-listed company, cooperative and other.

*Location:* Location is classified based on the distance to the capital city.

*Sales value:* The growth of sales value is considered as a variable which shows the growth of SMEs. It identifies the growth of SMEs by analyzing the sales value of last two consecutive years of the business. If there is a positive growth in sales = 1; a negative growth in sales = 0.

*Availability of audited financial statements:* If the firm has audited financial statements = 1. If the firm does not have audited financial statements = 0.

*Capital requirements:* The funding of the business is evaluated under this variable. Financial feasibility of the business will be addressed.

*Level of Education of the owner:* Education of the principle owner is redefined by categories from (a) to (d), corresponding to whether the owner has not completed secondary school, vocational training, a university graduate degree and/or postgraduate degree. Education may be proxy for unobserved managerial ability.

*Entrepreneur's experience and skills of the employees:* The variable is measured by considering the number of years of business experience they possess in the previous business and the current business at the time of the survey. If the entrepreneur is well experienced he/she will be more successful in analytical and management skills. Skilled employees are essential for a business to be effective and efficient. This will lead to a positive growth in the business.

*Technology:* Technology is the key to sustain any business in the long run. If a business produces innovative products in a well-timed manner, current customers will have faith in the business and more customers will be attracted to the business.

*Availability of raw materials:* This variable identifies the obstacles encountered when obtaining raw materials such as tariffs, import duties, etc. When the business is compelled to incur a large cost to obtain raw materials this will have a direct impact on the sales value of the business.

*Competition:* The business needs to identify its competitive rivalry. It will have a positive as well as a negative impact on the growth of SMEs. If the competition is high, businesses will try to improve themselves in order to meet the competition. However, high competitiveness will impact on the quality of the product and as a result, the businesses will lose their customers in the long run. Therefore the competition has a direct impact on the sales value of the business.

*Support of the government:* If the government is willing to improve the SME sector in the country and has already taken initiatives to develop this vital sector, it will clearly lead to a positive growth of SMEs

*Networking:* Entrepreneurial networks are defined in this study as entrepreneurs' personal relationships with external parties. The networking ability in this study was measured by their participation in networks such as business association and/or chamber of commerce. If a business is a part of a network it will get more up-to-date information about the industry.

### Data Analysis and Results:-

Statistically testable hypotheses are formulated to express the possible relationships between the growth of SMEs and the factors identified.

- Hypothesis 1. H<sub>O</sub>: Technology does not have an impact on the growth of SMEs  
H<sub>A</sub>: Technology does have an impact on the growth of SMEs
- Hypothesis 2. H<sub>O</sub>: Financial constraints do not impact on the growth of SMEs  
H<sub>A</sub>: Financial constraints have an impact on the growth of SMEs
- Hypothesis 3. H<sub>O</sub>: Education level of the owner does not have an impact on the growth of SMEs  
H<sub>A</sub>: Education level of the owner does have an impact on the growth of SMEs
- Hypothesis 4. H<sub>O</sub>: Purchase of raw materials does not have an impact on the growth of SMEs  
H<sub>A</sub>: Purchase of raw materials does have an impact on the growth of SMEs
- Hypothesis 5. H<sub>O</sub>: Age of the company does not have an impact on the growth of SMEs  
H<sub>A</sub>: Age of the company does have an impact on the growth of SMEs
- Hypothesis 6. H<sub>O</sub>: Competition rivalry does not have an impact on the growth of SMEs  
H<sub>A</sub>: Competition rivalry does have an impact on the growth of SMEs
- Hypothesis 7. H<sub>O</sub>: Years of experience as an entrepreneur do not have an impact on the growth of SMEs.  
H<sub>A</sub>: Years of experience as an entrepreneur does have an impact on the growth of SMEs.

#### *I. Technology and growth in sales*

The Pearson Chi-Square statistic (11.484) with a significant value of 0.001 is below the alpha level (0.05). This suggests that a statistically significant relationship does occur between the technology and growth in sales. Therefore, Hypothesis 1, which is the null hypothesis, is rejected.

#### *II. Fulfillment of capital requirement and growth in sales*

The Pearson Chi-Square statistic (5.529) with a significant value of 0.19 is below the alpha level (0.05) which suggests that there is evidence to prove that there is a significant relationship between the capital requirement fulfillment of the SME and the growth in sales. As a result we can reject the null Hypothesis 2.

#### *III. Level of education of the owner and growth in sales*

As might be expected, firms with educated owner-managers are more likely to grow presumably due to their knowledge in the strategies. The value of the Chi-Square statistic is 3.233. This indicates that this value is less than the tabulated value and thus, it is not significant. The significant value is 0.072 and it is higher than the alpha value (0.05). This indicates that there is no relationship between the level of education of the owner and the growth in sales. Therefore the hypothesized relationship (Hypothesis 3) is accepted.

#### *IV. Obtaining raw materials and growth in sales*

Somewhat surprisingly, it was found that there is no significant association between obtaining raw materials and growth in sales because the Pearson Chi-Square statistic is 0.134 and the significant value is 0.714 which is much higher than the alpha value (0.05). Hence the Hypothesis 4 is accepted.

#### *V. Age of the company and growth in sales*

The result of this survey suggests that there is no relationship between the age of the firm and the growth in sales as the Pearson Chi-Square statistic is 0.603 and the significant value is 0.438 which is higher than the alpha value (0.05). Therefore, null Hypothesis 5 is accepted. However, according to the literature review, more mature firms have a significant influence over the growth of sales of the firm.

#### *VI. Competition rivalry and growth in sales*

Hypothesis 6 states that "competition rivalry does not impact on the growth of sales". According to the Pearson Chi-Square, the variable is statistically not significant with a Chi-Square statistic of 0.010 with a significant value of 0.919 which is higher than the alpha value (0.05). Hence, Hypothesis 6 is accepted.

#### *VII. Years of experience as an entrepreneur and growth in sales*

The Pearson Chi-Square statistic is 0.719 and the significance value is 0.714 which is higher than the alpha value (0.05). Hence, Hypothesis 7 which indicates that there is no relationship between the experience of the entrepreneur and the growth in sales is accepted with a 95% confidence level, it can be concluded that the technology and financial constraints have a direct impact on the growth of sales whereas other factors such as the education level of



the owner, issues in obtaining raw materials, age of the company, competition rivalry and the experience as an entrepreneur do not have an impact on the growth in sales of the enterprise.

#### **Correlation analysis:-**

The correlation analysis is also used to recognize the possible relationships between the growth of SMEs and the identified independent variables. The results of the correlation analysis are as follows:

Considering the growth in sales and the required technology, the coefficient of correlation is 0.875. It shows that the two variables have a strong positive correlation with each other. The fulfillment of required amount of capital and the growth in sales have a correlation coefficient of 0.607. It indicates that the two variables have a positive correlation with each other. The coefficient of correlation between the level of education and the growth in sales is 0.464. The correlation between these two variables is a weak positive correlation. According to the correlation analysis, coefficient of correlation between the growth in sales and the raw materials is -0.094. It shows that these two variables have a weak negative correlation with each other. Similarly, the variables of growth in sales and the age of the company shows a weak negative correlation (-0.200). The two variables, growth in sales and competition rivalry confirms a weak positive correlation (0.026). The coefficient of correlation between the growth in sales and the years of experience as an entrepreneur is -0.094. This result implies that these two variables have a weak negative correlation but it is somewhat unrealistic.

#### **Case Studies:-**

##### **Case Study – I: *Diligent Products and Solutions*:-**

Mr. and Mrs. Fernando are not just partners in business, but in life too. The husband-wife duo operate a major business line called *Diligent Products and Solutions*. Being an MBA holder Mr. Fernando has been involved in many careers. However, he has always had a flair for drawing. He realized that he could convert this skill into a part-time profitable business by creating personally-designed furniture to suit for the international market. His wife was supportive of this decision and helped him to make his dream a reality.

For over a decade they have been able to successfully deliver their products to their loyal customers. In the earlier stages, the company was going through difficulties. However, later on, the duo were able to recover from this unfortunate situation and as a result, they are now one of the leading businesses in the industry. *Diligent Products and Solutions* has maintained a steady growth throughout the past years even though the owners have taken out a few loans with high interest rates.

However, the company's financial statements are not audited. Mr. Fernando says;

*“Because it's a family business and I, myself is involved in the business there is no point of auditing. Also, auditing leads to the compulsion to pay taxes such as VAT, etc. Hence, I don't audit my financial statements”.*

He believes that the reason for his success is the relationship he has with his workers. He finds it easy to find skilled workers due to this close relationship. He says;

*“Attitudes of the workers matter a lot”.*

Currently, he does not have new technology but he admits that he has all the required technology within the company. Furthermore, he has a website to promote his products and through that he has been able to expand the customer base. His major concern is about the raw materials. Timber is obtained from the Timber Cooperation. However, the quality of the timber is questionable. Further, he explains that at times due to the restrictions imposed by the government on the transportation of timber they have to bribe some of the dealers. Caster wheels and other equipment which are needed to develop the timber product have to be imported from agents. Consequently, there is a problem of obtaining raw materials when the company is in need and also result in high cost.

The company faces no competition as it depends only on contacts. Hence Mr. Fernando believes that the company can handle the capacity to meet the demand its own. When asked about the secret to their success he pointed out;

*“It is about making the right product available at the right time, as well as at the right place”.*

Over time, their business has evolved and expanded across other categories such as providing strategic business solutions to private companies.

**Case Study – II: ShelloCosmetics Company Private Limited:-**

Mr. Vipula Gunarathne, the owner of *Shello Cosmetics Private Limited* shared his success story with us. Being a graduate from the University of Kelaniya with experience in Australia regarding chemicals, he decided to get into the cosmetics industry. For more than a decade he has been successful in his business because of top quality products at a standard price and good presentation of the products. As he is well-educated, the financial statements of the company are audited.

The capital requirement for the company has been fulfilled by loans. The company has to allocate 10% from the monthly total income to settle down the loan interest and other capital requirements. He admits sometimes it takes up time to pay the due amount on time because it is difficult to collect money from the clients who bought goods on credit. Thereby he uses jewelry pawning, credit cards etc. to pay the due amount.

*Shello Cosmetics* has been able to acquire completely new technology during past few years which has paved the way for it to be a leading company in the industry. He says;

*“We have the required technology but we do not have knowledge in some areas, for instance, advertising. So we are looking forward to improving our knowledge in such areas”.*

The main problem the company faces is obtaining raw materials. Mr. Gunarathne says;

*“Sometimes we only need very small quantities of certain chemicals but we cannot import the exact quantity we need due to government regulations”.*

He further explained that due to the lack of advertising skills and poor market conditions, the company might be affected adversely in the future. However, currently the company is one of the leading cosmetics companies in Sri Lanka. It aims to grow further in the future.

**Conclusion:-**

The growth of Sri Lankan SMEs are closely associated with a number of factors. The present study revealed that some factors have adversely affected the growth of SMEs in Sri Lanka. Financial inadequacy is a factor which has significantly constrained the growth and expansion of the SME sector in Sri Lanka. The lack of access to new technology is another vital factor which has limited the growth and expansion of SMEs. However, access to new technology is directly linked to the availability of financial resources. Government regulations on imports and exports, particularly imposed duties and restrictions on certain raw materials also act as limitations on the growth and expansion of SMEs. This study also revealed that the level of education of the owner of the enterprise has a direct impact on the growth of SMEs. Moreover, this study revealed that the majority of Sri Lankan SMEs have little access to the international market and serve only the domestic market which in turn has had a negative impact on the expansion of SMEs.

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### RESEARCH ARTICLE

#### STUDY ON ENVIRONMENTAL AND SOCIAL IMPACT OF SECOND PHASE SYRDARYA CONTROL AND NORTHERN ARAL SEA (SYNAS) PROJECT.

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#### *Abstract*

The Aral Sea was once the world's fourth largest inland body of water, but has been forever altered by the USSR irrigation policies to reclaim the desert for cotton farming by rerouting the Amu Darya and Syr Darya rivers. The lake shrunk to a quarter of its original size in a few decades, creating an environmental and public health disaster. However, the completion of the Kok-Aral dam in 2005 (the first phase project) has yielded some positive results in recovery of the Northern Aral Sea recently. Local economies, long dependent on the water, were making a comeback. The second phase recovery project began in late 2012. The city of Aralsk has suffered most from a receding Aral Sea. The construction of a dam to raise the water to 46 m level in Saryshiganak bay will alleviate this problem. Environmental and social impacts of the second phase recovery project have been studied in this work, and the results have showed that further recovery of fish population, biodiversity, aquacultures, wildlife, fishery industry and local climate is expected after its completion. Implementation of this project will result in the increase of the total area of the Small Aral Sea, and as a result, increase the volume of water lost by evaporation from its surface to equalize the gain and loss parts of the water balance, stabilizing salinity. This will stop further freshening of the sea and associated adverse changes in its fauna.

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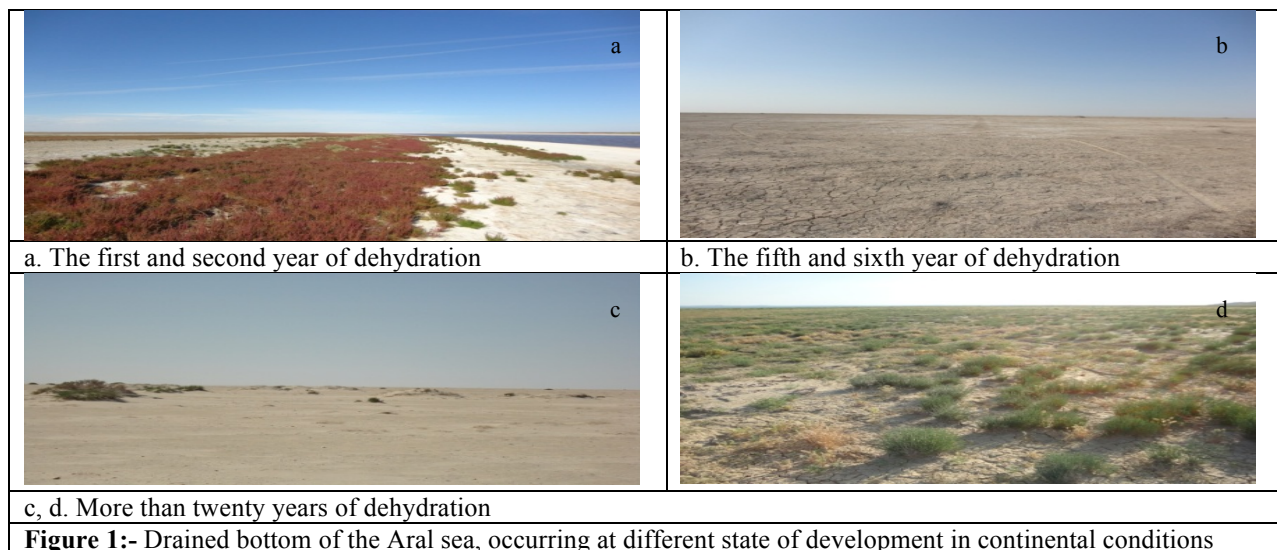
#### **Introduction:-**

The intensive use of the Syrdarya water resources resulted, that the Aral Sea between 1960 and 2012 lost 85 % of its area and 92 % of its volume.

The consequences of the crisis: as a result of directional falling levels of the Aral Sea since 1987, the pond was divided into two independent areas: the northern (Small) and southern (Big) Aral sea. More than 48 000 km<sup>2</sup> of the former sea bottom completely dried up (figure 1, table 1) (Micklin, 2003). Ecosystems of the Delta of the Syrdarya river transformed and degraded (Ogar, 2006).

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**Table 1:-** Shallowing and increasing salinity of the Aral Sea.

The parameters of the Aral Sea	
for 1960:	for 2014 (North Aral Sea):
Area– 68 000 km <sup>2</sup>	Area – 8 300 km <sup>2</sup>
The volume– 1064 km <sup>3</sup>	The Volume – 75 km <sup>3</sup>
Salinity – 10 ‰	Salinity – 79 ‰

**Shrinking of lake systems.** Monitoring observations with the use of remote sensing techniques and performance of instrumental observations allow to assess the real situation of the state of the deltaic lakes, including their water content: in 1967 the average water availability of lake systems were 339,2 km<sup>2</sup>, during extreme environmental situations in the Aral Sea area lake systems decreased from 306,2 km<sup>2</sup> (1981) to 245,0 km<sup>2</sup> (1989) (Budnikova, 2006; Dukravets, 1991).

**Degradation of soil and soil cover.** The main factor of soil cover degradation in the Kazakh part of the Aral Sea region and intensification of desertification processes is the regulation of the flow of the Syrdarya river. As a result, continuing the trend of reformation of water and salt regime in the delta natural complexes, increasing area of saline soils in irrigated areas, growing areas of new land within the former seafloor (Popov, 1984; Karajanov, 2004). The modern Delta of the Syr Darya river is characterized by heavy reclamation conditions, stagnant groundwater with a wide range of salinity (from 2 to 100 g/l), heavy mechanical composition of alluvial deposits (Kornienko, 1983). Periodic flooding of the wetland soils of present Delta contributes desalinization, but in a limited area (Demeeva, 2015). The main indicator of the tightening of environmental tensions in the Aral Sea region of Kazakhstan is a progressive growth of the saline soil areas within the Delta, and due to the desiccation of the former sea bottom (Karajanov, 2014) (figure 2).



**Figure 2:-** Secondary salinization of irrigated lands (Kazakh part of Aral Sea)

**Desertification.** The process of desertification in the Aral Sea, as in any other arid region, flows stadial. At the initial stage (60s and 70s) signs of desertification were evident, but poorly manifested, and the process was still potentially reversible. In the second stage (after the 80s) degradation of the natural resource potential of the region has become critical and the process of desertification is irreversible (Borovskiy, 1981; Akiyanova 2006).

**Changes in the bird population.** In the early 60s the Aral Sea was inhabited by over 300 species of birds (nesting – 173 span – 123, accidental types of - 23), by the beginning of 2000s the avifauna of Kazakhstan the Aral Sea has lost about 70 species (Berezovsky, 1982; Kovalenko, 2005).

**Changes in the fishery of the Aral Sea and reservoirs.** The Aral Sea was once the third largest fishery water body of the USSR. In 50s and 60s 40-50 thousand tons was extracted, in 1980 – not more than 2,5 thousand tons. Since 1988, the sea has lost its fishery value (Karimov, 1997; Balymbetov 2005). The commercial fishing industry that developed during the first half of the twentieth century ended in the early 1980s as the indigenous species providing the basis for the fishery disappeared owing to rising salinity and loss of shallow spawning and feeding areas. Tens-of-thousands were thrown out of work because of the loss of the fishery and associated activities and employment in these occupations today, although increasing because of the project to revitalize the Small (northern) Aral is still only a tiny fraction of what it was (Micklin, 2014).

In the frame of the inter-state co-operation of five Central Asian countries and “Program on the Aral Sea saving” in Kazakhstan a series of the measures, have been initiated, among which the «Syrdarya Control and the Northern Aral Sea» Project occupies a central focus. The phase 1 of the Project has already shown impressive results. The Kazakhstan Government is implementing the second phase project to restore the Small Aral Sea.

By the direct instructions of the President of Kazakhstan Nursultan Nazarbayev, one of the major projects initiated by the International Fund for Saving the Aral Sea (IFAS), is the project “The Syr Darya Control and North Aral Sea” (SYNAS-1) - the first phase (The project SYNAS-1, 2003-2010). The main idea of the President of the Republic of Kazakhstan N.Nazarbayev was to improve the environmental and socio-economic situation in the Northern part of the Aral Sea, where the main population of the Aral Sea region of Kazakhstan (Kipshakbayev, 2010).



To maintain the integrity of the Northern Aral Sea, the 13 km Kokaral Dike was constructed to separate the Northern Aral Sea from the South Aral Sea. Completion was in August 2005.

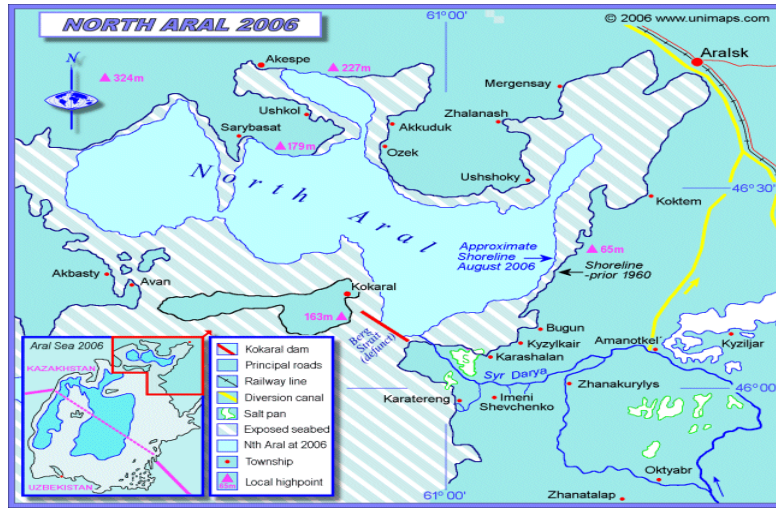


Figure 3:- The location of the Kokaral dam (Phase 1)

There have been several attempts to block the Small Aral Sea by a dam, so the water could not go away, but they were unsuccessful — the stormy waves of the lake destroyed the dam. The situation changed after the construction of Kokaral dike. In two years, the Small Aral Sea is almost completely filled with water, the sea got closer to Aralsk city, climate has changed dramatically for the better.

Table 2:- Changes of indicators of the North Aral Sea after the construction of Kokaral dike (Aladin, 2011)

Indicators	1970	1988	2003	2004	2007	2008	2009	2010	2011
The water level, m	53	40	30		42	42	42	42	42
The volume, km <sup>3</sup>	82			15,6				27,1	
The surface area, thousand km <sup>2</sup>	6,118		2,55			3,3			
Salinity, ‰	8-13	30		23	11-14		12	17	9

**Project Outcomes:-**

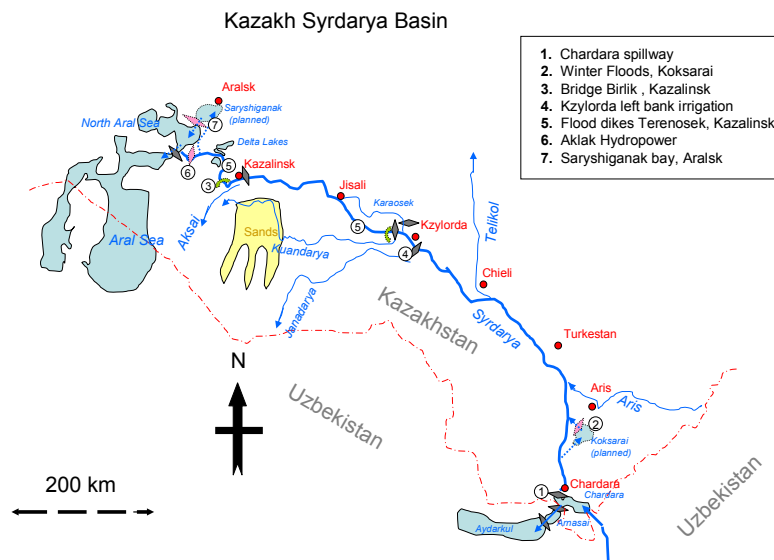
The Phase 1 Project has already shown impressive results:

- Eliminated the threat of extinction of the Northern part of the Aral sea;
- Raised the water level of the Small sea from 39.90 m BS to 42 m BS;
- Increased area of sea from 2414 to 3262 km<sup>2</sup>;
- Increased the volume of water in the Small sea from 15.6 to 27.1 km<sup>3</sup>;
- The Sea became closer to the city of Aralsk from 75 to 17 km;
- Reduced the level of mineralization of the Northern Aral sea from 23 to 17 g/l;
- Restored several lake basins in the area of 20-30 hectare, which gave the opportunity to further develop the fisheries activities;
- Created favorable conditions for reproduction of commercial and valuable species of fish (restored 13 species previously extinct, the volume of the catch increased from 0.4 to 5.0 thousand tons) (Water Feature Stories, 2008).

In 2005, during the visit of objects of SYNAS-1 by President N. Nazarbayev was given high evaluation and significance of technical installations of project, and was proposed to continue work on the stabilization and improvement of ecological and socio-economic situations in the Aral sea. The "The Syr Darya Control and North Aral Sea" (SYNAS-2) project is to continue the SYNAS 1 successful development of the Kazakh Syrdarya Basin in terms of improving living conditions for its inhabitants, improve safety, and to improve environmental conditions (The project «SYNAS-2»).

The proposed SYNAS-2 would be designed to improve further the environmental and economic conditions along the Syr Darya and the NAS. It would build on the work done under SYNAS-1. This would be achieved by focusing more on integrated water resources management in the basin, which would require a number of structural interventions and strengthening the institutional and management capacity for integrated water resources management in the basin.

**The aim of the SYNAS-2 project** is to increase the bandwidth of the lower part of Syr Darya, sustainable water supply and rehabilitation of the Delta lakes, as well as strengthening the capacity of the government in the field of river basin management that should be implemented in two stages. The first phase of the project, consists of 6 components, component names and places where they will be implemented activities are listed in figure 4.



**Figure 4:-** Map-scheme of location of the SYNAS 2

The Feasibility Study «Complex of structures in Saryshiganak bay» is part of the second stage of the "Northern Aral Sea" development. It foresees the flooding of the significant part of Saryshiganak bay and brings water back to the city of Aralsk, considerably improving the microclimate and ecological situation in the coastal area and in Aralsk. Creation of navigable access to the Northern Aral Sea allows to use partially the existing harbor, shipyard and fish processing industries, to organize commercial fish catch in the whole Northern Aral Sea, to create new working places, to improve social-economic level of the population.



**Site location:-**

Saryshiginak Bay is situated at the northern extremity of the Aral Sea between N 46 and 47 degrees and E 61 and 61 degrees 30. The dam will be constructed near the northern limit of the existing North Aral Sea, where the east and west banks are only separated by a short distance. The Bay will be supplied with water by means of a canal fed by an intake on the right bank of the Syrdarya river some 20 km upstream Aklak weir.

**Table 3:-** Description of the principal dimensions of new dike in Saryshiganak Bay

Principal dimensions	
length	10.7 km;
maximum height	8 to 9 m (to be confirmed by site survey);
crest level	48.4 m;
crest width	10 m;
downstream slope	1v:2h (with a 4 m wide berm at level 43.5 m);
fill volume	620,000m <sup>3</sup> .

**Objective of this paper:** to study the social and environmental impacts of the second phase “Syrdarya Control and Northern Aral Sea (SYNAS)” Project designed to elevate the water level in Saryshiginak Bay by filling the reservoir formed after construction of a new dam across the entrance to the Bay with the diverted water from Syrdarya River. This study will summarize some of the research findings made by scientists from different disciplines after completion of the Feasibility Study “Complex of Structures in Saryshiganak bay”.

**Research Methodology:-**

In the first step the appraisal of the proposed projects effects on the targeted communities was carried out as appraisal of various stakeholder categories *opinions and perceptions* as regards the projects socio-ecological effects. This type of participatory research was selected because it allows to:

1. forecast public support or opposition to decisions that will have been made on the projects,
2. refine public education strategy in the cases where misunderstanding and distortion of information as regards the proposed projects are detected, and
3. refine the projects at the feasibility study and implementation stages to better meet the affected stakeholders groups needs and reduce costs and potential temporary or permanent negative impact.

The analysis was carried out as a series of interviews with pre-determined categories of stakeholders. People were interviewed on the projects that

1. they have comprehensive technical knowledge of,
2. would affect their life and work conditions in an immediate way, or
3. are recurring discussion points at the political and social agenda locally and nationally.

A distinctive feature of this analysis was that the surveyed stakeholders’ collective or individual opinions were not ascribed weights that would have reflected respondents’ technical expertise, status in the hierarchy of authority either official or unofficial, income, education, or other socio-economic characteristics. All the obtained information constituted an array of arguments that were supportive or critical of every individual project from a socio-economic perspective. Only in the final analysis matrix weights were assigned to categories of socio-economic indicators.

**Socio-Economic and Ecological Analysis:-****SYNAS-II Project Social-Economic Appraisal Matrix:-**

One hundred six respondents were surveyed. All opinions expressed by the interviewed stakeholders were classified as either

- “Red”, i.e., arguments against a project in relation to a particular indicator,
- “Yellow”, i.e. arguments that delineate conditions under which a project may be supported, otherwise it should be rejected, or
- “Green”, i.e. arguments in support of a project.

Subsequently a number of distinct “green”, “yellow” and “red” arguments were counted per each indicator. Further weights of “green”, “yellow” and “red” arguments were calculated as a ratio of a number of arguments in each category to a total number of all arguments per individual indicator.

Obtained numbers for the safety indicator were multiplied by 2, while numbers for the political gain indicator were divided by 2. Numbers on the remaining indicators were not weighted. Total project rank was calculated as a sum of the all indicator numbers.

The projects that received only positive scores could be considered as most socially urgent and relevant. No controversy over their goals or proposed implementation schemes was elicited.

Goals of the projects that received a mix of positive and negative scores were not highly contested. However disagreement as regards their implementation and intended and unintended consequences were elicited. Further consultations, negotiations and public awareness activities may be needed.

Projects that received equal positive and negative or predominantly negative scores need revision, awareness raising campaign, lobbying, and new in-depth expert discussion.

The following opinions were collected and categorized according to five themes. The colours green, yellow and red indicate respectively recorded support, ambivalent opinion or opposition.

**Table 4:-** Socio-economic appraisal matrix

Indicator	People, livelihoods and agricultural lands safety	Enhancement of income generation opportunities	Ecological rehabilitation, creation, enhancement of human health	Revival of traditional habitats, emotional and moral renaissance	Impact on Kazakhstan's political and economic development prospects and its role in Central Asia
The complex of dam structures in the Saryshiganak bay, provision of water to Aralsk harbour	0 1 (106/106) 0  +1x2=2	0.8 (85/106) 0 0.2 (21/106)  +1	0.66 (70/106) 0 0.33 (36/106)  +1	0.66 (70/106) 0.33 (36/106) 0  +1	1 (106/106) 0 0  +1x0.5=0.5

**Comment:-**

$$2+1+1+1+0.5=+5.5$$

Overall, this project has an incontestable moral and political value both at the local and at the national and international level. Material gains for the affected population may also be significant.

**Results and Discussion.****Social impact of the project:-**

Filling up the Northern Aral Sea has become an integral part of the Aralsk district life. After the SYNAS-I people have believed that the once impossible task of the revival of the NAS may turn into real and feasible projects. Therefore no one opposed this idea and the line that the Aral Sea needs to be revived at all costs has become a guiding principle.

Major direct beneficiaries of this project will be people in the Aralsk District. First of all the environment will be affected in a positive way. Climate will get milder due to the replenishment of the Saryshiganak bay and this will positively impact people's health. There will be more rains and less dust storms. Environmental effect of the construction of the Saryshiganak bay dam, however, was perceived as arguable for the Kazalinsk district. The Small Sea will be replenishing while the Large Sea will further desiccate, while salt and sand winds blow from the dry bottom of the Large Sea. It is these winds that cause respiratory system diseases.

Material gains would be substantial. Turning Aralsk into a port would attract investments into the city. Second, replenishment of the NAS will lead to the increase in fish catch. This will stimulate fish factories revival in Aralsk. Processed fish will go up in price compared to raw fish.

The boat fleet will be revived to transport fish to Aralsk. Sea transport is a cheaper alternative to the transport by land. Jobs in the fish processing, fleet and fleet maintenance sectors will be created. A canal that would start before the river delta and become a shortcut between Syrdarya and the presently desiccated Saryshiganak bay has an added value as it presents the surrounding villages with a supplementary water reservoir as a pond for cattle and water

supply for melon cultivation. However those who live around the river mouth may not enjoy this revival to the same extent as the population of Aralsk itself and the surrounding villages.

Most benefits of the project in the opinion of the interviewed stakeholders concerned renaissance of the entire Aralsk district. Return of the sea and the subsequent improvement of the employment situation and investment climate would lighten the atmosphere in the city and empower people. Those who have never left the area regardless of the government's invitation to resettle would be morally satisfied. Those who have left Aralsk will be happy to return once jobs and other income generation opportunities present themselves should the replenishment of the NAS progress. Replenishment of the Aral Sea would reduce stress over the loss of the traditional habitat, social and economic decay and struggle for survival that have become a background for those who used to live off the sea.

Aral Sea is at the core of identity of people who've been living there for generations. Return of the sea would strengthen distinct collective identity and foster patriotism. Fame of Aral fishermen and fish factories will be restored. Professional cadre is still there, ready to work and train new specialists. Political gains are clear. Replenishment of the NAS is a test for the ability of the President to keep his promises.

Although no serious opposition to this project was expressed, there were voices that called for a more careful and less euphoric approach to this project. First, the dam construction is a high risk enterprise. Should the dam be washed away or destroyed there would be a catastrophic flood. Therefore careful calculations and perfect implementation are of key importance. Second, selection of the start of the channel into the Saryshiganak bay is vital because there is a danger that water from the lakes such as Tushibas would spill into this channel. An alternative is to reconstruct old natural channels that once connected the lakes with the sea.

As regards climate change sceptics say that the area of the Saryshiganak bay is not large enough to affect climate change.

Replenishment of the Saryshiganak bay would not make any difference for Kazalinsk rayon.

Overall, this project has an incontestable moral and political value both at the local and at the national and international level. Material gains for the affected population may also be significant.

#### **Ecological Section:-**

The project encompasses a cutoff dike of maximal 10.7 km length at Saryshiganak Bay with a maximum height of 9 m, an adduction canal of about 46 km length with a discharge capacity of 50 m<sup>3</sup>/s which would take off from the Tushibas Lake near Bugun village. Various water levels in the bay have been investigated between 45 m and 50 m. A complete restitution of the ancient Aral Sea water level in the bay of about 50 m will not be possible, as not enough gradient will be available from Syrdarya for the necessary transport length. While lower water level covers only part of the lake and the highest water level would almost reach Aralsk harbour, the costs for increasing the dam height becomes disproportional high, and vice versa, low water levels would increase disproportionately the access canal length and depth. A feasible compromise seems to be 46 m operational water level. The envisaged water level will require dredging to realize a navigable access to Aralsk harbour for ships up to a draft of 2 m.



**Figure 5:-** Saryshiganak project area with dam (orange), supply canal and access canal to Aralskharbour (blue) and flooded area (transparent) Remark: The flooded area was taken from an bathymetric map which was not entirely exact as the satellite image shows (Phase 2)

Inflow to Saryshiganak lake will be by diverting flows from the Syr darya, through Tushibas lake and via a 46 km canal to a discharge point at the east side of the lake. The project would bring the gulf back to the town of Aralsk the former main port and transshipment point at the northern end of the Aral Sea.

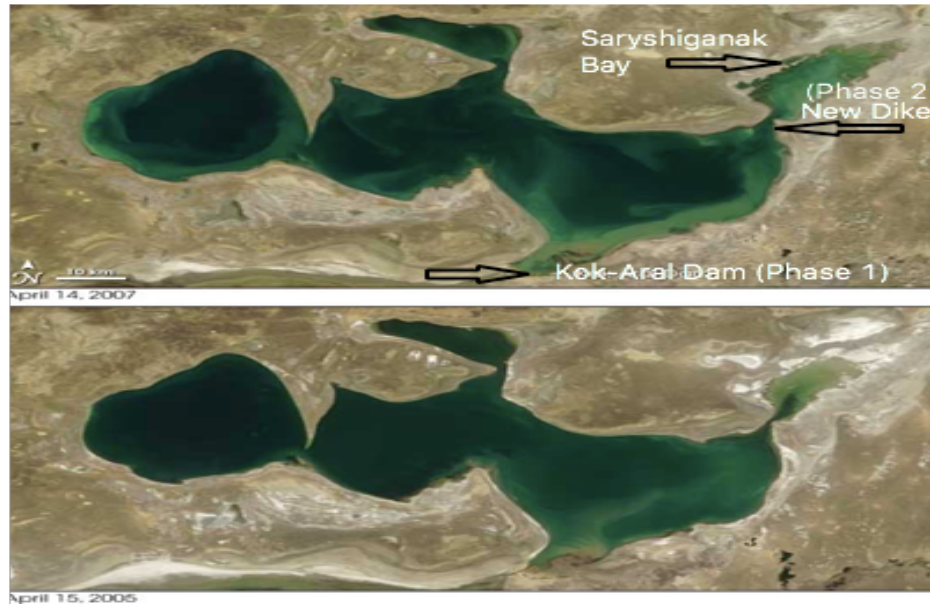
The reservoir created would have near fresh water salinities of 2–3 g/l. Locks would be installed at the dam allowing passage of fishing and cargo boats from the main part of the Small Aral to the gulf and vice versa. This would allow fishing vessels direct access to unload their catch at the newly rebuilt and quite modern fish processing plant in Aralsk.

As an alternative the increasing of the new Kokaral dike by 4 m to achieve a raise of the water level in the entire NAS up to 46 m was considered during the pre-feasibility study. This option would require significantly more water (more than the annual 3 km<sup>3</sup>) which is currently not sufficiently available from the Syr darya River which would cause long times for filling the entire NAS. However, a further increase in the level of the NAS to 46 m would require about USD 92 million investments in dike construction and additional considerable investments in upgrading of irrigation infrastructure along the Syr darya River in order to save more water to reach the NAS.

### **Environmental Impacts:-**

#### **(a) Impacts on the hydrology of the river system:-**

The water supply for the Saryshiganak Bay will be realized by withdrawal from the Syr darya River via Lake Tushibas and a canal of 45 km length and 50 m<sup>3</sup>/s discharge capacity from the northern edge of Lake Tushibas. The annual withdrawal for covering the losses due to evaporation, losses through the sluice and infiltration from the canal will be 0.556 km<sup>3</sup>. The impact on the Syr darya River system, by reduced runoff and – depending on the timing of withdrawal – changing of the flood dynamics concerns the river course downstream from the canal supplying the Lake Tushibas, in effect the last few kilometers. The water supply will be ensured by the Aklak weir (upstream water level at summer 53.5 m asl. During winter, the same operational level needs to be assured for feeding Saryshiganak bay and assuring sufficient head for hydropower production.



**Figure 6:-** Pictures of the North Aral Sea before (below) and after (top) construction of the Kokaral dam (April 2005 and April 2007 comparisons)

Images showing the recent flooding of already about 50% of the Saryshiganak Bay area to be rehabilitated under the project. Consequently, as project impact only evaporation losses from additional water surface should be calculated.

The impact on surface waters is not very significant for the Syrdarya River and the NAS. On the Lake Tushibas the impact concerns the maintenance of a maximum water level during the times of water supply to the bay. In what extent this will change the current hydrological conditions needs to be studied. It is positive for the Saryshiganak Bay, which will be revived as a water body of 593.6 km<sup>2</sup> with a volume of 1.76 km<sup>3</sup>. The construction of the Kok-Aral dike already caused the reestablishment of a water surface area of roughly estimated one half of the surface of the Saryshiganak Bay. Due to the withdrawal the annual inflow into the NAS and consequently into the Large Aral Sea (LAS) will be reduced by 0.23 km<sup>3</sup>, i.e. the evaporation losses from the additional water surface of the bay. The water released through the ship lock and infiltration water from the supply canal flow into the NAS. Against the backdrop of the highly negative water balance of the LAS of several km<sup>3</sup> per year, the reallocation of this water amount to a part of the Aral Sea - where its positive impact is considerable higher and sustainable – is acceptable.

In the vicinity of the re-established water body of the Saryshiganak Bay the ground water table will increase but remain below the level of the 1960s. Infiltration losses from the canal can cause local ground water table increase in the shore areas of the NAS.

#### **Impacts on water quality:-**

The project will have no impact on river water quality. During the construction period water pollution can occur from used machinery. This pollution has to be minimized by observing the required standards for machinery and transportation means. The pollution of the Syrdarya River water will be the determining factor for the water quality

in the Saryshiganak Bay. In contrast to the situation prior to the drying out when the Saryshiganak Bay was without freshwater inflow and thus belonged to the comparably saline areas it will now become a fresh water lake.

The flooding of the Saryshiganak Bay and the spillage of water through the sluice into the NAS from the north will improve the mixing of the NAS water of high salt content with fresh water from the Syrdarya. On the other hand, salt accumulation and toxic substances at the dry seabed in the bay will become dissolved and moved into the NAS. The proximity of the city of Aralsk to the re-established bay, the operation of the rehabilitated harbour and an increase of ship traffic can cause pollution of the Aral Sea by domestic and industrial sewage.

Desalinization of the Saryshiganak bay water will be achieved fairly rapidly. It should be mentioned, that during the drying out process, no residual salt pans accumulated in the bay, but that the waters retired towards the main body of the NAS, without leaving excessive salt incrustations. The relation between a high volume (1.76 km<sup>3</sup>) of fresh water (max 1.8 g/l salt) brought to the bay and the comparatively small amount of salts accumulated in the Solonchak layers (max 5 % within a depth of 0.5 m on a surface of 594 km<sup>2</sup>) on the dried out lake bottom will create and maintain a lake, whose salinity will be about 10 g/l, a concentration which is lower than in the NAS and which will gradually decrease with the yearly water exchange. This will impact positively on the distribution of commercially higher priced sweet water fish species.

At present the high salinity of the ground water in most wells of the NAS area limits its utilization as drinking water. The unknown patterns of ground water salinity and their relation to the Aral Sea level make a prediction of impacts on well drinking water difficult. A deterioration of ground water quantity and quality in the context of the drying of the sea is reported from the villages in the proximity of the former shoreline. Thus the rehabilitation of the water body will most likely have a positive impact.

#### **Impacts on atmospheric air :-**

From the rehabilitation of the water body a positive impact on the local climate in the vicinity is expected. This concerns higher air humidity and a less continental temperature regime. The dry Aral seabed, in particular in the Saryshiganak bay is considered being the major denudation source of frequent salt dust and sand storms in Aralsk and the region. The flooding of a considerable area, including the most critical substrates with high salt content should lead to a mitigation of these problems.

#### **Impact on soils:-**

The impact on soils includes flooding of dry seabed, which is considered positive. The areas of former seabed, which will remain open are mostly sand substrates which are well covered by vegetation. Further impacts on soils are the effects of construction of canal, dam and access road, including opening of borrow pits. The source of material for dam construction has been identified directly to the east of the damsite. Impacts should be minimized by restricting the area and mitigated by allowing a re-cultivation or a protected self-regeneration of borrow pits. The utilization of the excavated material from the canal for construction of the dam should be considered. The canal would be along the former seashore in largely sandy substrates. This can cause problems with infiltration losses.

**Impacts on biodiversity:-**

The project will have the major effect of restoring in a large extent of the former landscape before drying out of the bay. Significant areas of dry seabed will however remain as the water level will be still 4 m below the level of the 1960s. The impact of the construction of the dam and the supply canal will be local by character. When constructing the canal the material could likely be used for dam construction and thus the creation of dams along the canal be avoided.

The restoration of the Saryshiganak Bay will cause the flooding of vegetation established since the drying out. This vegetation consists of typical representatives of the psammophilous desert vegetation and in the lower parts of salt tolerating plants. In the area of canal and road construction and at the borrow pits for the dam construction the natural vegetation will locally be destroyed. The affected areas are not significant (few hundred hectares). The restoration of the lake ecosystem in the bay is considered positive impact by far outweighing the loss of secondary desert vegetation on the dry seabed and comparable small sections of desert vegetation outside. Among the fish, economically more attractive fresh water species will prevail. However it should be recognized that the flooding via a canal will cause conditions, which are in terms of water chemistry, significantly different from the former brackish water and the new developing ecosystems will thus differ from the previous ones.

During the detailed design studies, analysis should be done on how to populate the Saryshiganak bay fastest with fish. The present owners of fishery rights in Tushibas lake might prevent the most obvious path, directly by canal inflow from the fingerlings released from Tastak and Koszhar hatcheries on Syrdarya. For fish population and fish migration it would be important to have at least a temporary passage allowed. This can be achieved for instance by electric fish repellent structures at the Tushibas canal intake. Although not as effectively, fish could also travel via the locks and to a lesser extent via the bottom outlet in and out of the Saryshiganak bay. Initial fish population could also be realized by transport of fingerling by tanker trucks to the lake sites.

The Saryshiganak Bay is a part of the proposed Important Bird Area "Small Aral Sea". The most important species are water related birds as e.g. White and Dalmatian pelican and ferruginous duck. Those species may profit from the increase of the lake. However the raising of the water level can as well adversely affect waterfowl species because of changes of the water chemistry impacting on the fodder basis and distribution as well as extent of shallow areas with loamy substrates. The water body of the Saryshiganak Bay will in most areas reach the sites with steeper slopes and sand soils with higher vegetation. This will significantly reduce shallow water and salt marsh areas. Species breeding in areas with shallow waters or on flat places with sparse vegetation as diverse waders, among them the endangered steppe pratincole, white-tailed plover, Kentish plover or lark species, including the rare Asian short toed lark may lose breeding sites. The loss of shallow water areas will likely as well affect numerous migratory birds resting there. The construction of the Berg Strait dike and the raising level of the NAS already caused the loss of extensive feeding and resting areas in the region of the Syrdarya Estuary. The impact of the raising NAS level has been documented in the final monitoring report of Scott Wilson (2007). Unfortunately the Saryshiganak Bay was not included in the monitoring sites of Scott Wilson and the data basis on birds in this specific area is scarce.



The project has a positive impact on the ichthyofauna by increasing the fish habitats and reducing the salinity in sections of the NAS as described above. At the moment it cannot be predicted if the fish fauna of the area would be rehabilitated by immigration via the supply canal or if a fish ladder at the dam should be considered. The fish ladder could be combined with a spillway for release of fresh water into the NAS.

**Table 5:-** Future fish catch in the NAS and Saryshiganak bay

Location	Surface km <sup>2</sup>	Quantity of fish caught (t)						Gross margin (1000US\$)					
		Years						Years					
		1	2	3	4	5	6	1	2	3	4	5	6
Northern Aral Sea (SYNAS report 1999), without project	3243	917	1113	1310	1507	1703	1900	305.83	371.19	436.90	502.60	567.96	633.66
NAS fish catch forecast corrected	3164	1910.00	3633.00	5356.00	7079.00	8802.00	10525.00	637.00	1211.63	1786.27	2360.90	2935.54	3510.17
Saryshiganak Bay	594	350.00	1930.00	3510.00	5090.00	6670.00	8250.00	139.54	769.47	1399.39	2029.32	2659.25	3289.17
<b>Total</b>	<b>3758</b>	<b>2260.00</b>	<b>5563.00</b>	<b>8866.00</b>	<b>12169.00</b>	<b>15472.00</b>	<b>18775.00</b>	<b>776.54</b>	<b>1981.10</b>	<b>3185.66</b>	<b>4390.22</b>	<b>5594.78</b>	<b>6799.34</b>

Gross margin per ton of fish US \$/t

NAS: 333.51

Saryshiganak: 398.69

Scientists estimates that creation of a large fresh water reservoir in the bay will create additional fishing grounds and the accelerated desalination will increase the productivity of valuable fish species of low salt tolerance in the NAS. This will outweigh the further reduction of flounder catches caused by the reduced salinity.

The benefits of construction are calculated based on the expected growth of fish catch in the Sea and Saryshiganak bay as well as on the expected improvement of population health at the territories adjacent to the Sea.

- Growth of fish catches in Saryshiganak bay will be based on a growth from 350 tons to 8250 tons per year within six years, assuming a gross margin per tonne of qualitatively more valuable fish of US \$ 399.
- Growth in Northern Aral Sea will be based on a growth from 1910 tons to 10 525 tons within six years, assuming a gross margin per tonne of fish of US \$ 333.

Despite of some predictable negative impacts on the current biodiversity at the dry seabed the overall impact of the restoration of parts of the former sea area is considered overly positive. The development of new biocenoses will start immediately with the restoration of the water body. The impact on biodiversity needs to be further studied in the frame of the detailed design study.

#### **Impacts on human environment:-**

The expected reduction of salt dust in the air and potential improvement of the quality of ground water used as drinking water in villages close to the sea will have a considerable positive impact on human health. The restoration of a water body in the bay dry for decades will have a positive mental effect on the local population.

**Worst case scenario:-**

The worst case scenario would be the failure of the dam similarly to the previous Kok-Aral dike. This has to be prevented by an appropriate construction design and execution. The volumes to be released from Saryshiganak bay would be absorbed by the NAS and the existing NAS dam spillway. In the worst case, in which the water level of the NAS would rise to an unacceptable level, the earth fuse plug in the NAS dike will fail and release the water without further damage to human lives or property to the Main Aral Sea. The upstream slope must be protected from erosion by wave attack. With a maximum fetch of 40 km and a design sustained wind speed of 30 m/s (equivalent to the 1 in 1000 year event), it is estimated that the average height of the resultant waves could be 1 m and the 1 in 100 wave would be 2.1 m. To sustain the force of such waves the mean stone diameter should be 0.7m. Further it is crucial for the stone protection to be bedded on coarse highly permeable gravel of a suitable grading overlying a sand filter material. The downstream slope will be protected, where it is vulnerable to wave attack from the NAS, by the coarse material of the downstream cofferdam. A spillway of 45 m<sup>3</sup>/s capacity is required to ensure the embankment cannot be overtopped.

**Conclusion about the environmental impact:-**

The project has positive impacts in terms of hydrology, air, landscapes and human environment. The evaluation of impacts on biodiversity requires further assessment. So far positive as well as negative aspects are expected, with the positive aspects likely dominating. No clearly negative environmental impacts have been identified.

**General Conclusion:-**

An important contribution to redress the economic and ecologic effects of the drying out of the Aral Sea has been the SYNAS I building of the North Aral Sea dike and the achievement of an operational water level of 42 m. A further step taken by SYNAS II is the raising of the water level to 46 in Saryshiganak bay, so that fishery can again reach Aralsk city, albeit with the help of a dredged canal. The measure will be achieved by a dam of 10.3 km length and an adduction canal of 46 km length from Syrdarya through Tushibas lake.

The creation of a lake in Saryshiganak bay at a working level of 46 m to bring back water to the city of Aralsk is an object of highest national priority. Great hopes have been placed on the World Bank financed activities of the SYNAS projects to improve living conditions in the declared zone of environmental and economic disaster. The closing of the Kokaral dike (Phase 1) and the raising of the water level to 42 has shown the effectiveness of this initial measure. The next step (Phase 2) the raising of the water level to 46 m is universally expected and acclaimed. Great benefits in terms of fishery catch and transport improvement, boatbuilding, fish processing and the subsequent creation of business and job opportunities will provide a great impetus to the economic revival of the region. Other positive effects are related to improvement of environmental conditions and health. The improvement achieved comes at the cost of a high investment in 46 km of canal in ground material, which may make lining necessary, the dam of 10.3 km length and additional hydraulic infrastructure. In common economic terms, taking account of only tangible or monetary benefits, the project only provides an unsatisfactory return to capital investment.

Still, taking account of the many intangible and not valued benefits, the realization of project can be recommended without restriction as an important state-borne infrastructural measure.

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### RESEARCH ARTICLE

#### OPTICAL AND THERMAL STUDIES ON NANO-MOLECULAR SELF-ASSEMBLED INDUCED SMECTIC PHASES OF LIQUID CRYSTALLINE MATERIALS.

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 Electrical conductivity.

#### Abstract

In the present work, our investigation is to study the optical and thermal properties of the binary mixture of nematic and cholesteric compounds namely, 2-cyanonaphthalen-6-yl 4-(3, 7-dimethyloctyloxy)-benzoate (CNDOB) and cholesteryl nononate (CN), which exhibits different liquid crystalline phases of Cho-SmA-SmC-SmC\*-SmE phases and it is obtained sequentially when the specimen is cooled from isotropic phase. These phases have been characterized by using X-ray and optical texture studies. The temperature variation of electrical conductivity and helical pitch of the cholesteric phase has been discussed.

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#### Introduction:-

Liquid Crystals are a state of matter that is intermediate between the crystalline solid and amorphous liquid. Liquid crystals are flow like ordinary liquids and also exhibit anisotropy in their optical, electrical, magnetic properties like crystals. They are also called as mesophases because of their intermediate nature. Liquid crystalline materials are broadly classified as thermotropics and lyotropics. In thermotropics, the phase transition is mainly controlled by temperature: whereas in lyotropics, apart from temperature: phase transitions are controlled by the concentrations of molecules. On the basis of molecular arrangement, thermotropics are further classified into three main types namely, nematic, smectic and cholesteric. Nematics are characterized by orientational order while smectics have an additional positional order. Cholesterics are similar to nematics but, chiral in structure.

The cholesteric phase is regarded as twisted nematic wherein the molecules are orientationally ordered, but at the same time they are rotationally disordered with respect to long axis [1-3]. It is well known that, if a small percentage of cholesteric liquid crystals added to nematic, it results in the helical direction and pitch of the phase increases. When the pitch is comparable to wavelength of light the phase become iridescent because of the selective reflections of light. The recent studies on the mixture of cholesteric and nematic liquid crystals reveals that the mixture exhibits frustrated blue phase, twisted grain boundary phase, tilted phase, cholesteric phase and quasi crystalline phase[4-6]. Because of the tremendous potentialities of the liquid crystals in the field of display device technology, we have proposed the studies on the optical and thermal properties of mixture of cholesteric and nematic liquid crystals. Optical, thermal and X-ray studies have been carried out to understand the intermolecular interactions and the name of the induced smectic phases exhibited by the mixture.

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**Experimental section:-**

In the present investigation, we have been considered the binary mixture of liquid crystalline materials, namely: cholesteryl nononate (CN) and 2-cyanonaphthalen-6-yl 4-(3,7-dimethyloctyloxy)-benzoate (CNDOB). The chemicals are purified twice with benzene. Mixtures of twenty different concentrations of CN in CNDOB were prepared and were mixed thoroughly. These mixtures of various concentrations of CN in CNDOB were kept in desiccators for a long time. The samples were subjected to several cycles of heating, stirring and centrifuging to ensure homogeneity. The phase transition temperatures of these concentrations were measured with the help of Leitz-polarizing microscope in conjunction with a hot stage. The samples were sandwiched between the slide and cover slip and were sealed for microscopic observations. The X-ray broadening peaks were obtained at different temperatures using JEOL diffractometer. The density and refractive indices in the optical region are determined at different temperatures by employing the techniques described by the earlier investigators [7, 8]. Electrical-conductivity measurements of the mixture at different temperatures were carried out using digital LCR meter and a proportional temperature control unit.

**Results and Discussions:-****Phase Diagram:-**

The partial phase diagram of given molecules is a very important method to determine the stability of liquid crystalline phase at different temperatures for different concentrations. The partial phase diagram in the present case is as shown in Figure 1. This clearly illustrates that, the mixtures with concentrations ranging from 5% to 85% of CN in CNDOB exhibit Cholesteric SmA, SmC, SmC\* and SmE phases sequentially when the specimen is cooled from its isotropic melt. But the mixtures with concentrations ranging from 10% to 65% of CN in CNDOB show only SmC\* phase in addition to the above phases respectively at different temperatures. [9].

**Optical Texture Studies:-**

For the purpose of optical texture studies, the sample was sandwiched between the slide and cover glass and then the optical textures were observed using Leitz-polarizing microscope in conjunction with hot stage. The concentrations ranging from 10% to 65% of the given mixture are slowly cooled from its isotropic melt. The genesis of nucleation starts in the form of small bubbles and slowly grow radially, which form a spherulitic texture of cholesteric phase with large values of pitch and texture is as shown in Figure 2(a) [10-12] at temperature 94 °C. On further cooling the specimen, the cholesteric phase slowly changes over to focal conic fan shaped texture, which is the characteristics of SmA phase and is as shown in Figure 2(b) at temperature 80 °C. On further cooling the specimen, SmA phase changes over to schlieren texture of SmC phase, which is as shown in Figure 2(c) at temperature 65 °C. The SmC phase is not stable and then changes over to SmC\* phase, which exhibits radial fringes on the fans of focal conic textures, which is characteristic of chiral SmC\* phase. Further cooling the specimen, the chiral SmC\* phase changes over to the crystalline SmE phase, which remains up to room temperature and then it, becomes crystalline phase.

**Conductivity Measurements:-**

Electrical-conductivity measurements help in getting better idea on the phase behavior with temperature. An abrupt increase or decrease of electrical-conductivity with temperature relates to the phase behavior of the lyotropic and thermotropic systems [13]. The temperature variation of electrical-conductivity for the sample of 40% CN in CNDOB is shown in Figure 3. The changes were observed in electrical-conductivity, the values correspond to liquid crystalline phase transition of thermotropic and lyotropic systems, respectively, at different temperatures and they were also identified by optical texture studies. It was observed that, the electrical-conductivity shows changes as we move from 96.5°C→90.5°C, 90.5°C→70°C, 70°C→60°C, and 60°C→51°C, 51°C→48°C which correspond to phase transitions Ch→SmA, SmA→SmC, SmC→SmC\*, SmC\*→SmE and SmE→Cryst phases respectively. This type of behavior is generally observed in hexagonal, cubic and lamellar phases of lyotropic and thermotropic systems [14, 15]. These abrupt changes cannot be throughout if only due to change in the orientation of molecules. They can be attributed to changes in the dimension of disk along with changes in orientation.

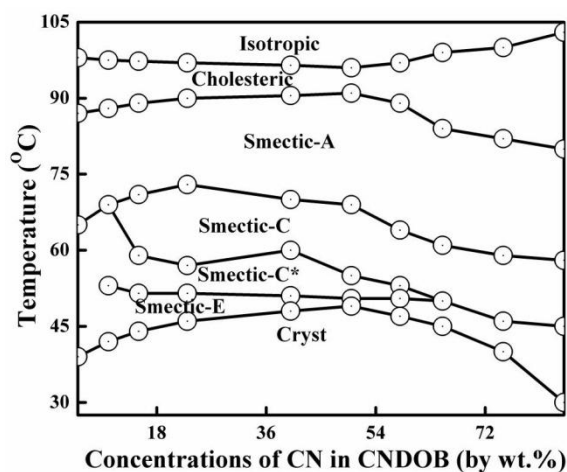
**Helical Pitch Measurements In Smectic And Cholesteryl Layers:-**

The helical pitch measurements were performed on the cholesteric phase following the well-known Grandjean–Cano wedge method [16, 17]. The given mixture was taken in a wedge-shaped cell treated for homogeneous alignment. The two glass plates formed a small angle at the wedge. The mixture was cooled slowly (0.2°C min<sup>-1</sup>) from isotropic cholesteric to smectic phase, which induces an array of equidistant Grandjean–Cano lines. The pitch of cholesteric phase was determined by measuring the distance between the Grandjean–Cano lines as a function of temperature. As the temperature was lowered the mesophase changes from cholesteric to smectic phase and the

spacing between the lines are increased, indicating that the pitch in the cholesteric phase is also increasing. The temperature variation of pitch for the mixture of 40% CN in CNDOB is shown in Figure 4. From this figure, it is evident that, the variation of pitch from cholesteric to smectic phase is smooth and continuous. But gradually, the value of pitch increases from 0.17 to 0.19 mm upon cooling the sample from cholesteric to smectic phase. The value of the pitch increases steeply and reaches a maximum of 0.34 mm at the cholesteric to smectic phase transition. In this study, we have noticed that, the sequence is Iso→Cho→SmA→SmC→SmC\*→SmE on cooling. Most of the data about the helical pitch are available in literature [18]. The pitch is continuous at the cho→smectic transition in spite of a rather energetic transition. It increases on cooling to smectic phase and diverges on approaching the SmA, SmC, SmC\* and SmE phases. This divergence is related to the second order nature of the transition. It exhibits a steep decrease, close to cholesteric phase which is usually the characteristics of second-order SmA, SmC, SmC\* and SmE phase transitions.

### X-Ray Studies:-

To understand the change in layer spacings in SmA and SmC phases with respect to temperature, X-ray diffractometer traces were taken. The traces obtained for the mixture of 40% CN in CNDOB at different temperatures correspond to SmA and SmC phases. It is observed that as the temperature increases the layer spacing also increases in SmC phase. But in SmA phase the layer spacing's are almost constant. These variations are as shown in Figure 5 [15, 16].

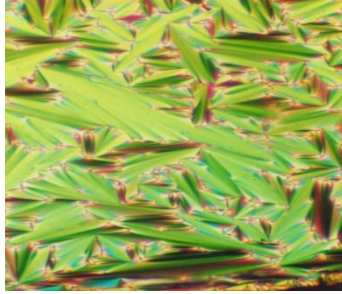


**Figure 1:-** Partial phase diagram for the mixture of CN in CNDOB.

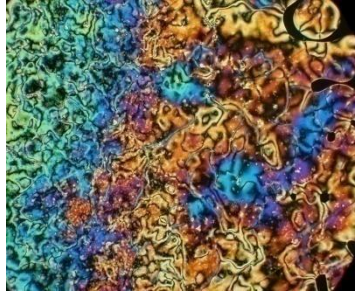
**Figure 2:-** Microphotographs obtained in between the crossed polars.



a) Spherulitic texture of cholesteric phase at temperature 94 °C.



b) Focal conic fan shaped texture of Smectic-A phase at temperature 80 °C.



c) Schlieren texture of Smectic-C phase at temperature 65 °C.

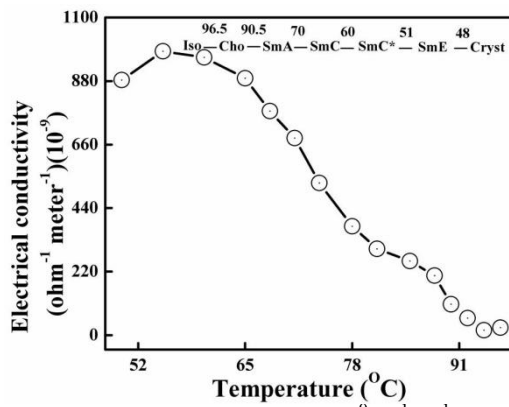


Figure 3:- Temperature variation of electrical-conductivity  $\sigma$  ( $\times 10^{-9} \Omega^{-1} \text{m}^{-1}$ ) for the sample of 40% CN in CNDOB.

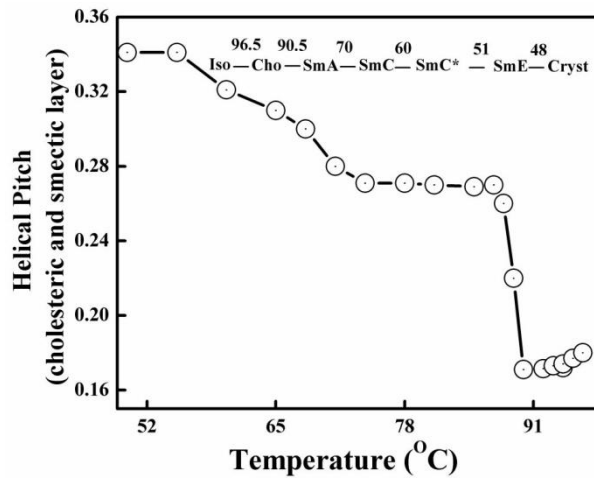


Figure 4:- The temperature variations of pitch for the mixture of 40% CN in CNDOB.

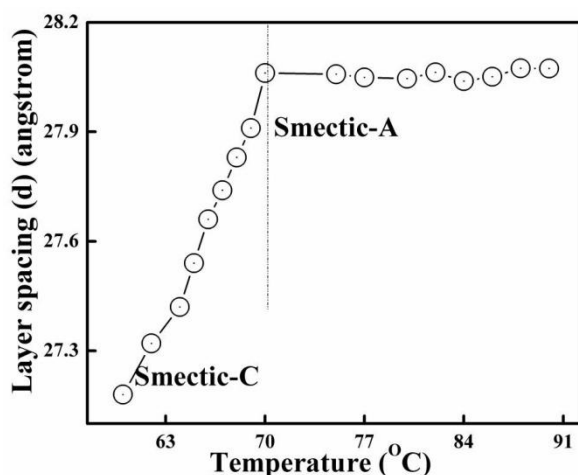


Figure 5:-Variation of layer spacing with temperature for the sample of 40% CN in CNDOB.

### Conclusions:-

In light of the above results, we have drawn the following conclusions. The binary system of given mixture exhibits an unusual sequence of phases showing the formation of cholesteric, SmA, SmC, SmC\* and SmE phases in different concentrations of CN in CNDOB. The phase behavior is discussed with the help of phase diagram. The X-ray results also lend support to the above observations. Changes in the values of electrical conductivity with temperature suggest that the size of aggregated molecules goes on increasing and the electrical conductivity is also increasing, while the mixture is cooled from the isotropic phase. The pitch of cholesteric phase is continuously increasing at the transition from cholesteric to smectic phase transition. But, it is very interesting to see that it increases on cooling to smectic phase, which evidently diverges on approaching the SmA, SmC, SmC\* and SmE phases respectively at different temperatures.

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### RESEARCH ARTICLE

#### FAULT DETECTION AND EVENT PREDICTION IN NETWORKS USING FEATURE MATRIX.

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#### Abstract

A data features selection and organization scheme is presented for future event predictions using historical event data. Most of the reported event prediction methods use data features in the form of time series. The proposed approach uses simple data feature statistics. First an event is defined based on historical event data features for all discrete time instances, then all events are ordered chronologically and divided into N time- windows with an overlapping interval. The probabilities (relative frequencies) for occurrence of all sequences of two events are calculated for each time-window and stored in a 3D input feature matrix. A prediction technique is trained using probabilities from one time-window to learn to predict probabilities for the next time-window. Once the prediction technique is iteratively trained for all N time-windows of the training data, it is used to predict future probabilities. The accuracy is calculated by comparing with the known test data probabilities. The proposed approach is tested for fault prediction in telecommunication networks using various Artificial Intelligence Techniques.

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#### Introduction:-

This paper presents a scheme of feature selection and organization of historical event data, useful for future event predictions. The future event is a personal event in the life of a person or nation or trend in economic markets or climate [1]. The accuracy of the prediction depends on the quality and amount of historical event data available and if some kind of correlation is present in the data. The main premise of this paper is that good prediction accuracy depends on finding good patterns in historical event data and good patterns are better found when proper event data features are selected and properly organized. Therefore the same historical event data can be organized and looked at differently resulting in different prediction accuracies [2].

The first step is to select problem domain specific data features that uniquely define distinct events. These unique events are chronologically organized into overlapping time- windows with each time-window representing a state of the historical event data within the bounds of the time-window. The probabilities (relative frequencies) of occurrence of all possible sequences of two events within each time-window are calculated and stored in a three dimensional (3D) feature input

Matrix such that two dimension (time-window) contains probability of occurrence of sequence of events and the third dimension is chronological organization of time-windows. Therefore probabilities within a time-window

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represent local event correlations and changes from window to window represent global event correlations. Please note that we use the term probability for relative frequency.

The historical event data used, for this paper, is the historical alarm log of a telecommunication system. The historical alarm log is first preprocessed to remove duplicates and insignificant alarms. Then based on alarm properties, unique events are identified and the probabilities of occurrence of all possible sequences of two events are calculated per overlapping time-window and stored in a 3D matrix. The 3D matrix is used as input to train a prediction technique, so that the prediction technique learn to produce probabilities of occurrences of all sequences of 2 events for the next window for any given window in the training set. The trained prediction technique is used to predict the probabilities of all event sequences for a future window. The set of predicted probabilities in the future time-window are compared with a set of pre-calculated probabilities of the test data to calculate prediction accuracies. False positives and negatives are considered for the calculation of these accuracies. The proposed approach of using the 3D matrix is unique, novel and is a simple method that provides accurate future fault predictions. The prediction results of 4 prediction techniques: Artificial Neural Network (ANN), Support Vector Machine (SVM), Kalman Filter (KF) and Hidden Markov Model (HMM). Please note that although the problem domain discussed contains fault events in telecommunication systems, the proposed 3D input feature matrix can be calculated for any problem domain and discussion presented is applicable to historical event data from any problem domain.

The rest of the paper is organized in 4 sections: The first covers some reported prediction techniques relevant to this paper, the second describes the proposed 3D matrix, the third presents prediction results for the 4 prediction techniques and the last section is the conclusion.

#### **Event Prediction Techniques:-**

Here some event prediction works are discussed. One such technique is used to predict traffic while also incorporating weather parameters [3]. Stationary Wavelet Transform (SWT) is used in conjunction with ANN. SWT is used to separate out approximation and details components from traffic and precipitation time series data. ANN is used to predict these components and then recombined using an inverse SWT. This SWT-ANN model is applied on real traffic and weather data for better accuracy than ANN alone, due to the feature processing of the data by the SWT.

Another technique predicts rain rates, to alleviate wireless signal attenuation, using conditional Gaussian Distribution of rain rate [4]. The historical data consists of rain rate and rain attenuation measurements with samples taken per second. Conditional occurrences of rain rate values are modeled, in a time series, using a Gaussian Distribution. The data (rain rate) at one instance is conditional on data (rain rate) in the previous instant. This model is successfully used to predict rain rates in 2008 from data of 2005-2007.

A multivariate reconstructed phase space (MRPS) is proposed to extend the univariate reconstructed phase space [5]. The premise is that multivariate data sequences are better than univariate data sequences for finding temporal patterns in dynamic data. The argument is that dynamic data contains sequences that are anomalously generated by hidden states and a univariate method will miss out on local trends and shifts. A real life application, of this method, is to detect causes of sludge bulking treatment plants.

Another application is to predict blood glucose concentration using meal information in addition to regular glucose readings [6]. Although the history of glucose concentration values can predict future glucose levels, the glucose levels also depend on food and medicine intake and physical exercise intensity. Therefore capturing of relations between glucose levels and meal intake, in a time series, can provide better predictions of future glucose levels. An ANN model predicts sum of 2 values, one is glucose prediction by a linear predictor and second is estimation of error in the first prediction. The error estimation is done on the basis of current prediction error, trend of prediction error, actual glucose measurement, glycemic trend and carbohydrate intake. The addition of food intake data has made glucose prediction much more accurate especially after and before a meal.

The work described in [7] is closer to our problem domain anomaly (fault) detection in operational networks such as customer care logs, system events, network alarms etc. All of these contain a lot of information about system health and performance. A time series prediction is an ideal choice for detection of anomalies in the system in operation. In the reported Tiresias system, heavy hitters (faults) are detected in real time using data hierarchy

present in operational logs. The dataset used is acquired from a broadband provider and consists of customer care logs and Setup box crash event logs. The input time series contains classification information and date-time stamp of a particular dataset. The classification is done using a hierarchical tree where nodes identify dataset weight of a category and time unit in which that data has been recorded. A sliding window concept is used to partition the data in time units. Arrival of new data adds more windows and older windows may be deleted to keep data from increasing too much. A separate seasonal analysis is done, using Fourier Transform and Wavelet Transform, to automatically choose seasonal parameters. The seasonal forecasting is done using Holt-Winters forecasting model.

The approach described by C. Xu et. al. is similar to the proposed approach [8]. Event sequence semantics are used in a Support Vector Regression (SVR) based predictive model. A semantic vector is defined that contains factors that affect the probability of occurrence of an event and weights for these factors. The time wise ordered events are partitioned in to Basic Windows (BWs) with interval T between BWs. For each BW, a standardized semantic vector is formed based on the sequence of events in BW and factors affecting the sequence of events. Now this se-mantic vector is used in the predictive model rather than the events. A hierarchical clustering algorithm is presented that uses a "Confidence" calculation (a measure of likelihood of one event following another event) instead of probability of occurrence of one event after another. The hierarchical clustering algorithm groups semantic vectors of similar semantics such that center of each group replaces all original semantic vectors and the frequency of the center is the total frequencies of all se-mantic vectors in the group. An event data dependent similarity threshold values decide number of groups. Furthermore a measure of "semantic distance" between event sequences is defined for the clustering algorithm. Different number and size of groups are formed using the similarity threshold and the semantic distance. A SVR based predictive model is built using the groups formed by the clustering algorithm. Experimental results are presented to show the general capability to predict events. A few papers are related to the domain of fault prediction using various prediction techniques [9] [10]. Here one approach uses hybrid fuzzy systems for stock price predictions [11].

The research covered above is a small sample of various novel and unique techniques reported for event prediction. As with the above event prediction techniques, most of the reported techniques use highly complicated algorithms and data processing techniques. Although various ways are suggested on how to augment the historical dataset to improve prediction accuracy, a significant effort is needed in order to evaluate the benefits of proper data organization and features. The work presented in this current paper suggests a simpler way of event data feature calculation and organization, for high prediction accuracies.

### **The Proposed 3d Data Feature Matrix:-**

In current event prediction techniques, the historical event data is considered in terms of one or more time series with data points at a certain time as one event e.g. weather or stock prices and other related factors on a particular day. Alternatively, rather than using time series, it is proposed to use some simple statistics available in the historical event data for future event prediction. For example, instead of using univariate (e.g. the price of a single stock) or multivariate time series (e.g. number of related and unrelated stock prices along with other relevant associated parameters), one can also define some unique state of the stocks as an event and then calculate the proposed feature input matrix. Another example is that of predicting the spread of a contagious disease by defining a unique event using number of affected patients and other information about the patients i.e. relationships between patients and demographics. Therefore it is proposed that a prediction technique may provide better prediction accuracies if first an appropriate event, based on data features, is defined and then event based statistics are used. In the predictive model, first find local patterns in the parameters of each event based on overlapping time-windows and then use a prediction technique (e.g. ANN) to learn how these parameters change from time- window to time-window. For every historical datum, an appropriate (optimal) time-window and overlap interval size can be found that best captures these local and global trends thus increasing the accuracy of the prediction technique.

The proposed input feature matrix is used to predict future impending faults in a telecommunication system using historical alarm log. Alarm management is an essential part of the FCAPS of the Telecommunication Management Network (TMN) standard and all telecommunication networks provide alarms management in one form or other [12]. These alarms are reported by the network constituent network elements and contain system health information in chronological order. For this paper, historical logs of three months of alarms from a telecommunication company are used. These alarms have been collected by an element management system

from the transmission unit of an operational telecommunication network. Here some definitions are in order:

1. Feature (or Parameter): is a unique property of an alarm e.g. equipment, severity
2. Unique Event (UE): is a unique combination of alarm features (parameters) e.g. equipment type, severity, slot and rack no. It should be noted that a UE is not necessarily an alarm of the telecommunication system.
3. Sequence of Unique Events (SUE): is a consecutive occurrence of two UEs. For example one UE A followed by another UE B in time. A and B can be same or different.
4. Probability of Occurrence of a SUE (POS): is the probability of occurrence of a SUE. POS is basically number of occurrences of an SUE divided by total number of SUEs
5. Time-window (TW): is a partition of historical event data by a time interval. A TW is defined by date-time bounds and may contain *m* SUEs. For example a TW of one month can be from April 1, 2014:00:00 to April 30, 2014:00:00 and contains *SUE1, SUE2, ..., SUE*
6. Overlapping Interval (OI): is the overlapping between TWs. There will be *N* TWs where *N* depends on the size of TW and OI. TW is a multiple of OI, therefore  $TW = OI$  means no overlap between TWs and  $TW = 2 * OI$  means 50% overlap
7. Input Feature Matrix (IFM): is a three dimensional matrix containing *N* TWs. IFM is used as an input to a prediction technique e.g. ANN.  $IFM = \{TW_1, TW_2, \dots, TW_N\}$
8. Training Data: is the portion of historical event data used for training of a prediction technique
9. Test Data: is the portion of historical event data used for calculation of false and true positives in prediction accuracies.

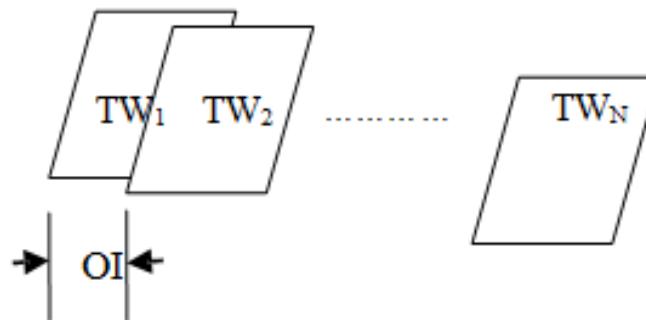


Fig. 1:- N Time-windows (TW) with Overlapping Interval (OI)

Fig. 1 shows that chronologically ordered UEs are divided into *N* equal size TWs with a predefined OI. Larger TW contains more UEs and smaller OI results in more time- windows. The POS for all SUEs are calculated for each TW. This calculation of POS, per TW, is organized in the form of a two dimensional matrix. This 2D matrix basically records the probability of occurrence of one UE against another UE (see table I & II below).

Historical Alarm Data.

Alarm	Alarm	Severity	Probable Case	Managed
42193	Link	Major	ALM_IMA_LINK_LCD	EMS

Managed Element	Rack	Shelf	Slot	Reason	Date
PTP	1	1	7	Loss of Signal	12/09/2013:4:27

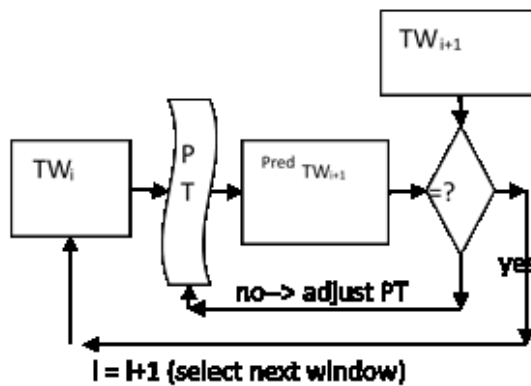
Fig. 2:- A typical Telecommunication Alarm

The alarm data used is acquired from three months of alarm logs from the transmission network of a telecommunication company. In three months about 45 hundred thousand alarms are generated and take 10 Giga Bytes (text) of disk space. Fig. 1 shows a typical alarm format containing information about date-time of alarm occurrence, network equipment information, severity level and probable cause. The historical alarm log is preprocessed to remove redundant and insignificant alarms. After pre-processing, all UE are found using alarm features and given a UE Identification Number (UEIN).

**Table I:-** Unique (Alarm) Events partitioned in *N* TWs. This 3D matrix is used as an input to train a prediction technique.

Alarm Type ID	Severity Level ID	Probable Cause ID	Managed Object ID	Alarm Reason	Unique Event
1	1	7	57	Unknown	1
1	1	57	4251	Unknown	2
1	2	3	2	Loss Of Signal	3
1	2	3	20285	Loss Of Signal	4
1	2	3	45616	Loss Of Signal	5
1	2	28	192	Loss Of Signal	6
2	2	5	46071	Equipment Malfunction	7
2	2	174	19662	Equipment Malfunction	8
2	2	174	19663	Equipment Malfunction	9
3	2	102	19610	External IF Device Problem	10

**Prediction Algorithm:-**



**Fig. 3:-** shows how a prediction technique (PT) is trained starting with the  $i^{th}$   $TW_i$  to predict POS values in the  $i+1^{th}$   $TW_{i+1}$ . The POS values contained in  $TW_i$

Table I shows an example of 10 of these UEs for the three months alarm log. The first 5 columns in table I are the alarm features that are used to select the UEs and last column is the index given to a particular UE. These preprocessed, chronologically ordered UEs are partitioned into TWs according to TW and OI size parameters.

**Table II:-** 10x10 Pos Matrix

	1	2	3	4	5	6	7	8	9	10
1	0.1	0.8	0.2	0.1	0.5	0.7	0.1	0.9	0.6	0.1
2	0	0	0.2	0.3	0.4	0.6	0.7	0.4	0.1	0.8
3	0	0.6	0.6	0.1	0.7	0.9	0	0.8	0	0
4	0.3	0.5	0	0.8	0	0.7	0	0.6	0	0.6
5	0.5	0	0.8	0	0	0.1	0.9	0	0.1	0.8
6	0.4	0.1	0.6	0.3	0.4	0	0.8	0.3	0	0
7	0.9	0.4	0.8	0	0	0	0.1	0	0.8	0.8
8	0.3	0.2	0.6	0.5	0.9	0.6	0.8	0.4	0.8	0.8
9	0.5	0.4	0.6	0.7	0.4	0	0.8	0	0.6	0.6
10	0.6	0.2	0	0.7	0	0	0.1	0	0	0

Table II shows a 10x10 POS matrix for all the UEs in table I of an  $i^{th}$  TW. In this case the value in cell (i, j) is the

probability of occurrence of sequence of  $UE_j$  happening after  $UE_i$ . For instant  $(3, 2) = 0.2$  means sequence of  $UE_C$  happening after  $UE_B$  has a probability of occurrence 0.2 within that  $TW$ . The probability calculations of occurrence of  $SUE$  are done for all  $N$   $TWs$  and that forms the proposed 3D data feature matrix. Therefore this 3D matrix contains  $UE$  sequence occurrence statistics for the whole historical data.

$POS$  values of  $PTW_{i+1}$ . Calculated  $POS$  values of  $TW_{i+1}$  are compared with predicted  $POS$  values of  $PredTW_{i+1}$ . If mean square error (MSE) is acceptable (denoted by '=' in the figure) then index is incremented to repeat for the next  $TW$ , otherwise the prediction technique parameters are adjusted until MSE is acceptable. For example starting with first set of  $POS$  values in  $TW_1$ , the prediction technique is trained to predict values for set of  $POS$  of values in  $TW_2$ . Now prediction technique is trained to predict set of  $POS$  values in  $TW_2$ . Similarly prediction technique is iteratively trained for all  $TWs$ . The prediction technique training is stopped when MSE from all  $TWs$  is below a predefined threshold. Please note that the prediction technique parameter adjustment is incremental from  $TW$  to  $TW$  and the finally trained prediction technique is based on the local (adjacent  $TWs$ ) as well as global ( $TW$  to  $TW$  for the whole training period) correlations. Once training is completed, the corresponding trained prediction technique is saved and is ready for prediction of alarm sequences in the future  $TW$ . A number of experiments are done on the training data to find optimal prediction technique parameters e.g. for ANN these parameters are learning rate, number of hidden layers, number of neurons in each layer and maximum number of epochs. The prediction technique is used to predict  $POS$  values in a future  $TW$ . All the  $SUEs$  with high  $POS$  are checked to see if any contains a  $UE$  with severity equal to "Critical". A  $UE$  having a severity equal to "Critical" is by definition a fault and must be reported. Furthermore other  $SUE$  are also useful for prediction of noncritical  $UEs$  and overall health of the system.

### Fault Prediction Results:-

The overall historical alarm data is divided into training dataset and test dataset. The test dataset size depends on the number of  $TWs$  (size of overlapping interval  $OI$ ). The  $POS$  values are also calculated for all the  $TWs$  of prediction dataset. The trained prediction technique is used to predict  $POS$  values in the prediction dataset and accuracy calculations are done using

The predicted  $POS$  values and actual  $POS$  values of the prediction dataset. The accuracy calculations are done using the following 2 parameters:

**Accuracy:-** It is defined as the ratio of correct predictions to the total possible prediction cases.

**Accuracy = (No. of true positives + No. of true negatives) / Total No. of Unique Events that can be predicted \* 100**

Here the true negative mean the number of  $UEs$  that are neither predicted nor are present in original future window. Accuracy provides an idea about how well our system is predicting the  $UEs$ . There is another factor which must be taken into account in testing a prediction.

**False Positive Rate:** It is defined as the ratio of false positive cases to Total number of Negative cases.

**False Positive Rate = No. of False Positives / (No. of True Negatives + No. of False Positives) \* 100**

Note that the denominator is basically the  $UEs$  that are absent in the predicted window. False Positive Rate is the measure of penalty due to over prediction. If accuracy of a technique is good but False Positive Rate is too high then it means that  $UEs$  are predicted but do not actually occur.

The three months alarm data is divided into training and prediction datasets on a 70:30 (percent) basis. The training datasets are used to train the prediction system using four techniques: Artificial Neural Network (ANN), Support Vector Machine (SVM), Kalman Filter (KF) and Hidden Markov Model (HMM). A number of experiments are performed using all of the four prediction techniques. The prediction technique is trained using the alarm characteristics ( $POS$ ) of a window as input and the alarm characteristics ( $POS$ ) of future window as output. Once the prediction system is trained, Accuracy and False Positive Rates are calculated for all the training examples and are averaged to get a mean value.

Now the rest of the 30% prediction windows are totally unknown to the predictor. A number of prediction experiments are performed and evaluated. The Accuracy and False Positive Rates are averaged over all the

prediction experiments. This is to evaluate how well the fault prediction system performs for unknown data. That is why some techniques that have performed well for training data, show poor results for unknown data predictions, whereas other prediction techniques that have relatively poor performance for training data, show good unknown data prediction results. Note that this process is done repeatedly for various TW and corresponding OI values.

The optimum OI values for each TW value have also been obtained after thorough experimentations. The detail analysis of these optimal parameters will be reported elsewhere. For different TW and OI, Table III and IV show average Accuracy values and Table V and VI show False Positive Rate values for the training and prediction datasets.

**Table III:-** Percentage Accuracy For The Training Dataset.

TW	OI	Prediction Technique			
		ANN	SVM	KF	HMM
4 hrs	2 hrs	78.25	98.92	73.14	70.5
10 hrs	5 hrs	76.26	98.86	70.91	69.1
2 days	1 day	69.77	98.97	65.76	56.0
4 days	2 days	67.91	99.37	59.75	51.4

**Table IV:-** Percentage Accuracy For Unknown Prediction Dataset

TW	OI	Prediction Technique			
		ANN	SVM	KF	HMM
4 hrs	2 hrs	54.67	66.67	93.33	54.34
10 hrs	5 hrs	54.67	58.67	93.67	58
2 days	1 day	54.34	54.67	93.76	41.67
4 days	2 days	50.34	56.67	88	48

**Table V:-** Percentage False Positive Rates For Training Dataset.

TW	OI	Prediction Technique			
		ANN	SVM	KF	HMM
4 hrs	2 hrs	1.826	2.04	1.45	4.5
10 hrs	5 hrs	1.76	1.578	1.106	7.78
2 days	1 day	2.86	1.907	1.22	20.09
4 days	2 days	5.48	1.136	1.29	16.93

**Table VI:-** Percentage False Positive Rates For Unknown Prediction Dataset

TW	OI	Prediction Technique			
		ANN	SVM	KF	HMM
4 hrs	2 hrs	31.3	36	8	55.67
10 hrs	5 hrs	46	38.67	7.34	53
2 days	1 day	39.6	5.76	0.00	34
4 days	2 days	46	8.67	16.34	33.34

The above tables (III and IV) show that for training data, SVM clearly shows best predictions for all four window sizes.

But we have to decide which technique outperforms others when it comes down to random and unknown test data windows. Table V shows that for prediction data, KF is the best prediction technique. Although it has been only the third favorite of the four techniques in case of training data, KF gives best prediction accuracies for various cases of random test data windows. False Positive Rate from table VI also confirms that the lowest False Positive Rate for training as well as prediction datasets is shown by KF, almost for all four window sizes. Next best choice is SVM. The reason behind KF performing best in unknown data case is that KF does not have the tendency to get as much over trained (during the training phase) as other techniques.



Furthermore from the four tables III, IV, V and VI, the best performance is for a TW = 10 hours and OI = 5 hours. Therefore for the given alarm data, it is recommended to use TW of 10 hours and OI of 5 hour. It should be noted that after experiments the optimal values of TW and OI can be found for any historical event data for any problem domain. The same is true for finding out the optimum prediction technique for a problem. Please note that the individual detail of ANN, SVM, KF and HMM parameter tuning and optimization are omitted due to conference paper size constraints and will be reported in an extended version of this paper.

### **Conclusion:-**

A simple statistical approach, as an alternate to more complex time series based approaches, is presented for future events prediction. After selection of appropriate problem domain based features, Unique Events (UEs) are defined and historical event data is partitioned into overlapping Time- windows (TWs). For each TW, Probabilities of Sequence of Unique Events (POS) values are calculated and stored in a three dimensional (3D) Input Feature Matrix (IFM). The 3D IFM contains local (within a TW) and global (TW to TW) correlations and a prediction technique is better able to predict future events. The proposed event prediction technique is applied to the domain of telecommunication alarms and future faults are predicted using three months of transmission system alarm log of a telecommunication company. Various experiments are done using different TW and OI values for four prediction techniques to find optimal TW and OI values.

Although the results show highly accurate results, we are not claiming that the proposed 3D input matrix will always produce the same level of prediction accuracy for all types of data. Our premise is that the highly accurate results are due to the calculated POS values and then used in the form of the proposed 3D IFM. Intuitively we feel that the proposed 3D input matrix should produce optimal prediction for any data. Although a lot of experimentation is needed with different prediction algorithm and in different problem domains to really validate the proposed approach. Such an effort is currently underway and detailed results will be reported in the future.

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### RESEARCH ARTICLE

#### THE EFFECT OF THE TRANSLATORS' STYLES IN TRANSLATION OF THE SALINGER'S "THE CATCHER IN THE RYE" IN IRAN.

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Translation, translator's style, stylistic features, type and token ratio, Leech and Short's checklist of style markers

#### Abstract

The aim of the present article is indicating to what extent the Iranian translators of J. D. Salinger's 'The Catcher in the Rye' could preserve the style of the author and also to find out whether the style of the translators of Salinger's 'The Catcher in the Rye' literary work had any effect in their translation. Since the researchers could not find any established model in translation or translator style, they went through a fundamental research and designed a first-hand framework to practice. The stylistic features of the source book were explored from the most famous and reliable critics in the authentic English sources and formed the corpus of this study along with their corresponding translations by Ahmad Karimi and Mohammad Najafi. The researchers conducted a careful comparative content analysis of both the source text and target texts exploiting Leech and Short's checklist of style markers and then through careful analysis of the findings, they found that Najafi has preserved 75.61% of the stylistic features of the ST while Karimi has preserved 43.09% of the stylistic features of the ST. the researchers applying binominal tests and chi square measurements, could not find any significant difference between the style of the translators when translating the context and cohesion features of the source text, but a significant difference in translating the lexical categories, grammatical categories and figures of speech. Considering the style in general, they applied type/token ratio. The result indicated a significant difference in preserving the author's style and Najafi could do a better job in this regard.

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#### Introduction:-

Literary translation comprises a significant part of the literary life of every country and impacts its culture in many ways. Therefore, it is crucial to study translation product and process closely. One of aspects of a literary work is its style. In the past it was believed that translators should not have their own style and must reproduce the style of the author. But scholars have started to admit that it is impossible to reproduce the ST author's style, and translators' trace can be tracked in a translation by studying style. To pinpoint the style of the translators, the researchers chose the most famous work of J. D. Salinger and two Persian translations of it to see to what extent the translators have followed the style of the author and what proportion of the product's style belongs to the translator himself. So the following questions were raised:

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Q1: To what extent could the Iranian translators of J. D. Salinger's '*The Catcher in the Rye*' preserve the style of the author?

Q2: Is there any significant difference between the styles of the Iranian translators of Salinger's '*The Catcher in the Rye*' literary work?

Based on the second question, the researchers proposed the following null hypothesis:

H0: There is no significant difference between the styles of the Iranian translators of Salinger's '*The Catcher in the Rye*' literary work.

### Significance of study:-

During the past decade many studies have been carried out to investigate translators' styles. To name a few we can refer to: Charlotte Bosseaux's (2004) comparison of Virginia Woolf's "The Waves (1931)" and two French translations published in 1937 and 1993. Bosseaux explored the translators' use of deixis, modality and transitivity in relation to their effect on narratological structures. Gabriela Saldanha (2004) set out to examine standardization patterns in translations, and ultimately investigated the use of split infinitives as a feature indicative of a translator's style. Mikhail Mikhailov and Miia Villikka (2001) compared Finnish translations of Russian fiction. They apply authorship attribution methods and look at vocabulary richness, frequent words, etc., their analysis of some lexical items and their Finnish equivalents revealed some patterns of preferred use by the individual translators. Marion Winters (2004), working with a parallel corpus composed of the German translations of F. Scott Fitzgerald's *The Beautiful and the Damned* (1922), pursued to identify the translators' style or "thumb-print" (Baker 2000:245) by looking at loan words, code switches and modal particles using WordSmith Tools and Multiconcord. Baker is the major scholar who undertook the task of studying "whether the individual literary translator can plausibly be assumed to use a distinctive style of their own, and if so how we might go about identifying what is distinctive about an individual translator's style" (Baker, 2000: 248). The present study is distinct from other researches in this area as it aimed at investigating translator style by comparing the target texts with the source text and against each other, to see the characteristic behavior of each translator when translating stylistic features outlined by Leech and Short (1981), that is, lexical categories, grammatical categories, figures of speech and cohesion & context, in other words, how they dealt with them.

### Literature Review:-

The most challenging branch of translation is literary translation, where literary text – as an "expressive" text type by Reiss (1977/1989) – involves a set of typical features. According to Jones literary texts are in a written form, fictional, and canonical, and they have an aesthetic function, focusing on the expression of emotions, with poetic language, implicit meanings, heteroglossia, and deviations (Jones, 2009, in Baker and Saldanha eds. 2009: 152).

According to Huang, X. (2011), (1) literary texts are characterized by rhetorical and aesthetic value, which is the essence expected to be captured and maintained in a literary translation; (2) in literary translation the form interlinks with the content; while in non-literary translation the content may be considered detachable from the form or structure; (3) literary translators' choices of wording are highly dependent on the target language (TL) and culture while literary texts are solidly rooted in the source language (SL) and culture; (4) a consideration of the target audiences is another important issue in literary translation. Literary translation always has a readership which is likely to be quite different from the one the writer originally had in mind; and (5) literary translation is a complicated act, and to this effect, there is no definite correct translation yet there is a proper or an appropriate translation according to certain criteria or from a certain perspective.

Translation is an artistic communication between the author, the translator, and the reader, and the selection of words by the translator is a core act in the process of translating as communication (Huang, X., 2011). Translation is a communicative act, and literary translation is especially an artistic communication. "Literature is both the condition and the place of artistic communication between senders and addressees, or the public" (Bassnett, 2002: 83). In this communication process, the translator has first to read, comprehend, and interpret the source text, then to represent it in a different medium. Selection is a core act in the process (Huang, X., 2011).

The noun style has a long history and wide range of meanings. Style derives from the Latin word *stylus* meaning stake or pointed instrument for writing, and modern meanings are an extension of this. The most relevant meaning provided by the Oxford English Dictionary is: "The manner of expression characteristic of a particular writer (hence of an orator) or of a literary group or period; a writer's mode of expression considered in regard to clearness,

effectiveness, beauty, and the like” (quoted in Hawthorn, 2000: 344). Abrams (1993: 203) defines style as “the manner of linguistic expression in prose or verse – it is how speakers or writers say whatever it is that they say”. Here how – which is emphasized by Abrams – refers to the technique or craft of writing, his definition emphasizes the linguistic approach of style.

Stylistics – more strictly known as literary stylistics or linguistic stylistics – is a linguistic approach to style or an approach that focuses on the linguistic properties of a writer’s style of a literary text (Huang, X., 2011). Influenced by the Russian formalists and the scholars of Prague School, literary stylistics holds that “Style could be more fully accounted for by text-immanent linguistic explanation and less effectively by means of interdisciplinary approaches” (Carter and Simpson, 2003, p. 2).

Literary texts have a hard-to-define “added value”, carried by the particular way in which they exploit lexis, grammar, pragmatics, and so on; this added value has everything to do with the text’s *style* (Huang, X., 2011). According to Leech and Short (1981:38): (1) Style is a way in which language is used: i.e. it belongs to *parole* rather than to *langue*. (2) Therefore style consists in choices made from the repertoire of the language. (3) A style is defined in terms of a domain of language use (e.g. what choices are made by a particular author, in a particular genre, or in a particular text).

According to Bell (1991): “Translation is the expression in another language (or target language) of what has been expressed in another source language, preserving semantic and stylistic equivalence” (p. 5). Such a view assumes that a translation must be ‘as good as’ an original and that translators are seen as ‘good’ translators when their work is transparent and does not show its own style (Bosseaux, 2004). Translators are therefore expected to reproduce the style of the original as closely as possible. However, this way of looking at translation has rightly been questioned by translation scholars such as Baker (2000) and Hermans (1996), since it seems impossible to produce a text without leaving one’s imprint on it.

Scholars working in the field of translation have paid particular attention to the style for some time now. Formulating a unified definition of what style exactly is, however, remains problematical. It remains both elusive and ambiguous in nature, and the investigation is still unsystematic. Boase-Beier, at the beginning of her book *Stylistic Approaches to Translation*, points out that:

From the earliest writings about translation, such as those of Cicero or Horace, style has often been mentioned but, as Snell-Hornby (1995: 119) notices, its role has rarely been systematically explored. Yet style is central to the way we construct and interpret texts. (Boase-Beier, 2006: 1)

The comments on style in many translation studies works tend to be ad hoc and impressionistic, and the notion of “style” in those comments is deemed as an abstract and obscure spirit or sense (Huang, X., 2011). Dryden, in 1680 referred to the style, or something similar to it, as the “genius” of a text; Pope spoke grandiosely of the “spirit” and “fire” (Lefevre, 1992: 64, in Boase-Beier, 2006: 11) of the text; Denham spoke of its “spirit” (Robinson, 2002: 156, in Boase-Beier, 2006: 11); Schleiermacher spoke of the need to pay attention to “the spirit not only of language but also of the original author” (Robinson, 2002: 233, in Boase-Beier, 2006: 11).

Jean Boase-Beier (2006) clearly underlines the importance of style in literary translation. She believes literary translation “can be seen as the translation of style because it is the style of a text which allows the text to function as literature” (2006: 114). Boase-Beier (2006) stresses the importance of choice, not only for the original author, but also for the translator. The main concern here is to investigate the impact of choices made by the translator on the reading and interpretation of the target text (Lance Hewson). Boase-Beier (2006) claims that stylistics supplies a more varied perspective of a reading and translation and informs translators’ decisions.

Style was long a primary concern in the pre-linguistics period of translation studies. It has often been approached from two perspectives: firstly, style is the result of choices; secondly, style is the author’s or is ST oriented (Huang and Chu, 2014). In general, translators are often taken as “writers” with limited freedom, because “translators are more concerned with questions of options than with servitudes”, and “grammar is the domain of servitudes whereas options belong to the domain of stylistics, or at least to a certain type of stylistics” (Vinay and Darbelnet 1995[1958], 16). This indicates that from the perspective of the translator, style in translation is closely related to the linguistic options taken by translators (Huang and Chu, 2014). However, since it is always maintained that style in

translation belongs only to the author and a translator should not have his or her own style, the task for a translator is nothing but to imitate the author's style (Huang and Chu, 2014).

In the pre-linguistics period, "loyalty" or "faithfulness" served as one of the key conceptual tools in discussing translations. A translator was forbidden to have his or her own style. To achieve the same stylistic effect of the ST in the TT was one of the ways to attain faithfulness in translation (Huang and Chu, 2014). The ST or the author is placed in the central, sacred position. Style, in the philological period of translation studies, was also taken as a yardstick to make an assessment of the translation (Huang and Chu, 2014). For instance, according to Tytler (1978, p. XXXVI as cited in Huang and Chu, 2014), in good translations, "the style and manner of writing should be of the same character with that of the original". Again, the style, more specifically the author's style, is considered to be something sacred in translation. Successful transfer of the ST style is the focus of attention of almost all translators. It appears that discussions about style in translation in the pre-linguistics period were mostly ST oriented (Huang and Chu, 2014).

Style is also a topic in linguistics-oriented translation studies. Nida and Taber (1969: 12) mention style in their definition of translation: "Translation consists in reproducing in the receptor language the closest natural equivalent of the source language message, first in terms of meaning and secondly in terms of style." According to the above definition, style in translation "reproduces" the ST style. However, in their further exposition, we can find that their "style" is a combination of (1) genre, such as poetry, prose, etc.; (2) text type, such as "narrative", "expository", "argumentative"; (3) author's style – for instance, "the fast-moving, brisk style of Mark", "the much more polished and structured style of Luke", etc.; and (4) rhetorical devices, such as plays on words, acrostic poems, rhythmic units. Nida indicates that the style is still the ST style or the author's style (pp. 13-14).

Within the field of translation studies of the style of the translator have received scant and sporadic attention. Translation has long been viewed as a derivative rather than a creative activity, i.e. the translator should faithfully maintain the original style of the source text rather than have their own style (Baker, 2000). However, it is acknowledged that in any translation there are inevitably traces of the translator. Translators have been discussed in regard to the visibility of the translator or the translator's voice in the target text by Venuti (1995) and Hermans (1996). However, Venuti's (1995) call for greater visibility for the translator is driven by cultural or ideological concerns; he does not really focus on style in relation to how such visibility manifests itself in the translation. Venuti's concern stays on the level of the translator's strategy of a foreignizing or domesticating approach. Hermans (1996) accounts for the translator's presence in the text on occasions of open interventions. He states that a translator may be present in a text to a greater or lesser extent, depending on the translator's strategy. Parks (1998) also looks at style in translation, but he actually describes the style of the author and in which way and to what extent the author's style is captured by the translator, and the problems the translator faces when translating (the author's style). Folkart (1991: 393- 398) argues that the translator's trace will always be present in the target text, a view also shared by Hermans (1996: 27-30).

The assumption that the translator cannot and should not have a style of their own is questioned by Baker who contends that "We may well want to question the feasibility of these assumptions, given that it is as impossible to produce a stretch of language in a totally impersonal way as it is to handle an object without leaving one's fingerprints on it" (Baker, 2000: 244). Mona Baker (2000) attempted to study "a literary translator's style" systematically using corpus tools, partly derived from Leech and Short's descriptions of style in English fictional prose. According to Winters (2005) Baker's definition of style reaches beyond Herman's open interventions. As well as use of metalanguage such as foot-/endnotes and prefaces/afterwords, it also includes non-linguistic features, such as the selection of material to translate (Winters, 2005). It is concerned with the translator's actual use of language as a kind of "thumbprint" which is always present, no matter what translation strategy is applied (Baker, 2000). Baker is concerned with what Leech and Short (1981: 14) call "forensic stylistics", i.e. linguistic habits that are beyond the conscious control of translators (Winters, 2005). Overall, she is interested in one translator's characteristic use of language, as compared to another translator's profile of linguistic habits (Baker, 2000).

Bassnett (1996: p. 22) stressed the need for reassessing the role of the translator by analyzing his/her intervention in the process of the linguistic transfer, when she argues "once considered a subservient, transparent filter through which a text could and should pass without alteration, the translation can now be seen as a process in which intervention is crucial". The myth of translation as a secondary activity with all the associations of lower status implied in that assessment can be dispelled once the extent of the pragmatic element of translation is accepted, and

once the relationship between author/translator/reader is outlined (Bassnett, 2002). A diagram of the communicative relationship in the process of translation, presented by Bassnett (2002), shows that the translator is receiver and emitter at the same time, the end and the beginning of two separate but linked chains of communication.

According to Boase-Beier (2006), "because the recreative process in the target text will also be influenced by the sorts of choices the translator makes, and style is the outcome of choice (as opposed to those aspects of language which are not open to option), the translator's own style will become part of the target text." (p. 1)

The most recent method of studying translator style has been the use of corpora using technological advances. The first published study that uses corpus methodology to compare the style of two translators is Baker (2000). She applied linguistic software WordSmith Tools for the quantitative research and analyzed key features such as type/token ratio, average sentence length and reporting structures in detail (Huang, 2011).

#### Style markers:-

In Leech and Short's *Style in Fiction*, a practical checklist of stylistic features is offered, "showing how the apparatus of linguistic description can be used in analyzing the style of a prose text" (Leech and Short, 1981: 74). While not exhaustive in itself, the list serves a heuristic purpose: it enables us to collect data on a fairly systematic basis. The list (Leech and Short, 1981: 75-82) is split into four categories and subdivisions as in Table 2.2:

Lexical Categories	Grammatical Categories	Figures of Speech	Context and Cohesion
General	Sentence type	Grammatical and lexical schemes	Cohesion
Nouns	Sentence complexity	Phonological schemes	Context
Adjectives	Clause types	Tropes	
Verbs	Clause structure		
Adverbs	Noun phrases		
	Verb phrases		
	Other phrase types		
	Word classes		
	General		

The investigations of the researchers showed that only a few researches have been done in Iran on translator style using corpus tools. Mehdi Kafil (2012) investigated translator's style in rendering literary texts by analyzing Daryabandari's translations in the light of the universals of translation, i.e. explicitation, simplification and normalization. He selected three well-known American novels and their Farsi translations, then randomly selected 40 sentences from each novel and their Farsi translations and examined them based on universals of translation. His findings showed that that the translator's thumbprint was evident in the translations through the application of the universals of translation and that he had his own unique style. His other finding was that Daryabandari had applied normalization as the most frequent stylistic feature in his translations.

Zahra Moshfegh (2013) addressed the issue of visibility or invisibility of the translators in three translations of Virginia Woolf's *Mrs. Dalloway* (1925), the focus of this study was limited to Woolf's style, i.e. free indirect discourse. She, also, used Baker's (1996) translation universals, namely, explicitation, simplification and normalization, to investigate the extent to which the translators of this novel were visible in their translations, and to determine how they manifested themselves on their translations of free indirect discourses. She found that the three translators almost always took different strategies in translating free indirect discourses.

During the past decade many studies have been carried out to investigate translator style throughout the world. Charlotte Bosseaux (2004) compared Virginia Woolf's *The Waves* (1931) and two French translations published in 1937 and 1993. Bosseaux explored the translators' use of deixis, modality and transitivity in relation to their effect on narratological structures. Gabriela Saldanha (2004) set out to examine standardization patterns in translations, and ultimately investigated the use of split infinitives as a feature indicative of a translator's style. Mikhail Mikhailov and Miia Villikka (2001) compared Finnish translations of Russian fiction. They applied authorship attribution methods and looked at vocabulary richness, frequent words, etc., their analysis of some lexical items and

their Finnish equivalents revealed some patterns of preferred use by the individual translators. Marion Winters (2004 and 2004a), working with a parallel corpus composed of the German translations of F. Scott Fitzgerald's *The Beautiful and the Damned* (1922), sought to identify the translators' style or "thumb-print" (Baker 2000:245) by looking at loan words, code switches and modal particles using WordSmith Tools and Multiconcord.

The researchers chose *The Catcher in the Rye* by J. D. Salinger to conduct this study. Jerome David Salinger is an American author born in New York in 1919. His most important work, *The Catcher in the Rye* (1951), established him as a leading author. According to James E. Miller "No writer since the 1920's – the era of Fitzgerald and Hemingway – has aroused so much public and critical interest" (as cited in Ohmann&Ohmann, 1976, p. 15). The hero of the book, Holden Caulfield, became a prototype of the rebellious and confused adolescent searching for truth and innocence outside the "phony" adult world, and the book itself came to be seen as "a kind of 'Bible' for a generation that wanted to revolt and didn't quite know how" (Brashers 1964: 212). Other works by Salinger are the short story collection *Nine Stories* (1953) and the novels *Franny and Zooey* (1961), *Raise High the Roof Beam, Carpenters and Seymour: An Introduction* (both 1963).

*The Catcher in the Rye* was first published in America on July 16, 1951. The first reviews of *Catcher* were far from unanimous, and although the novel was praised by many as a literary piece of work, the language in *Catcher* shocked many. "[Critics] have often remarked – uneasily – the 'daring,' 'obscene,' 'blasphemous' features of Holden's language" (Costello, 1959: 173). However daring, obscene or blasphemous it might have been regarded as, the language in *Catcher* was a true and authentic rendering of New York teenage colloquial speech (Costello, 1959: 172). The *New York Times*, on July 16, 1951, rolled out the red carpet: "Holden's story is told in Holden's own strange, wonderful language by J. D. Salinger in an unusually brilliant first novel..." (in Burger). The *Christian Science Monitor* on July 19, 1951, was less enthusiastic: "Holden's dead-pan narrative is quickmoving, absurd, and wholly repellent in its mingled vulgarity, naïveté, and sly perversion" (in Longstreth). But however much the reviewers disagreed over the merits of the novel; it was chosen as the midsummer selection of the Book-of-the-Month Club and made the best-seller list in the *New York Times*. Suddenly, *Catcher* had become "the most popular book of the 50's" (Brashers 1964: 212).

George R. Creeger in a review on *The Catcher in the Rye* states telling a story involves style; in *The Catcher* Holden is both the witness of and participant in the book's action; he is also its narrator, thus the style of the book is his style – the way in which he talks (as cited in Belcher and Lee, 2013). Salinger ran the risk in limiting himself to the vernacular of a prep school adolescent, of simple monotony. His style has genuine counterbalancing virtues such as spontaneity, freshness, immediacy, and vitality. Salinger's style in *The Catcher in the Rye* is colloquial and slangy, sounding a lot more like a real seventeen-year-old talking straight to you than an accomplished adult author (Costello, 1959).

### **Methodology:-**

To study the style of translators, the researchers chose two translations of *The Catcher in the Rye* by J. D. Salinger as their source material, the first translation rendered by Ahmad Karimi (1966/2014) and a well-known translation by Mohammad Najafi (1998/2014 2<sup>nd</sup> ed.). The corpus of this study was comprised of 124 examples (consisting of 139 sentences) of stylistic features indicating the style of Salinger based on the views of Donald P. Costello (1959), Heiserman and Miller (1956), S. N. Behrman (1951), and Donald Barr (1957), and their translations by the two Iranian translators. The corpus is presented in the appendix (Appendices 1-3).

The present research is a corpus-based descriptive comparative study which applied both the qualitative and quantitative research methods. Therefore, the researchers embarked on outlining the stylistic features of the ST and the treatment of the translators with those features. The present study is not a classical one-to-one bilingual comparative study, but a two-to-one study that compares the two target texts with each other, and with their shared source text.

### **Theoretical Framework:-**

Theoretical framework of this study has two parts: the first one clarifies the literary style which would be traced based on the theories of Leech and Short (1981) presented in table (1). The following table lists their checklist of style markers; the second one is an innovative empirical based on the views of Donald P. Costello (1959), Heiserman and Miller (1956), S. N. Behrman (1951), and Donald Barr (1957) tabulated in table (2).

**Table 1:-** Leech and Short's checklist of style markers.

Main Categories	Subdivisions
Lexical categories	General, nouns, adjectives, verbs, and adverbs
Grammatical categories	Sentence type, sentence complexity, clause types, clause structure, noun phrases, verb phrases, other phrase types, word classes, and general
Figures of speech	Grammatical and lexical schemes, phonological schemes, and tropes
Context and cohesion	Context and cohesion

**Table 2:-**Salinger's stylistic features in *The Catcher in the Rye*.

Stylistic Features of The Catcher in the Rye	Remarks
Two major speech habits of Holden	1- 'and all', 'or something,'/or anything': to end thoughts; to generalize
	2- "I really did," "It really was": to reinforce his sincerity and truthfulness; reveal his age
Other speech habit	'if you want to know the truth.': after personal affirmations
Vulgarity, obscenity, and divine name	For God's sake, God
	for Chrissake; Jesus; Jesus Christ: only when he feels the need for a strong expression; emotional situations
	Goddam: Holden's favorite adjective (an emotional feeling toward the object: favorable; or unfavorable; or indifferent)
	Damn: used interchangeably with goddam; no differentiation in its meaning is detectable
Other crude words	Ass: part of the body; a trite expression; an expletive
	Hell: Adjective; as the second part of a simile: 'hot as hell', 'cold as hell', 'sad as hell', 'playful as hell', 'old as hell', 'pretty as hell'
Other crude words	Bastard: a strong word reserved for things and people Holden particularly dislikes
	Sonuvabitch: he uses it only in the deepest anger
Slang	Crap: Foolishness; messy matter; miscellaneous matter; animal excreta; adjective: anything generally unfavorable; to be untrue; to chat
	Crazy: both trite and imprecise
	to be 'killed': emotionally affected either favorably or unfavorably; high degree of emotion
	Old: uses it only after he has previously mentioned the character
Adjectives and adverbs	Boy
	constant repetition of a few favorite words: lousy, pretty, crumby, terrific, quite, old, stupid
Trite figures of speech	Holden's most common simile: 'as hell': unrelated to a literal meaning & unimaginative; e.g. 'like a madman', 'like a bastard'
Repetitious and trite, but effective vocabulary	Piling up trite adjective upon another; e.g. 'he was a goddam stupid moron.'
Good comic effect	Funny constant repetition of identical expressions
Original figures of speech	Inspired, dramatically effective, and funny; e.g.: 'He started handling my exam paper like it was a turd or something'
Adaptability of language	turn nouns into adjectives, with addition of a -y: 'perverty,' 'Christmasy,' 'vomity- looking,'
	a versatile combining ability; e.g.: 'She sings it very Dixieland and whorehouse, and it doesn't sound at all mushy'
	use nouns as adverbs; e.g.: 'She sings it very Dixieland and whorehouse, and it doesn't sound at all mushy'
Using many words which are above	'Ostracized,' 'exhibitionist,' 'unscrupulous,' 'conversationalist,' 'psychic,' 'bourgeois.'



basicEnglish	
Conscious choice of words	to communicate to his adult reader
Humor	Writing on more than one level: 'They give guys the ax quite frequently at Pency'
Habit of direct repetition	'She likes me a lot. I mean she's quite fond of me'
Interpreting slang terms	'She killed Allie, too. I mean he liked her, too'
Conscious of his speech	Many of his comments to the reader are concerned with language
Grammar	Most common rule violations: misuse of lie and lay
	careless about relative pronouns, the double negative, the perfect tenses, extra words, pronoun number, pronoun position
	relative 'correctness: always intelligible, 'correct' in many usually difficult constructions
	uses many 'hyper' forms
Sentences	Spoken language; Faulty structure; Many fragments; Repetitions
Speech	Vocal; italicized (to imitate the rhythms of speech)
Conclusion	Informal, colloquial, teenage American spoken language

To achieve the purposes of the study, the researchers followed a step by step procedure as follows:

1. Read the original texts and the translations
2. Found the literary critical comments on the style of The Catcher in the authentic sources
3. Listed the stylistic features highlighted by critics and tabulated them
4. Traced and Identified the Persian equivalents
5. Adopted Leech and Short's checklist to categorize features
6. Tabulated the ST and TTs according to the checklist
7. Used online contents to check vocabulary and slang
8. Checked whether the style features were preserved or not
9. used online corpus tools to investigate the selected parts, calculated type/token ratio,
10. used Spss.21 software to calculate frequency, percentage and apply binominal test and Chi-square test to test different aspects of the null hypothesis

### Qualitative Data Analysis:-

#### Lexical categories:-

Based on the checklist of Leech and Short lexical categories consist of the following subdivisions: general, nouns, adjectives, verbs, and adverbs. The examples matching the above category are outlined below:

#### Teenage colloquial spoken language:-

According to Costello (1959) the language of The Catcher in the Rye is an authentic artistic rendering of a type of informal, colloquial, teenage American spoken language; it is strongly typical and trite, yet often somewhat individual; it is crude and slangy and imprecise, imitative yet occasionally imaginative, and affected toward standardization by the strong efforts of schools.

Example: 'she didn't give you a lot of horse manure about what a great guy her father was.'

T1(Karimi): هیچ وقت درباره این که پدرش چه آدم بزرگی است فیس و افاده نمی فروخت

T2(Najafi): راجع به مهم بودن باباش شر و ور نمییافت

Karimi's translation is more formal and his rendition is closer to written language than spoken. While Najafi's translation is more informal, trite and closer to the spoken language.

#### Trite repetitive vocabulary:-

Repetitious and trite as Holden's vocabulary may be, it can, nevertheless, become highly effective. For example, when Holden piles one trite adjective upon another, a strong power of invective is often the result:

Example 1: 'because he was a goddam stupid moron'

T1: که پسر بیشعور و کله بوکی است

واسه این ... به احمق کودنه: T2

Najafi has been succeeded in piling upon adjectives "احمق کودن", without splitting them. In the second example, both translators have chosen only one word for the three adjectives, only Najafi has displaced one of the adjectives at the end of the sentence.

#### Using the more vulgar terms:-

Her mother was married again to some booze hound,

T1: مادرش دوباره زن به عرق خور دائم‌الخمر شده بود.

T2: مادرش با این مرتیکه سگ مست ازدواج کرد

Translation of Najafi is vulgar, while Karimi's is more decent.

#### Using many words which are above basic English:-

An intelligent, well-read (I'm quite illiterate, but I read a lot'), and educated boy, Holden possesses, and can use when he wants to, many words which are many a cut above Basic English.

Example: The whole team ostracized me the whole way back on the train.

T1: موقع برگشتن توی قطار همه اعضای تیم مرا بایکوت کردند.

T2: تو راه برگشت هیچ کدوم بچه ها تحویل نگرفتند.

Karimi's translation is closer to ST.

#### Rich and colorful slang:-

Holden's speech is also typical in his use of slang. Holden uses over a hundred slang terms, and every one of these is in widespread use.

Example: It was on the crappy side, though.

T1: گو اینکه باز هم نزدیک به افتضاح بود.

T2: ولی باز مزخرف بود.

Both translators have maintained the connotation intended by the writer.

#### Turning nouns into adjectives, with the simple addition of a -y:-

It is very easy for Holden to turn nouns into adjectives, with the simple addition of a -y: 'pervery,' 'Christmasy,' 'vomity- looking,' 'whory-looking,' 'hoodlummy-looking,' 'show-offy,' 'flitty-looking,' 'dumpy-looking,' 'pimpy,' 'snobby,' 'fisty.'

Example: a few whory-looking blondes.

T1: چند زن موطلایی که می‌خورد خیابانی باشند.

T2: چن تا دختر موبور که شبیه خانومای خراب بودن

In both examples the translators have maintained the ST connotation.

#### Divine name:-

The Divine name is used habitually by Holden only in the comparatively weak for God's sake, God, and goddam. The stronger and usually more offense for Chrissake or Jesus or Jesus Christ are used habitually by Ackley and Stradlater.

Example: He wanted you to think he'd come in by mistake, for God's sake.

T1: میخواست فکر بکنم که اشتباهاً به اتاق من آمده است.

T2: میخواست فکر کنی اشتباهی اومده تو؛ آقا رو تو رو خدا!

Karimi has opted to omit divine names altogether, but Najafi has translated them.

#### Grammatical categories:-

Based on the checklist of Leech and Short grammatical categories consist of the following subdivisions: sentence type, sentence complexity, clause types, clause structure, noun phrases, verb phrases, other phrase types, word classes, and general. The examples matching the above category are outlined below:

#### Using 'if you want to know the truth' after affirmations:-

Holden uses 'if you want to know the truth.' after affirmations, just as he uses 'It really does,' but usually after the personal ones, where he is consciously being frank:

Example: I have no wind, if you want to know the truth.

T1: اگر حقیقتش را بخواهید من چندان نفسی ندارم.

راستشو بخوای خیلی نفس ندارم. T2:

In the above example both translators have translated if you want to know the truth, but both of them have placed it at the beginning of the sentence.

### Using "I really did"/"It really was" at the end of statements:-

Salinger gave Holden an extremely trite and typical teenage speech, overlaid with strong personal idiosyncrasies. There are two major speech habits which are Holden's own, which are endlessly repeated throughout the book. It is certainly common for teenagers to end thoughts with a loosely dangling "and all," just as it is common for them to add an insistent "I really did," "It really was." But Holden uses these phrases to such an overpowering degree that they become a clear part of the flavor of the book.

Example 1: I ignored him. I really did.

T1: محلس نگذاشتم.

T2: تحویلش نگرتم. جدی میگم.

Example 2: It was nice of him to go to all that trouble. It really was.

T1: آقای آنتولینی جدا بزرگواری کرد که این همه خودش را به ناراحتی انداخت. واقعا بزرگواری کرد.

T2: نهایت لطفش بود که این همه خودشو به زحمت میانداخت. جدی میگم.

In the first example, Karimi has decided to omit I really did. But Najafi has thought of it using "جدی میگم". For the second example, Karimi has repeated the verb and Najafi has used the same "جدی میگم".

### Using 'and all', 'or something/or anything' to end statements:-

Holden's 'and all' and its twins, 'or something,' 'or anything,' serve no real, consistent linguistic function. They simply give a sense of looseness of expression and looseness of thought. Donald Barr, writing in the Commonweal, finds this tendency to generalize, to find the all in the one.

Example: he's my brother and all.

T1: دی بی برادرم است.

T2: که برادرمه و از این حرفا.

Karimi has omitted and all but Najafi has translated it as "و از این حرفا".

### Careless about relative pronouns, the double negative, extra words, pronoun number, and pronoun position:-

He is careless about relative pronouns ('about a traffic cop that falls in love'), the double negative ('I hardly didn't even know I was doing it'), the perfect tenses ('I'd woke him up'), extra words ('like as if all you ever did at Pency was play polo all the time'), pronoun number ('it's pretty disgusting to watch somebody picking their nose'), and pronoun position ('I and this friend of mine, Mal Brossard').

Example: I hardly didn't even know I was doing it.

T1: اصلاً نمیفهمیدم که چه کار دارم میکنم.

T2: وقتی شیشه ها رو میشکوندم خودمم چیزی حالیم نبود.

Both translators have translated the above instances in correct Persian structure. Only, Najafi's translation is closer to spoken language.

### Use of many 'hyper' forms:-

More remarkable, however, than the instances of grammar rule violations is Holden's relative 'correctness.' Holden is always intelligible, and is even 'correct' in many usually difficult constructions. But then Holden is educated. He has, in fact, been over-taught, so that he uses many 'hyper' forms.

Example: She'd give Allie or I a push.

T1: به من یا الی سقله‌های می‌زد

T2: گاهی با دست می‌زد بهمون

Hyper form denotes to referring to persons together, for example, Mr. Smith and I. In English usually they bring I after a name or a pronoun. But Persian is flexible and can displace words easily. Najafi has omitted the structure.

### Spoken language:-

The book is more in terms of spoken language than written language. Holden's faulty structure is quite common and typical in vocal expression; a student who is 'good in English' would never create such sentence structure in writing. A student who showed the self-consciousness of Holden would not write so many fragments, such as afterthoughts, or such repetitions.

Example: 'It has a very good academic rating, Pency'

T1: در آنجا سطح معلومات شاگردها خیلی بالاست.

T2: پَنسی میون همه مدرسها مقام تحصیلی خیلی خوبی داره.

Karimi has omitted the afterthought. And Najafi has brought it at the beginning of the sentence.

### Figures of speech:-

Based on the checklist of Leech and Short lexical categories consist of the following subdivisions: grammatical and lexical schemes, phonological schemes, and tropes. The examples matching the above category are outlined below:

### Using italics to make the words read with the same emphasis as spoken:-

When he wants to emphasize, Salinger has tried to imitate the rhythms of speech using italics.

Example: I practically sat down on her lap, as a matter of fact.

T1: بلند شدم رفتم پیشش و روی مبل پهلویش نشستم

T2: راستش اصلا نشستم تو بغلش.

Karimi not only has thought of nothing for the italics, he also has decided to replace it with another word. In the case of Najafi, as we don't use italics in Farsi, he has used "راستش اصلا" to reproduce the emphasis.

### Most common simile: 'as hell':-

Holden's most common simile is the worn and meaningless 'as hell'. A thing can be either 'hot as hell' or, strangely, 'cold as hell'; or 'sad as hell' or 'playful as hell'; 'old as hell' or 'pretty as hell.' Like all of these words, hell has no close relationship to its original meaning.

Example 1: but they're also touchy as hell.

T1: اما در عین حال بیاندازه زودرنج و عصبانی مزاجند.

T2: ولی عین چی حساسن.

Example 2: You take somebody old as hell.

T1: شما بعضی از این اشخاص خیلی پیر را در نظر بگیرید.

T2: آدم به این پیری...

In the first example, Karimi has translated the simile as adjective and as adverb in the second example, but Najafi has reproduced the simile in both translations.

### Trite figures of speech:-

Even Holden's nonhabitual figures of speech are usually trite: 'sharp as a tack'; 'hot as a firecracker'; 'laughed like a hyena'; 'I know old Jane like a book'; 'drove off like a bat out of hell'; 'I began to feel like a horse's ass'; 'blind as a bat'; 'I know Central Park like the back of my hand.'

Example 1: sharp as a tack.

T1: یک حرف واقعا حساسی

T2: به چیز تیز عین پونس

Karimi has translated the simile as adverb "واقعا", while Najafi has translated it as a simile.

### Original figures of speech, which are inspired, dramatically effective and funny:-

Some of his figures of speech are entirely original; and these are inspired, dramatically effective, and terribly funny.

As always, Salinger's Holden is basically typical, with a strong over-lay of the individual.

Example: That guy Morrow was about as sensitive as a goddam toilet seat.

T1: این پسره ارنست مارو همان اندازه حساس بود که يك تِيَالِه پهن.

T2: این پسره مورو همون قدر حساس بود که کاسه توالِت.

Both translators have reproduced the figures of speech, Karimi has opted to replace the image.

### Context and cohesion:-

Based on the checklist of Leech and Short context and cohesion categories consist of the following subdivisions: context and cohesion. The examples matching the above category are outlined below:

### Constant repetition of a few favorite words and identical expressions:-

Repetition or avoidance of repetition is one of stylistic features related to the cohesion of the text. Holden's choice of adjectives and adverbs is indeed narrow, with a constant repetition of a few favorite words: lousy, pretty, crummy, terrific, quite, old, stupid--all used, as is the habit of teenage vernacular, with little regard to specific meaning.

Example: He wrote this terrific book of short stories, *The Secret Goldfish*.

T1: او همان کسی است که مجموعه داستانی به اسم "ماهی قرمز پنهان" نوشته:

T2: همون باباییه که این مجموعه محتشر داستان کوتاهاو نوشته: ماهی طلایی اسرار آمیز:

In the above example, Karimi has opted to omit the adjectives, but Najafi has translated them.

### Repetition of the word "and":-

The sentence structure of the writing is quite simple and it is not written in the style of an adult. He talks like a child and uses 'and' repeatedly to connect his sentences.

Example: And I got pretty run-down and had to come out here and take it easy.

T1: و مجبور بشوم بیایم اینجا و خودم را بزنم به سیم آخر.

T2: و مجبور شدم بیام این جا بیخیالی طی کنم.

Karimi has translated two 'and's out of the three, while Najafi has translated only one.

### Habit of direct repetition:-

Another major habit of Holden is direct repetition. Sometimes Holden stops specifically to interpret slang terms, as when he wants to communicate the fact that Allie liked Phoebe: 'She killed Allie, too. I mean he liked her, too'.

Example: She can be very snotty sometimes. She can be quite snotty.

T1: فیبی بعضی وقتها بجه خیلی مزخرفی میشود. واقعا مزخرف.

T2: گاهی حسابی بد عنق میشه. حسابی نحس.

Both translators have tried to reproduce the repetition, but with some small changes

### Protagonist addresses the reader directly using 'you':-

According to checklist of Leech and Short one of the stylistic features, which reveals the context, is how the narrator addresses the reader and what pronouns are used. Holden addresses his adult reader directly using 'you': Often Holden seems to choose his words consciously, in an effort to communicate to his adult reader clearly and properly.

Example: If you really want to hear about it.

T1: اگر واقعا میخواهید در این مورد چیزی بشنوید

T2: اگه واقعا میخوای قضیه رو بشنوی،

In addressing the reader, Karimi's translation is formal, while Najafi's translation is informal.

### Using old after he has previously mentioned the character:-

Using descriptive phrases like "old lawyer" to substitute for the repetition of an earlier "Mr. Jones" is a stylistic feature related to cohesion. Holden appends this word *old* to almost every character, real or fictional, mentioned in the novel, from the hated 'old Maurice' to 'old Peter Lorre,' to 'old Phoebe,' and even 'old Jesus.' The only pattern that can be discovered in Holden's use of this term is that he usually uses it only after he has previously mentioned the character; he then feels free to append the familiar old.

Example: I said old Jesus probably would've puked if

T1: من به او گفتم اگر حضرت مسیح ... هیچ بعید نبود که عیش بگیرد.

T2: گفتم اگه مسیح ... حتما بالا میآورد؛

In the first example, Karimi has opted to use the word "حضرت" for old, but Najafi has no solution for it and has omitted it.

## Quantitative Data Analysis:-

### Descriptive statistics:-

#### The frequency of the stylistic features:-

The researchers presented the frequency and the percentage of the stylistic features of the ST used by each translator in tables (4-1) and along with the related graphic presentation of the obtained data in figure(4-1).

**Table 4.1:-** Frequency of the stylistic features of the ST in TTs

Style	Total	T1 Frequency		T2 Frequency	
		Preserved	Not preserved	Preserved	Not preserved
Lexical Categories	49	17	32	39	10
Grammatical Categories	30	14	16	20	10
Figures of Speech	23	8	15	18	5
Context and Cohesion	21	14	7	16	5
	123	53	70	93	30
	Percent	43.09	56.91	75.61	24.39

The above table shows the frequency of preservation of the stylistic features of the ST in TTs. As it can be seen of 49 lexical categories in the ST, Karimi (T1) has preserved 17 and Najafi 39. For grammatical categories also of total 30, Karimi has preserved 14 and Najafi 20. For figures of speech, Karimi has preserved 8 out of 23 while Najafi has preserved 18. About context & cohesion, Karimi has preserved 14 and Najafi has preserved 16 from the total of 21. On the whole, Karimi has preserved 43.09% and had his own style in 56.91%. While Najafi has preserved 75.61% and departure from ST writer's style in 24.39%.

#### Inferential statistics: Testing null hypothesis:-

H0: "There is no significant difference between the styles of the Iranian translators of Salinger's *The Catcher in the Rye*."

#### Lexical categories

The number of examples in this category is 49. From 49 examples, T1 preserved 17 and T2 preserved 39. Using binomial (49, 0.5), we get 0.01 for T1 and 0.99 for T2. This results show that we can NOT reject the null hypothesis for T1. Thus, we can state that T1 has failed to preserve the lexical features of the style of the author. However, we can reject the null hypothesis for T2. Thus, with 95% certainty we can state that T2 preserved the Lexical style of the author.

**Table 4.2:-** Binomial Test of the preserved and not preserved lexical categories in T1 and T2

		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
Lexical T1	Group 1	0	32	.65	.50	.044
	Group 2	1	17	.35		
	Total		49	1.00		
Lexical T2	Group 1	1	39	.80	.50	.000
	Group 2	0	10	.20		
	Total		49	1.00		

#### Grammatical Categories:-

The number of examples in this category is 30. From 30 examples, T1 preserved 14 and T2 preserved 20. Using binomial (30, 0.5), we get 0.42 for T1 and 0.97 for T2. This results show that we can NOT reject the null hypothesis for T1. Thus, we can state that T1 has failed to preserve the grammatical style of the author. However, we can reject the null hypothesis for T2. Thus, with 95% certainty we can state that T2 preserved grammatical style of the author.

**Table 4.3:-** Binomial Test of the preserved and not preserved grammatical categories in T1 and T2

		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
GrammaticalT1	Group 1	1	14	.47	.50	.856
	Group 2	0	16	.53		
	Total		30	1.00		
GrammaticalT2	Group 1	1	20	.67	.50	.099
	Group 2	0	10	.33		
	Total		30	1.00		

#### Figures of Speech

The number of examples in this category is 23. From 23 examples, T1 preserved 8 and T2 preserved 18. Using binomial (23, 0.5), we get 0.05 for T1 and 0.99 for T2. This results show that we can NOT reject the null hypothesis for T1. Thus, we can state that T1 has failed to preserve the Figure of Speech style of the author. However, we can reject the null hypothesis for T2. Thus, with 95% certainty we can state that T2 preserved the Figure of Speech style of the author.

**Table 4.4:-** Binomial Test of the preserved and not preserved figures of speech categories in T1 and T2

		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
fig.speechT1	Group 1	0	15	.65	.50	.210
	Group 2	1	8	.35		
	Total		23	1.00		
fig. speech T2	Group 1	1	18	.78	.50	.011
	Group 2	0	5	.22		
	Total		23	1.00		

**Context and cohesion:-**

The number of examples in this category is 21. From 21 examples, T1 preserved 14 and T2 preserved 16. Using binomial (21, 0.5), we get 0.97 for T1 and 0.99 for T2. This results show that we can reject the null hypothesis for both T1 and T2. Thus, with 95% certainty we can state that both T1 and T2 preserved Context and Cohesion, as stylistic features of ST.

**Table 4.5:-** Binomial Test of the preserved and not preserved context and cohesion categories in T1 and T2

		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
Context&CohesionT1	Group 1	1	14	.67	.50	.189
	Group 2	0	7	.33		
	Total		21	1.00		
Context&CohesionT2	Group 1	1	16	.76	.50	.027
	Group 2	0	5	.24		
	Total		21	1.00		

**Type/token Ratio:-**

As it was mentioned earlier in this research, the type/token ratio is "a measure of the range and diversity of vocabulary used by a writer or in a given corpus". It is the ratio of different words to the overall number of words in a text or collection of texts (Baker 2000: 250). A high type/token ratio means that the writer uses a wide range of vocabulary and a low one means that she or he draws on a more restricted set of vocabulary items.

**Table 4.6:-** The frequency of applied types and tokens in different stylistic categories of the source text and T1 and T2

Type and token analysis	Lexical Categories			Grammatical Categories			Figures of Speech			Context and Cohesion		
	ST	T1	T2	ST	T1	T2	ST	T1	T2	ST	T1	T2
Sentence count	58	52	56	34	34	34	24	23	24	23	26	26
Token count (excluding numbers)	462	439	332	298	255	218	226	192	194	214	196	177
Type count (unique tokens, excluding numbers)	224	298	235	140	178	154	124	140	146	121	140	133
Average sentence length	7.97 words	8.44 words	5.93 words	8.76 words	7.50 words	6.41 words	9.42 words	8.35 words	8.08 words	9.30 words	7.54 words	6.81 words
Type/token ratio	0.48	0.68	0.70	0.47	0.69	0.71	0.55	0.73	0.75	0.57	0.71	0.75

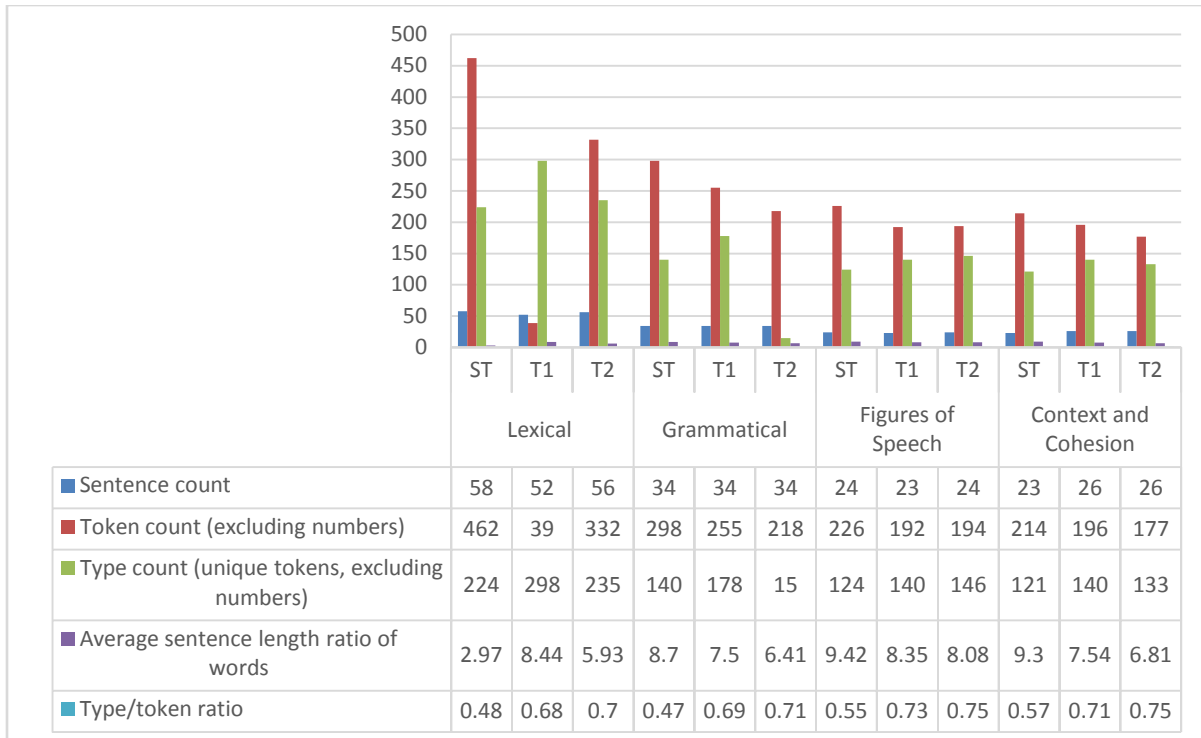


Figure 4.2:- the frequency of applied types and tokens in different stylistic categories of the source text and T1 and T2

Table 4.8:-The comparative study of applied type/token ratio

Categories	Style analysis	Type/token ratio
Lexical	ST	0.48
	T1	0.68
	T2	0.7
Grammatical	ST	0.47
	T1	0.69
	T2	0.71
Figures of Speech	ST	0.55
	T1	0.73
	T2	0.75
Context & Cohesion	ST	0.57
	T1	0.71
	T2	0.75

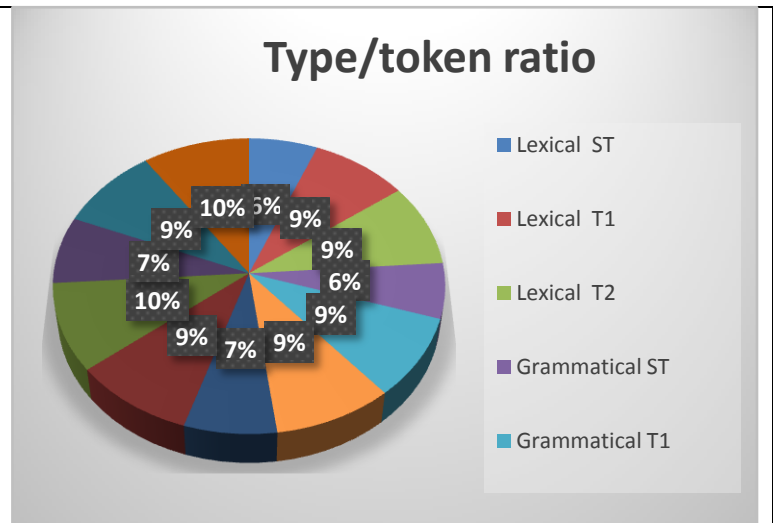


Figure 4.3:- The comparative study of the applied type/token ratio

A high type/token ratio means that the writer uses a wide range of vocabulary and a low one means that she or he draws on a more restricted set of vocabulary items. The type/token ratio of the ST is lower than the TTs in all four categories. And as mentioned before, Salinger's style in *The Catcher* is a simple, repetitious one. Therefore, as the type/token ratio of Najafi's translation is lower than Karimi's translation in all four categories, again we can argue that Najafi has preserved the style of the author more than Karimi and Karimi has opted for a style more far from the ST.



**Table4 9:-** Chi-Square test statistics of type/token ratio

	Type/token ratio	Token count	Type count
Chi-Square	1.333 <sup>a</sup>	.000 <sup>b</sup>	3.000 <sup>a</sup>
df	9	11	9
Asymp. Sig.	.998	1.000	.964
a. 10 cells (100.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1.2.			
b. 12 cells (100.0%) have expected frequencies less than 5. The minimum expected cell frequency is 1.0.			

Considering type and token we can observe that there is a significant difference between the style of the translators, the obtained chi-square for the ratio of type and token and the number of tokens is significantly greater than the critical value at the confidence levels of  $\alpha= 0.05$  and  $\alpha= 0.01$  for the related degree of freedom so using the inferential statistics considering type/token ratio, the researchers can reject the null hypothesis .

### Conclusion:-

The purpose of this study was to find out to what extent the Iranian translators of J. D. Salinger's 'The Catcher in the Rye' have preserved the style of the author and if there was any significant difference between their styles in translating the book. based on the views of Donald P. Costello (1959), Heiserman and Miller (1956), S. N. Behrman (1951), and Donald Barr (1957) and using the theoretical framework of this study considering Leech and Short's checklist of style markers, four categories of lexical categories, grammatical categories, figures of speech and context & cohesion were selected to analyze the style of the writer in the source book and the translators in the translated versions.

Qualitative analysis of the translations of Karimi and Najafi showed that, in lexical categories, of 49 examples Karimi had preserved 17 stylistic features of the ST while Najafi had preserved 39 features. Karimi's translation is more formal and written speech than spoken. While Najafi's translation is more informal, trite and closer to spoken speech. Najafi has been more successful to reproduce the ST structure, for example when piling adjectives upon each other. When translating vulgar terms, which are one of the main stylistic characteristics of Salinger in The Catcher, Najafi has tried to maintain the vulgarity, while Karimi has used more decent wording. Sometimes even Karimi has opted to change the author's connotation. Also, Najafi has tried to make up for constructs not usual in Persian by choosing more colloquial Persian structures. Overall, Karimi has opted to omit more than Najafi. For grammatical mistakes in the ST, both translators had no solution.

Analysis of grammatical categories showed that Karimi had preserved 14 stylistic features of the ST out of 30 and Najafi had preserved 20 features. Here again Karimi's main strategy was to omit, but Najafi has thought of equivalents.

For the figures of speech categories Karimi had preserved 8 stylistic features of the ST out of 23 and Najafi had preserved 18 features. Phonologically speaking, Najafi's translation of phonological schemes is closer to the ST, he has used spoken speech to reproduce the phonological schemes of the ST. When translating similes, in some cases, Karimi has changed the structure to adjective or adverb, while Najafi has tried to reproduce the simile.

For the context and cohesion categories Karimi had preserved 14 stylistic features of the ST out of 21 and Najafi had preserved 16 features. Again Karimi has opted to omit repetitions more while Najafi has translated them. They have maintained other context and cohesion features of the ST.

Regarding the second question of the study, the statistical analysis of the data revealed that there was no significant difference between the translators when translating the context and cohesion features of the ST. Meanwhile there was a significant difference between them when translating the lexical categories, grammatical categories and figures of speech.

The current study is also in line with the finding of Baker (2000) who believes one obvious difference between two translators concerns the overall type/token ratio. In simple terms, type/token ratio is a measure of the range and diversity of vocabulary used by a writer, or in a given corpus. According to the results illustrated in table 4.10, the type/token ratio of the ST is lower than the TTs in all four categories. And as mentioned before, Salinger's style in The Catcher is a simple, repetitious one. Therefore, as the type/token ratio of Najafi's translation is lower than

Karimi's translation in all four categories, again we can argue that Najafi has preserved the style of the author more than Karimi and Karimi has opted for a style more far from the ST.

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### RESEARCH ARTICLE

#### BEHAVIOUR AND MANAGEMENT GUIDE OF SOME ORNAMENTAL BIRDS IN RELATION TO DIURNAL HOURS.

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##### Key words:-

Behaviour, Cockatiel, Budgerigars,  
 diurnal hours, family variety.

#### Abstract

This study was conducted to study the effect of diurnal hours of the day on some maintenance behaviour of psittaciformes birds as cockatiel and blue Budgerigars. A total number of apparently healthy thirty nine birds (14 birds budgerigars and 25 birds cockateil aged from (12 month up to 10 years) belonged to the zoo at zagazig city, Sharkia governorate were housed in 2 large cages and aviaries. During the experiment, the duration and frequency of observed maintenance behaviour were recorded. From the obtained results, that there was a significant differences ( $P \leq 0.05$ ) of feeding time of Cockatiel in relation to the diurnal effects. As the feeding behaviour time and frequencies were increased at mid day than other times of the day. The sleeping behaviour and the time staying in the cage of cockatiel were increased with dusk and late afternoon and the differences were highly significant ( $P \leq 0.01$ ). There were a non significant differences of sexual and social bond of budgerigars with in the total day hours. Form this study, can mentioned that the family variety play an important role in change some behavioural patterns and habits of the ornamental birds as flying, walking and sleeping behaviour according to body mass of each bird family.

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#### Introduction:-

The most common pet bird is the budgerigar, they has a good creatures that are very adaptable and friendly. They are sociable and like to have a group. The males are to be easier to tame and teach to talk. Budgerigars are long-lived birds with a life span of 7-10 years and with low purchase cost (Nicol and Pope, 1993). Domesticated budgerigars come in large range of colours are always green with a yellow area and live in huge flocks. They originate from Australia and their name means song parrots. The hen have brown or white core but the male is blue (Gebhardt- Henrich and Steiger, 2006).

Budgerigars are one of the most commonly kept pet birds and are of the used as laboratory animals (Isenbugel, 1999). Most organisms have a clocks in their brain that regulate the timing of biological processes and daily behaviour, these clocks are known as circadian rhythms. They allow maintenance of these processes and behaviour relative to 24 hour day / night cycle (Kolmos and Davis, 2007). Budgerigars also known as the common pet parakeet or shell parakeet and in formally nicked name is the budgie from order psittaciformes, family psittacidae (Melopsittacus undulatus) (Marshall, 2013) are small size, cheap in cost and ability to mimic human speech. The

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cockatiel also known as quarrion and is a bird that is a member of cockatto family of genus Nymphicus, order psittaciforms family cocatuidae species, Nymphicus hollandicus (Cockatiel, 2008).

### **Material and Methods:-**

#### **Birds used and management:-**

Thirty nine birds (14 birds budgerigars and 25 birds cockatiel aged from 12 month up to 10 years) belonged to the zoo at zagazig city, Sharkia governorate were housed in 2 large cages each one (2.5 length breadth x 2.5 m height) as, well as, 5 aviaries (5 cm x 5 cm ) for rest and sleep, all cages had two perches .

Each cage had been large enough to ensure plenty of room to spread it's wings and flutter about easily. The bird prefer natural perches to fly and climbing about it and they are suitable for its small feet. Bird cages sand paper is best for the base. Temperature of the cage was about 17-24°C in light, draught-free place at about shoulder height as ,well as, avoiding direct sun light or heat.

cleanliness is important to the birds, health, so that sand paper needs changing daily. Food was offered on bottom of the cage.

#### **The Feeding:-**

The feed for healthy and happy budgerigars is important to provide it with correct amount of food to provide lots of variety according to (WOAW, 2014),60% of cockateil and budgie's diet as bird seeds food as sorghum of sun flower seeds, cooked rice, seedling grasses and whole meal bread, 10% of it's diet is fresh vegetables as peas, carrots and sweet potato, 5% of its diet should be fruits as apple. Do not feed the budgie sun flower seeds only, his will make it very sick and fat (Enkerlin- Hoeflich, 1995).

**Water:** should be provided with fresh water every day it has been given to the birds at least once or twice a day.The cage and all equipment has been cleaned once a day with mild disinfectant.

#### **Observation technique:-**

The behavioural observations were done using a focal sample technique, Video taping, camera and additional lamps were setup. The behaviour of the cockateil and budgerigars was recorded and analysed using the soft ware observers (observation sheet) according to (Gebhardt- Henrich and Steiger, 2006). Behavioural observations in both cages were recorded at 6 minutes interval through 3 hour observation period /week for each group for three months (experimental period) from January 2016 till march 2016, which represented the different diurnal hours as early morning (8-9 A.M), mid day(1-2 P.M) and afternoon (5-6 P.M).

The following behavioural activities, feeding, manipulation are object and feeding on the bottom, flying, climbing at the bar, preening, walking on bottom mounting on the perch at least once forward and back, Jumping , social bond, sexual bond, lifting the wings, rubbing head, back against perches, stretching wing. The frequency and duration were measured for all status, while for events only the frequency was determined.

#### **Statistical Analysis:-**

Results were statistically analyzed by use one way ANOVA according to (Snedecor and Cochran, 1989).

### **Results:-**

#### **Behaviour of Cockatiel in different diurnal hours:-**

The obtained results in table (1) revealed that there was a significant differences  $P (\leq 0.05)$ . of feeding time of Cockatiel in relation to the diurnal effects. As the feeding intake was increased at mid day than early morning and afternoon as following  $(340.00 \pm 47.25, 519.00 \pm 85.50$  and  $224.00 \pm 38.35)$  sec. respectively The feeding frequencies were nearly three times in all day times. There were a non significant differences of flying, standing, walking behaviour (time and frequencies) with in different day times. The sleeping behaviour and the time staying in the cage of Cockatiel were increased with late after noon  $(603.67 \pm 96.83$  sec.)and the differences were highly significant  $P (\leq 0.01)$ . There were a non significance differences of sexual and social bond and vocalization of Cockatiel with in the day hours.

**Comfort behaviour of Cockatiel in different diurnal hours:-**

The frequency of preening and feather shaking ( $15.33 \pm 3.17$  &  $13.33 \pm 1.20$ ) of Cockatiel in **Table (2)** not affected by diurnal factors, although it increased with dusk. Shaking of head was increased with late afternoon ( $19.66 \pm 1.76$ ) while rolling was increased at mid of day hours ( $21.33 \pm 3.38$ ) and the differences were highly significant  $P (\leq 0.01)$ .

**Behaviour of Budgerigars in relation to different diurnal hours:-**

**Table (3)** showed that there were a non significant differences of the feeding behaviour of budgerigars according to the diurnal factors, although the flying time was highly increased with early hours of the day light ( $372.67 \pm 26.74$  sec.) and the differences were highly significant  $P (\leq 0.01)$ . The standing time of budgerigars was at lowest level with late afternoon ( $434.67 \pm 146.85$  sec.) while the sleeping was at highest level at late afternoon ( $1627.70 \pm 192.68$  sec.) and the differences were highly significant  $P (\leq 0.01)$ . There were a non significance differences of sexual and social bond of budgerigars with in the day hours.

**Frequencies of comfort behaviour of Budgerigars in different diurnal hours:-**

Regarding to **(table 4)** there were a non significant differences of preening behaviour of budgerigars in relation to diurnal factors, although it increased with early morning and dusk. Shaking head was increased with late afternoon ( $24.00 \pm 4.72$ ) and the differences were highly significant  $P (\leq 0.01)$ . The frequency of rolling was increased early morning ( $15.33 \pm 1.76$ ) and the differences was significant  $P (\leq 0.05)$ .

**Maintenance behaviour of Cockatiel and Budgerigars in relation to family variation:-**

Concerning the different behavioural patterns of ornamental birds according to family variation in **table(5)** there were a non significant differences of the feeding behaviour between Cockateil and Budgerigars while there were a highly significance differences  $P (\leq 0.01)$  of flying frequency ( $15.00 \pm 1.42$ ) and walking behaviour ( $429.11 \pm 42.05$  sec.) as it increased with budgerigars. There were a non significant differences of sexual bond and social bond between Cockatiel and Budgerigars.

**Table 1:-** Some maintenance behaviour of Cockatiel in relation to different diurnal hours.

Diurnal hour Behaviour	Early morning	Mid day	Late afternoon	significance
Feeding time	$340.00 \pm 47.25$	$519.00 \pm 85.50$	$224.00 \pm 38.35$	*
Feeding frequency	$3.33 \pm 0.88$	$3.66 \pm 0.88$	$3.66 \pm 0.88$	N.S
Flying time	$180.00 \pm 41.96$	$216.67 \pm 12.17$	$223.33 \pm 52.38$	N.S
Flying frequency	$15.66 \pm 2.60$	$16.66 \pm 0.88$	$12.66 \pm 3.52$	N.S
Standing time	$1128.00 \pm 57.35$	$804.00 \pm 3.43$	$947.33 \pm 72.50$	N.S
Standing frequency	$17.66 \pm 3.28$	$14.33 \pm 3.84$	$16.00 \pm 2.30$	N.S
Walking time	$460.00 \pm 20.81$	$482.00 \pm 67.55$	$345.33 \pm 10.41$	N.S
Walking frequency	$14.33 \pm 1.45$	$10.00 \pm 3.05$	$9.33 \pm 4.37$	N.S
Sleeping time	$508.00 \pm 86.00$	$85.33 \pm 20.21$	$603.67 \pm 96.83$	**
Sleeping frequency	$4.00 \pm 1.15$	$1.66 \pm 0.33$	$1.00 \pm 0.00$	*
Cage staying time	$186.67 \pm 29.05$	$495.33 \pm 13.38$	$490.00 \pm 65.49$	**
Cage staying frequency	$3.00 \pm 0.57$	$8.00 \pm 1.15$	$8.66 \pm 2.90$	N.S
Sexual bond time	$26.66 \pm 17.63$	$35.00 \pm 18.02$	$23.33 \pm 12.01$	N.S
Sexual bond frequency	$1.66 \pm 0.88$	$0.66 \pm 0.33$	$0.66 \pm 0.33$	N.S
Social bond time	$93.33 \pm 16.90$	$76.66 \pm 12.01$	$40.60 \pm 6.74$	N.S
Social bond frequency	$5.00 \pm 1.73$	$2.33 \pm 0.33$	$1.33 \pm 0.33$	N.S
Vocalization frequency	$2.33 \pm 0.88$	$1.00 \pm 0.57$	$0.66 \pm 0.33$	N.S

N.S= Non significant. \* = significant difference at level  $P (\leq 0.05)$ . \*\* = highly significant difference at level  $P (\leq 0.01)$

**Table 2:-** Frequencies of comfort behaviour of Cockatiel in relation to different diurnal hours.

Diurnal hour Behaviour	Early morning	Mid day	Late afternoon	significance
Preening frequency	$16.00 \pm 2.30$	$9.66 \pm 0.88$	$15.33 \pm 3.17$	N.S
Head shaking frequency	$15.33 \pm 1.45$	$9.66 \pm 1.45$	$19.66 \pm 1.76$	**
Feather shaking frequency	$8.66 \pm 1.76$	$8.33 \pm 1.76$	$13.33 \pm 1.20$	N.S
Rolling frequency	$11.33 \pm 1.45$	$21.33 \pm 3.38$	$5.00 \pm 1.15$	**

N.S= Non significant.

\*\* = highly significant difference at level  $P (\leq 0.01)$

**Table 3:-** Some maintenance behaviour of Budgerigars in relation to different diurnal hours.

Diurnal hour Behaviour	Early morning	Mid day	Late afternoon	significance
Feeding time	355.33 ± 48.66	372.33 ± 54.77	338.67 ± 18.62	N.S
Feeding frequency	4.00 ± 1.15	3.33 ± 0.66	4.00 ± 1.15	N.S
Flying time	372.67 ± 26.74	236.67 ± 29.49	140.00 ± 20.29	**
Flying frequency	9.66 ± 1.20	8.00 ± 2.30	8.00 ± 1.15	N.S
Standing time	1834.70 ± 49.33	1546.70 ± 151.71	434.67 ± 146.85	**
Standing frequency	28.33 ± 4.17	28.66 ± 4.05	11.66 ± 0.88	*
Walking time	47.66 ± 6.22	79.00 ± 20.95	88.00 ± 13.31	N.S
Walking frequency	3.33 ± 0.88	2.66 ± 0.66	3.00 ± 1.00	N.S
Sleeping time	502.67 ± 28.32	991.00 ± 105.10	1627.70 ± 192.68	**
Sleeping frequency	6.33 ± 0.88	7.00 ± 1.73	4.00 ± 0.57	N.S
Cage staying time	18.00 ± 1.15	19.33 ± 4.05	284.00 ± 73.32	**
Cage staying frequency	2.00 ± 0.57	1.66 ± 0.33	6.00 ± 1.15	*
Sexual bond time	5.00 ± 5.00	11.66 ± 11.66	30.00 ± 15.27	N.S
Sexual bond frequency	0.33 ± 0.33	0.33 ± 0.33	0.66 ± 0.33	N.S
Social bond time	66.66 ± 9.27	60.66 ± 13.86	65.33 ± 6.11	N.S
Social bond frequency	5.66 ± 0.88	3.66 ± 0.66	3.00 ± 0.57	N.S
Vocalization frequency	1.33 ± 0.33	1.33 ± 0.33	1.66 ± 0.33	N.S

N.S= Non significant. \* = significant difference at level P ( $\leq 0.05$ ). \*\* = highly significant difference at level P ( $\leq 0.01$ ).

**Table 4:-** Frequencies of comfort behaviour of Budgerigars in relation to different diurnal hours.

Diurnal hour Behaviour	Early morning	Mid day	Late afternoon	significance
Preening frequency	25.33 ± 2.40	18.33 ± 2.02	24.00 ± 5.29	N.S
Head shaking frequency	21.33 ± 1.76	1.33 ± 0.33	24.00 ± 4.72	**
Feather shaking frequency	15.33 ± 4.37	3.00 ± 0.57	21.33 ± 2.60	*
Rolling frequency	15.33 ± 1.76	10.66 ± 1.33	6.66 ± 1.76	*

N.S= Non significant. \* = significant difference at level P ( $\leq 0.05$ ). \*\* = highly significant difference at level P ( $\leq 0.01$ ).

**Table 5:-** Some maintenance behaviour of Cockatiel and Budgerigars in relation to their family variation.

Bird family group Behaviour	Cockatiel	Budgerigars	significance
Feeding time	355.44 ± 40.54	361.00 ± 52.52	N.S
Feeding frequency	3.77 ± 0.52	2.88 ± 0.51	N.S
Flying time	249.78 ± 36.12	206.67 ± 20.81	N.S
Flying frequency	8.55 ± 0.86	15.00 ± 1.42	**
Standing time	1272.00 ± 22.24	959.78 ± 112.96	N.S
Standing frequency	22.88 ± 3.28	16.00 ± 1.67	N.S
Walking time	71.55 ± 9.58	429.11 ± 42.05	**
Walking frequency	3.00 ± 0.44	11.22 ± 1.77	**
Sleeping time	1040.40 ± 174.93	399.00 ± 88.51	**
Sleeping frequency	5.77 ± 1.15	2.22 ± 0.57	**
Cage staying time	107.11 ± 49.04	390.67 ± 55.17	**
Cage staying frequency	3.22 ± 0.79	6.55 ± 1.28	N.S
Sexual bond time	15.55 ± 6.84	28.33 ± 8.24	N.S
Sexual bond frequency	0.44 ± 0.17	1.00 ± 0.33	N.S
Social bond time	64.22 ± 5.20	70.22 ± 10.00	N.S
Social bond frequency	4.11 ± 0.53	2.88 ± 0.75	N.S
Preening frequency	22.55 ± 2.07	13.66 ± 4.60	**

N.S= Non significant.

\*\* = highly significant difference at level P ( $\leq 0.01$ )

**Discussion:-**

Circadian rhythms are most important factor that affect the behaviour of the ornamental birds, it controlled by mean of endogenous diurnal clock. As the feeding time was increased at mid day than early morning and afternoon. These results were in agreement with (Wikelski et al., 2008). In contrast (Lincoln et al., 2006; Holberton and Able 1992; Heideman and Bronson, 1994; Loudon, 1994) as they stated that circadian factors weakly affect the behaviour of birds as, well as, it's displaying of endogenous and exogenous characters expect of one rhythms that persist for many years under persistent light-dark schedules with changing a day length. The circadian hours have great varieties in seasonal behaviour occupy the habit of birds in different geographical and environmental sites (Nelson et al., 2001; Newton 2007). Parrots feeding behaviour are increased only twice a day once in early to mid-morning and once in late afternoon (Enkerlin – Hoeflich, 1995) and bird did not attempt feeding behaviour during middle of day and may make up missed feedings.

The feeding frequencies were nearly three times in all day times. These results differ than that obtained with (Koenig 1999) who reported that Parrots ingestive behaviour from four to five feeding times to their nest per day excessively at midday hours. The birds have two ingestive behaviour per day except in absence of major mid day temperature stress they can consume more feeding times per day (Snyder et al., 1999). There were non significant differences of flying, standing, walking behaviour (time and frequencies) with in different diurnal hours. The birds behave as rolling behaviour by poachers that have been totally eliminated from many areas as, well as, can from climbing from tree to another in some seconds with lesser degree of human impacts conservations. Flying behaviour occupies largest amount of waking hours after feeding as maintain the feathers in good conditions and also regulate the body temperature (Cech et al., 2001). Repetitive flying from perch to perch represents a stereotypic movement and associated with inferior housing management and reduced welfare (Garner et al., 2003 and Mason, 1991a).

Sleeping behaviour and the time staying in the cage of Cockatiel were increased with late after noon. The obtained results were similar to that obtained with Ayala – Guerrero (1989) who found that sleeping between 7 P.M. and 7 A.M. as, well as, they moving to the cage for sleep near to 12 hour of night time sleep, they provided with a quiet, dark sleeping area, ideally separate from their day time living area. Sleep and rest occupy the most time of 24 hour on day, the activities that take up greatest portions of their waking day are feeding and grooming (Grooming and other comfort behavior are major behavioural activities for parrots of all species (Rattenburg, 2000). In tropical and semi-tropical regions, their days normally roughly 12 hours of light and 12 hour of dark (Forshaw, 1989). In contrast, during middle of the day parrots will have a period of quiet time in form of sleeping and drowsiness (Wirringhous et al., 2001).

There were a non significance differences of sexual and social bond and vocalization of Cockatiel with in the day hours. In contrast. (Kondo et al., 2006; Gwinner and Diltami, 1990) they stated that the most obvious expressions of circadian rhythm include change in reproductive behaviour and become restlessness under constant caged conditions. Social pair bonding and dominance rank increases the social status of ornamental birds with in group size (Gill, 1995). Social pair bonding and sexual behaviour during perching in close contact all preening and solicitation of all preening (Garnetzke – Stollmann and Franck, 1991).

The preening and feather shaking frequencies of Cockatiel not affected by diurnal factors, although it increased with dusk. Head shaking was increased with late afternoon while rolling was increased at mid of day hours. These results were in agreement with that obtained by (Gill, 1995; Crowell- Davis 2001).

Concerning the feeding behaviour of budgerigars, it did not affected by the diurnal factors, although the flying time was highly increased with early hours of the day light. These obtained results were agree with Rowley (1990) who stated that parrot morning time occupy for flying and feeding for the day, after feeding they rest or stand in perches or nesting area. The standing behaviour of budgerigars was at lowest level with late afternoon while the sleeping was at highest level at mid day. Birds compensated for the smaller distance between the perches by flying more frequently (Wyndhem 1980 a,b). Budgerigars feeding behaviour was higher on the ground as naturally behaviour in the wild (Gebhardt-Henrich and Steiger, 2005). All birds regained their flying abilities after being in aviary for a couple of days (Benz, 1982). The body weight and flying behaviour of budgerigars were significantly influenced by the of browsing and could effect the welfare of birds (Wedel, 1999).

Cage staying time and sleeping were at highest level at late afternoon and the differences were highly significant. Budgerigars almost visit the cage as it's natural behaviour and excessively where lay the eggs may reach to 9 to 16

days (**Talkbudgies–Breeding, 2013**). Avian behaviour and physiology are affected by many levels of biological rhythms which important for sleep / wake cycle . Budgerigars spent 38% of 24 hour day in period of slow wave sleep between 7.00 P.M. and 7.00 A.M. This sleep behaviour is due to endogenous circadian rhythms (**Ayala – Guerrero et al., 1987**).

There were a non significance differences of sexual and social bond of budgerigars with in the day hours, although the sexual behaviour of budgerigars and vocalization were increased with late afternoon. These results were in agreement with that obtained by **Spoon (2003)** who mentioned that vocalizations comprise an important aspect of parrot sexual behaviour of Budgerigars and Cockatiels.

Regarding to preening behaviour of budgrigars, it not affected by diurnal factors although it increased with early morning and dusk. Shaking head was increased with late afternoon. Rolling was increased early morning and the significance was significance. Female budgerigars do not seem to be adapted to adlibitum feeding and consume more food than optimal amount than male (**Schnegg et al., 2007**) and the male did not significantly gain body mass due to their greater flying activity or a smaller feed intake. Individual uses it's beak to groom anther birds in important behaviour for maintain of pair bond. Grooming behaviour in parrots includes scratching with feather, stretching beak rubbing feather shaking important for communication of the bird flock (**Wirminghous et al., 2001**). The behave signs of affection to their flock mates by preening and feeding one anther than make a sex bond (**Michael and Cooper 1981; The wild bugerigars, 2006**).

Concerning the different behavioural patterns of ornamental birds according to family variation, the feeding behaviour didn't affected by family variation between Cockateil and Budgerigars , while flying and walking behaviour were increased with budgerigars . The obtained results go hand by hand with **Wedel (1999)**. The body mass of budgerigar was lighter than Cockatiel so help them in flying and walking. The sleeping was increased with Cockatiel due to larger body mass than budgerigars. These results were similar to that obtained with (**Wirminghous et al., 2001**). There were a non significant differences of sexual bond and social bond between Cockatiel and Budgerigars, as the cort ship was the same in cockatiel and Budgerigars (**Spoon, 2003**).

### Conclusions:-

The results in this work suggested that we should make a comparative studies of behaviour of different ornamental birds of different families into different diurnal hours for enhancing the conservation of this species in a number of respects.

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### RESEARCH ARTICLE

#### PORTFOLIO PERFORMANCE ANALYSIS WITH JENSEN'S METHOD ON CAPM AND APT MODELS

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Jensen's

#### Abstract

The purpose of this research is to analyze the portfolio using CAPM and APT models to predict stock returns LQ 45 in BEI. The issues raised in this study were: 1) Which combination of companies that produce optimal portfolio using the CAPM model; 2) Which company combination that produces an optimal portfolio by using the APT model; 3) How is the comparison of optimal portfolio by using Jensen's Index on the model of CAPM and APT models. Beta in this study using simple linear regression analysis method to the CAPM model and multiple linear regression model for APT. The independent variables in this model is LQ 45, while the dependent variable is the market risk premium, exchange rate, SBI, inflation and GDP. To determine the optimal portfolio return is analyzed using a model CAPM and APT models, whereas for portfolio performance measure used Jensen's index. On the other hand to know the difference between the CAPM model with the APT model used t test. The sample used in this study as many as 31 companies are determined by the criteria 1). Companies listed in the LQ 45 in BEI. 2). The company is listed in the LQ 45 actively traded 2 consecutive years from January 2010 to December 2011. The results of this study indicate that there are significant differences between Jensen's Index on the model of CAPM and APT models. With Jensen's Index score APT model larger than the CAPM model.

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#### Introduction:-

In the stock market almost all investment contain elements of uncertainty or risk. Investors do not know with certainty the results to be obtained from its investments. In such circumstances it is said that these investors face risks in its investments. Given this risk, the investor will suffer or benefit that is not as expected, resulting in the emergence of irregularities, divergence is often called the uncertainty (uncertainty). In theory it is said that a portfolio of high risk will provide high returns as well (high risk, high return), so the greater the risk will be greater the return that would be acceptable, and vice versa. But not all investors agree with the statement, and the main desire of investors is to minimize risk and increase the cost (minimize risk and maximize return). So that they will look for a portfolio that has the lowest possible risk to the optimum return.

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Model balance (analysis tools) will help the understanding of how to determine the relevant risk of an asset, as well as the relationship of risk and expected return on an asset when the market is in equilibrium. Two kinds of balance popular models that can be used in predicting exchange for shares (return) is expected is the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT). Both models are popular because of the ease of application as well as the assumptions underlying these two models.

Markowitz's portfolio theory put forward in 1952 (Arzac and Bawa, 1977), known as the Markowitz model, it provides a way how to invest efficiently and optimally. By forming the optimal portfolio. The purpose of forming the optimal portfolio is to fulfill the principles of investing. "Obtaining yield (return) at the desired level with minimum risk". To minimize the risk, there should be diversification in investing, is to establish a portfolio or to invest funds not only in one asset alone but to several asset. The problem is how large a proportion of the funds must be invested in each asset in order to obtain the desired level of yield with minimum risk. Bring Arzac research and use two parameters CAPM by behavioral approach safety- first on the return and risk, which found that safety-first approach implies a cautious attitude towards risk, portfolio choice and balance of the market comparable to that implied by the approach of expected utility. Black (1974) suggests that the estimator for the portfolio only the  $R_t - R$ . It is exactly the same as tests used for capital asset pricing model, using the world market portfolio to calculate this is consistent with the notion that taxes are what cause the world capital asset pricing model does not continue smoothly.

CAPM (Capital Asset Pricing Model) is a theory that tries to explain how an asset is determined by the market price, or how to determine the level of profit that is deemed worthy of an investment. Sharpe (1964) analyze how the links between return an asset ( $R_i$ ) with the market portfolio return ( $R_m$ ) is. By making a simple regression equation in which the dependent variable his return an asset and its independent variable return of the market portfolio will be determined how or the relationship between the return of the market portfolio with the return of certain assets. Cornell Research (1979), was able to show that the CAPM can be used to detect the investor excel in the world of asymmetric information, but they do not arouse demonstration CAPM as a practical tool for measuring performance.

APT (Arbitrage Pricing Theory) is an alternative model of CAPM to assess the financial asset. The financial model developed by Ross (1976) have emerged based on the idea that the financial markets are competitive, the arbitrage will make two assets that share similar characteristics, such as equally (riskless) or without taking the risk of giving expectations of return of the same. APT basically uses the idea also that two investment opportunities that have the same identical characteristics can not be sold at different prices (the law of one price). When assets are sold with the same characteristics different prices there will be a chance to do arbitrage, buying valuable assets cheap and sell at a higher price at the same time so as to obtain profit without risk.

APT model emphasizes that the level of expected return (expected return) is heavily influenced by macro-economic factors and not by the unique risks. We can assume that there are factors in arbitrage pricing as specific portfolios tend to be affected by the influence of joint (common influence). If the expected risk premium of each portfolio will be proportionate to the market beta portfolio, the APT and CAPM will give the same result.. Based on the description above, where it is known that the CAPM and APT models have strengths and weaknesses of each to determine which rewards portfolio shares (return) the most optimal and profitable for investors. The authors are interested to analyze the portfolio by using both models to compare measurement models that can be known where the most optimal as an asset assessment tool that can assist investors in selecting a portfolio decision making. In the APT model of macro-economic factors used in this study is inflation, gross domestic product, interest rates and the exchange rate against the US dollar (exchange rate).

#### **The author's intent in doing this Research are:-**

1. Determine the combination of companies which produce optimal portfolio using the CAPM model.
2. Knowing which combination of companies that produce optimal portfolio by using the APT model.
3. Determine the optimal portfolio performance comparison using Jensen's Index on the model of CAPM and APT models.

#### **Literature Review:-**

##### **Capital Asset Pricing Model:-**

Capital Asset Pricing Model (CAPM) is a model for determining the price of an asset (Sharpe, 1964). This model bases itself on equilibrium. Mathematically CAPM formula is as follows :  $E(R_i) = R_f + (R_m - R_f) \beta_i$

**Arbitrage Pricing Theory:-**

Approach Arbitrage Pricing Theory (APT) states that the expected return on an asset is a linear function of various macro-economic factors and the sensitivity of changes in any factor beta coefficient expressed by each of these factors (Ross, 1976). APT is the equations :  $E(R_i) - E(R_0) = \lambda_1 \beta_{i1} + \dots + \lambda_k \beta_{ik}$

**Index Jensen's:-**

Index Jensen's is also known as unique return expressed as alpha ( $\alpha$ ). If alpha = 0 means no unique return, if the alpha has a positive value, the fund's investment performance was better than the market index (ZalmiZubir, 2011: 259).

Jensen's measure:

Alpha = average return-expected return

**Methods:-**

The method used in the preparation of this research is descriptive and associative, ie data obtained are collected, processed, and analyzed mainly for the SBI interest rate, the rupiah against the US dollar, inflation, GDP, the risk premium market and the stock price on the company -the company listed as LQ45 shares in the Indonesian stock Exchange. This research was conducted using documentary data of Indonesia Stock Exchange period January 2010 to December 2011 (historical research or documentary research).

The population used in this study is LQ 45 listed in the Indonesia Stock Exchange. While the sample is determined by using purposive sampling method, which is intended to achieve certain limits or goals expected from this research. For that set of samples with the following criteria: The company whose shares including the shares are actively traded on an ongoing basis and is LQ 45 in Indonesia Stock Exchange 2010-2011 period.

**This study uses multiple methods of data collection are as follows:-**

1. Research Library (Library Research)
2. Research literature that research done by studying the literature related to the issues discussed authors in this study.
3. Field Research (Field Research) Field research is research conducted directly on the object of research, in order to get the data in relation in the field of research. This data collection can be done by means of observation and documentation.

**Data Analysis Techniques:-**

The analysis tool that authors use the quantitative analysis. Quantitative analysis is the analysis used by using the calculation of the figures, by comparing the value of E (R) CAPM model and the value of E (R) APT model, then do different test on the index Jensen's ( $\alpha$ ) CAPM model with index Jensen's ( $\alpha$ ) APT model using T-Test Paired Samples Test (Output Program SPSS version 17:00). Technical analysis of the data in this study through several stages, among others:

**Model CAPM:-**

1. Determining the estimation period (estimation period) that will be used in research. This study period from January 2010 until December 2011.
2. Calculate the real return ( $R_i$ ) on shares in companies LQ 45 by the formula:

$$R_{it} = \frac{P_{it} - P_{it-1}}{P_{it-1}}$$

3. Calculate market return ( $R_m$ ) is the return obtained from the ratio of stock index LQ 45 actively traded by the formula:

$$R_{mt} = \frac{LQ45_t - LQ45_{t-1}}{LQ_{t-1}}$$

4. Determining the regression model to find  $\beta$  shares of each company by the equation:  $R_m - R_f = X$  and  $R_i - R_f = Y$ .

5. After  $\beta$  shares of each company is known, then calculated the expected return of each company and created a line of SML. The formula used is:

$$E(R) = \Delta R_f + (\Delta R_m - \Delta R_f) \beta_i$$

6. Determine the combination of portfolio based on shares of companies whose line is above the SML.  
7. Determine the portfolio return ( $R_p$ ) any combination of the portfolio by the formula:

$$R_p = \frac{R_{i1}}{\sum R_i K_P} \times R_{i1} + \frac{R_{i2}}{\sum R_i K_P} \times R_{i2} + \dots + \frac{R_{in}}{\sum R_i K_P} \times R_{in}$$

8. Determining the regression model to search for any combination of  $\beta$  stock portfolio CAPM model with the equation:

$$\begin{aligned} R_m - R_f &= X \\ R_{p1} - R_f &= Y_1, R_{p2} - R_f = Y_2, \dots, R_{pn} - R_f = Y_n \end{aligned}$$

After  $\beta$  shares of each company is known, then the expected return is calculated every combination of portfolio CAPM model with the following formula:

$$E(R) = R_f + (R_m - R_f) \beta_i$$

#### Model APT:-

1. Determining the estimation period (estimation period) that will be used in research. This study period from January 2010 until December 2011.  
2. Calculate the real return ( $R_i$ ) on shares in companies LQ 45 by the formula:

$$R_{it} = \frac{P_{it} - P_{it-1}}{P_{it-1}}$$

3. Calculate market return ( $R_m$ ) is the return obtained from the ratio of stock index LQ 45 actively traded by the formula:

$$R_{mt} = \frac{LQ45_t - LQ45_{t-1}}{LQ_{t-1}}$$

4. Determining the regression model to find  $\beta$  shares of each company by the equation :  $R_m - R_f = X$  dan  $R_i - R_f = Y$ .  
5. e. After  $\beta$  shares of each company is known, then calculated the expected return of each company and created a line of SML. The formula used is:

$$E(R) = \Delta R_f + (\Delta R_m - \Delta R_f) \beta_i$$

6. Determine the combination of portfolio based on shares of companies whose line is above the SML.  
7. Determine the portfolio return ( $R_p$ ) any combination of the portfolio by the formula :  $R_p = \frac{R_{i1}}{\sum R_i K_P} \times R_{i1} +$

$$\frac{R_{i2}}{\sum R_i K_P} \times R_{i2} + \dots + \frac{R_{in}}{\sum R_i K_P} \times R_{in}$$

8. h. Determining the regression model to search for any combination of  $\beta$  stock portfolio APT model by the equation:

$$\begin{aligned} R_m - R_f &= X_1, I - R_f = X_2, \text{Kurs} - R_f = X_3, \text{PDB} - R_f = X_4 \text{ dan} \\ R_{p1} - R_f &= Y_1, R_{p2} - R_f = Y_2, \dots, R_{pn} - R_f = Y_n \end{aligned}$$

9. After  $\beta$  shares of each company is known, then calculated the expected return any combination of APT model portfolio with the following formula:

$$E(R_p) = R_f + (R_m - R_f)\beta_i + (I - R_f)\beta_i + (\text{Kurs} - R_f)\beta_i + (\text{PDB} - R_f)\beta_i$$

**Index Jensen's:-**

2. Calculating the index Jensen's model portfolio CAPM and APT model by using the following formula  

$$\alpha = R_i - E(R)$$
3. Calculating the average (average) from the calculation of Jensen's index ( $\alpha$ ) model of CAPM and APT model, then the calculation results be ranked from the largest to the smallest.
4. Regression Jensen's Index value ( $\alpha$ ) on the CAPM and APT models with T-Test Paired Samples Test to compare the significance between  $\alpha$  CAPM model with the APT model.

**Result and Discussion:-**

An Overview of Research Object

LQ-45 Index is an index composed of 45 stocks with liquidity (liquid) is the highest, which are selected by multiple selection criteria. In addition to an assessment of liquidity, the selection of these stocks also considers market capitalization. LQ-45 index was first launched on February 24, 1997. Today the basis for the calculation is July 13, 1994 with a base value of 100. All issuers listed on the Stock Exchange are classified into nine industry sectors according to the classification established BEI, named JASICA (Jakarta Industrial Classification). Nine (9) sectors contained in the incoming BEI LQ-45 index in 2010 and 2011 that were in line SML and is ranked top 3 in each sector according to its capitalization, among others:

**Agriculture sector:-**

PT. Astra Agro Lestari Tbk.

PT. Astra Agro Lestari Tbk (the "Company") was established on October 3, 1988 under the name. Suryaraya horizon, based on Deed 12 Notary RukmasantiHardjasatya, SH, in the company's articles of association, the scope of activities of the company is engaged in the plantation sector, trade, manufacturing, transportation, consulting and services.

PT. Perusahaan Perkebunan London Sumatra Tbk.

PT. Perusahaan Perkebunan London Tbk. (Company ") was established by Act No. 93 Notary RadenKadiman on December 18, 1962, and amended by Act No. 20 dated September 9, 1963. The Company is engaged in the plantation located in Sumatra, Java, Kalimantan and Sulawesi with the main product of crude palm oil and rubber, and a small amount of cocoa, tea and seeds.

**Property and Real Estate Sector:-**

PT. LippoKarawaciTbk.

PT. KarawaciTbk is single Reksakencana based on Deed 223 Notary MisahardiMilawarta SH, on October 15, 1990 in Jakarta. The Company is engaged in the field of urban development, development of large-scale integrated, malls, healthcare, restaurants, infrastructure and property, and portfolio management.

**Mining sector:-**

PT. Adaro Energy Tbk.

PT. Adaro Energy Tbk. (Formerly PT. Padang Karunia) was established by Act No. 25 on July 28, 2004 before Notary SukawatySumadi, SH, in Jakarta. In accordance with article 3 of the articles of association of companies engaged in trade, services, industry, transportation of coal, workshop activities, mining and construction.

PT. Indo TambangrayaTbk.

PT. Indo TambangrayaTbk. (The "Company") was established by Act No. 13 Notary Benny Kristianto, SH, on September 12, 1987, and approved by the Ministry of Justice of the Republic of Indonesia in Decree No. C2 640.HT.01.01.TH'89 dated January 20, 1989. The main activity of the company is mining, with investment in subsidiaries, and marketing services to the related companies.

PT. International Nickel Indonesia Tbk.

PT. International Nickel Indonesia Tbk., Was established on July 25, 1968 by Deed No. 49 compiled by Eliza Pondaag, a Notary in Jakarta. The main holding company is Vale S.A., a company registered in Brazil. The company's main activity is the exploration and mining, processing, storage, transportation and marketing of nickel and associated mineral products.

**Basic and Chemical Industry Sector:-**

PT. Holcim Indonesia Tbk.

PT. Holcim Indonesia Tbk. ("Limited") was established within the framework of the Foreign Capital Investment Law No. 1, 1967, as amended by Law No. 11 1970 based on Deed 53 dated June 15, 1971 before Notary Abdul Latief, SH, and from 1 January 2006 the company changed the name of PT. Semen Cibinong Tbk. into PT. Holcim Indonesia Tbk. The scope of this company is engaged in the operation of a cement plant and associated activities in the cement industry and to invest in other companies.

**Miscellaneous Industry Sector:-**

PT. Astra International Tbk.

PT. Astra International Tbk. (The "Company") was established in 1957 as PT. Astra International Incorporated, and in 1990 the company changed its name to PT. Astra International Tbk. Headquartered in Sunter, Jakarta. The scope of activities of companies engaged in general trade, industrial, mining, transportation, agriculture, construction, consulting and services.

**Trade in Services and Investment sector:-**

PT. United Tractors Tbk.

United Tractors ("UT" or "Limited") was established on October 13, 1972, as a heavy equipment distributor in Indonesia. The company went public and listed its shares on the Jakarta Stock Exchange on 19 September 1989. In addition to being a distributor of heavy equipment in Indonesia, UT also plays an active role in the field of coal mining and coal mining business.

**Financial sector:-**

PT. Bank Central Asia Tbk.

PT. Bank Central Asia Tbk. ("Bank") was founded with the name of the Company NV Commerce and Industrie Semarang Knitting Factory on October 10, 1955. The name has been changed for some time, the latest changes on May 21, 1974, namely PT. Bank Central Asia in front of the Notary RidwanSuselo. The head office of PT. BCA is located in Jakarta and two branch offices in Singapore and Hong Kong.

PT. Bank MandiriTbk.

The Indonesian government set up the Bank (the "Bank") on October 2, 1998, as part of the bank restructuring program in Indonesia. In July 1999, four (4) other banks, Bank BumiDaya, Bank Dagang Negara, Export-Import Bank Indonesia and Bank Pembangunan Indonesia joined Bank Mandiri.

PT. Bank Rakyat Indonesia Tbk.

PT. Bank Rakyat Indonesia Tbk. ("Limited") was formally established by the Act. No. 21 in 1968, but the roots of its history can be traced back since 1895. BRI went public in November 2003, and now the government has 56.8% of the shares issued and the remainder is owned by the public. BRI is famous for its focus on financing, Micro and Small and Medium Enterprises (SMEs).

**Sector Industrial Goods and Consumption:-**

PT. Unilever Indonesia Tbk.

PT. Unilever Indonesia Tbk. (The "Company") was established on December 5, 1933 with Lever Zeepfabrieken N.V name based on Deed 23 by Notary AH. Van Ophuijsen in Batavia. The company name was changed to PT. Unilever Indonesia by Deed No. 171 dated July 22, 1980 by notary KartiniMuljadi, SH, and then on June 30, 1997 based on Deed 92 company changed its name to PT. Unilever Indonesia Tbk., A notarized MudofirHadi, SH, in Jakarta. The Company is engaged in manufacturing, marketing, and distribution of consumer.

PT. Indofood SuksesMakmurTbk.

PT. Indofood SuksesMakmurTbk. (The "Company") was established on August 14, 1990 under the name. PanganjayaIntikusuma based on Deed 228 Notary Benny Kristianto, SH, in Jakarta. PT. Indofood SuksesMakmurTbk., Operates in all stages of food manufacturing from the production of raw materials, processing, to distribution of the retailer to the consumer.

PT. Kalbe Farma Tbk.

PT. Kalbe Farma Tbk. (The "Company") was established within the framework of Law on Domestic Investment No. 6 of 1968 and Act No. 12 in 1970, based on Deed 03 dated September 10, 1966 in presence of Notary Raden Imam Soesetyo Prawirokoesoemo in Jakarta. The company's main activity is the production, development and distribution of pharmaceutical products (human and veterinary).

#### Infrastructure Sector, Utilities and Transportation:-

PT. JasaMarga Tbk.

PT. JasaMarga Tbk. (The "Company") was established based on Government Regulation No. 04 1978 on the Establishment of Investment and State-Owned Company (Persero) in the field of management, maintenance and development of toll roads.

PT. Indika Energy Tbk.

PT. Indika Energy Tbk. (Formerly PT. IndikaIntiEnergi) was established by Act No. 31 dated October 19, 2000 before the Notary Hasan AlYani Ali Amin, A.H., in Jakarta. The scope of activities of the company are in the field of trade, construction, transportation, mining and services.

#### Results of Testing Requirements Analysis Data:-

Optimal portfolio

Outline Security Market Line (SML) describe the overall market return to long systematic risk (the risk can not be diversified away) or Beta. With these criteria results obtained from the company's stock 22 9 sector, then pursued again with a selection system that shares a big 3 ratings (sectors) based on market capitalization. That was selected 17 stocks of companies included in the criteria for the establishment of an optimal portfolio as shown in the figure below:

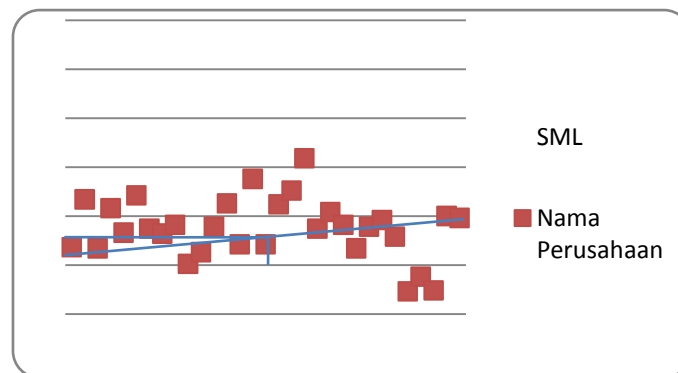


Figure 1:- Outline Security Market Shares LQ line 45 2010-2011

Figure 1 above shows the Security Market line is a line that shows the relationship between risk ( $\beta$ ) with the rate of profit. Where the upright axis is  $E(R_i)$  (expected return) and the flat axis illustrates the beta ( $\beta$ ) of each company. SML line drawn from a point  $R_f$  (risk free) cutting line  $R_m$  (market return) at  $\beta = 1$ . There are 9 industrial sector with 31 stocks of companies from all sectors of the incoming LQ 45 period of 2010 and 2011. In the image can be viewed from 31 LQ 45 after made the Security Market line then that position is above the line SML there are only 22 stocks. And the selection is again entering the top 3 rankings by market capitalization per sector then acquired 17 shares of nine sectors.



**Table 1:-** Stocks are selected for a combination of optimal portfolio

No	Code	Name	Sector	Symbol
1	AALI	Astra Agro Lestari Tbk.	1	A
2	LSIP	PP London Sumatera Tbk.	1	B
3	LPKR	LIPPOKarawaciTbk.	2	C
4	ADRO	Adaro Energy Tbk.	3	D
5	ITMG	Indo TambangrayaMegahTbk.	3	E
6	INCO	International Nickel Indonesia Tbk.	3	F
7	SMCB	Holcim Indonesia Tbk.	4	G
8	ASII	Astra International Tbk.	5	H
9	UNTR	United Tractors Tbk.	6	I
10	BBCA	Bank Central Asia Tbk.	7	J
11	BMRI	Bank MandiriTbk.	7	K
12	BBRI	Bank Republik Indonesia Tbk	7	L
13	UNVR	Unilever Indonesia Tbk.	8	M
14	INDF	Indofood SuksesMakmurTbk.	8	N
15	KLBF	Kalbe FarmaTbk.	8	O
16	JSMR	JasaMargaTbk.	9	P
17	INDY	Indika Energy Tbk.	9	Q
Information :				
Sector 1 = Agriculture				
Sector 2 = Property and Real Estate				
Sector 3 = Mining Sector				
Sector 4 = Basic and Chemical Industry				
Sector 5 = Various Industries				
Sector 6 = Trade in Services and Investment				
Sector 7 = Financial Sector				
Sector 8 = Industrial Goods and Consumption				
Sector 9 = Infrastructure, Utilities and Transportation				

In this study to determine the combined portfolio writer used a tree diagram that is a way to describe the nature of a hierarchical structure in graphical form. Tree (tree diagram) a specific type of diagram that has a network topology (relationship) is unique (AdhiDarmawanSutjiadi, 2003). Each stock companies get the opportunity, and equal opportunities to represent the sector in the combined portfolio, resulting from the 17 stocks incorporated in 9 sectors industry produces 108 combined portfolio as shown in the following table.

**Table 2:-** The combination of company shares

No	Combination	No	Combination	No	Combination	No	Combination
1	A, C, D, G, H, I, J, M, P	28	A, C, D, G, H, I, J, M, Q	55	B, C, D, G, H, I, J, M, P	82	B, C, D, G, H, I, J, M, Q
2	A, C, E, G, H, I, J, M, P	29	A, C, E, G, H, I, J, M, Q	56	B, C, E, G, H, I, J, M, P	83	B, C, E, G, H, I, J, M, Q
3	A, C, F, G, H, I, J, M, P	30	A, C, F, G, H, I, J, M, Q	57	B, C, F, G, H, I, J, M, P	84	B, C, F, G, H, I, J, M, Q
4	A, C, D, G, H, I, K, M, P	31	A, C, D, G, H, I, K, M, Q	58	B, C, D, G, H, I, K, M, P	85	B, C, D, G, H, I, K, M, Q
5	A, C, E, G, H, I, K, M, P	32	A, C, E, G, H, I, K, M, Q	59	B, C, E, G, H, I, K, M, P	86	B, C, E, G, H, I, K, M, Q
6	A, C, F, G, H, I, K, M, P	33	A, C, F, G, H, I, K, M, Q	60	B, C, F, G, H, I, K, M, P	87	B, C, F, G, H, I, K, M, Q
7	A, C, D, G, H, I, L, M, P	34	A, C, D, G, H, I, L, M, Q	61	B, C, D, G, H, I, L, M, P	88	B, C, D, G, H, I, L, M, Q
8	A, C, E, G, H, I, L, M, P	35	A, C, E, G, H, I, L, M, Q	62	B, C, E, G, H, I, L, M, P	89	B, C, E, G, H, I, L, M, Q
9	A, C, F, G, H, I, L, M, P	36	A, C, F, G, H, I, L, M, Q	63	B, C, F, G, H, I, L, M, P	90	B, C, F, G, H, I, L, M, Q
10	A, C, D, G, H, I, J, N, P	37	A, C, D, G, H, I, J, N, Q	64	B, C, D, G, H, I, J, N, P	91	B, C, D, G, H, I, J, N, Q
11	A, C, E, G, H, I, J, N, P	38	A, C, E, G, H, I, J, N, Q	65	B, C, E, G, H, I, J, N, P	92	B, C, E, G, H, I, J, N, Q
12	A, C, F, G, H, I, J, N, P	39	A, C, F, G, H, I, J, N, Q	66	B, C, F, G, H, I, J, N, P	93	B, C, F, G, H, I, J, N, Q
13	A, C, D, G, H, I, K, N, P	40	A, C, D, G, H, I, K, N, Q	67	B, C, D, G, H, I, K, N, P	94	B, C, D, G, H, I, K, N, Q
14	A, C, E, G, H, I, K, N, P	41	A, C, E, G, H, I, K, N, Q	68	B, C, E, G, H, I, K, N, P	95	B, C, E, G, H, I, K, N, Q
15	A, C, F, G, H, I, K, N, P	42	A, C, F, G, H, I, K, N, Q	69	B, C, F, G, H, I, K, N, P	96	B, C, F, G, H, I, K, N, Q
16	A, C, D, G, H, I, L, N, P	43	A, C, D, G, H, I, L, N, Q	70	B, C, D, G, H, I, L, N, P	97	B, C, D, G, H, I, L, N, Q
17	A, C, E, G, H, I, L, N, P	44	A, C, E, G, H, I, L, N, Q	71	B, C, E, G, H, I, L, N, P	98	B, C, E, G, H, I, L, N, Q
18	A, C, F, G, H, I, L, N, P	45	A, C, F, G, H, I, L, N, Q	72	B, C, F, G, H, I, L, N, P	99	B, C, F, G, H, I, L, N, Q
19	A, C, D, G, H, I, J, O, P	46	A, C, D, G, H, I, J, O, Q	73	B, C, D, G, H, I, J, O, P	100	B, C, D, G, H, I, J, O, Q
20	A, C, E, G, H, I, J, O, P	47	A, C, E, G, H, I, J, O, Q	74	B, C, E, G, H, I, J, O, P	101	B, C, E, G, H, I, J, O, Q
21	A, C, F, G, H, I, J, O, P	48	A, C, F, G, H, I, J, O, Q	75	B, C, F, G, H, I, J, O, P	102	B, C, F, G, H, I, J, O, Q
22	A, C, D, G, H, I, K, O, P	49	A, C, D, G, H, I, K, O, Q	76	B, C, D, G, H, I, K, O, P	103	B, C, D, G, H, I, K, O, Q
23	A, C, E, G, H, I, K, O, P	50	A, C, E, G, H, I, K, O, Q	77	B, C, E, G, H, I, K, O, P	104	B, C, E, G, H, I, K, O, Q
24	A, C, F, G, H, I, K, O, P	51	A, C, F, G, H, I, K, O, Q	78	B, C, F, G, H, I, K, O, P	105	B, C, F, G, H, I, K, O, Q
25	A, C, D, G, H, I, L, O, P	52	A, C, D, G, H, I, L, O, Q	79	B, C, D, G, H, I, L, O, P	106	B, C, D, G, H, I, L, O, Q
26	A, C, E, G, H, I, L, O, P	53	A, C, E, G, H, I, L, O, Q	80	B, C, E, G, H, I, L, O, P	107	B, C, E, G, H, I, L, O, Q
27	A, C, F, G, H, I, L, O, P	54	A, C, F, G, H, I, L, O, Q	81	B, C, F, G, H, I, L, O, P	108	B, C, F, G, H, I, L, O, Q

**Index Jensen's (α) model CAPM dan model APT:-**

Calculating Jensen's portfolio index by using the following formula:

$$\alpha = R_p - E(R)$$

After E (Rp) of each combination is obtained then the value of the portfolio Jensen's index (α) of the model CAPM and APT model can be calculated by using the formula above the monthly period so that we will get the value of α portfolio of 108 combinations. Then α portfolio value each combination calculated the mean (average) of its α, so that there is only one (1) α within 1 (one) combined portfolio, and as a result there will be as many as 108 α on the combined portfolio. To determine the return combinations where the most optimal portfolio can be seen from an index value of Jensen's (α) of each of the combined portfolio, the greater the value of α, the greater the return portfolio. Jensen's Index (α) the top 10 of the 108 combined portfolio CAPM and APT models shown in the following table.

**Table 3:-** Jensen's Index (α) top 10 CAPM model.

No	Code	Combination	Indeks Jensen's (α)
1	77	B, C, E, G, H, I, K, O, P	0.025107
2	80	B, C, E, G, H, I, L, O, P	0.024153
3	104	B, C, E, G, H, I, K, O, Q	0.023378
4	76	B, C, D, G, H, I, K, O, P	0.023085
5	107	B, C, E, G, H, I, L, O, Q	0.022453
6	79	B, C, D, G, H, I, L, O, P	0.022161
7	68	B, C, E, G, H, I, K, N, P	0.021502
8	103	B, C, D, G, H, I, K, O, Q	0.021385
9	74	B, C, E, G, H, I, J, O, P	0.021249
10	78	B, C, F, G, H, I, K, O, P	0.021093

**Table 4:-** Jensen's Index ( $\alpha$ ) top 10 models of APT

No	Code	Combination	Indeks Jensen's ( $\alpha$ )
1	80	B, C, E, G, H, I, L, O, P	1.208032
2	25	A, C, D, G, H, I, L, O, P	1.207309
3	85	B, C, D, G, H, I, K, M, Q	1.190167
4	26	A, C, E, G, H, I, L, O, P	1.140713
5	100	B, C, D, G, H, I, J, O, Q	1.139271
6	54	A, C, F, G, H, I, L, O, Q	1.131452
7	55	B, C, D, G, H, I, J, M, P	1.112528
8	105	B, C, F, G, H, I, K, O, Q	1.090122
9	46	A, C, D, G, H, I, J, O, Q	1.071981
10	101	B, C, E, G, H, I, J, O, Q	1.070365

From Table 3 and Table 4 illustrates Alpha ( $\alpha$ ) is showing the difference between the actual investment returns with the expected investment returns or the benchmark for the level of market risk (beta) specific. On top ranking calculation results showed that the alpha value of 0.025107 CAPM model, which is a positive alpha value and meaning describe portfolio performance is good or feasible to do investment. While the alpha value of 1.208032 top APT model, demonstrating the value of alpha is positive and that means investment or portfolio performance in good standing and eligible to do investment.

#### Different test by using T-Test Paired Samples Test:-

To find out if there is a difference between Jensen's Index APT model with CAPM model used Jensen's t test. Based on calculations using the T-Test Paired Samples Test (Output Program SPSS Version 17:00) as set forth in the following table:

**Table 5:-** Data Test Result Differences Index of Jensen's t APT model with Jensen's Index CAPM model.

		Paired Differences				
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference	
					Lower	Upper
Pair 1	Jensen_APT - Jensen_CAPM	.531223	.374122	.035999	.459857	.602589

The data indicate that Jensen's Index APT model was higher than Jensen's Index CAPM model with a number of differences in the average standard deviation of 0.53223 to 0.374123. Total average score of Jensen's Index APT model is 0.542808, while the total score of the average Index of Jensen's model of CAMP is 0.011585.

#### Conclusion:-

##### Based on the results of the discussion can be drawn conclusions as follows:-

1. The combination of the company that produces the optimal portfolio by using the CAPM model is PP London Sumatra Tbk, LIPPOKarawaciTbk, Indo TambangrayaTbk, Holcim Indonesia Tbk, PT Astra International Tbk, United Tractors Tbk, Bank MandiriTbk, Kalbe FarmaTbk and JasaMargaTbk , with an Index score of Jensen's CAPM model by 0.025107.
2. The combination of the company that produces the optimal portfolio by using the APT model is PP London Sumatra Tbk, LippoKarawaciTbk, Indo TambangrayaTbk, Holcim Indonesia Tbk, PT Astra International Tbk, United Tractors Tbk, Bank of the Republic of Indonesia Tbk, Kalbe FarmaTbk and JasaMargaTbk, with an Index score of Jensen's APT model by 1.208032.
3. The results of this study showed no significant difference between Jensen's index CAPM model with Jensen's index APT model, where Jensen's index APT model was higher than Jensen's Index CAPM model with a number of differences in the average standard deviation of 0.53223 to 0.374123. Total average score of Jensen's index APT model is 0.542808, while the average score of Jensen's index CAPM model is 0.011585.

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### RESEARCH ARTICLE

#### A WIDENED TAX BASE - REMEDY FOR ECONOMIC DEVELOPMENT AND DISTRIBUTIONAL EQUITY IN INDIA : AN ANALYSIS.

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#### Abstract

Personal income tax base in India is very low as compared to other emerging and developed nations. During the year 2010-11 the total returned filed was about 3.3% of the total population of India whereas the ratio of returned filed by Singapore was 39%, USA 46%, and New Zealand 75%. Taxation serves the purpose of promoting economic development by curbing consumption, increasing the incentive to save and invest and transferring resources from the hand of the public to the government for investment and public finance purposes. Initiative on widening of Tax base should be honest and vigorous one so that the entire potential tax payers comes under its purview which in turn shall contribute to national tax revenue. So, there is a need for creating transparent, friendlier and less discriminatory administrative system. In light of the above the relationship and trend among personal income tax, corporate Tax, indirect and GDP are analysed and it is suggested for Expansion of Scope for Presumptive Taxation, Discourage Cash Economy/ Encourage Cashless economy, Tax on Agriculture Income, Imposition of more Tax on High Net Worth Individuals, Imposition of Property Tax, Gradual Reduction/Withdrawal of Various Subsidies And Exemptions and Expanding the Tax Base.

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#### Introduction:-

Resource is the critical factor for every economy whether developed or least developed. Resource mobilisation is key to not only to the country but also for corporate and to all stake holders at large. It means collecting the funds from various internal and external sources for financing and executing development plans. The importance of resource mobilisation in emerging or under developed countries lies in curtailing consumption and augmenting savings for an accelerated investment in the interest of community. It is essential for the purpose of removing maladjustment between supply and demand of goods and services in order to avoid inflation and balance of payment difficulties.

Taxation serves the purpose of promoting economic development by curbing consumption, increasing the incentive to save and invest and transferring resources from the hand of the public to the government for investment and public finance purposes. It also reduces economic inequalities and mobilising economic surplus.

In India, additional taxation refers to additional resource mobilisation by levying additional taxes or through changes in the tax base and greater efforts at tax collection and by raising the administered prices of goods produced by public enterprises. Additional taxation has been one of the key sources of financing the expenditure during the five year plans.

No doubt the country needs larger tax revenue for financing its development plans but there are certain limitations to increase the tax revenue at a faster rate than in national income. The share of direct taxes in total tax revenue declined from 37% in 1950-51 to 14% in 1984-85. Gradually the share has increased from 14% in 1984-85 to 51% in the year 2014-15. But still the share is quite low in comparison to the existing international scenario. This indicates more dependence on indirect taxes. Indirect taxes raise prices which lead to inflationary consequences. The lower middle income groups and poorer sections of the society are being reduced to abject poverty with the reduction in their purchasing power due to increased indirect taxes. On the other hand, the burden of direct taxes has been declining on the upper middle and higher income groups. They are becoming better off. The scope for raising additional revenues through mere changes in the tax rates is limited. Moreover, the main drawback of higher taxation is that it leads to tax evasion thereby leading to creation of black money. There is considerable scope for reducing tax evasion, rationalising tax laws, streamlining tax administration and widening the tax base in the urban sector and tapping the surpluses of the affluent section of the farming community in rural sector of India.

So far as indirect taxes are concerned, there is the need for an adjustment and rationalisation of tax rates and GST is a step in this direction. Greater efforts are needed to explore ways of raising revenues by tapping rural income of large farmers and large land holders.

### **Objectives, Review Of Literature And Research Methodology:-**

The personal income tax base in India is very low as compared to other emerging and developed nations. The relevance of the study emanates from the fact that the contribution of indirect tax in total tax revenue collection in India is quite high in comparison to international scenario. This study aims to ascertain the tax structure, the ratio of direct taxes and indirect tax in total tax revenue collection, and impact of present tax system on lower income group and poor section of the society.

We try to explore the findings some of the studies. Gupta (2009) clarified in the trends in personal income tax reforms have a favourable impact on the growth of personal income tax. Nagaraj (2010) did a comparative study of direct tax revenue to GDP in developed and developing countries in the year 2008. It was 11% for India and the ratio was 42.9%, 43.1%, and 36.4% in Australia, France, and Germany respectively. Reason of Low ratio is due to collection of maximum tax from middle income group individuals. The major reasons for tax evasion are exorbitant rate, complex and complicated tax structure and inefficient and corrupt government administration. Wadhwa and Pal (2012) has found that the causes of tax evasion are high tax rates, corruption in public sector units, multiple tax rates and inefficient tax authorities. It has been suggested that reduction in tax rates, simplifications of tax laws, removal of loopholes in the tax system and to some extent proper processing of information available the under the annual information return can be best tool for improving Indian tax compliance. Dey (2014) pointed out that the structural shift in composition of tax revenue of central Government from indirect taxes to direct taxes. This can be considered as a positive development on the assumption that direct taxes are more equitable in impact and pro-poor as compared to indirect taxes. The Tenth Report of Public Accounts Committee (2014-15) shows that the numbers of tax payers in financial year 2006-07 were 313 lakhs and it increased to 335.80 lakhs by 2010-11. It shows an uptrend of 7.3 % and average annual growth of @ 1.8%. The direct tax collections was Rs. 2,30,181 Crore and Rs. 4,45,995 Crore during the same period and it shows an overall uptrend of 93% and average annual growth of @ 23.33%. Third Report of TARC (2014), and FICCI (2015) gave various reasons for declining tax payer base. The important cause for declining tax tax payer base are change in basic exemption limit, grant of additional exemption, huge unorganised sector, and culture of large scale cash transaction. There is huge gap between number of working company as per ROC Records (10.17 lakhs) and corporate tax payers registered with IT department (7 lakhs). The report suggested for wider tax base to achieve fiscal consolidation and higher tax GDP ratio, to meet the fiscal target of growth in tax collection, to enable government to undertake planned investment in infrastructure and other areas for growth and development of country, and to lower the burden of the existing tax payer. The NIPFP (2015) report indicates that the difference between potential and actual return filed is very high. The suggestion is to widen the tax base by increasing in penalty rate or reduction in tax which results in burden on people to file return, and reduction in tax rate will bring more persons in to tax regime. Fiscal Policy Strategy Statement (Fiscal policy in 2016-17) clarified that the effort of the Government has shifted from curtailing expenditure to generating higher revenues for

reducing the fiscal deficit and to raise additional resources to implement Government policy priorities. To achieve this, the Government policy is oriented broadly in favour of minimizing exemptions and broadening the tax base for a higher tax to GDP ratio.

The data collected from the secondary sources and simple growth trend and different ratio are being used for the analysis.

#### **Importance Of Direct Taxes Over Indirect Taxes In A Developing Or Under Developed Economy:-**

Taxation is the main source of revenue. Its classification into direct and indirect taxes is very essential because of their effects on production, distribution and consumption are different. In advanced countries of the world, the major part of their total tax revenue (about 70%) comes from direct taxes and about 30 percent in the form of indirect taxes. In contrast developing or under developed countries have to heavily rely on indirect taxes for revenue collection. Here indirect taxes account for 70 to 80 percent of the total revenue collection.

Direct taxes is paid entirely by those persons on whom they are imposed, and it cannot be shifted to others whereas indirect taxes which are later shifted to others by paying initially by those on whom they are imposed. Direct taxes are progressive in their rates which implies that higher incomes are taxed heavily and lower incomes lightly. The principle of equity which says that broader shoulder should bear a heavier money burden of a tax is satisfied. Direct taxes can be and are taxed according to the "ability to pay" of the tax payers. It, thus, satisfy the equity principle. On the hand indirect taxes are regressive in nature which will remain constant irrespective with the level of income and are equal for all. Elasticity in direct taxes implies that more revenue is collected by the government through direct taxes as the incomes of the people increases because larger income segments are taxes automatically at higher rates. It helps in collecting larger revenue. Direct taxes satisfy the cannons of economy convenience and certainty. They are economical in collection and administration hence the revenue rises without any corresponding addition to cost of collection. Direct taxes are paid directly to government. So there is no scope for any leakage. Though the direct taxes pinch the tax payer, the direct tax payers are more attentive towards the utilisation of their funds. People become more conscious of their rights and obligations. Thus there is a great chance to improve the educative value and civic consciousness. Direct taxes bring flexibility in their rates from time to time to avoid their adverse effect on willingness and ability to work, save and invest. Exemptions and concessions are used as tools to avoid the adverse effects of direct taxes on production, distribution and consumption.

#### **Data Analysis And Findings:-**

##### **Direct Tax (Data Analysis):-**

If a tax is intended to be paid by the person whom it is imposed is called direct tax. Direct taxes are imposed on receipts of income. Direct taxes are of various types like corporate tax, income tax wealth tax, property tax etc. Out of them corporate tax and income tax are major contributors to the revenue of the Government.

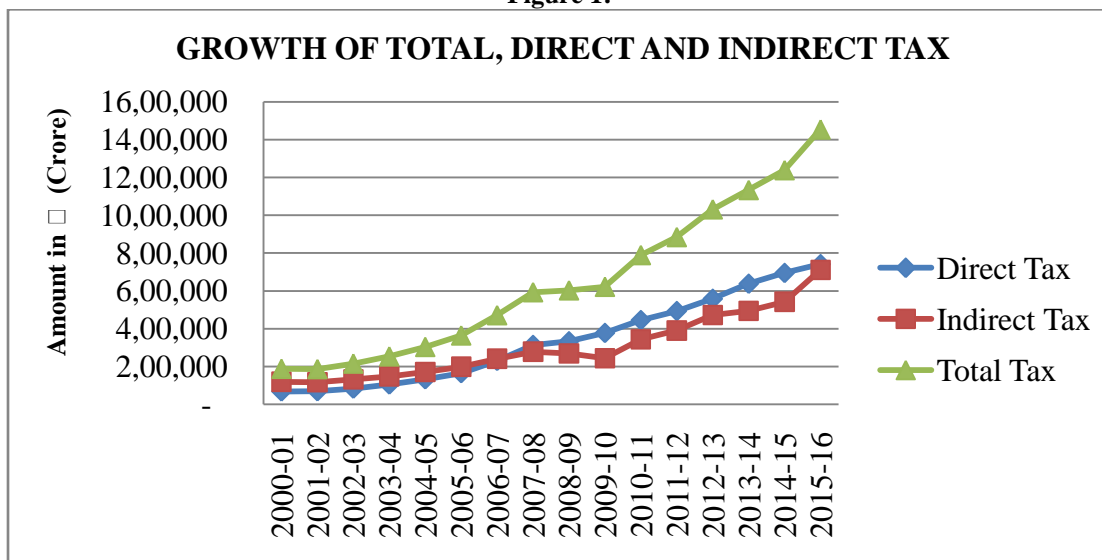
**Table No 1:-**

<b>Contribution Of Direct Taxes &amp; Indirect Taxes To Total Tax</b>				
<b>(Rs. In Crores)</b>				
<b>Financial Year</b>	<b>Direct Tax</b>	<b>Indirect Tax</b>	<b>Total Tax</b>	<b>Direct Tax to Total Tax (%)</b>
2000-01	68,305	1,19,814	1,88,119	36.31%
2001-02	69,198	1,17,318	1,86,516	37.10%
2002-03	83,088	1,32,608	2,15,696	38.52%
2003-04	1,05,088	1,48,608	2,53,696	41.42%
2004-05	1,32,771	1,70,936	3,03,707	43.72%
2005-06	1,65,216	1,99,348	3,64,564	45.32%
2006-07	2,30,181	2,41,538	4,71,719	48.80%
2007-08	3,14,330	2,79,031	5,93,361	52.97%
2008-09	3,33,818	2,69,433	6,03,251	55.34%
2009-10	3,78,063	2,43,939	6,22,002	60.78%
2010-11	4,45,995	3,43,716	7,89,711	56.48%
2011-12	4,93,987	3,90,953	8,84,940	55.82%
2012-13	5,58,989	4,72,915	10,31,904	54.17%
2013-14	6,38,596	4,95,347	11,33,943	56.32%
2014-15	6,95,792	5,43,215	12,39,007	56.16%
2015-16	7,42,295	7,11,885	14,54,180	51.05%

(Source: IT Department, Govt. Of India)

In Table-1 data shows the contribution of Direct Taxes to Total revenue. In the year 2000-01 the contribution of direct taxes to total taxes stands at 36.31% and this ratio has an increasing trend till 2009-10. There has been substantial increase in ratio in 2009-10 which stands at 60.78% in spite of the effect of global slowdown. The declining trend of direct tax to total revenue, in principle is not suggested for a developing country. If the direct tax to total tax declines it implies the growth of indirect tax to total tax. The increasing ratio of indirect taxes to total tax adversely affects the purchasing power of lower income group and poor people. That leads to more disparity in the poor and richer.

Figure 1:-



As the Figure-1 show, initially in 2000-01 the direct taxes are less than indirect tax. This trend continues till the mid of 2007-08. After 2007-08 the direct taxes ratio to total tax is started growing. In the year 2009-10 the direct tax is maximum level. The trend remained at higher side as compare to indirect to total tax ratio.

Table No- 2

Direct Tax Collection				
(Rs. In Crores)				
Financial Year	Corporate Tax	Personal Tax	Other Direct Tax	Total
2000-01	35,696	31,764	845	68,305
2001-02	36,609	32,004	585	69,198
2002-03	46,172	36,866	50	83,088
2003-04	63,562	41,386	140	1,05,088
2004-05	82,680	49,268	823	1,32,771
2005-06	1,01,277	63,689	250	1,65,216
2006-07	1,44,318	85,623	240	2,30,181
2007-08	1,93,561	1,20,429	340	3,14,330
2008-09	2,13,395	1,20,034	389	3,33,818
2009-10	2,44,725	1,32,833	505	3,78,063
2010-11	2,98,688	1,46,258	1,049	4,45,995
2011-12	3,22,816	1,70,181	990	4,93,987
2012-13	3,56,326	2,01,840	823	5,58,989
2013-14	3,94,678	2,42,888	1,030	6,38,596
2014-15	4,28,925	2,65,772	1,095	6,95,792
2015-16	4,54,419	2,86,801	1,075	7,42,295

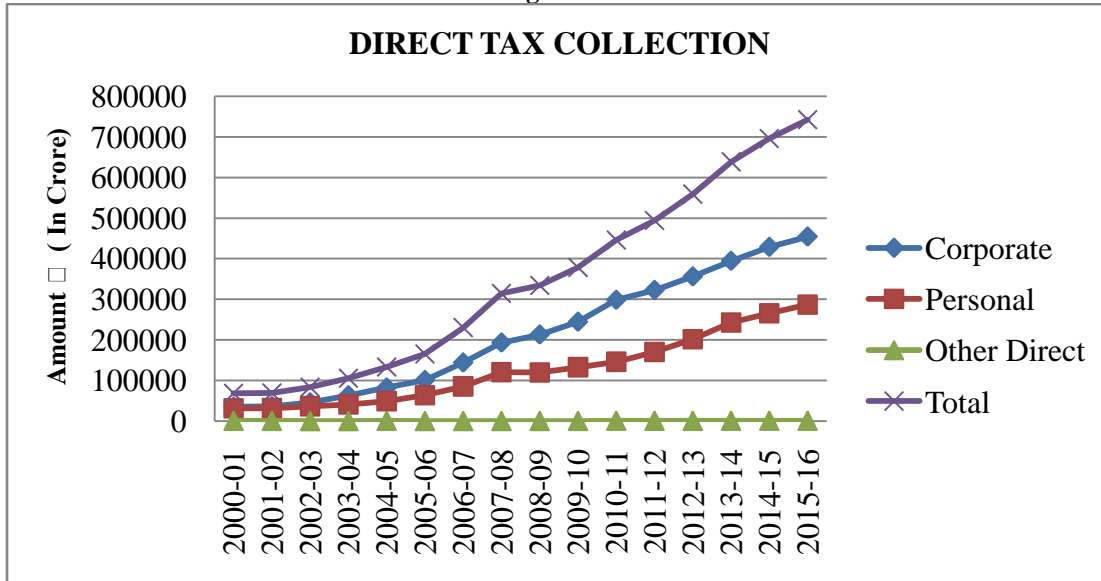
(Source: IT Department, Govt. Of India)

The Direct tax consists of corporate tax, personal tax and other direct tax. In the year 2000-01, the corporate tax and personal tax variance is small. The ratio of corporate tax increased gradually from Rs. 35,696 crore to Rs. 4,54,419 crore during the period 2000-01 to 2015-16. In contrast to that the personal tax increased in a slower rate i.e. from



Rs. 31,764 crore in 2000-01 to Rs. 2,86,801 crores during the same period. The other direct tax is not increasing in a constant pace; its trend is volatile as the data shows.

Figure 2:-



From the direct tax collection figure (Figure -2), it show that corporate tax is growing more in proportion to personal tax. The other direct taxes are stagnant. From the year 2008-09 the collection of all taxes, except other direct taxes are increasing in a better pace as compared to the period 2000-01 to 2007-08. In developed countries, the personal tax is more in comparison to corporate tax collection.

Table No 3:-

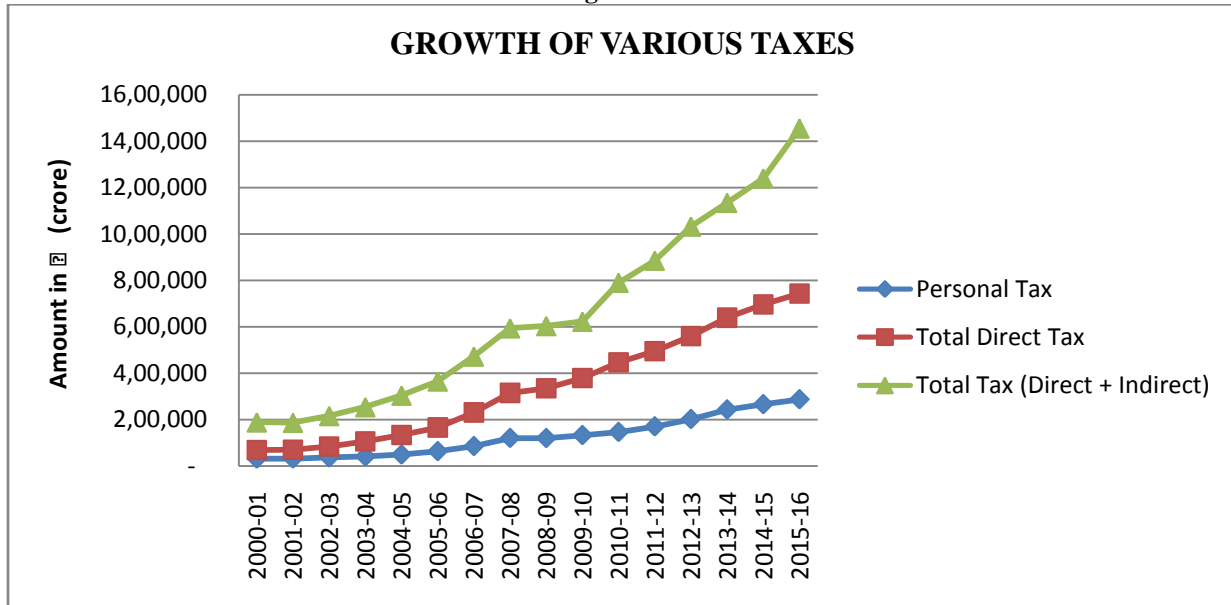
Personal Tax Ratios (Rs. In Crores)					
Financial Year	Personal Tax	Total Direct Tax	Personal Tax to Total Direct Tax (%)	Total Tax (Direct + Indirect)	Personal Tax to Total Tax (%)
2000-01	31,764	68,305	46.50%	1,88,119	16.89%
2001-02	32,004	69,198	46.25%	1,86,516	17.16%
2002-03	36,866	83,088	44.37%	2,15,696	17.09%
2003-04	41,386	1,05,088	39.38%	2,53,696	16.31%
2004-05	49,268	1,32,771	37.11%	3,03,707	16.22%
2005-06	63,689	1,65,216	38.55%	3,64,564	17.47%
2006-07	85,623	2,30,181	37.20%	4,71,719	18.15%
2007-08	1,20,429	3,14,330	38.31%	5,93,361	20.30%
2008-09	1,20,034	3,33,818	35.96%	6,03,251	19.90%
2009-10	1,32,833	3,78,063	35.14%	6,22,002	21.36%
2010-11	1,46,258	4,45,995	32.79%	7,89,711	18.52%
2011-12	1,70,181	4,93,987	34.45%	8,84,940	19.23%
2012-13	2,01,840	5,58,989	36.11%	10,31,904	19.56%
2013-14	2,42,888	6,38,596	38.03%	11,33,943	21.42%
2014-15	2,65,772	6,95,792	38.20%	12,39,007	21.45%
2015-16	2,86,801	7,42,295	38.64%	14,54,180	19.72%

(Source: IT Department, Govt. Of India)

Table No. - 3 is shows the ratio of personal taxes with total tax collection and total direct taxes during 2000-01 to 2015-16. Personal direct taxes to total direct taxes are decreasing. Initially, in 2000-01 the personal taxes collection is about to 46.50% of total direct taxes collection, but in consequent period it declined and by 2015-16 it was only 38.64% of total direct taxes collections. In contrast to that the ratio of personal income taxes to total taxes

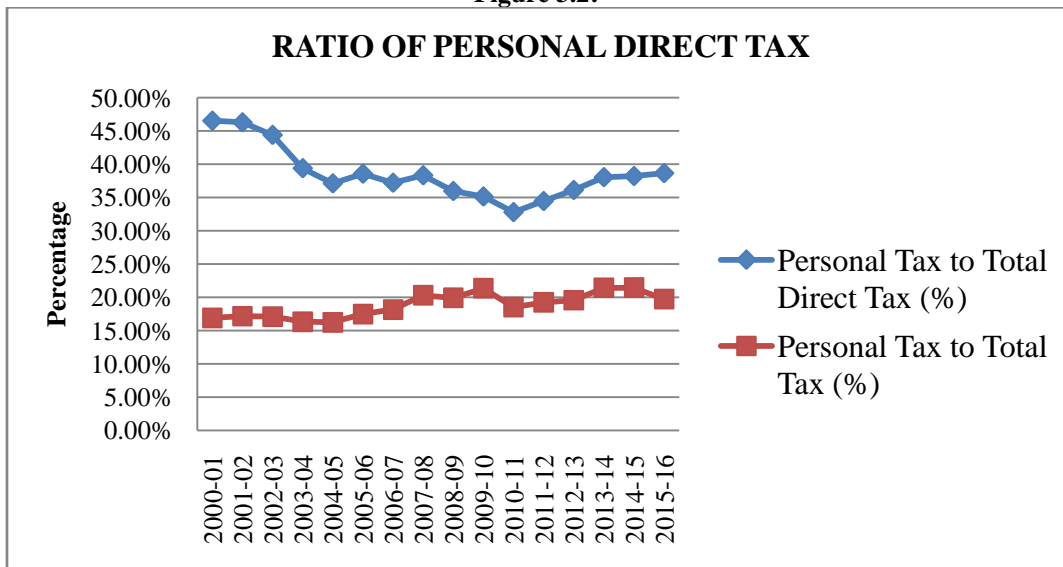
collections were increased up to 2007-08 in increasing rate but after that it fluctuated and grew unevenly. In 2015-16 it declined to 19.72% of total tax revenue. During the last 16 years personal tax collection has multiplied by 9 times whereas direct taxes and total tax revenue has multiplied by 10 times and 7 times respectively. It implies personal tax contribution in total direct tax revenue declines.

Figure 3.1:-



The figure 3.1 shows all three types of taxes are growing from 2000-01 to 2006-07. Due to the global slowdown and various scams took place in India the profit of various companies are adversely affected. So, during 2006-07, the all three types of taxes were affected adversely. After taking various measures by regulators the economy survived and started growing and gave positive result.

Figure 3.2:-



The figure 3.2 give the idea regarding the ratio of personal tax to total direct tax is in downward trend which denotes collection higher corporate tax in total direct tax. More dependence on corporate tax collection adversely affects the industries. This de-motivates the corporate in the economy. Personal tax to total tax ratio shows a very slow growth or we can say almost remain stagnant. The contribution of personal tax in both direct and total tax should be strengthened for an emerging economy.

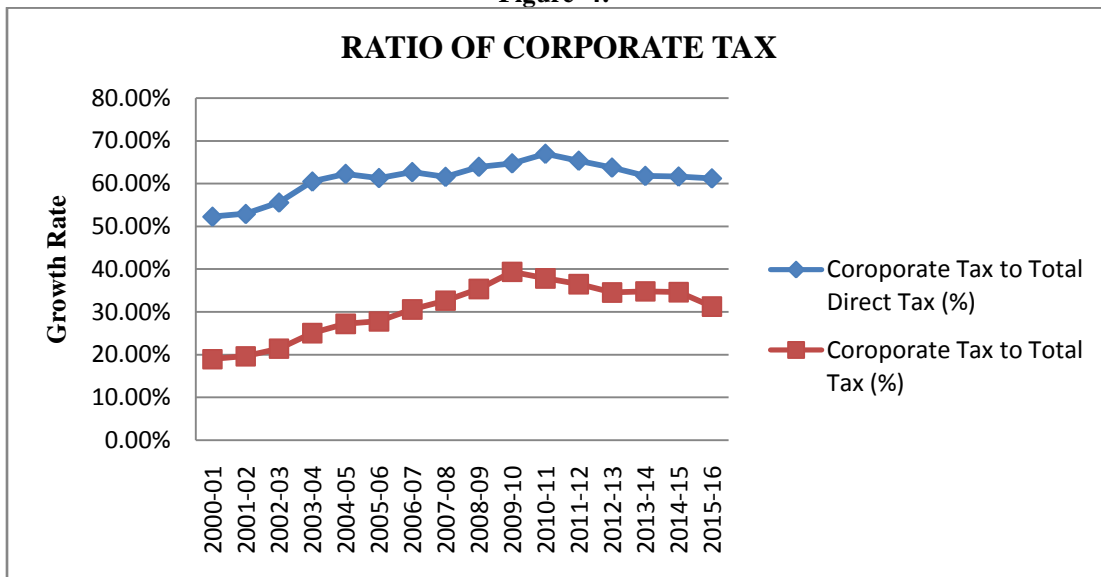
Table No. 4:-

Corporate Tax Ratios (Rs. In Crores)					
Financial Year	Corporate Tax	Total Direct Tax	Corporate Tax to Total Direct Tax (%)	Total Tax (Direct + Indirect)	Corporate Tax to Total Tax (%)
2000-01	35,696	68,305	52.26%	1,88,119	18.98%
2001-02	36,609	69,198	52.90%	1,86,516	19.63%
2002-03	46,172	83,088	55.57%	2,15,696	21.41%
2003-04	63,562	1,05,088	60.48%	2,53,696	25.05%
2004-05	82,680	1,32,771	62.27%	3,03,707	27.22%
2005-06	1,01,277	1,65,216	61.30%	3,64,564	27.78%
2006-07	1,44,318	2,30,181	62.70%	4,71,719	30.59%
2007-08	1,93,561	3,14,330	61.58%	5,93,361	32.62%
2008-09	2,13,395	3,33,818	63.93%	6,03,251	35.37%
2009-10	2,44,725	3,78,063	64.73%	6,22,002	39.34%
2010-11	2,98,688	4,45,995	66.97%	7,89,711	37.82%
2011-12	3,22,816	4,93,987	65.35%	8,84,940	36.48%
2012-13	3,56,326	5,58,989	63.74%	10,31,904	34.53%
2013-14	3,94,678	6,38,596	61.80%	11,33,943	34.81%
2014-15	4,28,925	6,95,792	61.65%	12,39,007	34.62%
2015-16	4,54,419	7,42,295	61.22%	14,54,180	31.25%

(Source: IT Department, Govt. Of India)

The Table- 4 data help us to interpret corporate tax to direct tax and total tax. In 2000-01 the corporate tax is 52.26% of total direct tax revenue. But gradually it increased and by 2010-11 it reached to 66.97%. After that it started declining, by 2015-16 it is 61.22%. The corporate tax to total tax is 18.98% in 2000-01. It increased by 20.36% in 2009-10. Once again it started declining and come down to 31.25% in 2015-16. The authority should take steps to bring down the much dependency on corporate tax to direct tax.

Figure 4:-



Corporate tax to total direct tax shows an uptrend during the period 2001-02 to 2010-11 as shown in figure-4, after that it shows declining trend till 2015-16. Corporate tax to total tax shows an upward trend during the period 2001-02 to 2009-10, after that it declined. By, 2015-16 corporate tax to total direct tax and total tax is 61.22% and 31.25% respectively.

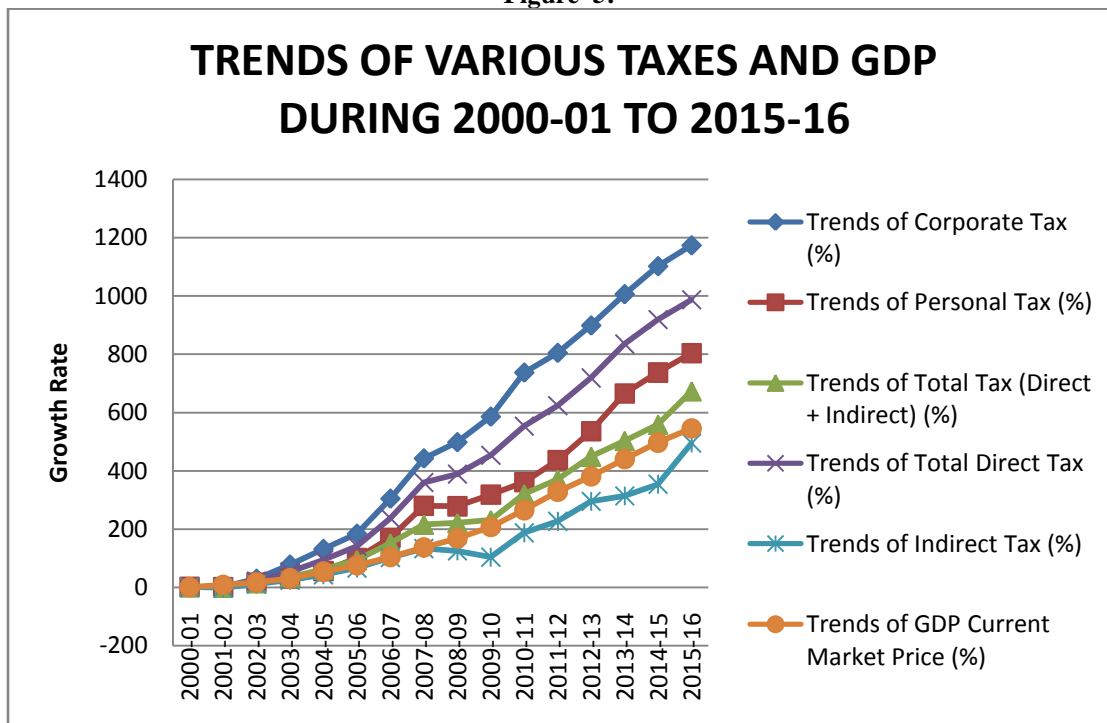
Table No 5:-

TRENDS OF VARIOUS TAXES AND GDP DURING 2000-01 TO 2015-16						
Financial Year	Trends of Corporate Tax (%)	Trends of Personal Tax (%)	Trends of Total Tax (Direct + Indirect) (%)	Trends of Total Direct Tax (%)	Trends of Indirect Tax (%)	Trends of GDP Current Market Price (%)
2000-01	1.00	1.00	1.00	1.00	1.00	1.00
2001-02	2.56	0.76	-0.85	1.31	-2.08	8.50
2002-03	29.35	16.06	14.66	21.64	10.68	16.92
2003-04	78.06	30.29	34.86	53.85	24.03	31.02
2004-05	131.62	55.11	61.44	94.38	42.67	54.22
2005-06	183.72	100.51	93.79	141.88	66.38	75.68
2006-07	304.30	169.56	150.76	236.99	101.59	104.28
2007-08	442.25	279.14	215.42	360.19	132.89	137.21
2008-09	497.81	277.89	220.68	388.72	124.88	167.80
2009-10	585.58	318.19	230.64	453.49	103.60	207.15
2010-11	736.75	360.45	319.79	552.95	186.87	265.02
2011-12	804.35	435.77	370.42	623.21	226.30	328.55
2012-13	898.22	535.44	448.54	718.37	294.71	381.04
2013-14	1,005.66	664.66	502.78	834.92	313.43	440.11
2014-15	1,101.61	736.71	558.63	918.65	353.38	496.53
2015-16	1,173.02	802.91	673.01	986.74	494.16	545.33

(Source: IT Department, Govt. Of India)

In Table No. 5 taking 2000-01 as base year by 2015-16 the growth rate of various taxes is shown. In respect to corporate tax the growth is highest in comparison to all other taxes. Its growth is near 1,173 % and indirect tax is grown with least that is by 494.16%. The personal tax grew by 802.91%.

Figure 5:-



Here 2000-01 is the base year. The figure shows the growth of various ratios and GDP from base year. From 2009 onwards direct taxes trends getting steeper which is not supporting to an economy like India. Total Taxes trends above the GDP which indicates that the government is not replacing new avenues for revenue like royalty, tax on agriculture income, property taxes etc.

**Tax To Gdp Ratio (Analysis):-**

The Tax-to-GDP ratio is the ratio of tax collected compared to national gross domestic product (GDP). Some countries seek to increase the tax-to-GDP ratio by a certain percentage to tackle deficiencies in their budgets.

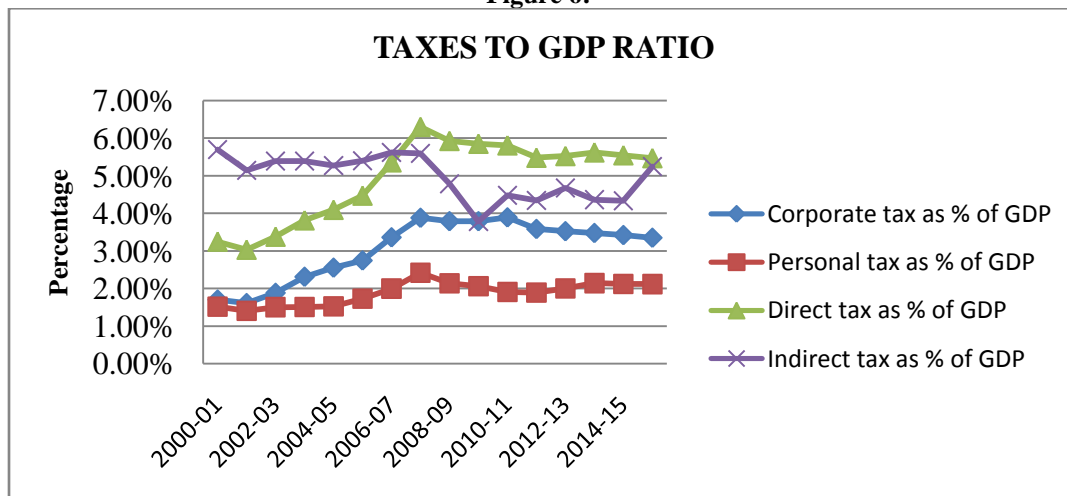
**Table No. – 6**

Different Taxes To Gdp Ratio				
Financial Year	Corporate tax as % of GDP	Personal tax as % of GDP	Direct tax as % of GDP	Indirect tax as % of GDP
2000-01	1.70%	1.51%	3.25%	5.70%
2001-02	1.60%	1.40%	3.03%	5.14%
2002-03	1.88%	1.50%	3.38%	5.39%
2003-04	2.31%	1.50%	3.81%	5.39%
2004-05	2.55%	1.52%	4.10%	5.27%
2005-06	2.74%	1.72%	4.47%	5.40%
2006-07	3.36%	1.99%	5.36%	5.62%
2007-08	3.88%	2.41%	6.30%	5.60%
2008-09	3.79%	2.13%	5.93%	4.79%
2009-10	3.79%	2.06%	5.85%	3.78%
2010-11	3.89%	1.91%	5.81%	4.48%
2011-12	3.58%	1.89%	5.48%	4.34%
2012-13	3.52%	2.00%	5.53%	4.68%
2013-14	3.48%	2.14%	5.62%	4.36%
2014-15	3.42%	2.12%	5.55%	4.33%
2015-16	3.35%	2.11%	5.47%	5.25%

(Source: IT Department, Govt. Of India)

The Table No – 6 shows the ratio of various tax to GDP ratio. In 2000-01 the indirect tax to GDP ratio i.e. 5.70% is highest in comparison to other taxes. In subsequent period Indirect tax to GDP ratio declining up to 2009-10. After that it uptrend once again and reach to 5.25%. Corporate tax to GDP ratio is 1.70% in 2000-01 and reached to 3.89% in 2010-11 at highest level during 2000-01 to 2015-16. But after that it declining and reached to 3.35%. The personal tax to GDP ratio reached to the peak level 2.41% during the same period. After 2007-08 it declined up to 2011-12. It is noticed that the personal tax to GDP ratio is volatile. Direct tax to GDP ratio was 3.25% in 2000-01, except 2001-02 and it moves upward till 2007-08. Though both personal and corporate tax ratio declined in 2008-09 hence direct tax to GDP ratio also declined.

**Figure 6:-**



The figure-6 shows that the personal tax-GDP ratio remained low throughout 2000-01 to 2015-16. It implies that personal incomes tax contributes very less to the economy as compare to other taxes. It is an unpleasant scenario for an emerging economy. It widens the gap between poor and rich. In this case Government should either widen the tax base or increase the tax rate. But as Kelkar report suggests increasing the tax rate will lead to tax evasion, and window dressing, so widening the tax base is required. Corporate tax to GDP is just 3.25% in 2000-01 but it increased to 5.47% by 2015-16. In case of indirect tax to GDP ratio the rate is higher as compare to other tax ratios. More dependent on indirect tax leads to reducing the purchase power of the common man. So the indirect tax rate should be moderate. As suggested by Kelkar committee report GST should be brought as soon as possible for rationalising indirect taxes which should be associated with reducing subsidies and indirect tax rate. Subsidies are not reaching the needy. If subsidy is required to be given the DBT (Direct Benefit Transfer) should come into picture at every case as it happened with fertiliser and domestic cooking gas case brought by Government of India

#### International Experience (Brics):-

India is the fastest growing nation in 2015-16 and one of the emerging economies in the world. Every country wants to keep good relation with India. The relationship may either in bilateral or multilateral. India is member of various multilateral institutions. BRICS is the collaboration of Brazil, Russia, India, China and South Africa. These countries are emerging countries as like as India. So a comparison of tax to total revenue is done from 2000 to 2015 for better picture.

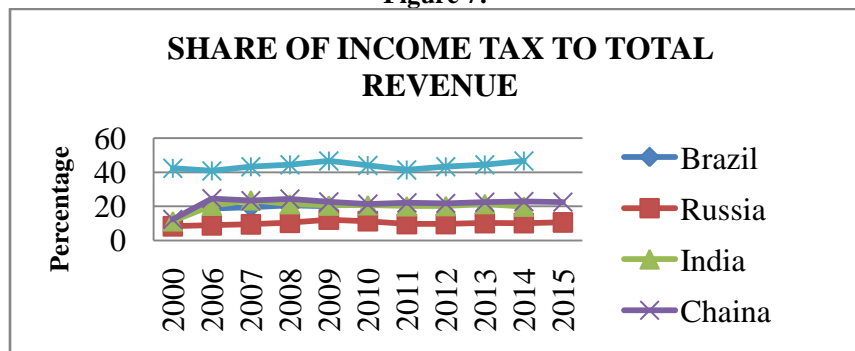
**Table No.- 7**

Share Of Income Tax To Total Revenue (Brics Countries)					
Year	Brazil	Russia	India	China	South Africa
2000	NA	8.3	11.3	12.4	42.3
2006	18.7	8.8	20.4	24.5	40.8
2007	19.4	9.5	23.6	23.3	43.3
2008	20.5	10.4	21.3	24.3	44.4
2009	19.9	12.2	20.5	22.6	46.6
2010	NA	11.2	20.7	21.3	43.9
2011	NA	9.6	20.1	22.0	41.3
2012	NA	9.6	20.2	21.7	43.3
2013	NA	10.2	21.4	22.4	44.4
2014	NA	10.1	19.9	22.8	46.6
2015	NA	10.6	NA	22.5	NA

(Source: BRICS\_Joint\_Statistical\_Publication\_2016)

The share of income tax to total revenue ratio amongst BRICS countries shows that Brazil, China and South Africa contributes higher in comparison to India. South Africa maintains the income tax share in total revenue with around more than 40% which is good for any economy. In South Africa Income tax to total revenue in the year 2000 was 42.3%. Year by year it increased and reached 46.6% in 2014. Whereas China, India and Brazil maintain their income tax to total revenue near around 20%. Among them China has 22.5% share of income tax to total revenue in 2015. India has 19.9% in 2014. Russia's income tax ratio in total revenue is around 10.6% in 2015.

**Figure 7:-**



In comparison with other BRICS countries India's ratio of income tax to total revenue is lower than South Africa and China and higher than Brazil and Russia. South Africa's income tax share in total revenue is increasing; it is also the case of China. Except these two countries other three countries ratio is uneven. Taking the background of

Russia and China which are socialist (Communist) economy and later on liberalised, it is natural the share of income tax to total revenue would not rise at a faster rate. In case of South Africa the ratio is quite high and it is presumed that perhaps individual income tax contributes more towards the resources for development.

#### Effective Assesses And Tax Base Analysis:-

Tax base means number of tax payers come into a particular income regime and accordingly tax slabs are fixed. As per the tax slab the assessee pay tax. In India, currently three types of tax slabs existed i.e. 2.5 lakhs to 5 lakhs (5% slab), more than 5 lakhs to 10 lakhs (20% slab) and more than 10 lakhs (30% slab).

**Table No 8:-**

Comparison Of Number Of Effective Assesses With Personal Tax Collection						
Financial Year	Individual Effective Assess	Growth of no of Individual Assesses	Trend of Individual Assesses	Personal Tax Collection (In Crore)	Growth of Personal Tax collection	Trend of Personal Tax Collection
2000-01	206,62,926		0.00%	31,764		0.00%
2001-02	237,34,413	14.86%	14.86%	32,004	0.76%	0.76%
2002-03	259,35,556	9.27%	25.52%	36,866	15.19%	16.06%
2003-04	266,24,224	2.66%	28.85%	41,386	12.26%	30.29%
2004-05	247,92,990	-6.88%	19.99%	49,268	19.05%	55.11%
2005-06	273,70,659	10.40%	32.46%	63,689	29.27%	100.51%
2006-07	293,55,248	7.25%	42.07%	85,623	34.44%	169.56%
2007-08	308,68,243	5.15%	49.39%	1,20,429	40.65%	279.14%
2008-09	301,01,260	-2.48%	45.68%	1,20,034	-0.33%	277.89%
2009-10	313,84,084	4.26%	51.89%	1,32,833	10.66%	318.19%
2010-11	408,83,558	30.27%	97.86%	1,46,258	10.11%	360.45%
2011-12	443,46,852	8.47%	114.62%	1,70,181	16.36%	435.77%
2012-13	490,33,288	10.57%	137.30%	2,01,840	18.60%	535.44%
2013-14	486,63,680	-0.75%	135.51%	2,42,888	20.34%	664.66%

(Source: CBDT & IT Department, Govt. Of India)

The table no.- 8 data shows that individual assesses are growing 135.51% during 2000-01 to 2013-14 financial year. Whereas, the total direct personal tax collection grew by 664.66%. The growth of number of individuals effective assesses has been doubled during this period. During the year 2010-11 the total returned filed was about 3.3% of the total population of India whereas the ratio of returned filed by Singapore was 39%, USA 46%, and New Zealand 75%. Since the returned filed ratio in India is very low, widening of direct tax base is required to include more people to come into the tax base.

**Table No. 9:-**

Comparison Of Growth Effective Corporate Assesses With Collection Growth						
Financial Year	Company Effective Assess	Growth of no of Companies	Trend of no of Companies	Corporate Tax Collection (In Crore)	Growth of Corporate tax collection	Trend of Corporate tax collection
2000-01	3,34,261	0	0	35,696	0	0
2001-02	3,49,185	4.46%	4.46%	36,609	2.56%	2.56%
2002-03	3,65,124	4.56%	9.23%	46,172	26.12%	29.35%
2003-04	3,72,483	2.02%	11.43%	63,562	37.66%	78.06%
2004-05	3,73,165	0.18%	11.64%	82,680	30.08%	131.62%
2005-06	3,82,021	2.37%	14.29%	1,01,277	22.49%	183.72%
2006-07	3,98,014	4.19%	19.07%	1,44,318	42.50%	304.30%
2007-08	4,98,066	25.14%	49.01%	1,93,561	34.12%	442.25%
2008-09	3,27,674	-34.21%	-1.97%	2,13,395	10.25%	497.81%
2009-10	3,67,884	12.27%	10.06%	2,44,725	14.68%	585.58%
2010-11	5,96,377	62.11%	78.42%	2,98,688	22.05%	736.75%
2011-12	6,54,766	9.79%	95.88%	3,22,816	8.08%	804.35%
2012-13	7,02,621	7.31%	110.20%	3,56,326	10.38%	898.22%
2013-14	7,14,419	1.68%	113.73%	3,94,678	10.76%	1005.66%

(Source: IT Department and Finance Ministry, Govt. Of India)

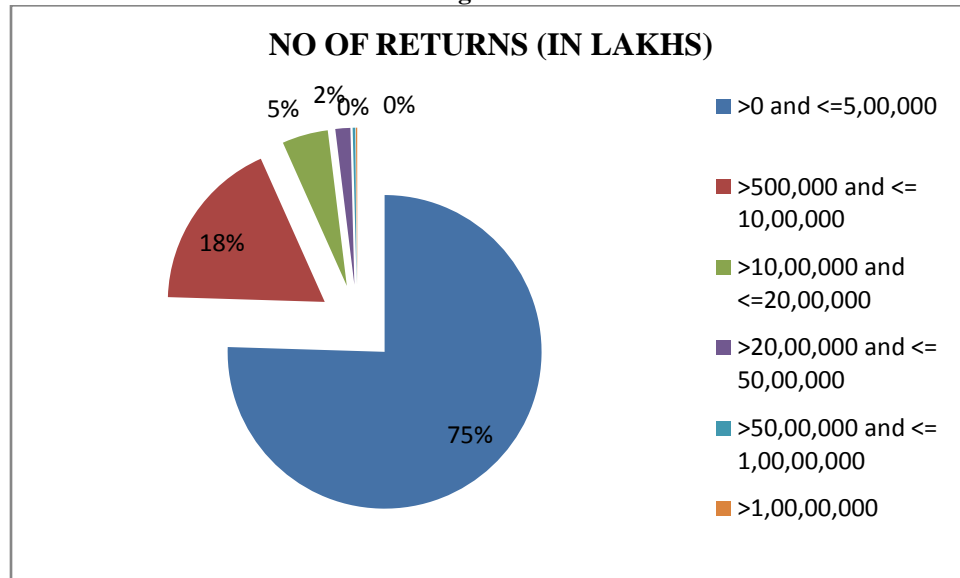
The corporate assesses were 3,34,261 in 2000-01 and by 2013-14 financial year their numbers uptrend to 7,14,419. It means around 113.73% growth in number of corporate tax assesses. In relation to that the corporate tax collection has grown by 1005.66%. It indicates that a few number of companies are paying large amount of tax. Again as on March 2011, the total companies at work as per records of Registrar of Companies is 7,14,555 where as 5,96,377 companies have filed their Income tax return which means about 1,18,178 companies has not at all filed the return even though they are statutorily bound to file Income Tax Return.

**Table No 10:-**

<b>Tax Base Of Individual Assesses For Assessment Year 2014-15</b>				
Range (in INR)	No of Returns (In Lacs)	Percentage of No of Returns (%)	Sum of Gross Total Income (in Crore INR)	Percentage of Sum of Gross Total Income
>0 and <=5,00,000	275,62,563.00	75.49%	7,37,756.00	12.82%
>500,000 and <= 10,00,000	65,09,561.00	17.83%	8,10,008.00	14.07%
>10,00,000 and <=20,00,000	17,30,064.00	4.74%	11,30,979.00	19.65%
>20,00,000 and <= 50,00,000	5,63,614.00	1.54%	11,03,078.00	19.17%
>50,00,000 and <= 1,00,00,000	98,815.00	0.27%	10,63,611.00	18.48%
>1,00,00,000	48,417.00	0.13%	9,09,718.00	15.81%
Total	365,13,034.00	100.00%	57,55,150.00	100.00%

Source (Income Tax Return Statistics-2014-15, CBDT, Govt. Of India)

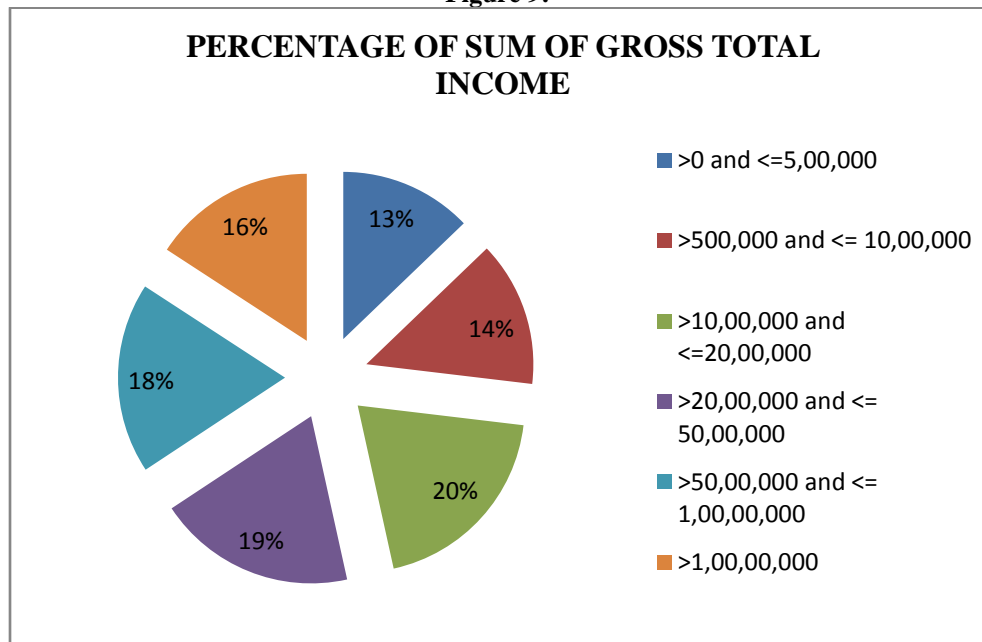
**Figure 8:-**



In zero to 5 lakhs income slab consisting of 2.76 crores nos of assesses which constitutes around 75% which represents that the major effective tax assessee are in low income group. In 5 to 10 lakhs slab consisting of 65 lakhs nos of assesses which constitutes around 18% which means around 93% of effective assesses is having income below 10 lakhs and the balance 7% which is around 7 lakhs assesses is having income of more than 10 lakhs. In contrast to that around 17.87 lakhs passenger car have purchased during the financial year 2013-14. This gap indicates that the practice of non-compliance of tax is very high in India as compared to BRICS countries and many developed and emerging economies.



Figure 9:-



The gross total income shows that 16% of total income lies with 0.13% population. 1.47 lakh assesses are above 50 lakh income category their ratio in total income is 34%. There is miniscule of tax return in India i.e. around 89 lakh assesses out of 130 crore population are above the 5 lakhs income category which is less than 1% of total population. Hence there is a huge gap to increase the tax base to bring more people into the tax bracket..

### Suggestions:-

1. **Expansion of Scope for Presumptive Taxation:** Presumptive taxation involves use of indirect means to ascertain tax liability, which differ from the usual rules based on the taxpayer's accounts. Various presumptive taxation methods are in use including reconstruction of income, percentage of gross receipts, asset based taxation, industry specific methods, methods based on outward signs of life style, etc. Argentina and Mexico have adopted the asset based taxation method. Ghana applies a minimum tax based on an individual's profession or trade. France and Belgium use a contractual method based on an advance agreement between the taxpayer and tax administration to base the tax liability on estimated income instead of actual income. In Israel and France, extensive work has been done to establish prevailing profit rates in various business activities. Presumptive of tax base should be extended to other tax fields.
2. **Discourage Cash Economy/ Encourage Cashless economy:** The cash economy is a major handicap in the Indian economic system. Large-scale transactions are understood to take place in cash. Cash plays an important role in generation of black money. It has always been a facilitator of black money since transactions made in cash do not leave any audit trail. Unorganised sectors have remained under-taxed or untaxed. It has given rise to a large cash economy which comprises mainly the unorganised sector that tends to include small businesses, as well as high net-worth individuals. With Cashless economy the tax base shall start widening with the inclusion of the entire sector under tax net.
3. **Tax on Agriculture Income:** Only state government can impose/levy tax of agricultural income. This may be revisited on the light of introduction of GST- a new approach to levy of tax and again it shall help in compensating the loss incurred by state and the obligation by Central to state. The principle should be in line with ability to pay i.e. the richer farmer should not be an exception to universally recognised principles.
4. **Imposition of more Tax on High Net Worth Individuals:** Direct personal taxes are imposed for equity, peace, and balanced growth in the society. To fulfil this, it is essential to tax more to higher net worth individuals and use it in developmental activities where all stake holder of the society will get its benefit.

5. Imposition of Property Tax: If better service delivery requires more resources, where can they be found? Perhaps the greatest immediate scope for revenue comes from the property tax. Property tax as a share of own revenue is above 50 per cent in Kanpur and Lucknow, but it is less than 15 per cent in Bhopal and Ranchi. So, the problem is not necessarily that Urban Local Bodies cannot raise resources because they are prevented from doing so. The major factors contributing to poor realisation from property tax are the poor assessment rate, weak collection efficiency, flawed methods for property valuation, loss on account of exemptions, and poor enforcement. In an exercise done for the Survey an attempt has been made to assess the property tax potential of Bengaluru and Jaipur using the latest satellite-based imagery. The results estimate that currently Bengaluru and Jaipur are collecting no more than 5 to 20 per cent of the property tax potential. Put differently, cities could increase their resources five to twenty fold. All efforts must be directed at realising potential of property taxes.
6. Allowance of various Deductions and Rebates: Under Direct Tax various Deductions and Rebates can be provided and this can be availed only on Filing of Tax Returns: From various findings and with our observation we see that many people are getting deductions, rebates and subsidies without filling tax returns. Government should make mandatory provision in this regard that those who want to get rebates or subsidies or deductions should file the returns give an affidavit in the assessment year.
7. Gradual Reduction/Withdrawal of Various Subsidies And Exemptions: Many good persons are frustrated with the way government gives subsidies and allowing exemptions to the unwanted people, those who actually want to take just advantage of this type of schemes. So Government must abolish all exemptions and subsidies and in place of that give soft loan and scrutinise in a scientific and , systematic way regularly so that chances of misuse shall be minimum.
8. Expanding Tax Base: In assessment year 2014-15, 4.87 crore people filed return which is less than 4% of total population. Domestic tax evasion is more concern than chasing black money abroad and is a testimony of India's failure to broaden its tax net. No of Salary Assessee having Income of more than 10 lacs is 11 lacs. India still have plenty of citizens who go out and buy expensive cars and jewellery but are not willing to pay the taxes to government on Income they earn. The sad fact is that all of us are too used to the freebies.
9. Inclusion of Unorganised and Rural Income under the expanded tax base: If we look at the unorganised or rural enterprises, we can see that many of them either do not know about the tax or do not want to pay tax. It is essential for an emerging economy like India to include them into the tax base. It is possible through awareness and investigation. If we can knock these sections then India's GDP as well as growth will be stronger by small contributions from this sector.
10. Reform in Tax Administrators: In India it is assumed that, why should pay so much tax, let's give some amount to government and some tax assessment officer and rest is our pocket. For example if a person is taxable income of 25 lakh for 2016-17 assessment year, then his tax liability is around 5.93 lakh. In place of showing taxable income of 25 lakh he shows a profit of 15 lakh and tax liability is 2.83 lakh. If scrutiny incurred then he pay 50000 to the tax assessment officer and rest 1.6 lakh remained with the tax payer. So government should dismiss such officers and seize all the property of that tax officer. The judiciary also must support and take strong actions so that no one will think about such embezzlement. This is possible only by bringing necessary reforms and transparency in tax administration which will help building of trust between tax assessee and tax administration

### **Conclusion:-**

There has been a good start by the present Government in widening the tax base through tax reforms both in direct and indirect taxes. At execution level the initiative should be honest and vigorous one so that the entire potential tax payers comes under its purview which in turn shall contribute to national tax revenue which shall further enable the Government to spend in providing basic social security measures and it shall also help in developing a healthy tax infrastructure in line with developed countries where the direct tax collection is lion share to total revenue. So, there is a need for creating transparent, friendlier and less discriminatory administrative system. Further there is also a need to educate the people about Indian tax law and create such an environment in which they pay their due taxes, do not evade the tax and feel proud in discharging their duty to pay the taxes. The rural India should be connected to the main stream if large farmers and land holders are brought under the tax net.

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### RESEARCH ARTICLE

#### PRODUCTION OF BIOPLASTICS FROM MICROORGANISMS.

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Polyhydroxyalkanoates, Bioplastic,  
 Sudan Black, Secondary Metabolite,  
 Cost Effective

#### Abstract

The deleterious effects of synthetic plastics and their products have become a major concern for researchers. Bioplastics or plastics produced by the microorganism is a promising replacement for the conventional synthetic plastics. Polyhydroxyalkanoate a biologically produced biodegradable substance that has characteristic properties similar to that of conventional plastics. Polyhydroxyalkanoates are secondary metabolites of microorganisms which are produced under stressful conditions. In this work, four different samples were collected. These strains were then morphologically and biochemically characterized. The strains producing polyhydroxyalkanoates from each sample were identified by Sudan Black staining. A 48-hour culture of these strains was harvested and alkali lysis method was used to isolate polyhydroxyalkanoate and polyhydroxyalkanoate was quantified. Sample 2 had the highest polyhydroxyalkanoate accumulation % (95.65%). The method used for the production and isolation of polyhydroxyalkanoate was cost effective and ecofriendly.

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#### Introduction:-

Synthetic plastics are one of the greatest inventions of mankind and have been developed into a major industry and have become an essential part of our day to day life. They are designed in such a way that they are suitable for constant and long lasting performance causing them to be inert to natural and chemical breakdown. The durability of the disposed plastic had caused many serious environmental problems.

As dependence on synthetic plastics and their endless products have resulted in waste accumulation and greenhouse gas emission, recent technologies are more focusing on developing a bio-green substituent for plastic that exerts negligible side effects on the environment.

Polyhydroxyalkanoate (PHA), a biologically produced biodegradable substance which has similar characteristics of plastic have become a main focus for the research in finding a substituent for plastic. The PHA is the only bioplastics completely synthesised by the microorganism. PHA is the linear polyesters that are produced by bacterial fermentation of sugars or lipids which can be converted into CO<sub>2</sub> by microorganisms. They can be either thermoplastics or elastoplastic with the melting point ranging from 50 - 180 °C.

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PHA production is increased by the excess of carbon source and limiting the nutrients like nitrogen, phosphorous, sulphur, magnesium, iron etc (minimal media). It is secondary metabolite produced under stressful conditions. PHA is typically produced as a polymer of 103-104 monomers, which accumulates as inclusions of 0.2-0.5 micrometer in diameter.

PHA have rich properties depending on the structures over 150 different PHA monomers are reported homopolymers, random copolymers and block copolymers of PHA can be produced depending on bacterial species. PHA is thermoplastics, biodegradable, biocompatible, optically active and non-permeable.

As PHA can be used the field of packaging, medicine and much more, and due to cost-effectiveness & environmentally friendly properties, it is the promising alternative to the conventional plastics.

## Materials And Methods:-

### Materials

Samples, all the reagents used were obtained from SDFCL(Indian), Ranbaxy(Indian) and Fine Chemicals Ltd(Indian)

### Sampling

Four samples were collected from different places to isolate the PHA-producing bacteria.

**Table 1:- samples**

Sample – 1	Sludge (Chamrajpet)
Sample -2	Sewage (Jnana Bharathi)
Sample – 3	Yeast Granules
Sample -4	Forest soil (Wayanad)

### Isolation of Bacterial Strains:-

Isolation of bacterial strains was carried out by serial dilution of the samples in saline solution followed by plating of the samples onto nutrient agar media. The samples were then incubated at 37°C for 48 hours.

### Colony Characteristics:-

Once a bacterium has been obtained in pure culture, it has to be identified in order to study them [13].

### Gram Staining:-

Gram staining [2, 4, & 9] is one of the techniques employed to analyse the bacteria and to classify them in order to study them.

### Biochemical Test:-

For the biochemical characterization of the isolates biochemical tests [6, 10, 15, 17, 20, 21, & 22] were done for each isolate.

Motility of the bacteria was observed by hanging drop slide [11, 12, & 19]. This experiment is helpful in observing both motility and general shape of living bacteria.

### Screening of Bacterial Strains for PHA Accumulation by Sudan Black Staining.

Bacterial strains were screened for the accumulation of PHA by Sudan black staining [3 & 18]. Sudan Black stain is a dye that is soluble in fat and insoluble in water and thus accumulates in fat globules of the cell. It is used for staining neutral lipids and triglycerides and some lipoproteins. Thus Sudan Black stain is used to identify PHA granules as they are fat globules.

### Culturing of Micro-organisms in Minimal Media:

As PHA is a secondary metabolite and is produced under stressful conditions, it is very much necessary to culture the microorganisms in a minimal nutrient media [1, 7, & 24]. Minimal media is an unbalanced culture media which contain an excess of carbon sources but a very limited amount of oxygen, nitrogen, phosphorous, sulphur, or magnesium. This minimal media will provide the suitable conditions for active PHA production by the cells.

The bacterial strains identified to produce PHA by Sudan black staining were inoculated into the minimal nutrient media. 15 ml of each sample was directly inoculated into 50 ml of minimal media. Whereas in the case of yeast two granules (0.5g each) of dry yeast were inoculated. The samples were incubated for 48 hours.

#### Examination of Samples by Spectroscopy:-

The optical density of PHA produced by each sample was obtained by spectroscopy [16]. UV – Visible spectroscopy is an important technique to determine the formation and stability of PHA.

#### Extraction of PHA

The cells were harvested from a 48-hour culture by filtering using Whatmann filter paper. The filtrate was allowed to dry in the Petri plates overnight in the incubator. The dry cell mass was later scraped and weighed. 0.25 mg of all the samples were further used for the extraction of PHA. We used the method of alkali hydrolysis [14] for the extraction of PHA.

Dried biomass of 0.25 mg was suspended in 1.25 ml of water and pH was set (between 8 to 11) using 25% v/v ammonia solution. They were then incubated for 10 minutes at 50°C. It was further centrifuged at 6000 rpm for 10 minutes and washed with acetone. It was further dissolved in chloroform and filtered. The chloroform layer containing PHA was evaporated and dried overnight.

#### Quantification of PHA

It is very important to know the quantity of PHA in the different samples collected [7 & 25]. The bacterial culture was centrifuged at 6000 rpm to obtain the cell pellet and dried to estimate the dry cell weight (DCW) in units of g/L. Residual biomass was estimated as the difference between dry cell weight and dry weight of PHA extracted. This was calculated to determine the cellular weight and accumulation other than PHA's. The percentage of intercellular PHA accumulation is estimated as the percentage composition of PHA present in the dry cell weight.

Residual biomass g/L = DCW g/L - dry weight of extracted PHA g/L.

PHA accumulation (%) =  $\frac{\text{dry weight of extracted PHA g/L}}{[\text{DCW g/L}]} \times 100$

After 48 hours incubation at 37°C. The culture was collected and centrifuged at 10,000 rpm for 15 minutes and lyophilized.

The addition of methanol and water and vortexing the pellet and then centrifugation at 10,000 rpm for 15 minutes. Methanol is added to lyse the cells and to dissolve PHA. Water is added for separation of PHA in lipid solvent completely.

#### Results:-

##### Colony Characteristics:-

Bacterial colonies were characterised by colony Gram staining, characterization and biochemical tests. (Table 2 & table 3)

**Table 2:-** streak plate colony characteristics after 24 hours of incubation.

Sample number	Form	Margin	Elevation	Color	Light transmission
1	round	Smooth	convex	White	Translucent
2	irregular	Wavy	flat	White	Transparent
3	round	Smooth	Convex	Creamy	Opaque
4	irregular	Wavy	umbonate	White	Opaque

**Table 3:** Gram staining & Biochemical characteristics

Biochemical Test	Sample1	Sample2	Sample 3	Sample4A
Gram staining	-	+	-	-
Shape	Cocci	Bacilli	Cocci	Cocci
Motility	Motile	Non-motile	Non-motile	Motile
Fermentation Tests				
Glucose	A, G	A, G	A	A
Lactose	A, G	A	A	A
Sucrose	A, G	A	A	A
IMVIC TESTS				
Indole	+	+	+	+
MR	-	-		+
VP	+	+		-
Citrate utilization	+	+		+
Starch hydrolysis	-	-	+	+
Gelatin liquefaction	-	-	+	+
Nitrate reduction	-	-	-	-
Tryptone test	+	+	-	+
Mac Conkey Agar	-	-	-	+
Oxidase Test	+	+	+	+
Catalase Test	+	+	+	+

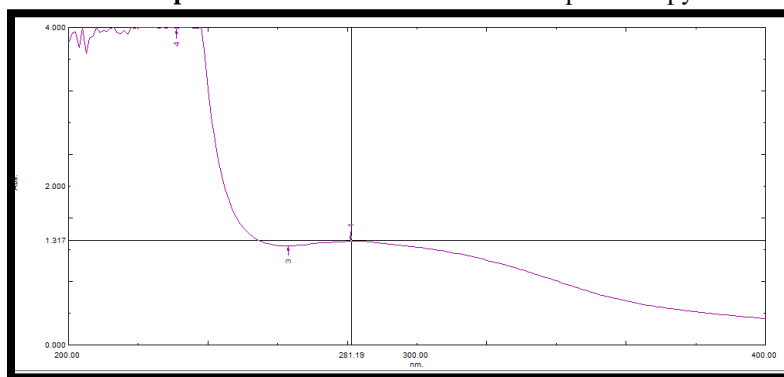
Examination of Samples by Spectroscopy, Extraction and Quantification of PHA

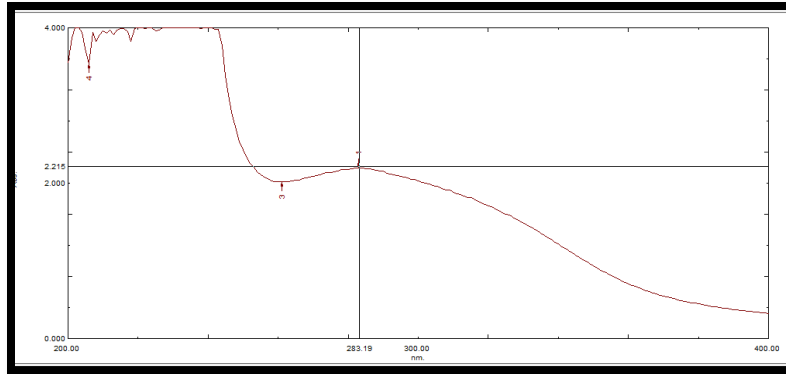
Optical density of PHA granules obtained from each sample was obtained using spectroscopy.

**Table 4:-** Optical density and absorption maxima of samples

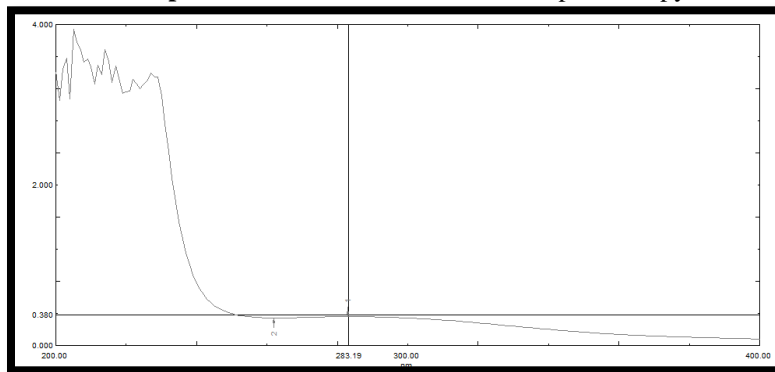
SAMPLE	MAX WAVELENGTH (nm)	OD
1	281.19	1.317
2	283.19	2.215
3	283.19	0.380
4	282.74	0.556

All the samples showed absorption maxima at 280nm which confirms the presence of PHA.

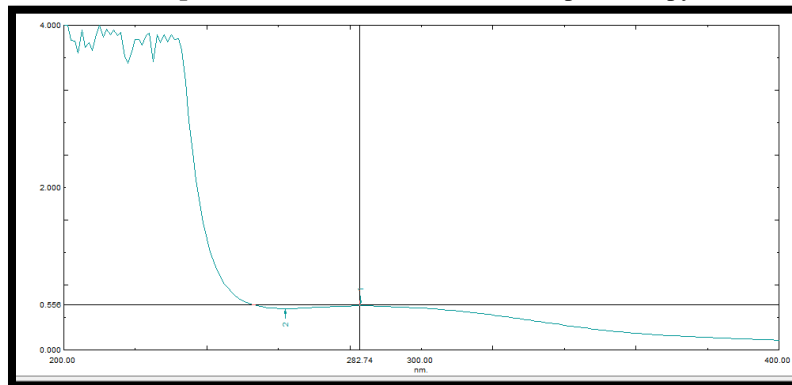
**Graph 1:-** SAMPLE 1 UV - Visible Spectroscopy**Graph 2:-** Sample 2 UV – Visible Spectroscopy



**Graph 3:- SAMPLE 3 UV – Visible Spectroscopy**

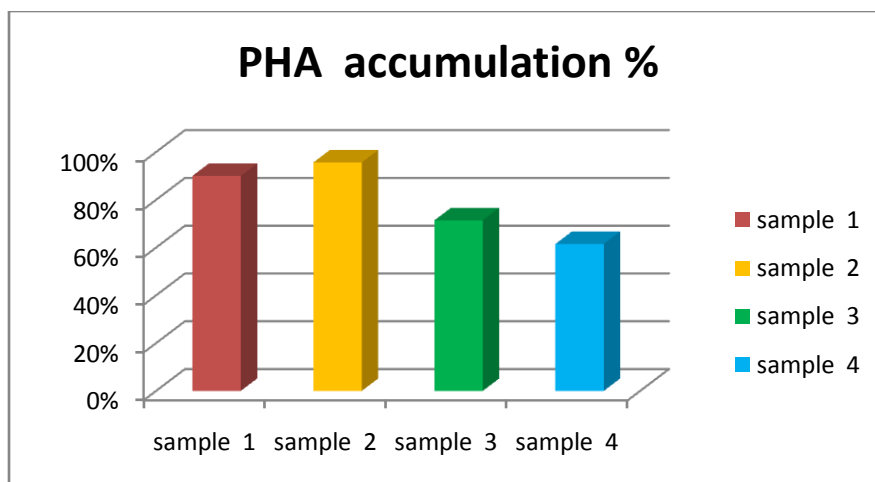


**Graph 4:- SAMPLE 4 UV - Visible Spectroscopy**



**Graph 5:- PHA accumulation % in each sample**





The PHA accumulation was found to be maximum in sample 2 followed by sample 1, 3 and 4.

### Discussion:-

PHA is a secondary metabolite produced by the various microbes present in nature. It can be of various types such as PHB, PHV, PHH and PHO [5]. The property of PHA being a biodegradable polymer makes it stand out of the crowd. But its high production cost compared to petrochemical - based plastics takes a back seat. Thus, during fermentation of microbes the biomass is produced in excess for the extraction of PHA. The aim is to find an easy and economic technique for the large scale production of PHA. Many common chemical methods using solvents have been used [8 & 23]. In certain cases, surfactants are used to recover the highly pure form of PHA. Out of the various novel techniques, alkali hydrolysis is a promising one as this proves to be comparatively simple and efficient. Various alkalis like sodium hydroxide, potassium hydroxide and ammonium hydroxide with varied pH can be used. It's important to note the effectiveness of the alkali in the digestion of non-PHA material without any distortion to the PHA. Retention of the properties of PHA depends on the technique of extraction. The efficiency of the production of PHA by microbes plays an important role in extraction. The microbes are isolated from various sites and are cultured in the minimal media. The minimal media induces the production of PHA in excess. The cells are then lysed and quantified for the PHA content. Sample 2 (sewage water) is the most promising source of PHA-producing bacteria (95.65%) compared to the other samples studied. Also highest accumulation is observed in waste containing samples. Therefore in future for large scale production, waste material can be utilized as PHA-producing bacteria's source.

### Conclusion:-

Bioplastics can replace petroleum based plastics primarily due to its biodegradability. It is more convenient to use bioplastics as they do not lead to the pollution of the environment and can be used widely to decrease the level of pollution. The production source of bioplastic is better in waste containing samples which is significant for commercial production.

### Acknowledgement:-

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### RESEARCH ARTICLE

## COMPARATIVE STUDY OF RESPONSE OF IRREGULAR STRUCTURES AND EFFECT OF SHEAR WALLS ON IRREGULAR BUILDINGS

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Response of Irregular RCC buildings, Soft-storey Drift & Displacement, Effect of Shear Walls on Soft-storey, Location of Shear Walls.

#### Abstract

A structure is “regular” if the distribution of its mass, strength, and stiffness is such that it will sway in a uniform manner when subjected to ground shaking – that is, the lateral movement in each storey and on each side of the structure will be about the same. Regular building configurations are almost symmetrical (in plan and elevation) about the axis and have uniform distribution of the lateral force-resisting structure such that, it provides a continuous load path for both gravity and lateral loads. A building with absence of symmetry and has discontinuity in geometry, mass or load resisting elements is called irregular. These irregularities may cause interruption of force flow and stress concentrations. Asymmetrical arrangements of mass and stiffness of elements may cause a large torsional force because the centre of mass does not coincide with the centre of rigidity. In this study L-shape plan of G+7 storey reinforced concrete building have been selected. The models are analyzed in two phases, in First Phase the building is analyzed without shear walls and soft-storey in Ground floor and Second Phase the same building is analyzed with shear walls and having soft-storey in Ground floor. In the Second Phase also the shear walls are added to the model in two different cases, to study the best location of shear walls in the building. The models are analyzed by STAAD. Pro V8i SS6 software using IBC-2012<sup>(9)</sup> code (International building code 2012), by Linear Static Method. As the IBC-2012 Draft Code (Afghanistan Building Code-2012) is used for structures in Afghanistan, so the IBC-2012 code has been selected for analysis. The aim of this paper is to study the effect of shear walls on soft-storey and compare the response of irregular building having shear walls with irregular buildings without shear walls. The results are summarized on basis of the response of building.

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#### Introduction:-

A weak storey is defined as one in which the story's lateral strength is less than 80 percent of that in the storey above. The storey lateral strength is the total strength of all seismic resisting elements sharing the storey shear for

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the direction under consideration, i.e. the shear capacity of the column or shear walls or horizontal component of the axial capacity of diagonal braces. Inadequate strength of frame columns usually make storey weak. A soft storey is one in which the lateral stiffness is less than 70% of that in the storey immediately above, or less than 80% of the combined stiffness of the three stories above (see Fig.1.1). The important characteristics of a weak or soft storey consist of a discontinuity of strength or stiffness, which occurs at the second storey connections. This discontinuity is caused by lesser strength, or increased flexibility, the structures results in large deflections in first storey of the structure, which in turn consequences in concentration forces at the second storey connections. The result is a connection of inelastic actions.

In reinforced concrete building in addition to slabs, beams and columns the vertical plate-like reinforced concrete wall is called shear wall, which is constructed from foundation level and continues throughout the building height and shear walls act like vertically oriented wide beam which carry lateral loads to the foundation of building. During past earthquake the buildings which are properly designed and detailed with shear walls have shown very good resistance to the seismic loads. In most earthquake prone countries, like USA, New Zealand and Chile shear walls buildings are common choice. In addition shear walls can be constructed easily, since the detailing of reinforcement is straight forward and its placing at site is easy. Shear walls are effective due to construction cost and minimizing the damage of earthquake in structural and non-structural elements of the building.

In this study L-shape plan of G+7 storey reinforced concrete building have been selected. The models are analyzed in two phases, in First Phase the building is analyzed without shear walls and soft-storey in Ground floor and Second Phase the same building is analyzed with shear walls and having soft-storey in Ground floor.

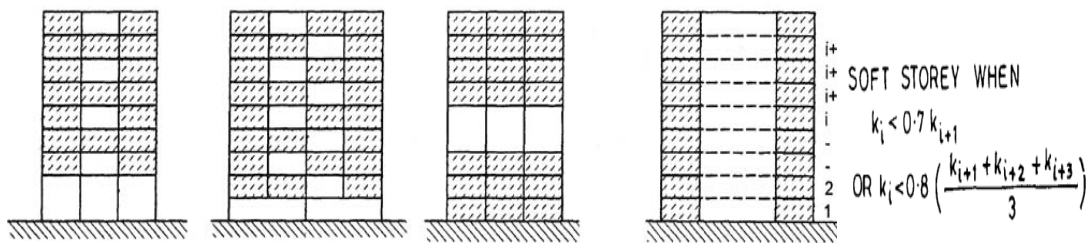


Fig. 1:-Stiffness Irregularities-Soft Storey

In a study of a residential building of G+15 irregular high-rise building without shear wall and with shear wall was considered to compare lateral loads, torsion effects and storey drifts. In comparison, it was summarized that the lateral forces are decreasing if the shear walls are located in proper location of frame and the values of lateral forces are minimum<sup>(5)</sup>. Eccentricity cause torsion in structures and structural in case of large torsion the elements or the entire structure may be deflect beyond its lateral deflection limit. If the adjacent buildings are not separated from each other properly, so torsional irregularity may cause pounding. If strength of structural elements increase on weak direction or decrease on strong direction, the effects of torsion on structures can be prevented. The best solution is that the structural systems should be designed without irregularities including torsional irregularity<sup>(8)</sup>. With refuse area beams, mass irregular building deflection will be more than without mass irregular building. The mass irregular building moment is 67% more than without mass irregular building. The size of member and amount of reinforcement increase in building that have mass irregularity<sup>(4)</sup>.

#### Irregular and Regular Classification of Structures:-

Structures can be classified due to various structural irregularities. Such classification shall be based on their structural configurations. Generally structures irregularities as per IBC-2012 (ASCE-7-10) code are defined as under.

**Horizontal irregularity:** -Horizontal irregularities are divided into five categories.

1. (a) Torsional Irregularity: Torsional irregularity is exist, where the maximum storey drift, computed including accidental torsion with  $A_x = 1.0$ , at one end of the structure transverse to an axis is more than 1.2 times the average of the storey drifts at the two ends of the structure. Torsional irregularity requirements in the reference sections apply only to structures in which the diaphragms are rigid or semi-rigid.

1. (b) Extreme Torsional Irregularity: Extreme torsional irregularity is exist, where the maximum storey drift, computed including accidental torsion with  $A_x = 1.0$ , at one end of the structure transverse to an axis is more than 1.4 times the average of the storey drifts at the two ends of the structure.

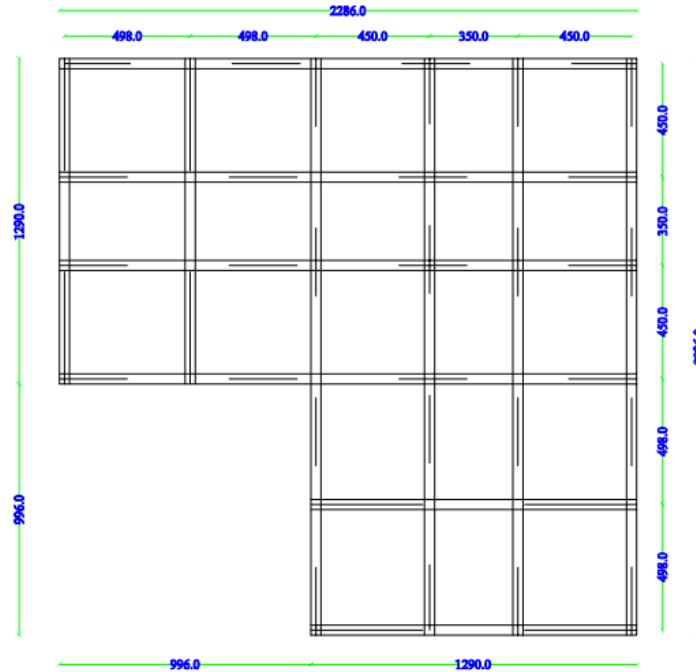
2. **Reentrant Corner Irregularity:** Reentrant corner irregularity is defined to occur where both plan projections of the structure beyond a reentrant corner are greater than 15% of the plan dimension of the structure in the given direction.
3. **Diaphragm Discontinuity Irregularity:** Diaphragm discontinuity irregularity is defined to exist where there is a diaphragm with a sudden discontinuity or variation in stiffness, including one having open area more than 50% of the gross enclosed diaphragm area, or an alteration in effective diaphragm stiffness of more than 50% from one of the next storey.
4. **Out-of-Plane Offset Irregularity:** Out-of-plane offset irregularity is that to present where there is a discontinuity in a lateral force-resistance path, such as an out-of-plane offset of at least one of the vertical elements.
5. **Non-parallel System Irregularity:** Non-parallel system irregularity is exist, where vertical lateral force-resisting elements are not parallel to the major orthogonal axes of the seismic force-resisting system.

**Vertical Irregularity:** -Vertical irregularities are divided into five types.

1. (a) **Stiffness-Soft Storey Irregularity:** Stiffness-soft storey irregularity is defined, if a storey lateral stiffness is less than 70% of the storey above or less than 80% of the average stiffness of the three stories above.
1. (b) **Stiffness-Extreme Soft Storey Irregularity:** Stiffness-extreme soft storey irregularity is defined, if a storey lateral stiffness is less than 60% of the storey above or less than 70% of the average stiffness of the three stories above.
2. **Weight (Mass) Irregularity:** Weight (mass) irregularity is defined where the effective mass of any storey is more than 150% of the effective mass of an adjacent storey. Generally roof is lighter than the floor below is not to be considered.
3. **Vertical Geometric Irregularity:** Vertical geometric irregularity is defined, where the horizontal dimension of the seismic force-resisting system in any storey is more than 130% of adjacent storey.
4. **In-Plane Discontinuity in Vertical Lateral Force-Resisting Element Irregularity:** In plane discontinuity in vertical lateral force-resisting elements irregularity is if there is an in-plane offset of a vertical lateral force-resisting element which causing in overturning demands on a supporting column, beam, slab, or truss.
5. (a) **Discontinuity in Lateral Strength-Weak Storey Irregularity:** Discontinuity in lateral strength-weak storey irregularity is that, where lateral strength of a storey is less than 80% of the above storey. The storey lateral strength is the total lateral strength of all seismic-resisting elements that sharing the storey shear for the direction under consideration.
5. (b) **Discontinuity in Lateral Strength-Extreme Weak Storey Irregularity:** Discontinuity in lateral strength-extreme weak storey irregularity is where the storey lateral strength is less than 65% of the storey above. The storey strength is the total strength of all seismic-resisting elements that sharing the storey shear for the direction under consideration.

**Details of RCC Buildings Selected for study:-**

In this study L-shape plan of G+7 storey reinforced concrete building have been selected. The models are analyzed in two phases, in first phase the building is analyzed without shear walls and soft-storey in Ground floor and second phase the same building is analyzed with shear walls and having soft-storey in Ground floor. The plan of Building is shown in Fig. 2. The data for analysis of the selected building is given in the Table 1.



Not: All Dimensions are in cm.

Fig. 2:-Plan of G+7 Storey RCC Buildings

Table 1:- Data for the Building

Live load	4.0 kN/m <sup>2</sup> at typical floor 1.5 kN/ m <sup>2</sup> on terrace
Floor finish	1.0 kN/ m <sup>2</sup>
Water proofing	2.0 kN/ m <sup>2</sup>
Terrace finish	1.0 kN/ m <sup>2</sup>
Seismic zone	3 <sup>rd</sup>
Important factor	1
Type of soil	Medium
Storey height	Typical floor: 3m, GF: 3m, and height of column from base to Ground floor level: 2m
Floors	G.F. + 7 upper floors
Columns size	400mm*400mm
Beams size	400mm*500mm
No. of Columns	32
Slab thickness	100mm
Thickness of all masonry Walls	230mm
Parapet wall height	1.2m
Grade of concrete	M35 for plinth columns and ground floor columns, M30 from first floor to the 7 <sup>th</sup> floor columns, M30 for all other components
Grade of steel	Fe 415 HYSD
Floor Area	423.3 sqm

The horizontal spectral response acceleration for 0.2 second period (5 percent of critical damping) is for Khost Province in Figure 311.4.1-1 of ABC-2012 code (Afghanistan Building Code-2012) is 60% ( $S_s=0.6g$ ) and horizontal spectral response acceleration for 1.0 second period (5 percent of critical damping) is for KhostProvince in figure 311.4.1-2 of ABC code is 25% ( $S_1=0.25g$ ).

The storey numbers are given to the portion of the building between two successive grids of beams. The storey numbers are defined as follows:

Portion of the building	Storey No.
Foundation top to first floor	1
First Floor to second floor	2
Second floor to third floor	3
Third floor to fourth floor	4
Fourth floor to fifth floor	5
Fifth floor to sixth floor	6
Sixth floor to seventh floor	7
Seventh floor to roof	8

### Analysis of Models:-

Since in these days in most multi-storey building the ground floor is considered for parking, or the height of ground floor columns is more than the above storeys, for this to study the effect of soft-storey in seismic areas, therefore in this study Ground floor is selected as soft-storey. In plinth level of Ground floor, tie beams are not considered, so the column height for Ground floor increase than upper storeys and the lateral stiffness of this floor decreases.

### Calculation of Stiffness:-

The lateral stiffness of the storey is calculated, to know that the Storey-1 (Ground floor) is soft-storey or not. As Ground floor column height is 5 m and the upper each storey height is 3m, so the stiffness of Ground floor (Storey-1) and First floor (Storey-2) are calculated.

### Stiffness of Ground floor (Storey-1):-

Stiffness of storey column is calculated as below,

$$K = \frac{12 EI}{L^3}$$

where, E = Elastic modulus of concrete

I = Moment of inertia of column

L = Height of column.

For M30 grade of concrete E,

$$E = 5000 \sqrt{f_{ck}} = 5000 \sqrt{30} = 27386 \frac{N}{mm^2} = 27386 \times 10^3 kN/m^2$$

For M35 grade of concrete E,

$$E = 5000 \sqrt{35} = 29580 \frac{N}{mm^2} = 29580 \times 10^3 kN/m^2$$

Moment of inertia of column,

$$I = \frac{1}{12} bd^3 = \frac{1}{12} \times 0.40 \times 0.40^3 = 0.002133 m^4$$

Total number of columns of Ground floor is 32 and all the columns are same size and column height is 5m. The grade of concrete in these columns is M35.

$$\text{Stiffness of Ground floor} = 32 \times \frac{12 \times 29580 \times 10^3 \times 0.002133}{5^3} = 193825.198 kN/m$$

**Stiffness of First floor (Storey-2):** Total number of columns of is 32, all the columns are same size and its height is 3m. The cross section dimensions of First floor columns are same as Ground floor column, but grade of concrete in from First floor to Roof of building is M30.

$$\text{Stiffness of first floor} = 32 \times \frac{12 \times 27386 \times 10^3 \times 0.002133}{3^3} = 830781.69 kN/m$$

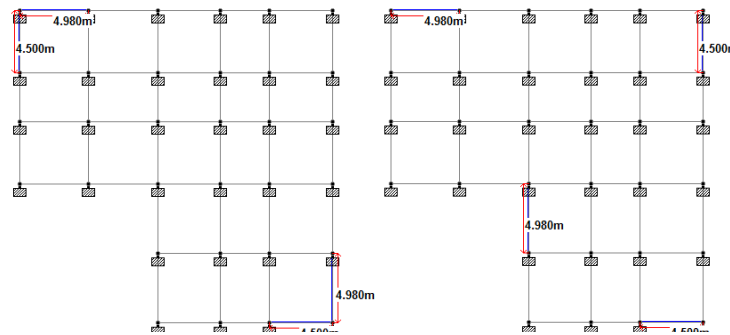
The stiffness of Ground floor is 23.33% of stiffness of First floor, so the stiffness of Storey-1 is less than 60% of the stiffness Storey-2. As per Table 12.3.2, clause 12.3.2 of ASCE-7-10, "an extreme soft-storey is one in which the lateral stiffness is less than 60 percent of that in storey above or less than 70 percent of the average stiffness of the three storeys above". So the selected model has soft-storey in Ground floor.

For analysis, these selected G+7 reinforced concrete framed buildings are modeled and analyzed by STAAD. Pro V8i SS6 software according to the given data using IBC-2012 code and load combinations are prepared according to



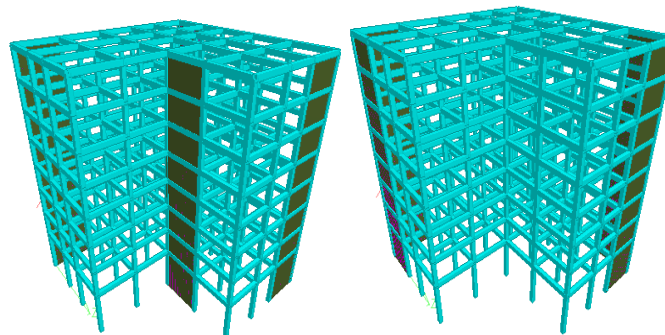
the IBC-2012 code. The analysis is performed in two phases, in First Phase the model is analyzed without shear walls and Second Phase, it is analyzed with shear walls. Also in Second Phase the shear walls are added in different location of the plan to the irregular building and analyzed the models. The results of the models with shear walls & having soft-storey in Ground floor are compared with the results of model without shear walls and having soft-storey in Ground floor.

As shear walls are added in two different cases. In First Model, four shear walls are considered, two in left corner and two in the opposite right corner and this case the shear walls are arranged in such that two shear walls are located along X-direction and other two shear walls are located along Z-direction, therefore the stiffness of shear in both directions is same (see Fig. 3 (a) ). In Second Model, the same size four shear walls are added as in First Model, but in this case the shear walls arranged in four corners, that two shear walls are positioned along X-direction and two shear walls are arranged along Z-direction and the stiffness of shear walls in both direction is equal (see Fig. 3(b) ). Thickness of shear walls is 220 mm and the length of shear walls is shown in Fig. 3 below.



(a) Model-1 (b) Model-2

Fig. 3:- Location of Shear Walls in L-shape Building.



(a) Model-1

(b) Model-2

Fig. 4:- 3D of Models with Shear Walls.

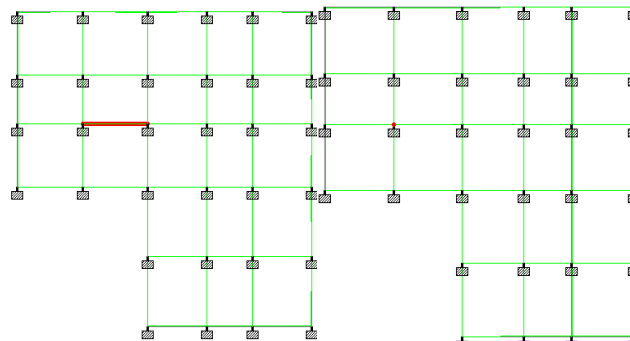


Fig. 5:- Selected Beams Fig. 6 Selected Columns.



**Result and Discussion:-**

The results of model without shear walls and having soft-storey in Ground floor are compared to the results of models with shear walls and having soft-storey in Ground floor. Also the locations of shear walls are studied in two cases, for selecting the best locations of shear walls in L-shaped RCC Building.

**Total Seismic Weight & Base Shear:-**

It is clear that the total seismic weight and base shear due to the self-weight of shear walls will be increased as compared to the model without shear walls and total seismic weight and base shear are shown in Table 2 below.

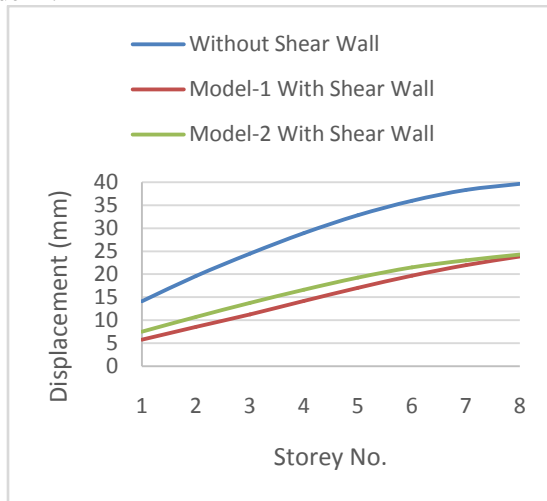
**Table 2:-**Total Seismic Weight&Base Shear of Buildings

Description	Without Shear	With Shear Wall	
		Model-1	Model-2
Seismic Weight (kN)	30704.5	33260	33260
Base Shear in X-direction (kN)	1397	1729	1729
Base Shear in Z-direction (kN)	1397	1729	1729

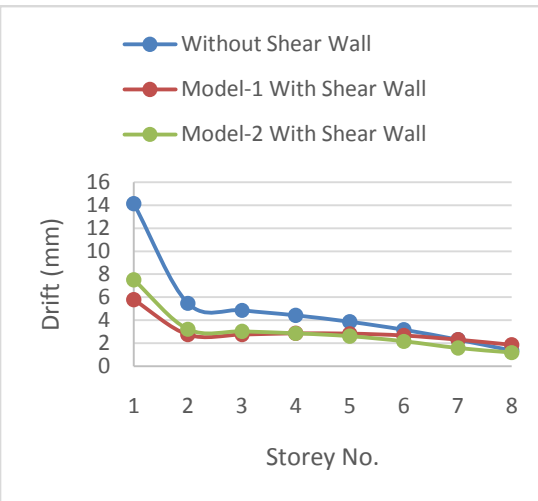
**Storey Displacement and Storey Drift:-**

The displacement and storey drift significantly decrease, when add shear walls to the models.

From the Fig. 7 & Fig 8, it is observed, that displacement & storey drift of models with shear walls is lesser than model without shear walls. Between the two cases, in Model-1 displacement and storey drift is lesser than Model-2. The soft-storey drift by adding shear walls to the building is decreased significantly and it decrease more than 50% in Model-1.



**Fig. 7:-** Maximum Storey Displacement.



**Fig. 8:-** Maximum Storey Drift

**Maximum Moment and Shear Force in Beams:-**

For the models one interior beam in each floor has been selected and the selected beams have been shown in Fig.5. Moments and shear forces in selected beams are compared. The centre to centre span length of selected beam is 4.98 m.

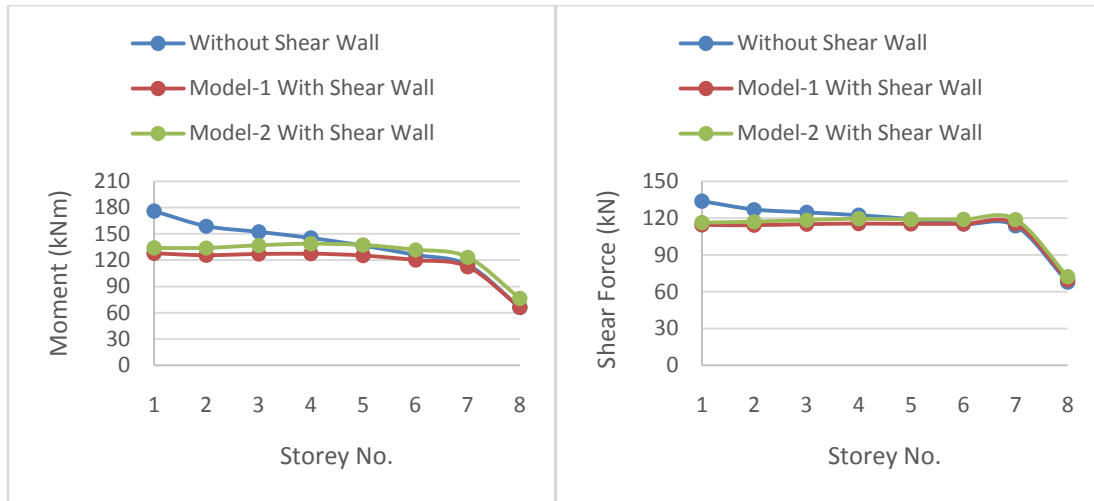


Fig. 9:- Max.Envelope Moments in Beams

Fig. 10:- Max.Envelope Shear Forces in Beams.

From Fig. 9, it is observed, that in Model-1 moments of beams show decreasing in all storeys as compared to model without shear walls, but in Model-2 moments of beams show decreasing in soft-storey and near to soft-storey, but in upper storeys they show increasing. In Fig. 10, shear forces of beams in Model-2 also decrease in soft-storey and near to soft-storey, but in upper storeys they increase when it is compared with models without shear walls. The shear forces of beams in Model-1 show decreasing in the lower storeys, but in the above storeys they have about equal values to the beams of models without shear walls.

**Maximum Moment in Columns:-**

For the model one interior column in each floor has been selected and the selected columns have been shown in Fig.6. From Fig. 11, it is cleared, that moment ( $M_z$  &  $M_y$ ) of columns generally in both models decrease significantly as compared to the models without shear walls.

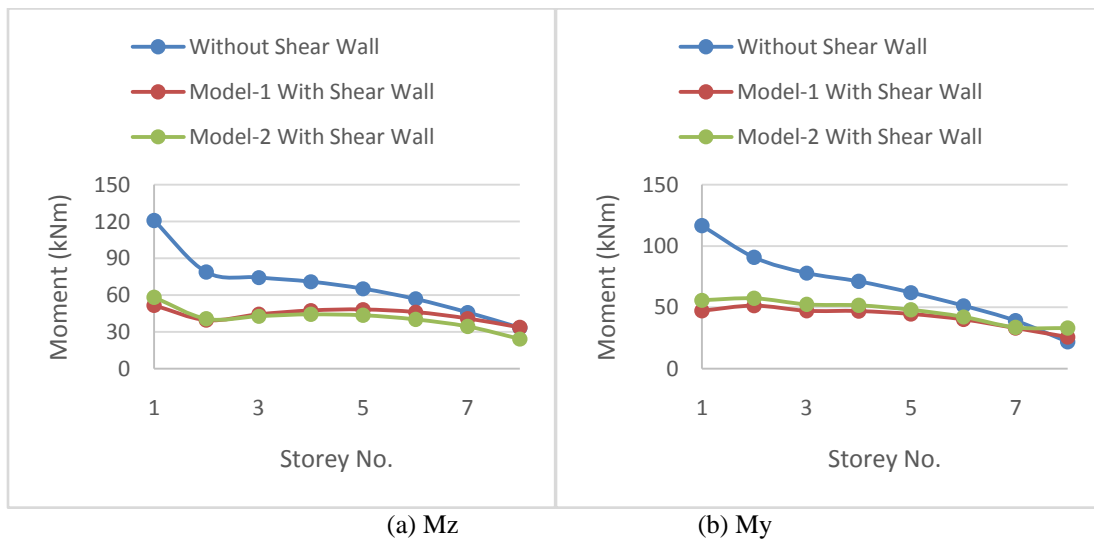


Fig. 11:- Maximum Envelope Moments in Columns

**Comparing Support Reactions:-**

The selected columns support reactions of models without shear walls are compared with the models having shear walls and the results are shown in Table 3 below.

**Table 3:-**Maximum Envelop Support Reactions

Description	Without Shear	With Shear Wall	
		Model-1	Model-2
Fy (kN)	2804.8	2759.1	2746.6
Fx (kN)	45.53	19.27	21.85
Fz (kN)	45.08	18.86	21.96
Mx (kNm)	116.6	47.25	55.94
Mz (kNm)	120.77	51.81	58.16

Support reactions (see Table 3) of Model-1 and Model-2 show significantly decreasing as compared to the models without shear walls.

### Conclusion:-

In this study L-shape plan of G+7 storey reinforced concrete building have been selected. The models have been analyzed in two phases, in First Phase the building has been analyzed without shear walls and soft-storey in Ground floor and Second Phase the same building has been analyzed with shear walls and having soft-storey in Ground floor. In the second phase also the shear walls were added to the model in two different cases, to study the best location of shear walls in the building. The results are concluded as under:

1. It is observed, that displacement, storey drift, moments and shear forces in beams, moments in columns and support reactions decrease of the building with shear walls and having soft-storey in Ground floor as compared to the buildings without shear walls and having soft-storey in Ground floor.
2. By adding shear walls to irregular building, generally the effect irregularities like soft-storey drift, displacement and moments & shear forces in beams and moments in columns of soft-storey decrease significantly as compared to the other storeys.
3. The soft-storey drift by adding shear walls to the building is decreased significantly and it decrease more than 50% in Model-1.
4. Stiffness of shear walls in both directions and location of shear walls are very important, if the shear walls are added in proper location and have equal stiffness in both directions, it will be more effective.
5. In L-shape that four shear walls were added to the model in two different cases (see Fig. 3), the location of shear walls in Model-1, in which two shear walls were arranged in left side corner and two shear walls were added in right side opposite corner was better than Model-2.

### Acknowledgement:-

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### **RESEARCH ARTICLE**

#### **ANALYSIS OF ACHIEVEMENT MOTIVATION AND AGGRESSION AMONG THE ATTACKER, SETTER AND LIBERO PLAYER AT INTER COLLEGIATE LEVEL MEN VOLLEYBALL PLAYERS.**

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##### **Key words:-**

Achievement Motivation, Aggression, Attacker, Setter, Libero and Volleyball.

#### **Abstract**

“The life is like sport. The lord is the greatest sportsman. The purpose of the study was to analysis of achievement motivation and aggression among attacker, setter, and libero player at inter collegiate level volleyball players. It was hypothesized that there will be a significant of achievement motivation and aggression among the attacker, setter, and libro player at inter collegiate level volleyball players. A total of 90 inter collegiate level consist of attacker setter and libero are selected. Selected as a random, they were divided in to 3 equal groups (30 from attacker, 30 from setter and 30 from libero) The research scholar reviewed the available scientific literature, books, journals, periodicals, and magazine and research papers pertaining to the study. Taking into consideration of the importance of these variables and the feasibility criteria for these following variables were selected for the investigator. 1. Achievement motivation 2. Aggression The data that were collected form the subjects were treated statistically. To find out the significance difference among the attacker, setter and libero with their achievement motivation and aggression for that Analysis of Variance (ANOVA) was used to find out any significant difference among the group. In view of the formulation of hypotheses the following results were emphasized based on the analysis of data The result of the study shows that there has no significant difference in the achievement motivation among attacker, setter, libero between these variables have better in achievement motivation. The result of the study showed that there has significant difference in the aggression among attacker, setter & libero at inter collegiate level men volley ball players Because volley players need very quick movement for receiving and attacker the ball every second they keep on moving place to place quickness is a prime necessity in the modem volley bale both in attack and defence. That is the reason attacker, setter and libero player hove more aggressive in game.

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**Introduction:-**

Sport has become one of the most widely practiced human activities Whether as professionals of amateurs, regularly or occasionally, millions of people now engage in the various forms of physical and sporting activity available in the European Union. In addition to its health benefits, sport plays an important economic and social role. It contributes to social integration and inclusion, plays a part in the process of non-formal education, promotes intercultural exchanges and creates. "The life is like sport. The lord is the greatest sportsman. He plays without thinking of winning or losing". Physical Education is an integral part of total Education. It is an education through physical Fitness, Social Fitness, moral fitness and emotional fitness for an individual to develop not only a good physique but also help in develop desirable social qualities. The word 'Sports' occasionally denotes either to a pleasant part time or somewhat hazardous recreation. Today sports are considered as international discipline as it develops international understanding and universal brotherhood. Sports develop national character and also it provides to fullest self expression to man and it is one of the fundamental needs. RAMA DASS (2003):Conducted a study on a comparative study on self concept and achievement motivation between physical education and education student students. Mukta Rani Rastogi's self concept scale was used to quanti self concept and M.L.kamelsh sports achievement motivation test questionnaire was used. The purpose of the study was analysis the self concept and achievement motivaton between physical education and education students. To achieve this purpose a totally 30 subjects from physical education and education. Their age group is between 20 to 25 years, the 't'-ratio was used the results of the study was the level of the self-concept between physical education students was higher than education students, the level of achievements motivation between physical education students was higher than education student.

**Sports:-**

The word 'Sports' occasionally denotes either to a pleasant part time or somewhat hazardous recreation.

**Sport Psychology:-**

Sports psychologist is the scientific study of people and their behaviours in sport. The main job of a sports psychologist is to recognize how participation in sport exercise and physical activity enhances a person's development. Sport psychology is a specialization within psychology that seeks to understand psychological/mental factors that affect performance in sports, physical activity and exercise and apply these to enhance individual and team performance.

**Motivation:-**

Ask any person who is successful in whatever he or she is doing What motivate him/her, and very likely answer will be "goals". Goal Setting goals, is extremely important to motivation and success.

**Aggression:-**

Aggression refers to any behaviour that is hostiles, destructive and/or violent. Generally, aggressive behaviour has the potential to Inflict injury or damage to the target person or object. Example of aggressive behaviour include physical assault, throwing objects, property destruction, self harming behaviours, and verbal threats.

**Volley Ball:-**

Volleyball is a typical American game. It was invented by "William,G,Moran" Physical Director of Holyoake YMCA Mass, U.S.A. in the year 1895.he wanted to introduce a game to the members of his YMCA with a view to provide a suitable recreational game less strenuous then that of Basket Ball. There was at the time, a game called "Minton" in which at worsted yarn ball was batted back and forth over a 7 foot net with help of a racket. Morgan modified this game by eliminating the racket and worsted yarn ball and experimented with an inflected basketball bladder, which was batted with the hands on over the net. He introduced this game in his gymnasium and he called this game as 'Mintonette'. Since the basketball bladder was not conducive for proper play, a new ball devised though the help of a sports company. Dr.A.T.Haisteds of spring Field College, gave the application of "Volley Ball" to this game, since the idea of the play was to volley the ball to and fro over the net.

**Statement Of The Problem:-**

The purpose of the study was to analysis of achievement motivation and aggression among attacker, setter, and libero player at inter collegiate level volleyball players.

**Hypothesis:-**

It was hypothesized that there will be a significant of achievement motivation and aggression among the attacker, setter, and libero player at inter collegiate level volleyball players.

**Delimitation:-**

The present study was delimited in the following aspects.

1. The study will be restricted to 30 attacker, 30 setter, 30 libero players.
2. The age limit of the subject will be limited to the range of 18 to 25 years.
3. The study was restricted to two psychological variables namely achievement motivation and aggression were analyzed.
4. Only standardized questionnaire was measured the psychological variables.
  - a. Anandakumar inventor for aggression
  - b. M.L.Kamalesh questionnaire for achievement motivation.

**Limitation:-**

The limitation of the present study is as follows.

1. The food habits, other regular habits and life style are not controlled.
2. The regular activities of the students will not be controlled.
3. Family background of the subject will not be considered.
4. Environmental factors, which contribute to the mental ability of the players, were not taken into consideration.
5. The response of the subject to the questionnaire might not be honest in all cases and this was recognized as a limitation.

**Significance of The Study:-**

1. The study will be helping the players to find out psychological factors.
2. The study will help the coaches.

**Definition of Terms:-****Aggression:-**

“Defines aggression as the intentional response a person makes to inflict pain or harm on another person”

**Achievement Motivation:-**

Achievement motivation is an effective arousal state directing behaviour in an achievement oriented activity cognitively appraised as potentially satisfying.

**Attacker:-**

An offensive shot where a player returns the ball to the opponent's court. Normally this is done in a manner where the attacker hits the ball above the height of the net in a downward direction toward the floor.

**Setter:-**

Setters have the task for orchestrating the offense of the team. They aim for second touch and their main responsibility is to place the ball in the air where the attacker can hit the ball into the opponents' court in the easiest way possible. They have to be able to operate with the hitters with variety and break up the enemy's block. Setters need to have swift and skilful appraisal and tactical accuracy, and must be quick at moving around the court.

**Libero:-**

“Lee beh rob” –Lee—means to act against the wind from same side of the two part and dictionary word.

**Methodology:-****Selection Of Subjects:-**

A total of 90 inter collegiate level consist of attacker setter and libero are selected. Selected as a random, they were divided in to 3 equal groups (30 from attacker, 30 from setter and 30 from libero)

**Selection of Variables:-**

The research scholar reviewed the available scientific literature, books, journals, periodicals, and magazine and research papers pertaining to the study. Taking into consideration of the importance of these variables and the feasibility criteria for these following variables were selected for the investigator.

1. Achievement motivation
2. Aggression

**Psychological Variables:-**

Achievement motivation laws measured by using questionnaire.

**Achievement Motivation:-**

Motivation was measured through achievement motivation questionnaire prepared by M. L.Kamlesh. Achievement motivation was given to all investigation; the computed questionnaire was scored as follows.

For items 1,3,4,9,10,11,12,13,16,17 and 20 the despondence answer "a" scored two points: if he answer "B" scored only zero points.

For items 2, 5, 6, 7, 8, 14, 15, 18, and 19 the despondence answer "b" is scores 2 points, if he answer "a" scored only zero points.

The larger the score, higher the achievement motivation of the subject

**Aggression:-**

To measure the aggression Anandakumar aggression scale prepared by crafty was used.

Aggression was given to all investigation, The computed questionnaire was scored as follows.

For items 1,4,5,6,9,12,14,16,18,21,22,24, and 25 answer "yes" he scored two point. In the answer "no" get zero point.

For items 2,3,7,8,10,11,13,15,17,19,20, and 23 answer "no" he scored two point. If he answer "yes" zero point.

( The copy of questionnaire was given in appendix-II )

**Statistical Techniques:-**

The data that were collected from the subjects were treated statistically. To find out the significance difference among the attacker, setter and libero with their achievement motivation and aggression for that Analysis of Variance (ANOVA) was used to find out any significant difference among the group.

**Analysis and Interpretation Of Data:-**

After the data had been collected, it was processed and tabulated using Microsoft Excel - 2000 Software. The data collected on achievement motivation and aggression from three types of players (Attackers, Setter and Libero) at inter collegiate men Volleyball players. Then the data were analyzed with reference to the objectives and hypotheses by using differential statistics including One way ANOVA followed by unpaired t-test and Pearson's correlation coefficient technique by using SPSS 16.0 statistical software and the results obtained thereby have been interpreted.

Hypothesis: There is no significant difference between three groups of players (Attackers, Setter and Libero) at inter collegiate men Volleyball players respect to achievement motivation scores.

To achieve this hypothesis, the one way NAOVA test was applied and the results are presented in the following table.

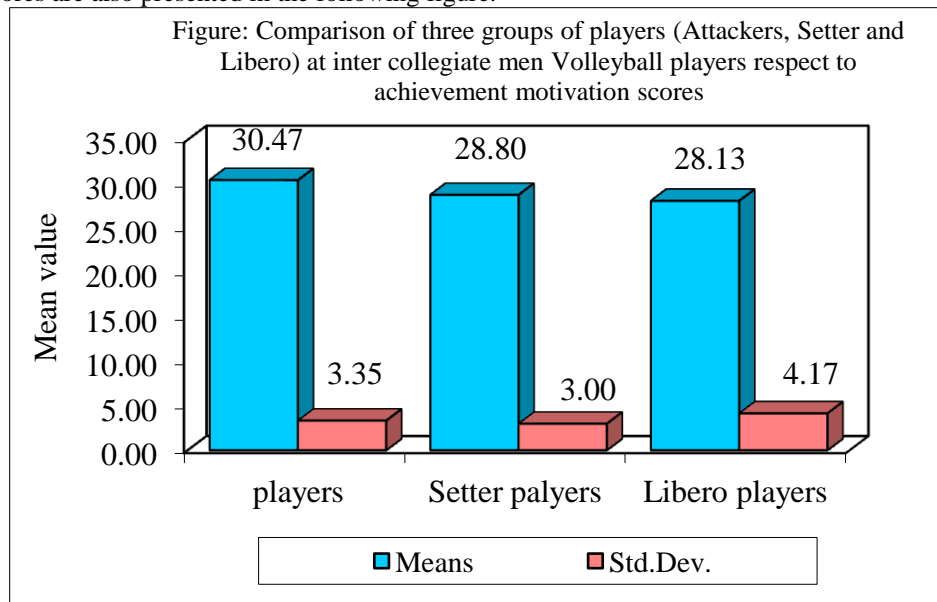
**Table:** Results of ANOVA test between three groups of players (Attackers, Setter and Libero) at inter collegiate men Volleyball players respect to achievement motivation scores

Source of variation	Degrees of freedom	Sum of squares	Mean sum of squares	F-value	P-value
Between groups	2	86.67	43.33	3.4596	0.0358*
Within groups	87	1089.73	12.53		
Total	89	1176.40			

\*  $p < 0.05$  From the results of the above table it can be seen that, the three groups of players (Attackers, Setter and Libero) at inter collegiate men Volleyball players differ statistically significant respect to achievement motivation



scores ( $F=3.4596$ ,  $p<0.05$ ) at 5% level of significance. Hence, the null hypothesis is rejected and alternative hypothesis is accepted. It means that, the attacker players have significant higher achievement motivation scores as compared to Setter and Libero players at inter collegiate men Volleyball players. The mean of achievement motivation scores are also presented in the following figure.



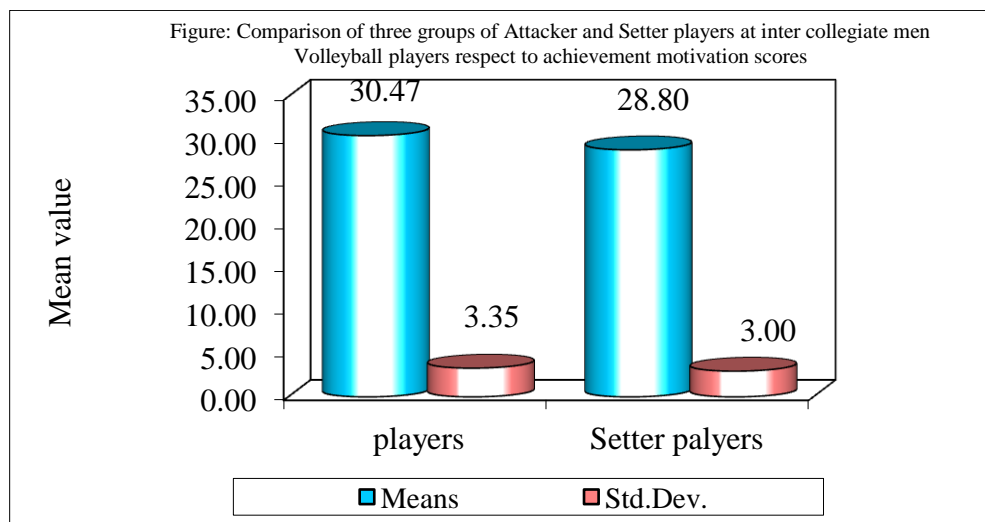
Sub Hypothesis: There is no significant difference between Attackers and Setter players at inter collegiate men Volleyball players respect to achievement motivation scores.

To achieve this hypothesis, the t- test was applied and the results are presented in the following table.

**Table:** Results of t-test between Attackers and Setter players at inter collegiate men Volleyball players respect to achievement motivation scores

Players	Mean	SD	t-value	p-value
Attacker player	30.4667	3.3501	2.0303	0.0469*
Setter player	28.8000	2.9989		

\*  $p<0.05$  From the results of the above table it can be seen that, the Attackers and Setter players at inter collegiate men Volleyball players differ statistically significant respect to achievement motivation scores ( $t=2.0303$ ,  $p<0.05$ ) at 5% level of significance. Hence, the null hypothesis is rejected and alternative hypothesis is accepted. It means that, the attacker players have significant higher achievement motivation scores as compared to Setter players at inter collegiate men Volleyball players. The mean of achievement motivation scores are also presented in the following figure.



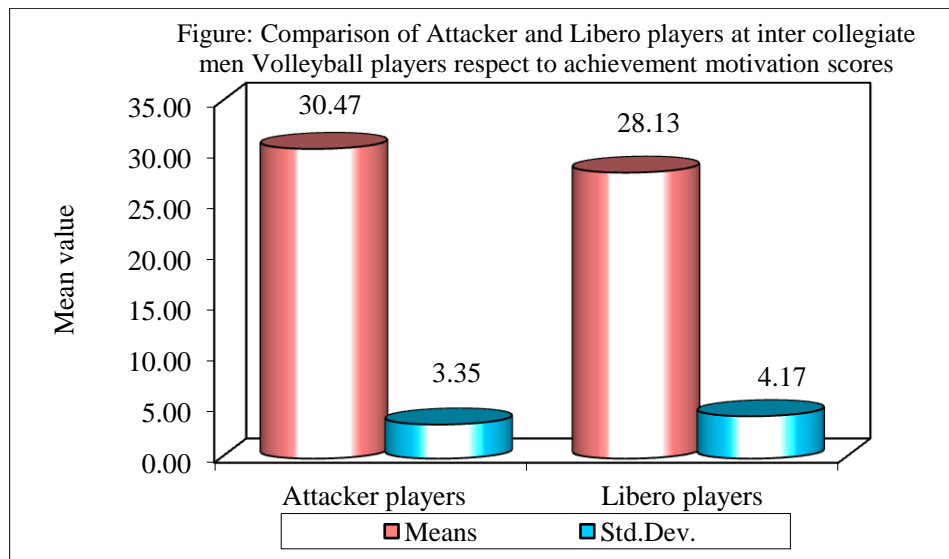
Sub Hypothesis: There is no significant differences between Attacker and Libero players at inter collegiate men Volleyball players respect to achievement motivation scores.

To achieve this hypothesis, the t- test was applied and the results are presented in the following table.

**Table:** Results of t-test between Attacker and Libero players at inter collegiate men Volleyball players respect to achievement motivation scores

Players	Mean	SD	t-value	p-value
Attacker player	30.4667	3.3501	2.3904	0.0201*
Libero player	28.1333	4.1666		

\*  $p < 0.05$  From the results of the above table it can be seen that, the Attackers and Lebero players at inter collegiate men Volleyball players differ statistically significant respect to achievement motivation scores ( $t=2.3904$ ,  $p < 0.05$ ) at 5% level of significance. Hence, the null hypothesis is rejected and alternative hypothesis is accepted. It means that, the attacker players have significant higher achievement motivation scores as compared to Lebero players at inter collegiate men Volleyball players. The mean of achievement motivation scores are also presented in the following figure.



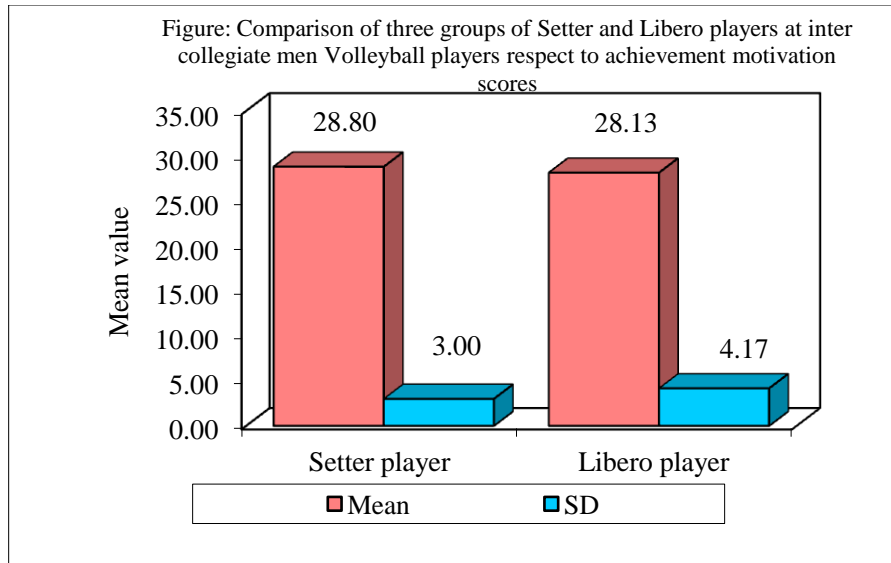
Sub Hypothesis: There is no significant differences between Setter and Libero players at inter collegiate men Volleyball players respect to achievement motivation scores.

To achieve this hypothesis, the t- test was applied and the results are presented in the following table.

**Table:** Results of t-test between Setter and Libero players at inter collegiate men Volleyball players respect to achievement motivation scores

Players	Mean	SD	t-value	p-value
Setter player	28.8000	2.9989	0.7113	0.4798
Libero player	28.1333	4.1666		

From the results of the above table it can be seen that, the Atta Setter and Libero players at inter collegiate men Volleyball players do not differ statistically significant respect to achievement motivation scores ( $t=0.7113$ ,  $p > 0.05$ ) at 5% level of significance. Hence, the null hypothesis is accepted and alternative hypothesis is rejected. It means that, the Setter and Libero players at inter collegiate men Volleyball players respect to achievement motivation scores have similar achievement motivation scores. The mean of achievement motivation scores are also presented in the following figure.



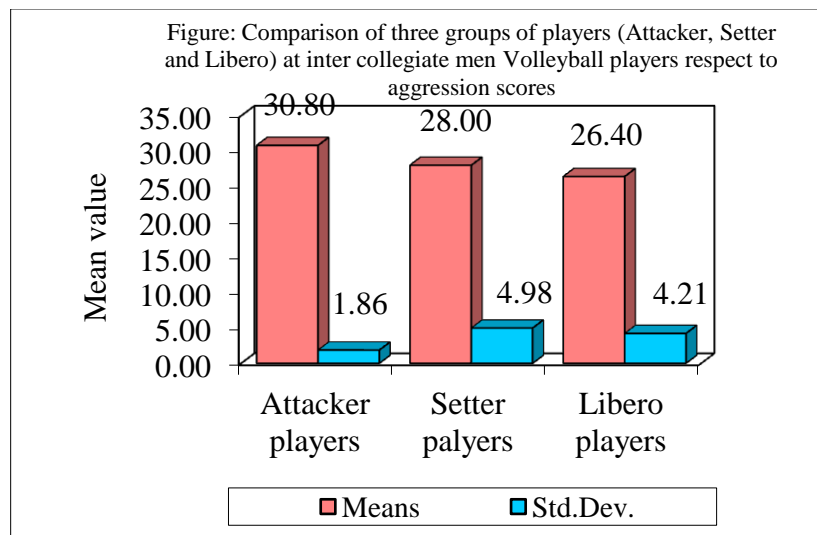
Hypothesis: There is no significant difference between three groups of players (Attacker, Setter and Libero) at inter collegiate men Volleyball players respect to aggression scores.

To achieve this hypothesis, the one way NAOVA test was applied and the results are presented in the following table.

**Table:** Results of ANOVA test between three groups of players (Attacker, Setter and Libero) at inter collegiate men Volleyball players respect to aggression scores

Source of variation	Degrees of freedom	Sum of squares	Mean sum of squares	F-value	P-value
Between groups	2	297.60	148.80	9.6898	0.0002*
Within groups	87	1336.00	15.36		
Total	89	1633.60			

\* $p < 0.05$  From the results of the above table it can be seen that, the three groups of players (Attackers, Setter and Libero) at inter collegiate men Volleyball players differ statistically significant respect to aggression scores ( $F=9.6898$ ,  $p < 0.05$ ) at 5% level of significance. Hence, the null hypothesis is rejected and alternative hypothesis is accepted. It means that, the attacker players have significant higher aggression scores as compared to Setter and Libero players at inter collegiate men Volleyball players. The mean of aggression scores are also presented in the following figure.



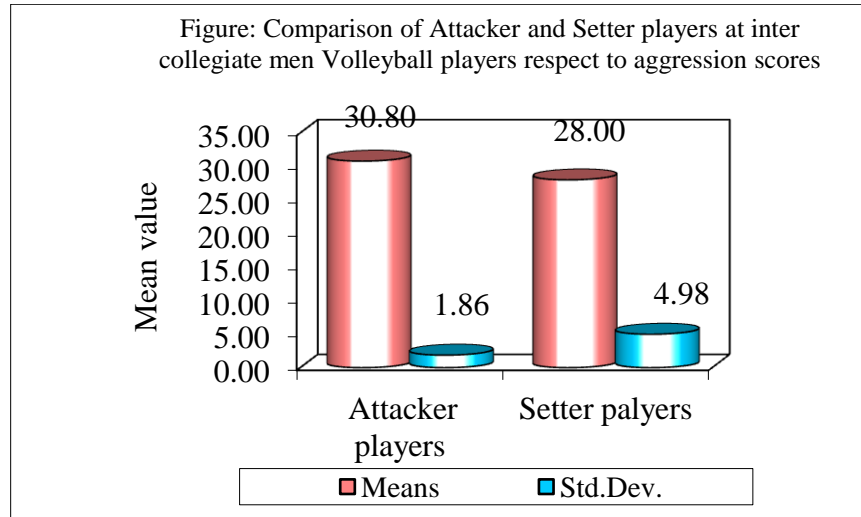
Sub Hypothesis: There is no significant differences between Attacker and Setter players at inter collegiate men Volleyball players respect to aggression scores.

To achieve this hypothesis, the t- test was applied and the results are presented in the following table.

**Table:** Results of t-test between Attacker and Setter players at inter collegiate men Volleyball players respect to aggression scores

Players	Mean	SD	t-value	p-value
Attacker player	30.8000	1.8644	2.8827	0.0055*
Setter player	28.0000	4.9827		

\*p<0.05 From the results of the above table it can be seen that, the Attackers and Setter players at inter collegiate men Volleyball players differ statistically significant respect to aggression scores (t=2.8827, p<0.05) at 5% level of significance. Hence, the null hypothesis is rejected and alternative hypothesis is accepted. It means that, the attacker players have significant higher aggression scores as compared to Setter players at inter collegiate men Volleyball players. The mean of aggression scores are also presented in the following figure.



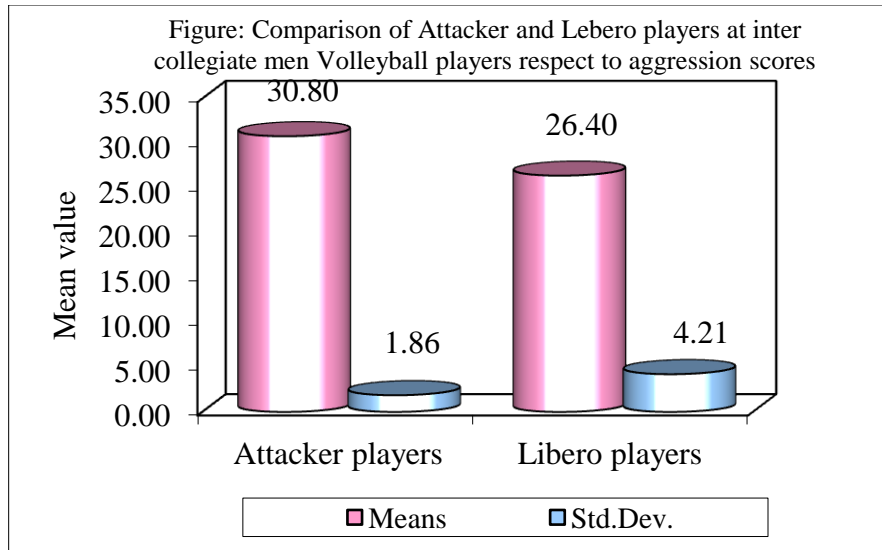
Sub Hypothesis: There is no significant difference between Attacker and Libero players at inter collegiate men Volleyball players respect to aggression scores.

To achieve this hypothesis, the t- test was applied and the results are presented in the following table.

**Table:** Results of t-test between Attacker and Libero players at inter collegiate men Volleyball players respect to aggression scores

Players	Mean	SD	t-value	p-value
Attacker player	30.8000	1.8644	5.2290	0.0000*
Libero player	26.4000	4.2149		

\* p<0.05 From the results of the above table it can be seen that, the Attackers and Lebero players at inter collegiate men Volleyball players differ statistically significant respect to aggression scores (t=5.2290, p<0.05) at 5% level of significance. Hence, the null hypothesis is rejected and alternative hypothesis is accepted. It means that, the attacker players have significant higher aggression scores as compared to Lebero players at inter collegiate men Volleyball players. The mean of aggression scores are also presented in the following figure.



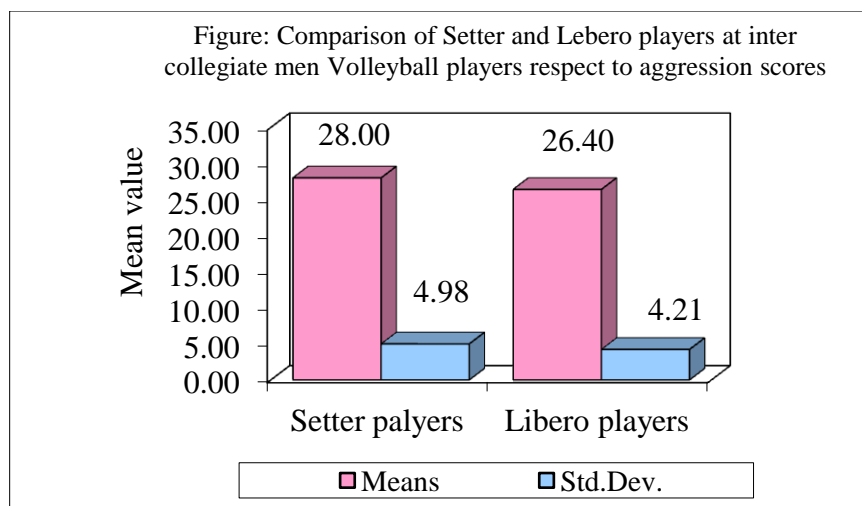
Sub Hypothesis: There is no significant differences between Setter and Libero players at inter collegiate men Volleyball players respect to aggression scores.

To achieve this hypothesis, the t- test was applied and the results are presented in the following table.

**Table:** Results of t-test between Setter and Libero players at inter collegiate men Volleyball players respect to aggression scores

Players	Mean	SD	t-value	p-value
Setter player	28.0000	4.9827	1.3428	0.1846
Libero player	26.4000	4.2149		

From the results of the above table it can be seen that, the Atta Setter and Libero players at inter collegiate men Volleyball players do not differ statistically significant respect to aggression scores ( $t=1.3428$ ,  $p>0.05$ ) at 5% level of significance. Hence, the null hypothesis is accepted and alternative hypothesis is rejected. It means that, the Setter and Libero players at inter collegiate men Volleyball players respect to aggression scores have similar aggression scores. The mean of aggression scores are also presented in the following figure.



Hypothesis: There is no significant association between achievement motivation and aggression scores of all players i.e. Attacker, Setter and Libero at inter collegiate men Volleyball players

To achieve this hypothesis, the Karl Pearson's correlation coefficient technique has been applied and the results are presented in the following table.

**Table:** Results of correlation coefficient between achievement motivation and aggression scores of all players i.e. Attacker, Setter and Libero at inter collegiate men Volleyball players.

variables	Correlation coefficient between achievement motivation with		
	Correlation coefficient	t-value	P-value
Aggression scores	0.2880	2.8208	0.0059*

\*  $p < 0.05$  From the results of the above table, it can be observed that, a significant and positive relationship was observed between achievement motivation and aggression scores of all players i.e. Attacker, Setter and Libero at inter collegiate men Volleyball players ( $r=0.2880$ ,  $p < 0.05$ ) at 5% level of significance. Hence, the null hypothesis is rejected and alternative hypothesis is accepted. It means that, the achievement motivation scores are increases or decreases with increase or decrease in aggression scores of all players.

Hypothesis: There is no significant association between achievement motivation and aggression scores of Attacker players at inter collegiate men Volleyball players

To achieve this hypothesis, the Karl Pearson's correlation coefficient technique has been applied and the results are presented in the following table.

**Table:** Results of correlation coefficient between achievement motivation and aggression scores of Attacker players at inter collegiate men Volleyball players

variables	Correlation coefficient between achievement motivation with		
	Correlation coefficient	t-value	P-value
Aggression scores	0.0707	0.3749	0.7106

From the results of the above table, it can be observed that, a non-significant and positive relationship was observed between achievement motivation and aggression scores of Attacker players at inter collegiate men Volleyball players ( $r=0.0707$ ,  $p > 0.05$ ) at 5% level of significance. Hence, the null hypothesis is accepted and alternative hypothesis is rejected.

Hypothesis: There is no significant association between achievement motivation and aggression scores of Setter players at inter collegiate men Volleyball players

To achieve this hypothesis, the Karl Pearson's correlation coefficient technique has been applied and the results are presented in the following table.

**Table:** Results of correlation coefficient between achievement motivation and aggression scores of Setter players at inter collegiate men Volleyball players

variables	Correlation coefficient between achievement motivation with		
	Correlation coefficient	t-value	P-value
Aggression scores	0.2031	1.0975	0.2818

From the results of the above table, it can be observed that, a non-significant and positive relationship was observed between achievement motivation and aggression scores of Setter players at inter collegiate men Volleyball players ( $r=0.2031$ ,  $p > 0.05$ ) at 5% level of significance. Hence, the null hypothesis is accepted and alternative hypothesis is rejected.

Hypothesis: There is no significant association between achievement motivation and aggression scores of Libero players at inter collegiate men Volleyball players

To achieve this hypothesis, the Karl Pearson's correlation coefficient technique has been applied and the results are presented in the following table.

**Table:** Results of correlation coefficient between achievement motivation and aggression scores of Libero players at inter collegiate men Volleyball players

variables	Correlation coefficient between achievement motivation with		
	Correlation coefficient	t-value	P-value
Aggression scores	0.3617	1.9998	0.0451*

\* $p < 0.05$  From the results of the above table, it can be observed that, a significant and positive relationship was observed between achievement motivation and aggression scores of Libero players at inter collegiate men Volleyball players ( $r=0.3617$ ,  $p < 0.05$ ) at 5% level of significance. Hence, the null hypothesis is rejected and alternative hypothesis is accepted. It means that, the achievement motivation scores are increases or decreases with increase or decrease in aggression scores of Libero players at inter collegiate men Volleyball players.

### **Discussion on Findings:-**

In view of the formulation of hypotheses the following results were emphasized based on the analysis of data. The result of the study shows that there has no significant difference in the achievement motivation among attacker, setter, libero between these variables have better in achievement motivation.

The result of the study showed that there has significant difference in the aggression among attacker, setter & libero at inter collegiate level men volley ball players. Because volley players need very quick movement for receiving and attacker the ball every second they keep on moving place to place quickness is a prime necessity in the modern volleyball both in attack and defence. That is the reason attacker, setter and libero player have more aggressive in game.

### **Summary:-**

The purpose of the study was to find out whether there was any significant difference in achievement motivation aggression for the Inter collegiate level attacker, setter, libero of the volley ball players. In order to achieve the purpose of the study 90 selected men volley ball players only.

To assess the level of aggression inventory questionnaire was used and the data were collected from the subjects.

To assess the level of achievement motivation the sports achievement motivation questionnaire designed and validated by Mr. Kamlesh was used. The data were collected from the subjects.

The collected data were put into statistical analysis. The level of significance was set at 0.05 level to find out the significance difference between means one way analysis of variance was used.

### **Conclusion:-**

On the basis of the interpretation of the data the following appropriate conclusions are drawn from the study.

Attacker players have significant higher achievement motivation scores as compared to setter and Libero players at inter collegiate men volleyball players. ( $F=3.4596, p<0.05$ )

Attacker players have significant higher aggression scores as compared to setter and Libero players at inter collegiate men Volleyball players. ( $F=9.6898, p<0.05$ )

### **Suggestions:-**

1. Similar study may be conducted taking to the other psychological variables.
2. Similar study may be conducted for school, state, national and university level volley ball players.
3. Similar study may be conducted among different sports and games.
4. Similar study may be conducted among female volley ball players.
5. Similar study can be conducted among different age groups in different disciplines.

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### RESEARCH ARTICLE

## OPTIMIZATION OF BUS BODY BUILDING METHODS BY INVESTIGATION OF THE EXISTING PROBLEMS AND RECTIFICATION IN ADDIS ABABA, ETHIOPIA.

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##### Key words:-

Bus body building, heavier bus bodies, spurious materials, and non-uniform construction.

#### Abstract

The design of the bus body depends largely upon the performance requirements under various types of loading, operating and the road conditions. Nowadays for the passenger buses there are many local producers which construct vehicles based on local needs. The big challenges found in the bus body building companies are applying spurious materials, heavier bus bodies; non-uniform construction and absence of code of practice for bus body design and approval. In the competitive to stay these producers comply with the same requirements of their international counterparts without access to latest computation facilities. This paper explores the existing problems in the industry and proposes the right solution to optimize the bus body manufacturing. To achieve the expected research goals, the researcher randomly selected one hundred fifty locally manufactured buses. The tools used are; statistical analysis, Pareto chart/diagram, cause and effect analysis, field observation and literature survey.

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#### Introduction:-

##### Automobile Body Building in Ethiopia:-

Ethiopia imports automobiles, buses/coaches, trucks, equipment's/machineries and spare parts from abroad. It does not manufacture automotive products. Some companies only assemble and build bodies of buses and dry and wet cargo on chassis imported with cab. The automotive industry is serving the transportation of freight and passenger. This study is concerned with the investigation of the major problems and challenges existing in passenger bus body building sector.

The bus body building industry will have huge contribution to the growth of the national economy if it is well addressed and supported with attractive incentives.

The major areas the contribution can be felt easily along:

- Job creation
- Saving foreign currency
- Technology transfer and progress

The major problems observed in the local bus body building sector are absence of national standard, lack of adequate testing tools/ machines, shortage of skilled manpower and shortage of advanced machines to manufacture

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different internal and external structures to be manufactured from different materials (metallic and nonmetallic) and limitation of some advanced lightest materials like composites and plastics.

During service, any vehicle is subjected to loads that cause stresses, vibrations and noise in the different components of its structure. This requires appropriate strength, stiffness and fatigue properties of the components to be able to stand these loads. On top of that, quality of a vehicle, as a system, which include efficient energy consumption, safety, and provision of comfort to the user are highly desired.

Companies construct bus body on most popularly used Isuzu models like NPR, NQR and FSR series for commercial intercity passenger transportation purposes. Local bus body manufacturers started body building by making 'wuyiyit', a locally manufactured taxi body structure, on Toyota, Nissan, and Peugeot model pick up vehicles.

*It was noticed that the vehicle manufacturers sell their products in the form of drive away chassis and the body design and building is being done by way side body builders who employ poor design, poor quality products, spurious materials and parts, with no uniformity in the construction, resulting in large amounts of fatal accidents, reduced product life, reduced vehicle performance, poor safety and comfort for the passengers. The cabins and seats have cramped designs which do not provide safety and comfort to the driver. Body designs offer extreme heat, vibration, noise, poor comfort and protection. Wood is being used in the construction of the body to a large extent. Of late some reputed body builders have brought in improved bus designs in the market but still a lot has to be done.*

Hence the paper addresses on selected areas to investigate the major challenges in the bus body manufacturing companies and suggests scientific ways to optimize the process.

#### **Planning of Bodies, selecting chassis and Vehicle Modifications:-**

When designing vehicle bodies in addition to a user-friendly and maintenance friendly design, the careful choice of materials and, in consequence, the associated corrosion protection measures and of great importance.

In order to ensure safe operation of the vehicle, it is essential to choose the chassis carefully in accordance with the intended use. Planning should therefore consider the following items in particular and adapt them to the intended use wheelbase, engine, axle, maximum permissible gross vehicle weight and position of the center of gravity [1].

Before carrying out any work on the body or modification work, the delivered vehicle must be submitted to a check to verify whether it fulfills the necessary requirements.

Before starting work, the body builder must check whether:

- ❖ The vehicle is suitable for the planned body
- ❖ The chassis model and equipment are suitable for the operating conditions intended for the body.

#### **Purpose and Requirements of Vehicle Body Structures:-**

The purpose of the bus body structure is to maintain the shape of the vehicle and to support the various loads applied to it and to carry the passengers and/or payload in a safe and comfortable manner. The structure usually accounts for a large proportion of the development and manufacturing cost in a new vehicle programme, and many different structural concepts are available to the designer. It is essential that the best one is chosen to ensure acceptable structural performance within other design constraints such as cost, volume and method of production, product application [1].

The structural requirements of any vehicle structure can be summarized as follows:

- a. The structure must be sufficiently stiff to withstand the static loads and dynamic loads without excessive deformation
- b. The structure must be sufficiently strong to withstand many cycles of the applied loading without suffering from fatigue or other forms of material failure
- c. The structure should deform in such a manner under impact load conditions so as to minimize the risk of injury to the occupants and other road users

Assessments of the performance of a vehicle structure are related to its strength and stiffness. A design aim is to achieve sufficient levels of these with as little mass as possible [2].

In the event of collision, the body must be capable of transforming as much kinetic energy as possible into deformation work while minimizing deformation of the vehicle interior [3].

Sheet steel of various grades is customarily used for the vehicle body structure. Sheet thickness from 0.6 to 3mm with most pieces being between 0.8 and 1.0mm thick. Due to the mechanical properties of steel with regard to stiffness, strength, economy and ductility, alternative materials for the vehicle body structure are not yet available. High strength, low alloy (HSLA) sheet steel is used for highly stressed structural components. The increased strength of these components allows their thickness to be reduced.

The light weight construction a priority-Low weight construction of vehicles is a top priority at DaimlerChrysler. Besides aluminum, magnesium, ceramics and carbon-reinforced plastics extremely light materials now include high strength steels, said Pollman. Components made of these new high- tech materials are up to 60% lighter than those made of conventional steel, the use of which will decline substantially.

Developing the materials and production technologies that open up these materials for the design of motor vehicles is one of the most important core technologies at DaimlerChrysler. *Low weight materials can increase performance, quality and driving pleasure.* Moreover, they can improve environmental soundness while reducing costs. Know-how regarding materials and production technologies is a key competitive factor [2] [4].

The strength requirements which must be met by the seats in a collision pertain to the seat cushion and backrest, the head restraints, the seat adjustment mechanism and the seat anchors (pertinent regulations: FMVSS 207,202; ECE-R 17,25;RREG 74/408,78/932 and others). One component of active safety is seating comfort. Seats must be designed such that vehicle occupants with different body dimensions do not suffer from driving fatigue.

Strength analysis for individual parts and body areas which are subject to specific stresses caused by factors such as restraints systems or trailer loads, detailed examinations are carried out with the aim of providing proof of sufficient strength or of reducing unacceptable stresses by modifying the design[5].

#### **Modern Advanced Lightweight Materials, Weight and Vehicle Performance:-**

Reducing the loads (weight, rolling and air resistance and accessory loads) on the vehicle, thus reducing the work needed to operate it; The loads on the vehicle consist of the force needed to accelerate the vehicle, to overcome inertia; vehicle weight when climbing slopes; the rolling resistance of the tires; aerodynamic forces; and accessory loads. In urban stop-and-go driving, aerodynamic forces play little role, but rolling resistance and especially inertial forces are critical. In steady highway driving, aerodynamic forces dominate, because these forces increase with the square of velocity; aerodynamic forces at 90 km/h are four times the forces at 45 km/h. Reducing inertial loads is accomplished by reducing vehicle weight, with improved design and greater use of lightweight materials[6].

A 10% weight reduction from a total vehicle weight can improve fuel economy by 4–8%, expending on changes in vehicle size and whether or not the engine is downsized. There are several ways to reduce vehicle weight; including switching to high strength steels (HSS), replacing steel by lighter materials such as Al, Mg and plastics, evolution of lighter design concepts and forming technologies. The amount of lighter materials in vehicles has been progressively increasing over time, although not always resulting in weight reductions and better fuel economy if they are used to increase the size or performance of the vehicle. In fact, the average weight of a vehicle in the USA and Japan has increased by 10–20% in the last 10 years (JAMA, 2002; Haight, 2003), partly due to increased concern for safety and customers' desire for greater comfort [7].

Steel is still the main material used in vehicles, currently averaging 70% of curb weight. Aluminum usage has grown to roughly 100 kg per average passenger car, mainly in the engine, drive train and chassis in the form of castings and forgings. Aluminum is twice as strong as an equal weight of steel, allowing the designer to provide strong, yet lightweight structures. Aluminum use in body structures is limited, but there are a few commercial vehicles with all Al bodies (e.g., Audi's A2 and A8). Where more than 200 kg of Al is used and secondary weight reductions are gained by down-sizing the engine and suspension – more than 11–13% weight reduction can be achieved. Ford's P2000 concept car11 has demonstrated that up to 300 kg of Al can be used in a 900 kg vehicle.

The use of plastics in vehicles has increased to about 8% of total vehicle weight, which corresponds to 100-120 kg per vehicle. The growth rate of plastics content has been decreasing in recent years however, probably due to

concerns about recycling, given that most of the plastic goes to the automobile shredder residue (ASR) at the end of vehicle life. Fiber reinforced plastic (FRP) is now widely used in aviation, but its application to automobiles is limited due to its high cost and long processing time. However, its weight reduction potential is very high, maybe as much as 60%. Examples of FRP structures manufactured using RTM (resin transfer method) technology are wheel housings or entire floor assemblies. For a compact size car, this would make it possible to reduce the weight; of a floor assembly (including wheel housings) by 60%, or 22 kg per car compared to a steel floor assembly. Research examples of plastics use in the chassis are leaf or coil springs manufactured from fiber composite plastic. Weight reduction potentials of up to 63% have been achieved in demonstrators using glass and/or carbon fiber structures (Friedrich, 2002).

Aside from the effect of the growing use of non-steel materials, the reduction in the average weight of steel in a car is driven by the growing shift from conventional steels to high strength steels (HSS). There are various types of HSS, from relatively low strength grade (around 400 MPa) such as solution-hardened and precipitation-hardened HSS to very high strength grade (980–1400 MPa) such as TRIP steel and tempered martensitic HSS. At present, the average usage per vehicle of HSS is 160 kg (11% of whole weight) in the USA and 75 kg (7%) in Japan. In the latest Mercedes A-class vehicle, HSS comprises 67% of body structure weight. The international ULSAB-AVC project (Ultra-Light Steel Auto Body – Advanced Vehicle Concept) investigated intensive use of HSS, including advanced HSS, and demonstrated that using HSS as much as possible can reduce vehicle weight by 214 kg (–19%) and 472 kg (–32%) for small and medium passenger cars respectively. In this concept, the total usage of HSS in body and closures structures is 280–330 kg, of which over 80% is advanced HSS (Nippon Steel, 2002).

### Methods and Materials:-

Different options available to carry out the study and gives reasons why a particular method was selected at different stages of the project. The research is intended to answer the following questions;

- ❖ What are the main methods which can be implemented to reduce the weight of the buses during body modification?
- ❖ Are there any proper rules and regulations (national standard code of practice for bus body building, design and approval) set by the respective bodies to control the process.
- ❖ What measures should be taken to improve the bus interior structure to make the bus comfortable and safe for occupants.

To address these research questions, the following steps are carried out during different phase of the study:  
Statistical analysis of the data collected from the Transport Authority.

- ❖ Literature survey
- ❖ Close observation of the procedures practiced in the bus body building units.
- ❖ Pareto chart analysis to pin point the potential causing factor.
- ❖ Cause and effect analysis of the problem.
- ❖ Recognize how different groups benefit from the study

### Research Method:-

The method used when collecting, processing and analyzing the gathered information can be either quantitative or qualitative research method.

The nature of the present study requires both quantitative and qualitative information to obtain best results and to propose important recommendation. Both kinds of methods have also been used to support conclusions made in this thesis. Mixing qualitative and quantitative research methods is called triangulation method. While most researchers develop expertise in one style, the two types of methods have different, complementary strengths and when used together can lead to a more comprehensive understanding of a phenomenon.

### Data Collection Techniques:-

Depending on the research perspective and strategy chosen, the researcher must choose methods for collecting data. The data or information collected by the researcher can be either primary, i.e. the researcher collects the material himself, or secondary, i.e. already documented material are being used as a data source, which can be done in either quantitative or qualitative way. In this thesis, both the primary and secondary data are used.

**Weight Distribution Concepts:-**

The gross vehicle weight rating (GVWR) and the gross axle weight rating (GAWR) of each incomplete vehicle are specified on the cover of its incomplete vehicle document in conformance to the requirements of the federal motor vehicle safety regulations [8][9]. The final stage manufacturer is responsible to place the Gross Vehicle Weight Rating and the Gross Axle Weight Rating of each axle on the final vehicle certification label. The regulation states that the appropriate rating “shall not be less than the sum of the unloaded vehicle weight, rated cargo load, and 150 pounds times the vehicle’s designated seating capacity” [8][9].

Unloaded vehicle weight means the weight of a vehicle with maximum capacity of all fluids necessary for operation of the vehicle, but without cargo or occupants.

During completion of this vehicle, Gross Vehicle Weight Rating and Gross Axle Weight Rating may be affected in various ways, including but not limited to the following:

- a. The installation of a body or equipment that exceeds the rated capacities of this Incomplete Vehicle.
- b. The addition of designated seating positions which exceeds the rated capacities of this incomplete vehicle.
- c. Alterations or substitution of any components such as axles, springs, tires, wheels, frame, steering and brake systems that may affect the rated capacities of this incomplete vehicle.

The following formula is used to assure compliance with the regulations. Chassis curb weight and GVW rating is located below in each vehicle section. Always verify the results by weighing the completed vehicle on a certified scale.

Gross Vehicle Weight(GVW) = Curb Weight of Chassis Weight of added body components, accessories or other permanently attached components + Total weight of passengers, and all load or cargo[8].

**Gross Axle Weight Rating:-**

The gross vehicle weight is further restricted by the gross axle weight rating (GAWR). The maximum GAWR for both front and rear axles is listed in each Vehicle Section. Weight distribution calculations must be performed to ensure Gross Axle Weight Rating is not exceeded. Always verify the results by weighing the completed vehicle on a certified scale.

Note: Although the front gross axle weight rating (FGAWR) plus the rear gross axle weight Rating (RGAWR) may exceed the gross vehicle weight rating (GVWR), the total GVW may not exceed the respective maximum Gross Vehicle Weight Rating.

The variation in the Gross Axle Weight Ratings allows the second stage manufacturer some flexibility in the design of the weight distribution of the attached unit [9].

**Weighing the Vehicle:-**

Front and rear Gross Axle Weight Ratings and total Gross Vehicle Weight Rating should be verified by weighing a completed loaded vehicle. Weigh the front and rear of the vehicle separately and combine the weights for the total Gross Vehicle Weight Rating [9]. All three weights must be less than the respective maximum shown in figure 1[8].

**Center of Gravity:-**

The design of the truck body should be such that the center of gravity of the added load does not exceed the guidelines as listed in each Vehicle Section. If the body is mounted in such a way that, the center of gravity height exceeds the maximum height of the center of gravity designated for each model, the directional stability at braking and roll stability at cornering will be adversely affected. A vertical and/or horizontal center of gravity calculation must be performed if a question in stability arises to ensure the designed maximum height of the center of gravity is not violated [9].

**Weight Distribution:-**

A truck as a commercial vehicle has but one purpose. That purpose is to haul some commodity from one place to another. A short distance or a long distance, the weight to be hauled, more than any other factor, determines the size of the truck. A small weight requires only a small truck; a large weight requires a large truck. A simple principle, but it can easily be misapplied. In any case, selecting the right size truck for the load to be hauled will ensure that the job

will be done and that it will be able to be done with some degree of reliability and within the legal limitations of total gross weight and axle gross weights [9].

Not only must a truck be selected that will handle the total load, but the weight must also be properly distributed between the axles. This is of extreme importance from both a functional and economic aspect. If a truck consistently hauls less than its capacity, the owner is not realizing full return on his investment and his operating costs will be higher than they should be. If the truck is improperly loaded or overloaded, profits will be reduced due to increased maintenance costs and potential fines resulting from overloading beyond legal limitations.

Careful consideration must be given to distribution of the load weight in order to determine how much of the total, including chassis, cab, body and payload, will be carried on the front axle and how much will be carried on the rear axle, on the trailer axles and the total.

Moving a load a few inches forward or backward on the chassis can mean the difference between acceptable weight distribution for the truck or an application that will not do the job satisfactorily [8].

Every truck has a specific capacity and should be loaded so that the load distribution is kept within gross axle weight ratings and the truck's gross vehicle weight rating or gross combination weight rating (GCWR).

Improper weight distribution will cause problems in many areas like Excessive front end wear and failure, if center of payload is nearer to front end suspension, rapid tire wear when the weight on a tire exceeds its rating capacity, rough and erratic ride if the center of the payload is directly over or slightly behind the rear axle, the lack of sufficient weight on the front axle will create a bobbing effect, very rough ride, and erratic steering, hard steering when loads beyond the capacity of the front axle are imposed upon it, unsafe operating and conditions, high maintenance costs when a truck is overloaded, a dangerous situation may exist because minimum speeds cannot always be maintained, directional control may not be precise and insufficient braking capacity can cause longer than normal braking distance, Improper weight distribution and overloading cause excessive wear and premature failure of parts.

In this way, maximum payloads may be carried without exceeding legal limits. If the body is too long for a wheelbase, the center of the body and payload is placed directly over the rear axle. This places the entire payload on the rear axles, resulting in overloading the rear tires, rear axle springs and wheel bearings and potentially exceeding the rear axle legal weight limit. The front axle is then carrying no part of the payload and is easily lifted off the ground when going over rough terrain, creating a very rough ride and temporary loss of steering control. If the body is too short for the wheelbase used, frame stress may be increased and may result in excessive loads on the front axle. Excessive front axle loads increase wear on the kingpins and bushings, wheel bearings and steering gear. Excessive front axle loads also overstress the front axle, springs, tires and wheels. All of these contribute directly to higher maintenance costs and hard steering, both of which are undesirable. Weight distribution analysis involves the application of basic mathematical principles to determine the proper positioning of the payload and body weight in relation to the wheelbase of the truck chassis. It is much less expensive to work all of this out on paper, make mistakes on paper and correct them there than to set up the truck incorrectly and either have it fail to do the job or, much worse, fail completely. It is important to become familiar with the dimensions of the truck, as these will be needed to perform the necessary calculations [8] [9].

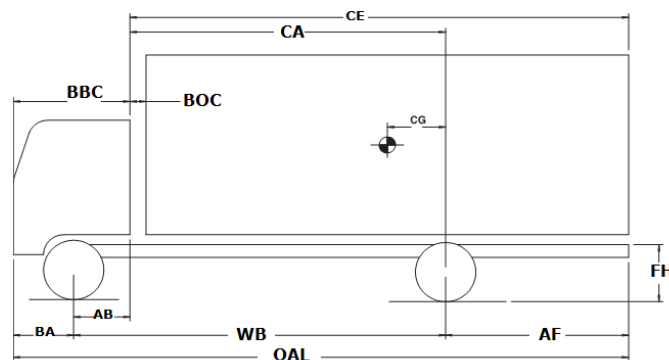


Figure 1 Weight distributions (Truck Isuzu NPR)

**Glossary of Dimensions:-**

- BBC – Bumper to back of cab
- BA – Bumper to axle
- WB – Wheelbase
- CA – Cab to axle
- AL – Overall length
- AB – Axle to back of cab
- AF – Axle to end of frame
- BOC – Back of cab clearance
- FH – Frame height
- CE – Cab to end of frame

**Weight Distribution Formula:-**

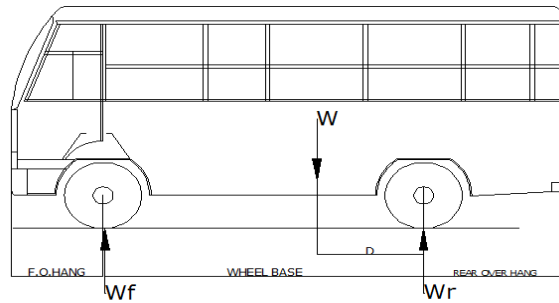


Figure 2 weight distribution of modified midi bus

- D* – Distance C.G. of body is ahead of rear axle
- F* - Distance C.G. from point of C.G to front axle
- WB* – Wheelbase
- W* – Weight of body plus payload
- W<sub>f</sub>*– Portion of *W* transferred to front axle
- W<sub>r</sub>*– Portion of *W* transferred to rear axle

**Basic Formulae:-**

$$(W \times D = W_f \times WB) \text{ and } (W = W_f + W_r)$$

$$W_f = \frac{W \times D}{WB} \dots\dots\dots 1$$

$$D = \frac{W_f \times WB}{W} \dots\dots\dots 2$$

$$WB = \frac{W \times D}{W_f} \dots\dots\dots 3$$

$$W = \frac{W_f \times WB}{D} \dots\dots\dots 4$$

$$W_r = \frac{W \times F}{WB} \dots\dots\dots 5$$

$$F = \frac{W_r \times WB}{W} \dots\dots\dots 6$$

$$WB = \frac{W \times F}{W_r} \dots\dots\dots 7$$

$$W = \frac{W_r \times WB}{F} \dots\dots\dots 8$$

**Recommended Weight Distribution % of Gross Vehicle Weight Conventional 2 Axles:-**

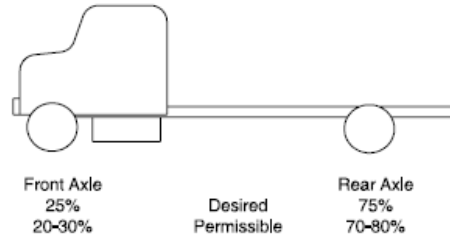


Figure 3 weight distribution % of gross vehicle weight by axle (Isuzu motors)

**Calculation of Center of Gravity:-**

In this case we have the following data to calculate the center of gravity of Isuzu NPR series

**Note:** The body manufacturer can provide the body length and weight, or actual measurements of the body may be taken with a tape [5].

The following Table 1 compares the dimensions of original truck to the modified bus.

Table 1 Comparisons of the truck and the bus

No	Dimensions	Isuzu NPR 66L	Modified NPR 66L midi bus
1	Model name	NPR 66L	NPR 66L
2	WB mm	3365	3365
3	FOH mm	1085	1100
4	ROH mm	1505	2300
5	OAL mm	5995	6765
6	GVW kg	6300kg	> 6300kg
7	Windshield	Laminated uniform and curved	Not curved & two pieces

**Center of Gravity for Chassis-Cab Mass:-**

Weight on Front Axle,  $W_f=1535$  kg

Weight on Rear Axle,  $W_r = 775$  kg

Total weight,  $W = 2310$  kg

Center of gravity,  $D = ?$

$$D = \frac{W_f \times WB}{W}$$

$$D = \frac{1535 \text{ kg} \times 3.365 \text{ m}}{2310 \text{ kg}} = \mathbf{2.236 \text{ m}}$$

Therefore, the center of gravity, D of the chassis–cab mass is 2.236 meters ahead of rear axle.

**Center of Gravity of Truck:-**

The following original equipment manufacturer (OEM) dimensions should be considered before calculating the center of gravity. These are:

Table 2 Original Equipment Manufacturer specification

Wheel base (WB)	3365mm
Front Overhang (FOH)	1085mm
Rear Overhang (ROH)	1505 mm
Overall length (OAL)	5995mm
Gross Vehicle Weight	6300 kg
Desired weight on front axle	25% of GVW
Desired weight on rear axle	75% of GVW

Source: Isuzu NPR 66/66-2 manual 2007



Desired % of weight on front axle is 25% of W

$$W_f = 0.256 \times 6300 \text{ kg} = 1575\text{kg}$$

Desired % of weight on rear axle is 75% of W

$$W_r = 0.75 \times 6300 \text{ kg} = 4725\text{kg}$$

Gross Vehicle Weight, W = 6300kg

Then center of gravity, D is equal to

$$D = \frac{1575 \text{ kg} \times 3.365 \text{ m}}{6300 \text{ kg}} = \mathbf{0.84\text{m}}$$

Table 3 Dimensional deviations during modification

Original truck		Modified bus
Wheel base (WB)	3365mm	3365mm
Front Overhang (FOH)	1085mm	1100mm
Rear Overhang (ROH)	1505 mm	2300mm
Overall length (OAL)	5995mm	6765
Gross Vehicle Weight (GVW)	6300 kg	> 6300kg e.g.8140kg
Desired weight on front axle	25% of GVW	
Desired weight on rear axle	75% of GVW	

**Center of Gravity of Bus with Full Passengers:-**

Tare weight = 5440kg, considering the severe case from the table 1

Payload of passengers 25 passengers + 1 driver + 1 co-driver = 27

Payload = 27 × 100 kg per passengers = **2700 kg**

Gross Vehicle Weight (GVW) = Payload + Tare weight of Bus

$$GVW = 2700 \text{ kg} + 5440 \text{ kg} = \mathbf{8140 \text{ kg}}$$

During bus bodies building the following dimensions are modified.

$$W_f = 0.25 \times 8140 = 2035 \text{ kg}$$

$$W_r = 0.75 \times 8140 = 6105 \text{ kg}$$

$$\text{Thus, } D = \frac{2035 \times 3.365}{8140} = 0.84\text{m ahead of the rear axle}$$

During body construction, the rear over hang was increased by lengthening the chassis by welding. This further shifts the center of gravity to move very close to the rear axle.

If the body is too long for a wheelbase, the center of the body and payload is placed directly over the rear axle. This places the entire payload on the rear axles, resulting in overloading the rear tires, rear axle springs and wheel bearings and potentially exceeding the rear axle legal weight limit (*Isuzu motors limited 2007*).

Moving a load a few inches forward or backward on the chassis can mean the difference between acceptable weight distribution for the truck or an application that will not do the job satisfactorily (*2007 Series, Chevrolet and GMC N-Series Isuzu GM USA*).

When there is the possibility that axle loads will exceed existing weight laws and regulations, careful weight distribution is necessary to provide a correct balance between front and rear axle loads and total load within legal limitations.

**Rear Overhang Limit:-**

Rear over hang must not exceed the 60% of the wheelbase [10]. Thus the sample measurement of bus rear overhang is 2300mm which is larger than 60% of wheelbase (3365mm) .This shows that the weight distribution on the rear wheels extremely larger than the recommendations of the manufacturer.

**Weight Deviation from Specification:-**

Tare weight of the 150 modified buses registered by transport authority (TA) from the years 2010 to 2012 collected. The weight data of buses randomly selected are 150 buses in the three years of which 50 midi buses in each year. The Ethiopian Transport Authority, allows the passengers to have a right to use the bus with the 25 kilograms of luggage and the passenger average weight is 75 kilograms [11].

These are summarized as follows:

- Tare weight of a bus after modification  $\leq 3800\text{kg}$
- Weight one passenger = 75 Kg +25kg = 100kg.

As the performed investigation, the tare weight of locally manufactured bus bodies from the years 2010-2012 was 4197.4 kg, 4177.4 kg, and 4197.4 kg respectively, which is much greater than the allowed maximum tare weight limit which is  $\leq 3800\text{kg}$ .

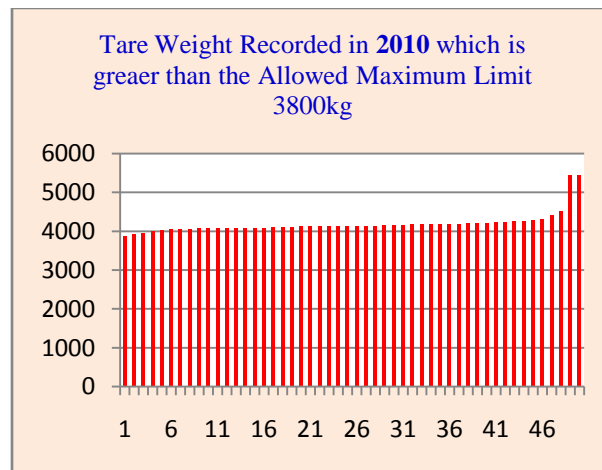


Figure 4(a) Tare weight in the year 2010

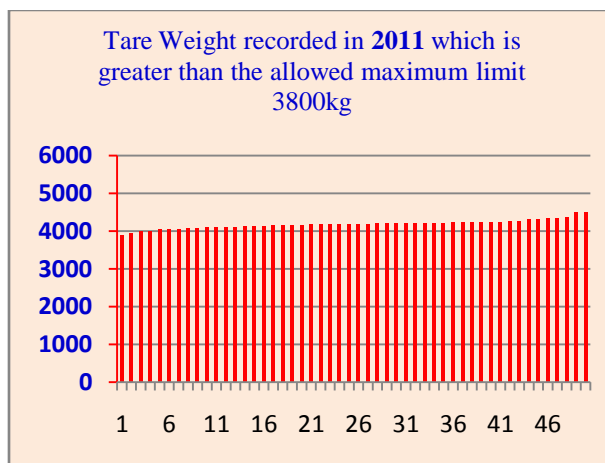


Figure 4(b) Tare weight in the year 2011

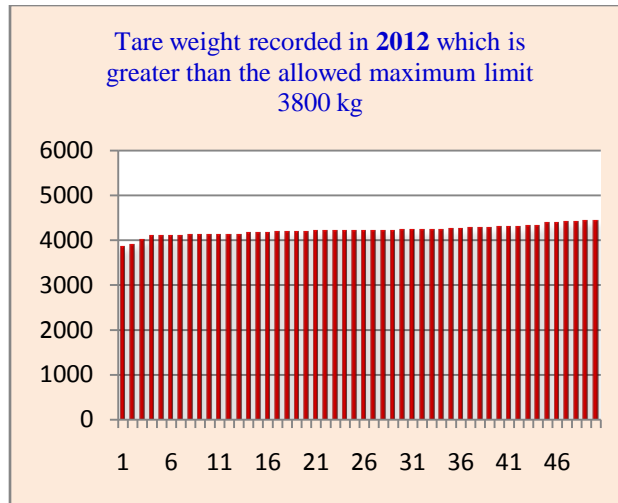


Figure 4(c) Tare weight in the year 2012

Figure 4(a), (b) and (c) the graphs show that TW is >3800kg

The average of the tare weight 2010-2012 from the arbitrarily selected sample size of 150 midi buses, the average of each year is 4197.4, 4177.4, and 4197.4 kg respectively. The average of the three years is greater than the specified range of weight.

**Reasons for the Overweight of Modified Buses:-**

**Absence of Code of Practices for Bus body building design and Approval:-**

The mandatory requirements for buses are intended to bring together the Standards, procedures, specifications and transport regulations for the purpose of regulating and determining the rules for the manufacture, construction and registration of a bus in the country.

The Transport authority should examine and check the mandatory requirements and periodically amend them in accordance with the safety, engineering and ecological standardization. An important part in consolidating the mandatory requirements is based on many years of testing, manufacturing and operating buses in the country, findings of road accident investigations etc., whose purpose is to lead to raising the level of comfort and safety for the passenger and road transport.

In view of this, committees of experts should be convened, to represent various bodies dealing with buses, which include representatives of the Vehicles Department in the Ministry of Transport, representatives of local bus manufacturers, public transport cooperatives and bus importers. The purpose of preparing code of practice leads to improvement of the structure of a bus, passenger safety and comfort, technological progress, the bus owners and insurance companies due to reduced cost of maintenance, reduced property and life loss.

So the following table 4 shows the weight of the problem in the industry from highest contributor to the least contributor depending on the feedback collected from different groups of people concerned in the sector like supervisors, transport officials, technicians, body builders, and passengers. According to the respondents 46% said the main problem is absence of national standard or code for bus body building and no continuous follow up the builders.

Table 4 Major reasons for defects in bus body building

N0	Category	100%
1	No National Standard	46
2	No well Organized Bus Body design	36
3	Shortage/No Advanced Machines	8
4	Poor material selection	6
5	Operators Skill	3
6	Poor/ No Workshops	2

### Cause Analysis Tools:-

#### Pareto Charts Analysis:

The main problems shown in table 4 are analyzed according to Pareto chart below.

A Pareto chart is a bar graph. The lengths of the bars represent frequency or cost (time or money), and are arranged with longest bars on the left and the shortest to the right. In this way the chart visually depicts which cause is more significant [12] [13].

It is used when analyzing data about the frequency of problems or causes in a process and when there are many problems or causes and you want to focus on the most significant.

Thus, the Pareto chart shows the greatest solution can be obtained or the problem of the bus body building can be solved by preparing the national standard for all bus body building industries and continuous follow up, and checks during and after modification.

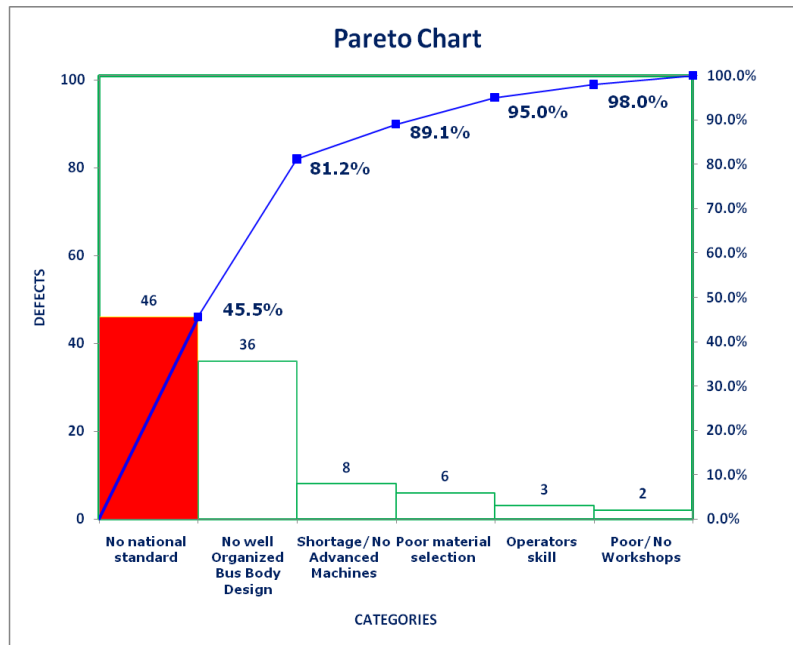


Figure 5 Pareto chart analysis for the most significant Causes of the problems.

If the bus body building code is prepared with appropriate scientific rules and regulation and continuous check-up followed, the existing problems are reduced by 45.5% as indicated in chart shown in figure 5 [12].

If the problems related with bus body builders are obtained solution, the problems are further reduced by 81.2 % and finally solving problems related to bus owners we can achieve better results [13].

### Cause-and-Effect Diagram Analysis

The Cause and Effect diagram also known as the "fishbone" or "Ishikawa" diagram after its creator Kaoru Ishikawa is used to systematically list all the different causes that can be attributed to a specific problem (or effect). A cause-and-effect diagram can help identify the reasons why a process goes out of control or it is a common tool used for a cause and effect analysis, where you try to identify possible causes for a certain problem or event [14].

The cause and effect diagrams give a fast and comprehensive overview of how a single quantity depends on other quantities. Common categories in a Fishbone Diagram are: Machine (equipment), method, manpower, material, environment, Management (policies), maintenance [14].

The chart in figure 6 identifies multiple potential causes for the problem at hand. The "bones" of the normal potential "cause" categories include people, methods, machinery, and materials. As problem situations vary, this tool has the added benefit of being able to creatively identify different elements to better fit the individual situation.

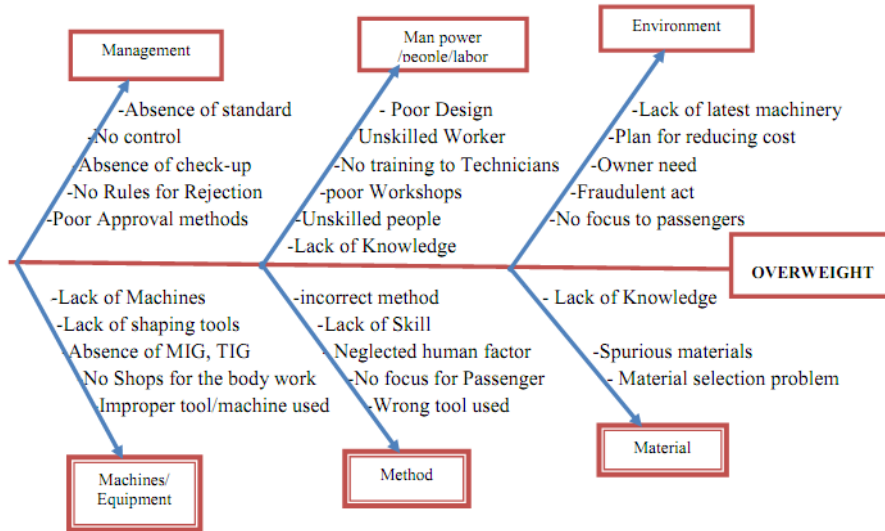


Figure 6 Fishbone or Cause-and-effect diagram

**Comparison of the Structures of Body Frame Work:-**

**Mounting Frame as Floor assembly:** A mounting frame with continuous longitudinal members is not required if the body floor assembly can assume the mounting frame function. The longitudinal members can also be integrated in the body. If the mounting frame longitudinal members are intersected by the chassis members, the connection between the longitudinal and cross members must be rigid and resistant to torsion and bending.

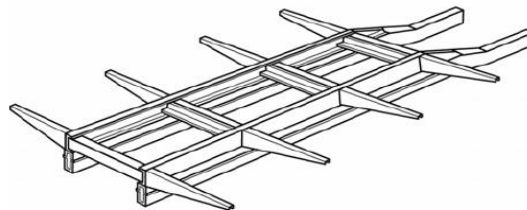


Figure 7 Longitudinal members are intersected by the chassis members to resist torsion & bending (sprinter, 2007)

The floor assembly of locally built buses is greatly different from the shown in figure 8.



Figure 8 Floor assembly of locally modified midi bus (Source: field survey)

**Self-Supporting Bodies**

A mounting frame with continuous longitudinal members is not required if the body floor assembly must have the same mounting frame function.

Self- supporting bodies must have the same characteristics as specified mounting frame. The body floor assembly must have the same rigidity and moment of resistance as a mounting frame.

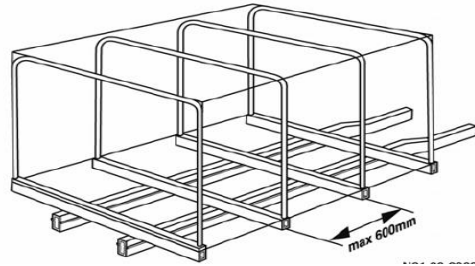


Figure 9 Body design spacing maximum 600mm



Figure 10 Roof structure of locally made (field photo)



Figure 11 Framework of locally Made (Field photo)

The safest roof structures are shown in the figure 12. These body structures are very strong, stiff and provide more safety and comfort to the bus occupants (sprinter 2007). The roof structure must be tested for strength and stiffness, to reduce the life fatalities during the bus roll-over accidents.

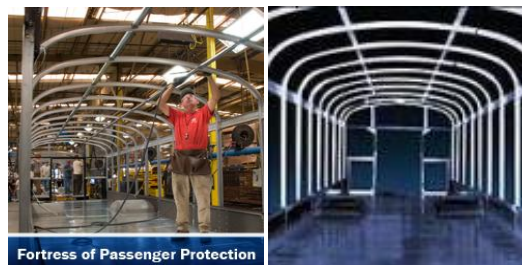


Figure 12 Best framework of body design (Sprinter, Dec, 2007)

Comparing figures 7, 9, and 12, with locally built bus bodies shown in figures 8, 10, and 11 the following summary concludes:

Locally built buses should follow the following important guides to obtain strong structures to resist torsion and bending loads and to guarantee passengers safety.



- The pillars should be round hollow sections extending from the right side chassis to roof structure and then to the left chassis without welding to get self-supporting bodies and have the same rigidity. The stress is uniformly distributed among the structures.
- In locally modified buses the pillars or posts are rectangular hollow sections (RHS) which are cut into pieces each of 2 meters long. These structure minimum welded in four places to make side and roof structures. The welded surface stress distribution is concentrated on the welded section.

#### **Mandatory Tests on the bus:-**

From the values of the measurements taken it is obvious that the measurements are deviated from the given standard values of the minimum requirements.

To conclude the above all analysis result the following photograph is a strong witness for little or no consideration of passengers' safety and comfort, poor material joining and assembling techniques.

The other most important idea is the body must be tested to the following to measure the stiffness and strength to increase the safety for the bus occupants. Figure 13 shows the vehicle body structure conditions during rollover accident. The bus structures completely disintegrated and passengers are thrown out the bus interior, which results in increase in life fatalities instead of minimizing risks [15][16].

Each bus should be tested for the following tests in order to ensure stiff and strong structures should be used to ensure to provide reliable safety, comfort and durable structure for the bus owners and passengers [12][16].

- Vehicle Roll over test:** While the vehicle need not be in a fully finished condition, it shall be representative of production vehicles in respect of the mass of the vehicle in running order, center of gravity and distribution of mass as declared by the manufacturer.
- Joint Strength Test:** Each body panel joint shall be capable of holding the body panel to the member to which it is joined when subjected to a force of 60% of the tensile strength of the weakest joined body panel.
- Vehicle Stability Test:** The stability of a vehicle shall be considered to comply with the requirement if the angle at which overturning occurs is greater than 28 degrees from the horizontal (acceptance criteria).
- Impact Strength for Bumpers:** the front and rear bumpers of the vehicle shall meet the requirements prescribed in relevant standard as and when notified.
- Water Test:** every vehicle must be tested for water or rain test to prevent the entry of rain or leakage to the bus interior [12] [16] [17].

**f. Roof Strength Test:** should be performed to reduce fatalities during vehicle rollover accident.



*Figure 13 Rolled over bus and body structures response during accident (source: field photo)*

**Conclusions:-**

Absence of proper national standard/code of practice for bus body building design and approval to regulate and control the builders allowed the builder to follow their own experience. Thus, setting and implementing the rules for the body builders corrects the existing challenges and helps to manufacture quality products which are economical, safe and comfortable. In addition, proper design which includes complete technical specifications, general drawings of bus structure along with complete dimensions, its components, seats, interior/ exterior fittings, electrical systems, wiring harness, photometric items and other accessories along with complete details of materials used, their specification, manufacturing tolerances shall be provided.

The vehicle performance parameters like; the power, speed and fuel consumption greatly affected by the overweight. Using lightest material like High Strength Steel (HSS), Acrylonitrile Butadiene Styrene (ABS), Polyvinyl-Chloride (ABS-PVC), Composite Body Solutions (CBS), Fiber Reinforced Plastics (FRP), mineral wood the weight can be reduced. Plastics have gained wide usage as transit vehicle liners because highly suitable components can be economically produced, usually at reduced weight [18].

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### RESEARCH ARTICLE

#### ASSESSMENT OF RADIOLOGY HEALTH WORKERS' KNOWLEDGE, ATTITUDES AND PRACTICES OF RADIATION PROTECTION PRECAUTIONS IN MAKKAH CITY, SAUDI ARABIA.

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#### Abstract

The exposure to radiation from medical procedures has become a topic of recent public and scientific discussion. Strict adherence to the radiation exposure guidelines is mandatory when using X-rays for disease detection in order to minimize its harmful effects.

**Aim:** The main aim of this study was to assess radiology health workers' knowledge, practices, and attitudes of radiation protection precautions in Makkah City, Saudi Arabia.

**Subjects and methods:** Descriptive cross section research design was used in the conduction of this study in different governmental and private hospitals. Random sample 283 radiology health workers were participated in this study. One standardized questionnaire was used.

**Results:** The majority of studied participants had good knowledge, practices, and attitudes regarding radiation protection precautions in Makkah City, Saudi Arabia.

**Conclusions:** The present study's findings revealed that, the highest percentages of study participants were aware about radiation protection precautions in Makkah City, Saudi Arabia.

**Recommendations:** Designing and implementing a comprehensive training program to all healthcare workers as doctors, nurses and all personnel contact with radiology area. Replication of the study on larger sample and different healthcare workers will be beneficial to decrease health hazards associated with radiation.

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#### Introduction:-

Radiation protection is the science and art of protecting people and the environment from the harmful effects of ionizing radiation. It is also described as all activities directed towards minimizing radiation exposure of patients and personnel during x-ray exposure (Elamin, 2013). The objective of radiation protection is to define how one can

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protect individuals, their descendants and the human race against the potential risks of ionizing radiation (*UcheEze, et al., 2013*).

Radiography (also called radiologic technology) includes conventional x-ray imaging as well as additional imaging modalities such as fluoroscopy, mammography, ultrasound (US), computed tomography (CT), magnetic resonance imaging (MRI), nuclear medicines (NM) and radiation therapy (RT). Radiography is an essential diagnostic tool of modern medicine. Within a hospital, radiologists, radiology and nuclear medicine technicians, and others involved in the performance of x-ray and computed tomography (CT) scan examinations, have an increased risk for radiation exposure than the general hospital population (*Salama, et al., 2016*).

Treatment of a patient depends on the accurate and precise production of radiographic images and successful interpretation of these images. Various injuries and conditions can be treated when the exact diagnosis is known to the physician. Therefore, a radiographer must be well educated and trained to achieve this goal. A highly qualified and skilled radiographer is a significant member of the health care staff. He could provide appropriate services using imaging techniques, and evaluates radio-graphs of technical quality (*Alaamer, 2012*).

Despite the recent wide radiation applications in medicine, it can be hazardous if not properly handled. A careful balance between the benefits of enhancing human health, and the risks related to the radiation exposure of radiographers, patients, and the public, has to be involved in the practice of diagnostic and interventional radiation. X-rays have the potential for damaging healthy cells and tissues. After interaction of ionizing radiation with biological tissues through various mechanisms, the ions caused by such interactions can affect normal biological processes. Improper protection against high exposures of ionizing radiation can lead to death, cancer, skin burn, cataract, and radiation infertility (deterministic effects) (*Adejumo et al., 2012*).

In addition, although the low dose of radiation exposure may cause no observable damage, the probability of chromosomal damage in the germ cells, with the consequence of mutations giving rise to genetic damages (stochastic effects), can make such doses significant for large populations. Accordingly, the need for radiation protection exists, in all medical facilities and for all radiation equipment types (*Johnston et al., 2011*).

The characterization of medical applications, in terms of occupational exposures, is sometimes done by reporting an average annual individual dose for all exposed and/or measurably exposed workers. In practical radiation protection, this approach is, however, meaningless, as individual doses in the medical field differ substantially. During the evaluation of dosimetric data one needs information about the distribution of the yearly doses. When individual monitoring is used as a tool in practical radiation protection, it is important to know if the order of magnitude of the individual dose is defined by the nature of the procedure, the individual workload, the level of radiation protection measures, or the methodology of the assessment (*Covens, et al., 2007*).

Occupational exposure is the result of radiation exposure at work, and personal dosimetry is an important tool to ensure compliance with regulatory or generally accepted dose limits. Radiation safety is the main health issue of concern to health-care facilities. Ionizing radiation is a known carcinogen at high doses, and clinical symptoms are known to be associated with the chronic low-dose exposure. The use of ionizing radiations in medicine is expanding rapidly due to the introduction of new ionizing radiation oriented diagnostic and therapeutic practices. Radiographic imaging is extremely valuable as a diagnostic tool in medicine, but ionizing radiation also carries well-known potential risks (*Salama, et al., 2016*).

Radiation exposure poses hazards for healthcare providers as well as patients, and it may have somatic and genetic effects. Monitoring of radiation doses received by staff in radio-diagnostic centers is of great importance to the radiographers in their effort to protect themselves, patients, and the general public from the untoward effect of excessive radiation (*Salama, et al., 2016*).

The as low as reasonably achievable (ALARA) principle, which emphasizes utilizing techniques and procedures to keep exposure to a level as low as reasonably achievable, should be followed to minimize the risk of radiation exposure to medical professionals. Personnel shielding options (e.g., two-piece wraparound aprons, thyroid shields, and eye protection) should be used to effectively attenuate scattered x-ray levels (*Greenlee, et al., 2011*).

**Significance of the study:-**

Legislations for X-radiation protection of the environment and workers in industries and health care in developing countries are either nonexistent or unimplemented because of lack of concern, inadequate manpower, and logistics (Agbor and Azodo, 2017). The exposure to radiation from these diagnostic X-rays exerts adverse effects on humans, and these effects are classified as deterministic and stochastic effects. In order to protect the employees against occupational exposure to radiation, appropriate technical education and training suitable for effective protection of tools and equipment should be provided. These measures must be in accordance with national regulatory codes. So, this study aimed to assess the awareness of radiation protection precautions among radiology health workers in Makkah City, Saudi Arabia.

**Aim of the study:-**

The main aim of this study was to assess radiology health workers' knowledge, practices, and attitudes of radiation protection precautions in Makkah City, Saudi Arabia.

**Subjects and Methods:-****Research design:-**

A descriptive cross section study design was used in the conduction of this study, during the period from December 2016 to February 2017.

**Setting:-**

The study was conducted in different government and private hospitals, in Makkah city, Saudi Arabia.

**Subjects of the study:-**

Random sample (283) of radiology health workers were selected for this study from previously mentioned setting. Out of 400 questionnaire only 283 were completed. The response rate were (70.75%) selected.

**Tool of data collection:** A structured questionnaire was designed for data collection by researchers based on review of literature. It included four parts.

**First part :** included socio-demographic data of the study subject as age, gender, Nationality, marital status, Type of hospitals, Duration of Employment (years), Average working hours/day and which department you work in?.

**Second parts:** Included knowledge about radiation protection, Response of radiographers to radiation safety compliance. It composed of 4 statements.

**Third part:** Revealed the practice of radiation protection, applicability & convenience of radiation protection policies, procedures & PPE (Personal Protective Equipment). It composed of 5 statements.

**Fourth parts :** Comprised of attitude, assessment of the work place safety requirements. It included 7 statements.

**Ethical consideration:-**

Before any attempt to collect data, an official approval to conduct the study was obtained from all hospitals included in the study. This was done by sending letters containing the aim of the study from King Faisal Hospital in Taif city to ethical research committee in all hospitals. Each participant was notified about the purpose of the study, the right to refuse to participate in the study. Anonymity and confidentiality of the information gathered was ensured.

**Statistical analysis:-**

Data were revised, coded, entered, analyzed and tabulated using SPSS version 19. Both descriptive statistics (frequency, percentage, mean and standard deviation) P value less than 0.05 was considered significant.

**Results:-**

**Table 1:** This table represented socio-demographic characteristics of studied sample, as evident from the table, most of participants (51.9%) were female, nearly about two thirds of study participants (59.0%) were Saudi, and (63.3%) of study participants were married. The majority of study participants (85.9%), worked in government hospitals. Regarding working hours, the majority of study participants (81.6%) worked about 6-9 H/Day. Concerning departments, nearly about one third of study participants (36.0%) worked in General x-ray. The age of study participants were  $32.5 \pm 7.2$ .

**Table 2:** Revealed participants' knowledge about radiation, this table showed that (96.8%) of participants were aware about the radiation hazards, (73.1%) of participants were aware about radiation safety standards, (97.9%) of participants knew the importance of radiation safety and (88.3%) knew about wearing Personal Protective Equipment (PPE) during any imaging.

**Table 3:** Demonstrated participants' practices about radiation. This table revealed that most of participants have the Lead aprons and lead gloves in their department with percentage (82.7% and 73.5% respectively), while, the percentage of use is (68.2%), the integrity of checking periodically was (65.4%) and most of participants (68.9%) answered more than 2m about the distance from radiological device without protection during the procedure (meter).

**Table 4:** Illustrated participants' attitudes about radiation. This table demonstrated that, (65.0%) of participants have the personal monitoring records, it is checking periodically (59.7%) and it does not recorded high reading with (65.4%), (67.1%) of participant have Environmental monitoring records with percentage (67.1%), (92.2%) have a safety written policy in their department, (94.3%) of participants answer yes about the lead plaster/lead lining of walls and doors and if there is a safety warning signs with percentage (94.3% and 97.2% respectively).

**Table (1):-** Socio -demographic Characteristics of Studied Sample (N=283).

Socio –demographic Data	N	%	Total	
<b>Sex:</b>				
Male	136	48.1%		
Female	147	51.9%	283	100%
<b>Nationality:</b>				
Saudi	167	59.0%		
Non-Saudi	116	41.0%	283	100%
<b>Marital Status:</b>				
Married	179	63.3%		
Single	81	28.6%	283	100%
Divorce	23	8.1%		
<b>Type of Hospitals:</b>				
Government	243	85.9%		
Private	40	14.1%	283	100%
<b>Average working Hours\Day:</b>				
3-5 Hours\Day	39	13.8%		
6-9Hours\Day	231	81.6%	283	100%
9-12 Hours\Day	13	4.6%		
<b>Department:</b>				
MRI	53	18.7%		
CT	66	23.3%		
General x-ray	102	36.0%		
US	40	14.1%	283	100%
Fluoroscopy	22	7.8%		
Age : (X ± SD)	32.5±7.2			
Experience: (X ± SD)	2.8±1.3			

**Table (2):-** Knowledge about Radiation among Study Sample (N=283).

Statements	Yes		No		Total
	N	%	N	%	
<b>Awareness of radiation hazards.</b>	274	96.8%	9	3.2%	283 100%
<b>Awareness of radiation safety standards.</b>	207	73.1%	76	26.9%	
<b>The Importance of radiation safety.</b>	277	97.9%	6	2.1%	
<b>Knowledge about wearing (PPE) Personal Protective Equipment during any imaging</b>	250	88.3%	33	11.7%	

**Table (3):- Practice about Radiation among Study Sample (N=283).**

Statements	Yes		No		Total
	N	%	N	%	
Is there the Lead aprons in your department ?	234	82.7%	49	17.3%	283 100%
Is it used?	193	68.2%	90	31.8%	
Is there the Leaded gloves in your department?	208	73.5%	75	26.5%	
Is integrity checking periodically?	185	65.4%	98	34.6%	
the distance from radiological device without protection during the procedure (meter):	N		%		283 100%
Less than1m	29		10.2%		
From 1-2 m	59		20.8%		
More than 2 m	195		68.9%		

**Table (4):- Attitude about Radiation among Study Sample( N=283).**

Statements	Yes		No		Total
	N	%	N	%	
Do you have personal monitoring records?	184	65.0%	99	35.0%	283 100%
Is it checking periodically?	169	59.7%	114	40.3%	283 100%
Is it recorded high readings?	98	34.6%	185	65.4%	283 100%
Is there any Environmental monitoring records?	190	67.1%	93	32.9%	283 100%
Is there a safety written policy ?	261	92.2%	22	7.8%	283 100%
Is there lead plaster/lead lining of walls and doors ?	267	94.3%	16	5.7%	283 100%
In your department, is there a safety warning signs ?	275	97.2%	8	2.8%	283 100%

### Discussion:-

This cross-sectional descriptive study included 283healthcare workers, with the aim of assessing radiology health workers' knowledge, attitudes and practices of radiation protection precautions in Makkah City, Saudi Arabia. The results of the present study showed good knowledge, attitude, and practice for radiation protection, This is better than what was reported in a similar study in Tehran Province (Iran) which found knowledge of radiation protection issues among radiographers in that country to be poor(*Shohreh, 2015*), but it was consistent with study reported in Lagos (Nigeria) which foundRadiographers in Lagos, Nigeria, exhibited a very good understanding of the issues pertaining to radiation protection (*Cletus, 2013*).

In this study, the maximum age of participants is 54 years old, with the employment of 6 years and the minimum is 21 years old, with the employment of 1 year.The female is represented 51.9% and the male 48.1%, most of participants were Saudi with percentage 59.0% and the non-Saudi formed 41.0%, the participants ranging between married, single and divorce with percentage 63.3%, 28.6% and 8.1% respectively.Most of participants were working in governmental hospitals by 85.9% percentage and the private hospitals represented 14.1%.The highest rate of work for participants was 6-9 Hours\Day in general x-ray with percentage 81.6% and 36.0% respectively.

Regarding knowledge about radiation safety we observed that; the majority of study subjects were aware about radiation hazard and safety; whereas 96.8% of participants were aware about radiation hazards and the awareness about importance and standard of radiation safety is 97.9%, 73.1% respectively, this study' result wasconfirmed by *Paolicchi, et al.,(2016)* who reported that almost all participants (95 %) showed an awareness of the need to communicate to the patient the possible risks related to radiation exposure. But this study was disagree with *Melaih, and Mishah(2008)*who revealed that the nurses in general don't have enough knowledge about radiation safety and protection principles.

The participants wearing Personal Protective Equipment during examinations by percentage 88.3%,this result was not coincided with (*UcheEze, et al., 2013*)who mentioned that only 50% of respondents were observed to wear radiation dosimeters during the period studied.

Regarding the practice about radiation, there are lead aprons in the departments by percentages 82.7% and it were using with 68.2% , This result is coincided with *Elamin, (2013)*who mentioned all the hospitals either governmental or private have lead rubber aprons. All the governmental hospitals had gonadal shield although none is using them on a routine basis,in study reported by (*UcheEze, et al., 2013*)who indicated that in particular, gonad shields were available in all the centers studied but were either deliberately or inadvertently ignored in government hospitals.

It is mandatory, according to International Commission on Radiological Protection(ICRP) radiation safety standards for gonads shields to be used for the protection of the gonads when the pelvis is not part of the anatomical area being examined. Their use is more essential when women of child bearing age in whom early cyesis is suspected come for x-ray examinations. Most of the radiology departments have lead gloves by percentage 73.5% and it were using with 53.7%, table3, this result disagreed with *Ahmed et al., (2015)* they said: only (22.7%) use lead gloves and this behavior will protect the radiographers themselves.

Replacing a lead apron averts an increase in dose due to defects in the apron. Therefore, the replacement cost of the lead apron is the amount spent to avert the dose due to a defective lead apron, (*Kent, 2001*). In this research the integrity was checking periodically by percentage 65.4% and did not checking by 34.6%, this result was not consistent with, *Oyar, et al., ( 2012)* who revealed that considering the use of radiation protection aprons in clinics, we have seen that personnel are not aware of the importance of preservation and storage conditions, and for this reason, they do not heed the rules for using, preserving and cleaning aprons.

Radiation dose rates increase or decrease according to the inverse square of the distance from the source. Understanding the inverse square law can help personnel in decreasing their exposure to scattered radiation. The inverse square law states that exposure at a distance from a point of radiation is inversely proportional to the square of the distance, (*Erica et al., 2011*) in this research the distance from radiological machines in the most departments are more than 2m by percentage 68.9%, this result was confirm by *Abdellah et al., 2015* who indicated that the 28 physicians (35%) were standing at a distance of two meters or less from source point without protection.

Related to attitude of radiation, 65.0% of participants have personal monitoring records and it is checking periodically by 59.7%, this result was confirm with Rania M. et al, (2015) they said: (98.7%) of the staff have periodical radiation dose check from their TLDs (wearing TLDs during their work hours), also in the research written by *Meenakshisundaram, et al.* who mentioned that about 200 radiation workers are issued Thermo Luminescent Dosimeters (TLD) every month and their dose records are well documented in a computerized dose management system with a feature to view the dose history of an individual at any given time.

According to the ALARA (As Low As Reasonably Achievable) principle, it is possible to considerably lower the dose of ionizing radiations during tests. *Asl, et al., (2013)* stated that the study results showed 34.6% of this monitoring recorded high reading while 65.4% did not recorded high reading. Almost; all the x-ray departments have lead lining the wall and door and have safety written policy by percentage 94.3%, and 92.2% respectively. The radiology departments using the safety-warning signs by percentage 97.2%, this result was agree with *Dehaghi, et al., (2015)* who reported that according to the obtained results, 71% of the described radiology departments generally used warning signs, 67.1% of the radiology departments have environmental monitoring records, this result not coincided with *Elamin,(2013)* who concluded that the results of this study reveals low personal and environmental radiation monitoring by hospitals in Khartoum State as only (20.7 %).

#### **Limitation of the study:-**

The most remarkable limitation of the present study was that all data in this study was obtained through cross-sectional, self-report surveys, which could lead to common method variance Therefore, it is suggested that these results be used cautiously.

#### **Conclusions:-**

The present study's findings revealed that, the highest percentages of study participants were aware about radiation protection precautions. The majority of studied participants had good knowledge, practices, and attitudes regarding radiation protection precautions in Makkah City, Saudi Arabia.

## Recommendations:-

**Based on the findings of this study, the following recommendations are proposed:**

1. Designing and implementing a comprehensive training program to all healthcare workers as doctors, nurses and personnel contact with radiology area.
2. Replication of the study on larger sample and different healthcare workers will be beneficial to decrease health hazards associated with radiation.

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### RESEARCH ARTICLE

#### HEDGING EFFICIENCY OF FUTURES MARKET ON CASH CROPS (JUTE) - AN INDIAN EXPERIENCE.

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#### Abstract

Commodities have played a major role in shaping the international economy by affecting the lives and livelihoods of people. Particularly, in India Shortage of critical commodities sparked huge public outcry and social unrest. Price volatility which arises from bad weather irregular production and harvests as well as from swings in demand and supply is one of the key problems associated with commodity. Volatility evokes not only yield risk but also price risk for both producers and consumers of the commodity. To manage these price volatility derivative products i.e. commodity futures are being used by farmers, consumers, firms, exporters, importers etc. to reduce the price risk.

Commodity derivative market particularly, commodity futures is recognized as one of the important instrument that has been devised to achieve price risk management. In this context, an attempt has been made in the paper to evaluate the hedging effectiveness of commodity derivative market in the management of price risk with reference to the raw jute derivative market in India. The study utilized daily futures price and spot price data of Raw Jute provided by National Multi Commodity Exchange (NMCE) during the period 2010-14. Trend of spot and future prices in raw jute was analyzed by using descriptive statistical measures. To analyses the hedging effectiveness of the raw jute futures contract minimum variance hedge ratio has been used. Empirical evidence suggests variation in spot and futures prices of raw jute are higher however, an equal trend is found between the variations of spot and futures prices. The results of this study are useful for various stakeholders' of agricultural commodity markets such as producers, traders, commission agents, commodity exchange participants, regulators and policy makers.

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#### Introduction:-

Since 19th century trading in Commodity Futures has been in existence in India with organized trading in cotton, through the establishment of Bombay Cotton Association Ltd. in 1875. Over a period of time, various other commodities were allowed to be traded in futures Exchanges. Though, India is a commodity based economy where

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two-third of the total population depend on agricultural commodities, surprisingly has an under developed commodity market. Since commodity “futures” trading was permitted by government in 2003 by lifting prohibition against futures trading and granting recognition to electronic exchanges namely National Multi Commodity Exchange of India (NMCE), Multi Commodity Exchange of India (MCX), National Commodity and Derivatives Exchange (NCDEX) as national multi commodity exchanges, the commodity derivative market in India has witnessed exceptional growth. In addition to the above exchanges the other major commodity exchanges operating now in India are Indian Commodity Exchange Limited (ICEX), Ace derivative and commodity exchange Limited (ACE) and Universal Commodity Exchange (UCE).

The primary economic function of futures markets is the hedging or risk sharing function and the secondary functions include price discovery function, financing function, liquidity function and price stabilization function (Somanathan, 1998). The argument of risk minimization through hedging primarily conditioned upon the movement of spot and futures markets together, so that losses in one market can be compensated by gains in other market. In fact, the existence of higher price volatility in the spot market provides a room for the operation of commodity derivative market to hedge against the price risk. Thus, an element of the price risk management in the commodity derivative market is expected to stabilize spot prices of the essential commodities. In order to manage price risk efficiently, it is enviable to control both price risk and basis risk<sup>1</sup>. An un-hedged producer or investor faces price risk in the spot market while a hedged investor or producer faces basis risk. When the basis risk is low, hedging can be used as an efficient instrument, but while basis risk is as large as price risk then hedging cannot be used as an effective instrument for mitigating business risk. In this case it is not profitable for producer or investor to enter into the derivative market. If the basis is close to zero in the maturity month then futures price converges to the spot price and there is no such business risk (Naik and Jain, 2002; Lokare, 2007; Commission for Agricultural Cost and Prices, 2008).

Jute is a natural fiber with golden and silky shine and hence called the golden fiber. It is the cheapest vegetable fiber procured from the skin of the plant's stem and the second most important vegetable fiber after cotton, in terms of usage, global consumption, production and availability. It has high tensile strength, low extensibility and ensures better breath ability of fabrics. The British East India Company was the first jute trader in India. After the fall of British Empire in India during 1947, most of the Jute Barons started evacuate India, leaving behind the industrial setup of the Industry. Then most of the jute mills were taken over by the Marwari businessmen. India is the largest producer with a share of 66% of the world' total production and West Bengal is the largest producing state in the country accounting for 71% of the national production. Therefore, it can be undoubtedly summarize that jute sector plays an important role in the economy of the country. However, the sector has been beset with several problems, including small and marginal growers with low bargaining power, inadequate institutional credit facility, imperfection in marketing structure, low productivity, competition from the synthetics, high labour costs, repeated industrial unrest, obsolete machinery, stagnating exports, all of which have led to prevalent sickness in the jute industry. Furthermore, with variation in the behaviour of weather, jute crop is potentially influenced by such weather vagaries. Instability in raw jute production dovetailed with little holding capacity of farmers generally gives rise to erratic price movement in raw jute both during intra-season and inter-seasons. Moreover, the Indian jute market is often guided by the existence of different price system i.e. spot, futures and government administered minimum support prices. So, the millions of families who are dependent on cultivation of jute especially in Eastern India often face price volatility in raw jute market.

Not many studies have been conducted in India after introduction of futures specifically on agricultural commodities. It is also safe to assume that the agricultural commodities spot market still continues to fragmented and inefficient. The futures market provides a unified price at national level acts as a bench mark for regional market. Jute being a cash crop cultivated and produced mostly in eastern India. Acreage for cultivation gets reduced year by year as the farmer do not realize the best of prices, as reported and adds to the distress sale.

In light of the above facts this study wants to examine the raw jute market and jute prices from 2010 to 2014. This also brings the fact that a few studies have been conducted on the jute with special reference to its futures and it provides a better scope to study the future market of jute.

The outline of the paper is as follows. The next section briefly reviews the related literatures and discusses the contribution of this study. Section III explains about the meaning, nature, production, and spot market prices of raw

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<sup>1</sup> The difference between future price and spot prices are called Basis.

jute in Indian context and also the various regulatory bodies associated with the Indian jute industry. Section IV describes about jute futures market in Indian context and how the futures market can be used for hedging the spot exposure. Section V covers the sources and properties of the data, hypothesis along with the research methodology and its limitations. While the sixth section shows the empirical results of the applied tools. In the final section, it summarizes the main findings of the study in form of conclusion.

### **Review of Literature:-**

Since the introduction of futures in Indian commodity market there are numerous studies have been conducted in the ascertainment of whether the price information is reflected in the spot market or in its underlying futures market under various interval of time. There have been both supporting and contrary views on impact of derivatives trading. The following are brief reviews of some of the research papers that have been done nationally and internationally to study the price risk management efficiency of commodity futures market.

**Chan (1992), Garbade and Silber (1983), Oellermann et al. (1989), Feeder cattle and Schroeder and Goodwin (1991), Zhong et al. (2004), Zapta and Fortenberry (1997)** tested the relationship between spot and futures prices and concluded that in the beginning the futures market captures the new information and then transfer happens to the spot market. They also explained that the futures market is the main source of market and futures market helps in price discovery. By supporting the explanation, Tan and Lim (2001), Tse (1999) propounded that futures market influences the cash market and vice versa.

**Brockman and Tse (1995), Zapata et al (2005), Roy (2008)** used econometrics technique such as Co-integration, Vector Error Correction Model (VECM) etc. and concluded that the physical market of the commodities follows the commodity futures market hence, futures market drives the price discovery.

**Thomas and karande (2001)** studied the price discovery process of castor seed futures traded on the regional exchanges of the Ahmadabad and Mumbai and concluded that there is no lag and lead relationship between the spot and futures prices of castor seed traded at Ahmadabad market and spot market dominates the Mumbai futures market.

**Gopal and Sudhir (2002)** in their study propounded that Indian agriculture commodity futures market is not fully competent for risk management and price discovery in the same time blamed poor management, infrastructure and logistics for the inefficiency of the market

**Lingareddy, Tulsii (2008)**, in his paper named 'Expert committee on commodity Futures: Agreements and Disagreements' explained that futures trade in India has increased the price volatility of largely traded commodities like urad, chana and wheat during periods of excess liquidity and in contrast, other commodities like soya oil futures trading has led to a reduction in volatilities and better price discovery. They concluded that futures trading in agricultural commodities are beneficial for only those commodities that fulfill the basic selection criteria for futures trading.

**Kumar Sunil (2004)** in their study they have taken five Indian agricultural commodities and to examine the price discovery phenomenon applied Johansen Co-integration technique. It concluded that the Indian agriculture commodity futures is inefficient and it unable to absorb the spot market information.

**Jose, k Sharon (2005)**, in his article titled "Forecasting Future basis levels in Commodity Futures" and **Mahalik et al. (2009) Shihabudheen and Padhi (2010), Ranajit and Asima, 2010, Srinivasan (2012), Gurbandini and Roy (2008)**, explained commodity futures contracts helps to hedge the commodity price risk which in turn helps in avoiding uncertainty of future cash flows so commodity futures can be used as an efficient price discovery vehicle.

**Jose, k Sharon (2005), Kaul, Sanjay, (2007)** their empirical evidences explains that introduction of derivatives does not destabilize the underlying market, but the literature strongly suggests that the introduction of derivatives tends to improve liquidity and information of the market.

A study by **Indian Institute of Management, Bangalore, (2006)** with regard to gram, sugar, guar-seed, wheat, urad, and tur states that these commodities witnessed higher price increase in the Post Exchange period as compared

with the pre-exchange period. It concludes that changes in the fundamentals were important in causing the higher post-futures price rise, with government policies also contributing. Therefore, the role of futures remains unclear.

**The study by Sahi, G.S, (2006), R. Salvadi and P. Ramasundaram, 2008** the study suggests that excessive speculative activity in futures market which is not driven by those who manage price risks in physical trade. Their results showed the inefficiency of agricultural commodity futures market in terms of price discovery due to the non integration of futures and the spot market.

By examining efficiency of Indian commodity futures market **Samal, G.P and Swain, Anil (2015)** concluded that there was a long-term relationship existed between futures and spot prices for cotton, turmeric and castor seed during the calendar year 2013. Further, causality test proved that futures markets have stronger ability to predict subsequent spot prices for cotton, turmeric and castor seed during the same period.

From the literature review, it is observed that there is enormous amount of literature on the concerned subject considering the world-wide commodity market. However, it is comparatively less in case of price risk management in agricultural commodities, especially in raw jute. In the same time it is found out that there is enormous amount of literature on efficiency in information flow between the two markets i.e. Spot and the Futures, Co-integration between both the markets. The study relating to Jute has not made. Hence, the study is taken up. In such circumstances, this study carries a significant importance to re-look on the price risk management efficiency of agricultural commodity market in India.

### Spot Market of Jute- In Indian Context:-

Jute is the cheapest and the strongest of all natural fibers also considered as the fiber of the future. According to world's production of textile fibers Jute is the second largest after cotton. Particularly India, Bangladesh, China, Thailand, south Asian countries and Brazil are the leading producers of raw Jute and also the main producers of White jute and dark jute. Jute is extensively used in the manufacture of different types of packaging fabrics, carpet backing, mats, bags, decorative fabrics, chic-saris, soft luggage's, footwear, greeting cards, molded door panels, tarpaulins, ropes and twines etc. and also other types of consumer products.

India is the largest producer of jute goods in the world, while Bangladesh is the largest cultivator of raw jute. Eastern Indian states v.i.z. West Bengal, Bihar, Assam, Tripura, Meghalaya, Odisha and Uttar Pradesh are the major cultivator of Jute. In India West Bengal alone produces approximately fifty percent of total raw jute. In India 4000,000 families are involved in the cultivation of raw jute. There are 76 jute mills and provides employment opportunity nearly to 1, 37,679 people. Several thousand other people are engaged in several jute related diversified goods also. The state seed corporation of Andhra Pradesh and Maharashtra produces more than 90 percent of jute seeds so, India is self-sufficient in the jute seed production.

Jute, being a natural fibre, is biodegradable and eco-friendly and it has many advantages over synthetics. It also enjoys the advantages like low extensibility, high tensile strength, lusture, moderate heat and fire resistance and long staple lengths. Recently Indian Jute Industries Research Association (IJIRA) has developed Hydrocarbon free jute bags and food grade jute bags of international standard. Now these bags have great demand throughout the world for packing food stuffs. There are many varieties of jute but according to general utility purposes some of the important varieties are the following:

- ✦ Hessian Or Burlap - these are plain woven fabric of 5 to 12 ozs./ yard, and used for making cloths and bags.
- ✦ Sacking – these qualities are made from lower grades of fiber and weighing from 12-20 ozs./yard popularly known as 'heavy goods'. In all types of bags these qualities are used.
- ✦ Canvas - it is the finest jute product and woven of the best grades of fiber used as a protection from the weather.
- ✦ Jute Yarn And Twine – it has varying weights and thickness these are consumed by the jute mills themselves in fabrics. It has variety of applications such as sewing, tying, packing pipe joints, cable binding etc.

There are many regulatory and development organizations associated with the jute industry for its sustainable development. The International Jute Study Group (IJSG) which is an intergovernmental body set up by the UNCTAD to promote the international trade by developing new markets, developing sustainable and qualitative new jute products and providing a platform for active participation among private sectors globally. In India under the National Jute Board Act, 2008 a statutory body was set up called National Jute Board (NJB) that functions under the

Ministry of Textiles, Govt. of India and has started its operation with effect from the 1 April 2010. The two organizations i.e. Jute Manufactures Development Council (JMDC) and National Centre for Jute Diversification (NCJD) are merged with the NJB. It functions with the objective of promoting standardization of raw jute and jute goods, developing entrepreneurship in jute sector by organising entrepreneurial development programmes, modernizing jute industry etc. Other organizations like Indian Jute Industries Research Association (IJIRA), Central Research Institute for Jute & Allied Fibers (CRIJAF), Jute Manufactures Development Council (JMDC), Indian Jute Mills Association (IJMA), Gunny Trades Association (GTA), Institute of Jute Technology (IJT), Office of Jute Commission (Ministry of Textile) and many more were established to strengthen the sector. Further in the year 2005 the govt. of India framed the national jute policy with the objective of improving the quality of jute, increasing its export, producing and exporting the jute goods which confirms the international standard, utilizing the advanced technology in production, improving the working environment of the jute industry and providing fair emoluments to the workers which are conducive for their reasonable quality of life etc.

So far as the pricing of the raw jute is concerned the Government of India every year determines the Minimum Support Price of various grades of raw jute with the consolation of Commission for Agricultural Cost and Prices (CACAP). This year Government has increased the Minimum Support Price (MSP) of raw jute of TD-5 grade from Rs. 2300 per quintal (100 Kilograms) to Rs. 2400 per quintal for the 2014-2015 seasons i.e. an increase of 4.34 percent over last year's. Government also fixes the MSP for grades of raw jute. Jute Corporation of India (JCI) acts as a nodal agency of the govt. for undertaking price support operations.

#### Minimum Support Prices of Jute of TD-5 (a tossa variety grown in Assam) Grade in India.

Crop Year	MSP Per 100 Kgs	Price Increase	% of Price Increase	Crop Year	MSP Per 100 Kgs	Price Increase	% of Price Increase
2014-15	2400	100	4.34%	2002-03	850	40	04.94%
2013-14	2300	100	4.54%	2001-02	810	25	03.18%
2012-13	2,200	525	31.34%	2000-01	785	35	04.67%
2011-12	1,675	100	06.35%	1999-2000	750	100	15.38%
2010-11	1,575	200	14.55%	1998-99	650	80	14.03%
2009-10	1,375	125	10.00%	1997-98	570	60	11.76%
2008-09	1,250	195	18.48%	1996-97	510	20	04.08%
2007-08	1,055	55	05.50%	1995-96	490	20	04.26%
2006-07	1,000	90	09.89%	1994-95	470	20	04.44%
2005-06	910	20	02.25%	1993-94	450	50	12.50%
2004-05	890	30	03.49%	1992-93	400	00	00.00%
2003-04	860	10	01.18%				

Source: Jute Corporation of India Limited.

#### Jute Futures Market and Hedging Effectiveness - In Indian Context:-

As mentioned earlier price volatility is one of the key problems associated with commodities. To manage these price volatility derivative products like Commodity futures can be used. Commodity Futures contracts are standardized forward contracts that are transacted through a recognized commodity exchange. In futures contracts underlying's are standardized in quality, quantity and location but leaving price as the only variable factor. Modern futures agreements began in Chicago in the 1840s. The following are some of the salient features of commodity futures:

- ✚ Commodity Futures contracts always traded on an organized exchange such as NCDX, MCX, NMCE etc. in India and NYMEX, LME, COMEX etc. internationally. These exchange provides a ready, liquid market in which futures can be bought and sold at any time
- ✚ Quality, quantity, and delivery date, of the underlying are predetermined by the exchanges and different exchanges have their own standard.
- ✚ The minimum price variation which is standardized for every contract called tick size and it also may vary from exchanges to exchange.
- ✚ Commodity Futures exchanges use clearing house which acts as a guarantor for both the parties against counter party risk by keeping margin money. It gives the guarantee for execution and delivery of the contracts held till

maturity.

- ✦ In order to avoid counter party risk, both the parties' deposits some amount of money with the clearing house called margin money. Generally there are two types of margin money v.i.z. initial margin and maintenance margin.
- ✦ On daily basis profit and loss on each transaction is determined which is called mark to market or making to market. On daily basis the profit is credited and the loss is debited in the margin money account of the trader for which it is called daily reconnected forwards.
- ✦ Its Proper regulation ensures fair practices in these markets. Previously commodity futures market was regulated by the forward market commission (FMC) but after the merger of FMC with SEBI now it is coming under the purview of SEBI.

Futures market provides many advantages directly and indirectly as the primary objectives of any commodity futures exchange are price discovery and an efficient price risk management. Based on inputs regarding demand and supply equilibrium, weather forecasts, expert views and comments, inflation rates, Government policies, market dynamics, hopes and fears, hedgers' trades at commodity futures exchanges facilitates determining the fair value of a commodity. Secondly the futures market provides the platform to the hedgers for price risk management. By taking an equal but opposite position in the futures market, participants like farmers, processors, merchandisers, manufacturers, exporters, importers etc are used it to hedge their spot exposure. Thirdly the importers and exporters can hedge their price risk and improve their competitiveness by making use of futures market. Fourthly, futures contracts will enable predictability in domestic prices which helps the manufacturers to smooth out the influence of changes in their input prices. Otherwise the manufacturers are required to keep sufficient financial reserve to met the adverse price changes which could have been utilized for making other profitable investments. Fifthly, the quality certificates that are issued by the exchange-certified warehouses where farmers kept their standardized produce, have the potential to become the norm for physical trade. Last but not the least commodity futures market needs modern warehousing, quality and grading testing centers that leads to development of infrastructures which paves the way of economic development of a country.

Despite of the above benefits there are also some loop holes of the futures market. First the low margin requirement may encourage to the speculative activity among the participants which leads to unnecessary risk taking as a result the potential for losses is also increases. Participation of large number of farmers is also imperative for an efficient commodity futures market but bringing the farmers into the mechanism by creating awareness among them is also challenging. Some also argued that the delivery based settlement is the most critical part of the commodity futures for which the speculators those trade in a exchange without having the underlyings squares up their position before the contract period approaches. Others have the view that trading in futures are just for experts for general people it's a risky business. But enormous studies suggest that futures can be used as an important instrument for price risk management.

So far as the participants of the future market are concerned, they can be broadly divided into three types v.i.z. hedgers, speculators and arbitrageurs. Hedgers are the commercial producer enters into futures market for hedging their spot exposure whereas speculators predicts the direction of prices and makes profit by using the futures market. When price differential prevails between the two market arbitragers makes money by simultaneously buying and selling the same commodities in different markets. Hedgers transfers the risk of adverse price movement by foregoing the profit potential where as speculators accepts that risk with objective of making money by predicting the future price movement for All the above participant makes the futures market efficient and speculators brings equilibrium between the two market which makes price discovery process more efficient in the futures market.

Risk arises due to unanticipated and unfavorable movement of the price. Risk can't be completely eliminated but can be reduced by using different strategies and techniques. Commodity futures is one of the most important technique among the available alternatives. Unfavorable price changes in the commodity cash market can be hedged by using commodity futures. In the context of future trading hedging is the process of taking a position in futures market to protect the value of spot positions. There are different concepts of hedging such as Perfect Hedge, Carrying charge Hedging, Discretionary Hedging, Anticipatory Hedging, Long Hedge, Short Hedge, Cross Hedging etc.



**Research Methodology:-**

The study utilized secondary data source viz. daily historical closing spot and futures price of raw jute transacted in National Multi Commodity Exchange (NMCE) during 2010-14. Thus, the data collected is for a period of five years from 2010 to 2014. The data are collected from the home page of National Multi Commodity Exchange of India i.e. www.nmce.com

Trend of spot and futures prices in raw jute was analyzed in the study by using descriptive statistical measures like mean, standard deviation and coefficient of variation. For empirical analysis of raw jute futures market in India the following methodology has been applied are as follows:

To identify the minimum variance hedge ratio, we first rewrite the cash flows in terms of prices changes i.e.  $S^T - S$  and  $\Delta F = F^T - F$  denote the change in spot and futures prices respectively over the hedging horizon. Now it is required to add and subtract quantity QS to obtain;

$$Q S^T - Q S + Q S - H(F^T - F) = Q (S^T - S) - H (F^T - F) + Q S$$

$$Q \Delta S - H \Delta F + Q S \text{ ----- Eq.- 1.1}$$

Now let  $h = H/Q$  denote the hedge ratio. The cash flow (1.1) can be expressed in terms of hedge ratio as

$$Q [\Delta S - h \Delta F] + Q S \text{ ----- Eq. 1.2}$$

We want to pick  $h$  to minimize the variance of this quantity. It should be noted that the last term QS is a known quantity at the time hedge is put on, so it contributes nothing to the variance. From (Eq.1.2) the variance of the hedged cash flow comes from the three sources<sup>2</sup>:

- ✚ The variance of spot price changes  $\Delta S$ . Denote this quantity by  $\sigma^2 (\Delta S)$ .
- ✚ The variance of futures price changes  $\Delta F$ . Denote this quantity by  $\sigma^2 (\Delta F)$ .
- ✚ The co variance between these quantities, denoted cov.  $(\Delta S, \Delta F)$ .

Using this notation the variance of hedged cash flow (1.2) is

$$\text{Var} [Q (\Delta S - h \Delta F)] = Q^2 \text{Var} (\Delta S - h \Delta F)$$

$$= Q^2 [\sigma^2 (\Delta S) + h^2 \sigma^2 (\Delta F) - 2h \text{Cov.} (\Delta S, \Delta F)] \text{ ----- Eq. - 1.3}$$

The presence of the  $h^2$  term ensures that the last term is U- shaped as a function of  $h$ . to identify the point of minimum variance, we have to take the derivative of Eq.-1.3 with respect to  $h$  and set it equal to zero. This yields-

$$2h \sigma^2 (\Delta F) - 2 \text{Cov.} (\Delta S, \Delta F) = 0 \text{ ----- Eq.1.4}$$

Or  $h \sigma^2 (\Delta F) = \text{Cov.} (\Delta S, \Delta F)$ . Thus the variance minimizing value of  $h$  is :

$$h = \text{cov.} (\Delta S, \Delta F) / \sigma^2 F \text{ ----- Eq. - 1.5}$$

To express  $h$  in terms of the correlation  $P$  between  $\Delta S$  and  $\Delta F$ , note that by definition

$$\rho = \text{Cov.} (\Delta S, \Delta F) / \sigma(\Delta S) \sigma (\Delta F) \text{ ----- Eq.1.6}$$

Thus  $\text{Cov.} (\Delta S, \Delta F) = \rho \sigma (\Delta S) \sigma (\Delta F)$ , SO  $h$  can also be written as

$$h = \rho (\sigma \Delta S) / (\sigma \Delta F) \text{ ----- Eq.-1.7}$$

Where,  $h$  = Minimum Variance Hedge Ratio

$\Delta S$  = Change in spot price during a period of time equal to the life of the hedge

$\Delta F$  = Change in futures price during a period of time equal to the life of the hedge

$\sigma \Delta S$  = Standard deviation of change in spot price.

$\sigma \Delta F$  = Standard deviation of change in futures price.

$\rho$  = co-efficient of correlation between  $\Delta S$  and  $\Delta F$ .

If  $\rho = 1$ , and  $\sigma \Delta F = \sigma \Delta S$  then,  $h = 1$ . In this case, the futures price mirrors the spot price perfectly. If  $\rho = 1$  and  $\sigma \Delta F = 2 \sigma \Delta S$ , then the hedge ratio  $h$  will be 0.5. In this case, the futures price always changes by twice as much as the spot price. So, the proportion of variance which is eliminated by hedging is called hedge effectiveness.

As stated earlier minimum variance hedge ratio or risk minimizing hedge ratio  $h$  is the multiplication of ‘ $\rho$ ’ with the scaling factor. ‘ $\rho$ ’ denotes the correlation between  $\Delta S$  and  $\sigma \Delta F$  and the ‘scaling factor’ denotes the ratio of  $\sigma \Delta S$  to  $\sigma \Delta F$ . when hedging a given quantity of an asset we have to multiply  $h$  by the number of units of the spot good per the

<sup>2</sup>Das,Sundaram. (2013), “Derivative: Principles and Practice’ ’Tata McGraw-Hill Publishing Company Limited, New Delhi, p- 107.

number of unites covered by a futures contract<sup>3</sup>. Number of futures contracts to trade to have a risk minimizing hedge will be

$$=h \frac{\text{quantity of the cash assets to be hedged}}{\text{quantity of the asset underlying one futures contracts}} \text{----- Eq.-1.8}$$

For instance - if  $h=0.7$  and one futures contract covers 100 unites, then for hedging 800 unites, the risk minimizing number of futures contracts required to sell is 5.6(i.e.  $0.7*800/100$ ).

#### Hypothesis of the Study:-

Ho: Indian Raw Jute Futures market manages price risk efficiently

H1: Indian Raw Jute Futures market does not manage the price risk efficiently.

#### Limitations of the study:-

The important limitations of the study are as follows:

- ✦ The research work is completely based on secondary data which is collected from the websites of National Multi commodity Exchange.
- ✦ The secondary data of raw jute futures and spot prices are collected only from one commodity derivative exchange. i.e. NMCE.
- ✦ The third limitation of the project is regarding period of data i.e. only five years (2010-2014) data are taken for the purpose of study.

#### Empirical Finding and Discussion :-

##### Trends of Spot and Futures Prices of Raw Jute:

Before analyzing the trend of futures price and spot price, it is necessary to understand the concept of types of market. As the delivery date of a futures contract is approached, the futures price converges to the spot price of the underlying asset. In other word when the delivery period is reached, the futures price equals or is very close to the spot price. In such a case the market is known as a perfect market. But if the futures price is more than the spot price at the time to maturity then, it is known as a normal market and if the futures price is less than the spot price at the time to maturity, it is known as an inverted market. The hedger is advised to enter into the derivative market in case of a perfect market.

The spot and future prices of raw jute by using daily data over a period of last five years (2010-14) is presented in table 1 and its diagrammatic illustration is given in figure 1 . The spot price of raw jute, which was quoted at Rs. 3109.85 per quintal in 2010, decreased to Rs.2441.58 in 2012 and then rose to Rs. 3034.01 in 2014, registering an up and down trend over the period. The coefficient of variation around the annual mean price of raw jute has at first gone up from 9.02 in 2010 to 20.60 in 2012. Thereafter, the variation exhibited a decreasing trend and reached at 4.47 in 2014. Interestingly, the downward trends in prices are also associated with smaller standard deviations, resulting in lesser coefficient of variations during 2013-14. Over the whole five year period (2010-14), there is a lower variation in the spot prices of raw jute and the coefficient of variation is found to be around 12.23 percent. In case of futures price, coefficient of variation is recorded at 12.33 percent over the last five years. Thus, the futures price shows a more or less same extent of variation in comparison to spot price of raw jute. A year-wise analysis suggests that in most of the years, coefficient of variation lies below 10 per cent in spot and futures prices of raw jute. The only exception is found in the years 2011 and 2012.

**Table 1:-** Trend of Spot and Future Prices of Raw Jute in India (2010-14)

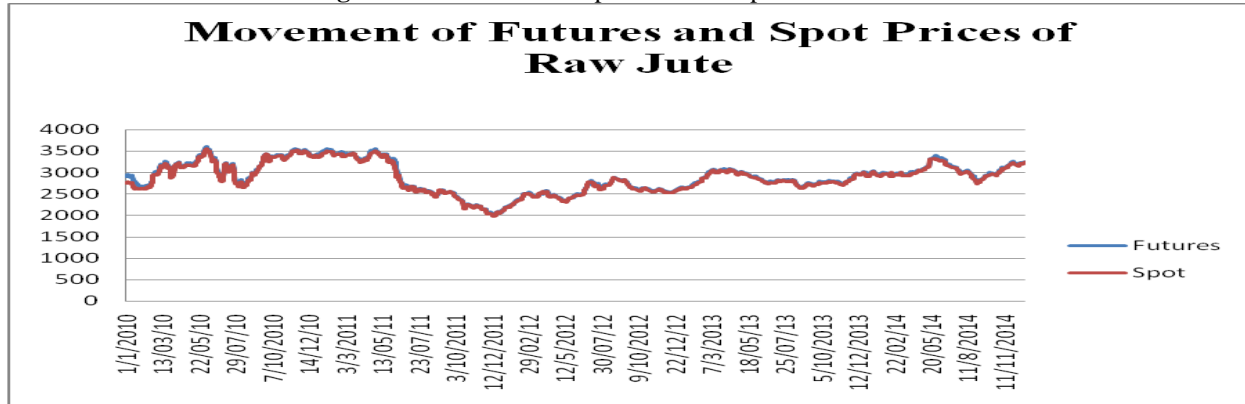
Descriptive Statistics	2010	2011	2012	2013	2014	Whole Period (2010-2014)
<b>Spot Price (Raw Jute)</b>						
Count	297	288	277	291	248	1401
Mean	3109.85	2822.55	2441.58	2826.39	3034.01	2865.11
Standard Deviation	280.55	516.12	503.06	123.69	135.64	350.40
coefficient of variation (CV)	9.02	18.29	20.60	4.38	4.47	12.23
<b>Future Price (Raw Jute)</b>						

<sup>3</sup>Dubofsky, David A and Miller Jr., Thomas. (2003), “*Derivatives: Valuation and Risk Management*”, Oxford University Press, New York, p-172.



<b>Count</b>	297	288	277	291	248	1401
<b>Mean</b>	3149.07	2847.77	2452.26	2842.77	3055.64	2888.06
<b>Standard Deviation</b>	264.82	527.13	505.69	124.87	140.73	356.23
<b>coefficient of variation (CV)</b>	8.41	18.51	20.62	4.39	4.61	12.33
Source: NMCE Daily Data						

Figure 1:- Movement of spot and future price of Raw Jute



Source: NMCE Daily Data

**Correlation between Change in Spot and Futures Price of Raw Jute:-**

The Table-2 clearly depicts throughout the year 2010 the co-relation between change in spot and futures of raw jute remains above 80% except for the month Dec., March and August touching 90% which are the lean seasons, so in these period prices normally farmed up. The harvest season starts from Sept. to Nov. end and the price falls during this period because most of the jute small farmers cultivating jute bring the jute in the market as they don't have the space to store off and further these marginal farmers needs money badly. Even at times it leads to distress sell.

In Oct. and Nov. of each year the co-relation is very high because of supply factor. The correlation was more than 60 times in between 0.75 to1.0 in harvesting period, and Oct. of every year there is a strong correlation found between the prices i.e. nearer to 90 percentages. The traders enter the spot and also probably to protect the price rise, enter the futures simultaneously. Hence, bringing a strong correlation between both the returns. Supply continues till Jan. and from March onwards the supply gets reduced normally. From April to Aug. which is the sowing season normally the farmers don't hold the stock and it is the traders who are found mostly in spot and futures. In harvesting season though there is a positive co-relation between spot and futures the returns are very less in both the prices. In the beginning of the harvesting month (Sept.) the returns are higher because the traders take position in both the spot and futures simultaneously. Hence market remains volatile due to the expectation of new arrivals. In true sense from Jul. to Aug. is the lean season, here also returns are higher. July is equally far from sowing and harvesting, so this is the month which gives better returns to trader and big farmers who holds stock. In the month of May returns are not good in the same time the correlation between the returns were very poor i.e. 80 times the correlation was below0.75. This trend is found in every year.

So the futures and spot market takes cues from the production cycle. The market seems to the spot reflects to the futures and in other way futures do reflects the spot. Though the market is not hundred percent efficient it moves increasingly towards efficiency.

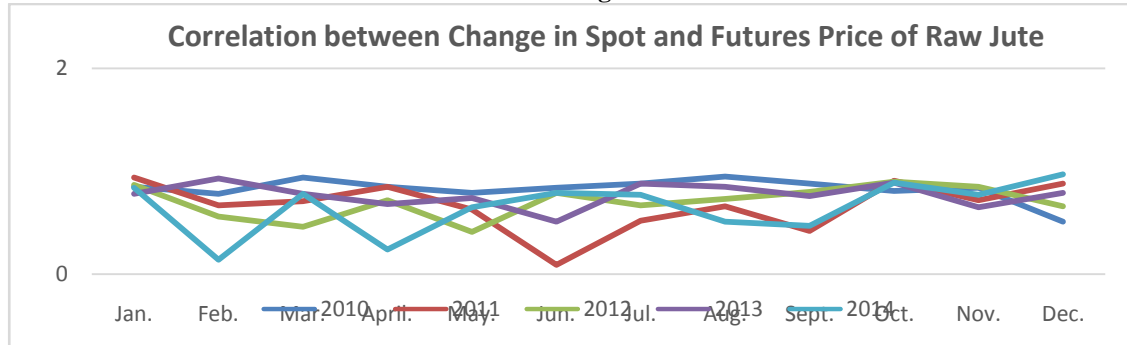
**Table 2:-** Correlation between Change in Spot and Futures Price of Raw Jute.

Month/ Year	2010	2011	2012	2013	2014	% times the correlation was	
						<0.75	0.75-1.0
<b>Jan.</b>	0.85	0.94	0.87	0.78	0.84		100
<b>Feb.</b>	0.78	0.67	0.56	0.93	0.14	60	40
<b>Mar.</b>	0.94	0.71	0.46	0.78	0.78	40	60
<b>April.</b>	0.85	0.85	0.72	0.68	0.24	60	40
<b>May.</b>	0.79	0.63	0.41	0.74	0.65	80	20
<b>Jun.</b>	0.84	0.09	0.79	0.51	0.79	40	60

<b>Jul.</b>	0.88	0.52	0.67	0.88	0.77	40	60
<b>Aug.</b>	0.95	0.66	0.73	0.85	0.51	60	40
<b>Sept.</b>	0.88	0.42	0.8	0.76	0.47	40	60
<b>Oct.</b>	0.81	0.91	0.9	0.89	0.89	-	100
<b>Nov.</b>	0.84	0.72	0.85	0.65	0.77	40	60
<b>Dec.</b>	0.51	0.88	0.66	0.79	0.97	40	60
<b>&lt;0.75</b>	8	67	59	25	42		
<b>0.75-1.0</b>	92	33	41	75	58		

Source: Calculation based on NMCE data(calculated by taking the daily price changes of the respective month)

Figure 2:-



Source: NMCE Daily Data

**Volatility of Spot and Futures Market:-**

Standard deviation measures the variation in spot and futures prices. From Jan. to Apr. the variation in spot return is more than the variation of futures return indicates that the supply is more in the spot and the farmers bring the stock to the market. From May on wards till sept the supply from the farmer’s side get reduced and bringing volatility in the spot market and these are the lean seasons. From Oct. to Jan. which is the harvesting season the futures remains more volatile than the spot and the price is normally discovered by the futures market during this period.

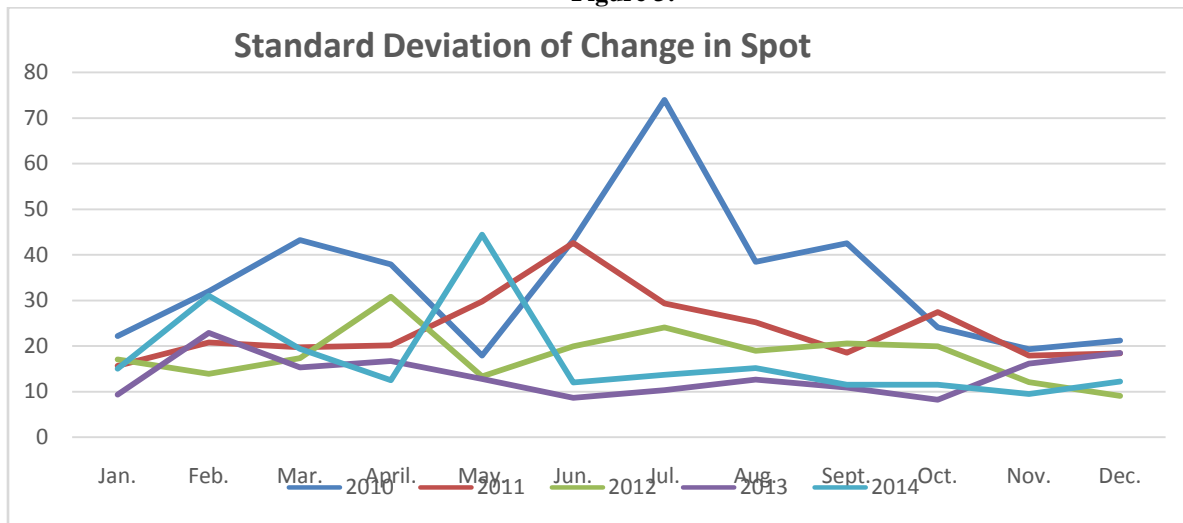
In majority cases the trend in volatility of futures and spot indicates that the price is discovered during the harvesting season with futures higher volatility than the spot and in lean season the trend get reversed.

Table 3:- Standard Deviation of Change in Spot

Month/Year	2010	2011	2012	2013	2014
<b>Jan.</b>	22.2	15.66	17.04	9.292	14.96
<b>Feb.</b>	31.98	20.82	13.85	22.83	30.96
<b>Mar.</b>	43.23	19.76	17.29	15.26	19.31
<b>April.</b>	37.93	20.16	30.83	16.69	12.47
<b>May.</b>	17.9	29.75	13.32	12.72	44.4
<b>Jun.</b>	43.26	42.62	19.93	8.59	11.93
<b>Jul.</b>	73.98	29.33	24.09	10.31	13.67
<b>Aug.</b>	38.43	25.23	18.96	12.57	15.09
<b>Sept.</b>	42.57	18.52	20.56	10.86	11.43
<b>Oct.</b>	24.11	27.42	19.95	8.191	11.46
<b>Nov.</b>	19.29	17.92	12	16.09	9.423
<b>Dec.</b>	21.23	18.42	9.004	18.4	12.14

Source: Calculation based on NMCE data, (calculated by taking the daily price changes of the respective month)

Figure 3:-



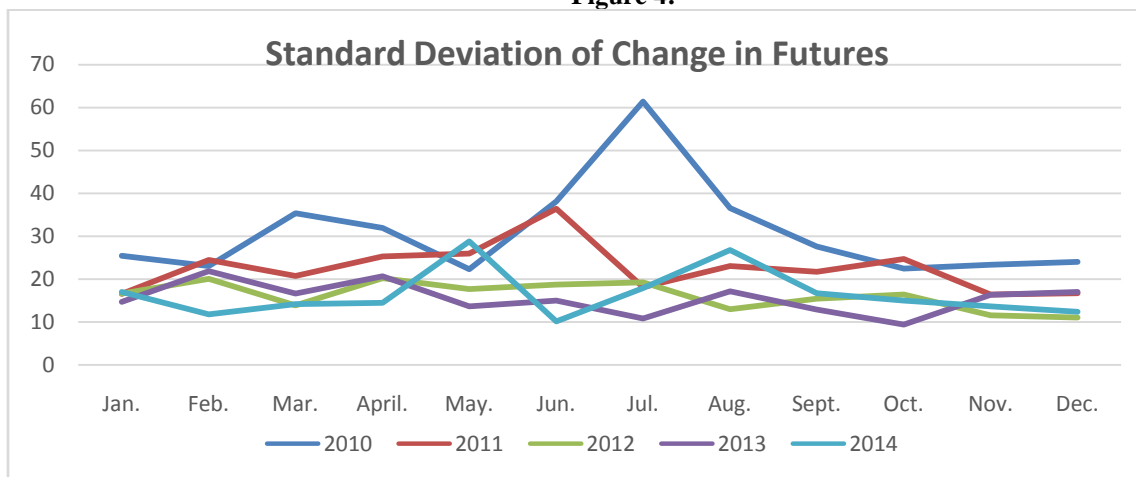
Source: NMCE Daily Data

Table 4:- Standard Deviation of Change in Futures

Month/Year	2010	2011	2012	2013	2014
Jan.	25.42	16.5	16.64	14.7	16.98
Feb.	23.02	24.39	20.05	21.8	11.76
Mar.	35.34	20.69	13.88	16.6	14.15
April.	31.89	25.26	20.19	20.6	14.47
May.	22.25	25.88	17.68	13.6	28.8
Jun.	38.11	36.35	18.69	15	10.11
Jul.	61.38	18.12	19.22	10.8	17.87
Aug.	36.53	22.99	12.98	17.1	26.81
Sept.	27.54	21.69	15.41	12.9	16.68
Oct.	22.41	24.64	16.43	9.4	14.94
Nov.	23.29	16.37	11.55	16.3	13.62
Dec.	23.97	16.64	11.04	17	12.36

Source: Calculation based on NMCE data, (calculated by taking the daily price changes of the respective month)

Figure 4:-



Source: NMCE Daily Data

**Ratio of Standard Deviation of Change in Spot to Change in Futures:-**

The ratio indicates the variation between spot and futures prices. From Oct. on wards when the harvesting seasons starts not only the co-relation between the change in spot and change in futures remains high but also spot prices varies more than the variation in the futures prices resulting a higher ratio of standard deviation of change in spot to standard deviation of futures. It simply depicts the volatility in spot is more than the volatility in futures prices basically due to supply factor. Particularly in this harvesting month of every year the ratio remains 100 times in between 0.75 and 1.25. This trend sustains till Jan. end of every year. Feb, Aug and Sept. are the periods coming between sowing and harvesting season shows a very low ratio. This kind of trend is found in all the years.

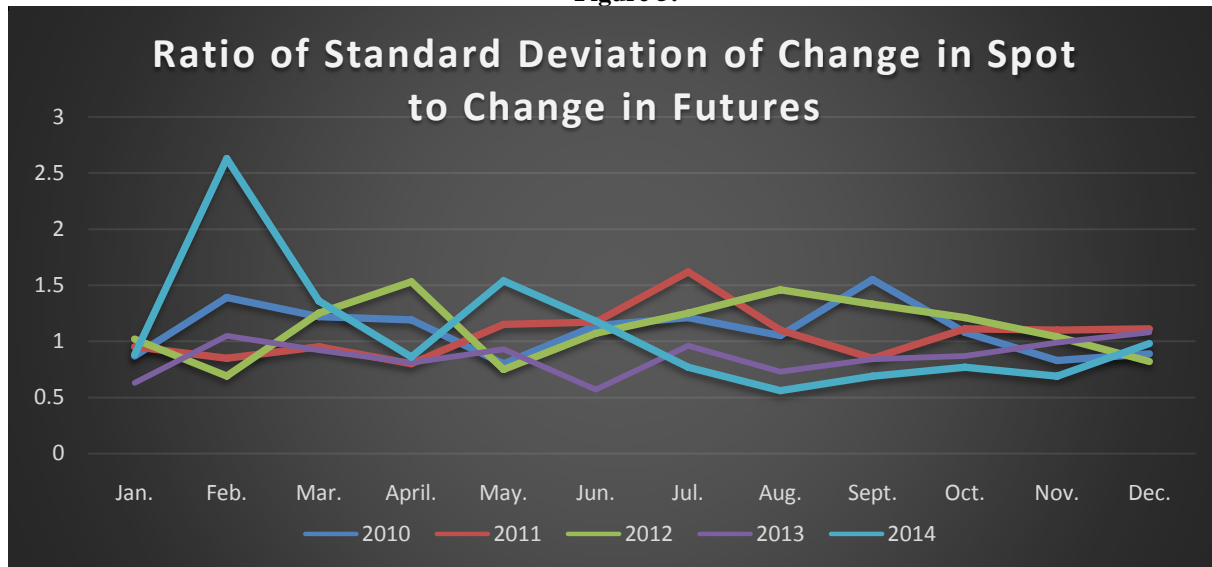
In the year 2011, 92 times the ratio was between 0.75 to 1.2. The year 2014 shows lowest ratio i.e. only 50 times the ratio was between 0.75 to 1.25.

**Table 5:-** Ratio of Standard Deviation of Change in Spot to Change in Futures.

Month/Year	2010	2011	2012	2013	2014	Per cent of times the ratio was		
						<0.75	0.75-1.25	>1.25
Jan.	0.87	0.95	1.02	0.63	0.88	20	80	-
Feb.	1.39	0.85	0.69	1.05	2.63	20	40	40
Mar.	1.22	0.95	1.25	0.92	1.36	-	80	20
April.	1.19	0.8	1.53	0.81	0.86	-	80	20
May.	0.8	1.15	0.75	0.93	1.54	-	80	20
Jun.	1.14	1.17	1.07	0.57	1.18	20	80	-
Jul.	1.21	1.62	1.25	0.96	0.77	-	80	20
Aug.	1.05	1.1	1.46	0.73	0.56	40	40	20
Sept.	1.55	0.85	1.33	0.84	0.69	20	40	40
Oct.	1.08	1.11	1.21	0.87	0.77	-	100	-
Nov.	0.83	1.1	1.04	0.99	0.69	-	100	-
Dec.	0.89	1.11	0.82	1.08	0.98	-	100	-
<0.75	-	-	8	25	25			
0.75-1.25	83	92	67	75	50			
>1.25	17	8	25	-	25			

Source: Calculation based on NMCE data, (calculated by taking the daily price changes of the respective month)

**Figure 5:-**



Source: NMCE Daily Data

**Analysis of minimum variance hedge ratio:-**

The most important function of the futures market is enabling investors to hedge exposures i.e. to reduce the riskiness of cash flow associated with spot market commitments. A hedge is said to be perfect when the basis is riskless at the time of terminating hedge, this only ensures a certainty cash flow from the hedge. But perfect hedge is a theoretical phenomenon due to various factors perfect hedge is not practically possible. The first factor which doesn't let the perfect hedge model practically possible is the commodity mismatch. Standardization is the most important characteristic of futures contract. Standard grade underlying of the futures contract may not be the same as the grade of the assets being hedged. As a result the futures price  $F^T$  may not coincide with  $S^T$ , the time T spot price of the assets being hedged. So the basis  $F^T - S^T$  is in nonzero. This is what the basis risk caused by commodity mismatch or grade mismatch.

The second factor is delivery date mismatch. Though futures contract have standardized delivery period, so the available futures contract may not coincide with the investors' date of market commitment. Even if there is no commodity mismatch, but due to delivery period mismatch of the commodity the basis will be nonzero. So the presence of basis risk implies that cash flow can't be made completely riskless by hedging. Risk can be reduced by hedging. First, it is need to measure the risk. As usual the risk of cash flow can be measured by its variance. Variance is a good first approximation of risk. So here we will identify the hedge that will lead to the least cash flow variance among all possible hedges. This is called minimum variance hedge.

It is already earlier mentioned that hedging is nothing but an offsetting of risk. In hedging we offset the exposure of spot with futures. In other word we are trying to offset the effect of spot price movement with price movement so that the resulting cash flow has minimum risk. For offsetting the exposure of spot with futures it is inevitable to take into consideration the movement of both spot and futures prices to cancel the effect of one by other. This is called correlation between spot and futures prices. The higher the degree of correlation greater the co-movement and the easier to offset the risk. So when there is perfect co- relation between the movement of spot and futures prices, then offsetting the exposure of spot with futures is also perfect. So we obtain a riskless hedge.

For this purposes hedge ratio is taken by the investors or hedgers. The hedger ratio simply measures the number of futures position taken per unit of spot exposure. It is earlier mentioned that optimal hedge ratio is the hedge ratio of unity i.e. one for one. It means for offsetting one spot exposure you should go for equal futures position. But in practice in the presence of basis risk, it is not generally optimal to hedge exposure one to one but variance minimizing hedge ratio which we called minimum variance hedge ratio.

Minimum variance hedge ratio has two important aspect one is co- relation between the change in spot and futures prices and the other one is ratio of standard deviation between the change in spot and futures prices. Thus minimum variance hedge ratio is the co-relation ' $P$ ' multiplied by the scaling factor i.e.  $(\sigma \Delta S) / (\sigma \Delta F)$ .

To understand the minimum variance hedge ratio we have to go to the deep. It is earlier mentioned that minimum variance hedge ratio has two aspect i.e. ' $P$ ' and 'scaling factor'. Let's take the first factor ' $\rho$ ' which signifies the Co-relation between the change in spot and futures prices. If co-relation is zero, then there is no offsetting of risk at all from hedging using futures. In this case any hedging activity will increase the overall cash flow risk by creating cash flow uncertainty from the second source i.e. the futures position. Thus the optimal hedge ratio will becomes zero. As co-relation increases, however greater offsetting of risk is facilitated, so we want to use a higher hedge ratio to take advantages.

Now let's take the second important factor i.e. 'scaling factor'. The first question arises here is: why scale the co-relation by the ratio of standard deviation? As we know the objective of hedging is nothing but offsetting the exposure of spot by using futures. Suppose the typical move in futures prices is twice the size of typical move in spot prices. Then other things remaining equal the size of the futures position used for hedging should be only half of the size of the spot exposure. This typical price movement of both spot and futures are measured by their respective standard deviations. When  $\sigma \Delta F$  is more than the  $\sigma \Delta S$ , then less number of futures contracts are required to hedge the higher number of spot contracts, keeping all other things same. In other word keeping other factors constant, if  $\sigma \Delta S$  is less than the  $\sigma \Delta F$  then with less number of futures contract positions can be able to hedge the higher number of spot contracts exposures and vice-versa. When  $\sigma \Delta S$  is equal to the  $\sigma \Delta F$  then keeping the effect of ' $P$ ' value constant hedging ratio will be one. Minimum variance hedge ratio increases as the co-relation increases or in other word variance of cash flow under the minimum variance hedge ratio will be lower when co-relation is

higher, higher correlation implies a superior ability to offset cash flow risk by hedging<sup>4</sup>. In the limit, when correlation is perfect, the minimized cash flow variance will become zero.

Minimized variance will not be zero except in the trial case where  $\rho = \pm 1$  i.e. when the  $\Delta S$  and the  $\Delta F$  are perfectly co-related either negatively or positively. But futures and spots are perfectly co-related only when there is no basis risk, so if basis risk is present there is always some residual uncertainty even after hedging. By concluding the above discussion we can say that higher the  $\rho$  value more is the hedge ratio and vice-versa, when all other factors remain constant. And higher the  $\sigma \Delta F$  than the  $\sigma \Delta S$  then lesser number of futures contracts can be able to hedge a larger number of spot contracts position. The detail analysis of minimum variance hedge ratio of raw jute is given below:

Table No-6 depicts the hedge ratio of different years on month wise which is calculated by taking the daily change in prices of spot and futures. It is very clear from the table that when harvesting season starts i.e. from Oct. onwards till Jan. end the hedge ratio remains high. In this period more than 60 times the hedge ratio remains between 0.75 to 1.25. In the month of Oct. it remains high with the expectation of new arrivals and when actually supply comes to the market it also becomes high. The reverse is found in sowing seasons. In harvesting season the co-relation between the change in spot and futures increase and the variation in change in spot becomes more than the variation in change in futures resulting a high minimum variance hedge ratio. Particularly this kind of trend is found in every year.

**Table 6:- Analysis of ‘ $\rho$ ’, ‘Scaling factor’ and Minimum Variance Hedge Ratio**

Year	$\rho$	$\sigma \Delta S$	$\sigma \Delta F$	$\sigma \Delta S / \sigma \Delta F$	Hedge Ratio
<b>2010</b>					
Jan.	0.85	22.2	25.42	0.87	0.75
Feb.	0.78	31.98	23.02	1.39	1.09
Mar.	0.94	43.23	35.34	1.22	1.15
April.	0.85	37.93	31.89	1.19	1.01
May.	0.79	17.9	22.25	0.8	0.63
Jun.	0.84	43.26	38.11	1.14	0.95
Jul.	0.88	73.98	61.38	1.21	1.06
Aug.	0.95	38.43	36.53	1.05	1
Sept.	0.88	42.57	27.54	1.55	1.36
Oct.	0.81	24.11	22.41	1.08	0.88
Nov.	0.84	19.29	23.29	0.83	0.7
Dec.	0.51	21.23	23.97	0.89	0.45
<b>2011</b>					
Jan.	0.94	15.66	16.5	0.95	0.9
Feb.	0.67	20.82	24.39	0.85	0.57
Mar.	0.71	19.76	20.69	0.96	0.67
April.	0.85	20.16	25.26	0.8	0.68
May.	0.63	29.75	25.88	1.15	0.72
Jun.	0.09	42.62	36.35	1.17	0.11
Jul.	0.52	29.33	18.12	1.62	0.85
Aug.	0.66	25.23	22.99	1.1	0.72
Sept.	0.42	18.52	21.69	0.85	0.36
Oct.	0.91	27.42	24.64	1.11	1.02
Nov.	0.72	17.92	16.37	1.1	0.78
Dec.	0.88	18.42	16.64	1.11	0.98
<b>2012</b>					
Jan.	0.87	17.04	16.64	1.02	0.89
Feb.	0.56	13.85	20.05	0.69	0.38
Mar.	0.46	17.29	13.88	1.25	0.57
April.	0.72	30.83	20.19	1.53	1.1
May.	0.41	13.32	17.68	0.75	0.31

<sup>4</sup>.Das,Sundaram. (2013), “*Derivative: Principles and Practice*”,Tata McGraw-Hill Publishing Company Limited, New Delhi, p- 107

Jun.	0.79	19.93	18.69	1.07	0.85
Jul.	0.67	24.09	19.22	1.25	0.84
Aug.	0.73	18.96	12.98	1.46	1.07
Sept.	0.8	20.56	15.41	1.33	1.07
Oct.	0.9	19.95	16.43	1.21	1.09
Nov.	0.85	12	11.55	1.04	0.89
Dec.	0.66	9.004	11.04	0.82	0.54
2013					
Jan.	0.78	9.292	14.69	0.63	0.49
Feb.	0.93	22.83	21.76	1.05	0.97
Mar.	0.78	15.26	16.55	0.92	0.72
April.	0.68	16.69	20.57	0.81	0.55
May.	0.74	12.72	13.61	0.93	0.69
Jun.	0.51	8.59	15	0.57	0.29
Jul.	0.88	10.31	10.77	0.96	0.84
Aug.	0.85	12.57	17.15	0.73	0.62
Sept.	0.76	10.86	12.94	0.84	0.64
Oct.	0.89	8.191	9.403	0.87	0.78
Nov.	0.65	16.09	16.31	0.99	0.64
Dec.	0.79	18.4	17.02	1.08	0.85
2014					
Jan.	0.84	14.96	16.98	0.88	0.74
Feb.	0.14	30.96	11.76	2.63	0.37
Mar.	0.78	19.31	14.15	1.36	1.06
April.	0.24	12.47	14.47	0.86	0.21
May.	0.65	44.4	28.8	1.54	1.01
Jun.	0.79	11.93	10.11	1.18	0.94
Jul.	0.77	13.67	17.87	0.77	0.59
Aug.	0.51	15.09	26.81	0.56	0.28
Sept.	0.47	11.43	16.68	0.69	0.32
Oct.	0.89	11.46	14.94	0.77	0.68
Nov.	0.77	9.423	13.62	0.69	0.53
Dec.	0.97	12.14	12.36	0.98	0.96

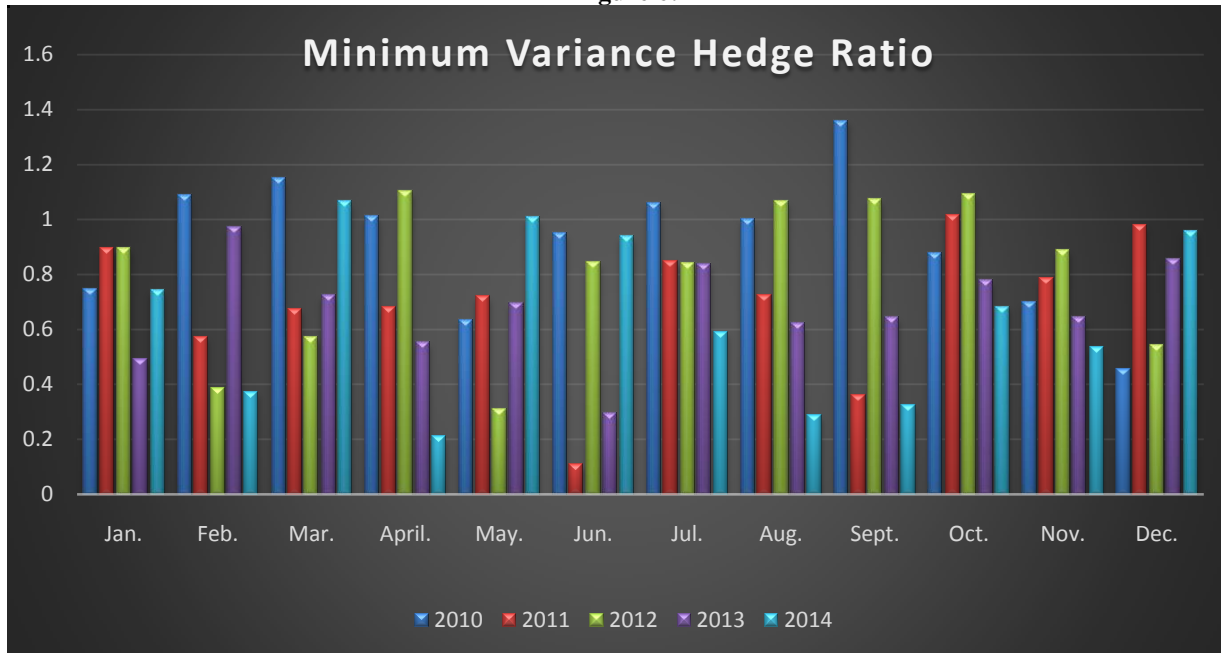
Source: Calculation based on NMCE data, (calculated by taking the daily price changes of the respective month)

**Table 7:-** Minimum Variance Hedge Ratio ( $h$ )

Month/Year	2010	2011	2012	2013	2014	Per cent of times the ratio was		
						<0.75	0.75-1.25	>1.25
Jan.	0.75	0.9	0.89	0.49	0.74	40	60	-
Feb.	1.09	0.57	0.38	0.97	0.37	60	40	-
Mar.	1.15	0.67	0.57	0.72	1.06	60	40	-
April.	1.01	0.68	1.1	0.55	0.21	40	60	-
May.	0.63	0.72	0.31	0.69	1.01	80	20	-
Jun.	0.95	0.11	0.85	0.29	0.94	40	60	-
Jul.	1.06	0.85	0.84	0.84	0.59	20	80	-
Aug.	1	0.72	1.07	0.62	0.28	60	40	-
Sept.	1.36	0.36	1.07	0.64	0.32	60	40	-
Oct.	0.88	1.02	1.09	0.78	0.68	20	80	-
Nov.	0.7	0.78	0.89	0.64	0.53	60	40	-
Dec.	0.45	0.98	0.54	0.85	0.96	40	60	
<0.75	25	42	33	67	67			
0.75-1.25	75	58	67	33	33			
>1.25								

Source: Calculation based on NMCE data, (calculated by taking the daily price changes of the respective month)

Figure 6:-



Source: NMCE Daily Data

#### Number of Futures Contracts Required to Trade to have a Risk Minimizing Hedge.

As stated earlier minimum variance hedge ratio or risk minimizing hedge ratio 'h' is the multiplication of 'p' and the 'scaling factor' of change in spot and futures prices. When hedging a given quantity of an asset, multiply 'h' by the number of unites of the spot good per the number of unites covered by a futures contract<sup>5</sup>. For example- 800 unites are to be hedged, one futures contract covers 100 unites and hedge ratio is .7, then the risk minimizing number of futures contracts to take position is 5.6 (i.e.  $.7 \times 800 / 100$ ). The Table-8 shows that the number of futures contract position required to take at NMCE for raw jute (GRADE-TD4, West Bengal) to have a risk minimizing hedge, if you have 1000MT of spot exposure. The standardized raw jute futures quantity traded at NMCE is 10MT, for three month expiry. The following calculation is made by assuming we have 100MT of raw jute (GRADE-TD4, West Bengal) spot exposure.

The number of contracts required to trade in futures to offset the spot exposure remains more than 60 times between 70 to 120 in harvesting periods which is nearer to one. And again from jun. to Aug. it also follows the same pattern. This trend is found in every year. But the periods which arises in between harvesting and sowing seasons i.e. March, Aug, and Sept. the market was not efficient i.e. far away from optimal hedging number. So it can be concluded that the market is not efficient but moving increasingly towards efficiency.

**Table 8:-** Number of Futures Contracts Required to Trade to have a Risk Minimizing Hedge

Month/Year	2010	2011	2012	2013	2014	% of times the number of contract was		
						<70%	70%-120%	>120%
Jan.	74.5	89.5	89.2	49.1	73.9	20	80	-
Feb.	109	57.4	38.4	97.1	36.9	60	40	-
Mar.	115	67.5	57	72.3	106	40	60	-
April.	101	68.1	110	55.2	21	60	40	-
May.	63.3	72	30.7	69.5	101	60	40	-
Jun.	94.9	10.8	84.6	29.3	93.8	40	60	-
Jul.	106	85	84.1	83.9	58.9	20	80	-

<sup>5</sup>Dubofsky, David A and Miller Jr., Thomas. (2003), "Derivatives: Valuation and Risk Management", Oxford University Press, New York, p- 172.



<b>Aug.</b>	99.9	72.3	107	62.2	28.5	40	60	-
<b>Sept.</b>	136	36	107	64.1	32.4	60	20	20
<b>Oct.</b>	87.5	102	109	77.7	68	20	80	-
<b>Nov.</b>	69.8	78.5	88.7	64.2	53.4	40	60	-
<b>Dec.</b>	45.3	97.6	54	85.4	95.5	40	60	-
<b>&lt;70%</b>	25	42	33	58	58			
<b>70%-120%</b>	67	58	67	42	42			
<b>&gt;120%</b>	8	-	-	-	-			

Source: Calculation based on NMCE data, (calculated by taking the daily price changes of the respective month)

Figure 7:-



Source: NMCE Daily Data

### Concluding Remarks:-

Empirical evidence suggests a wide variation in spot and futures prices of raw jute over a period of five years (2010-2014). However no such variation is established in between the movement of spot and futures prices of raw jute. In fact the extent of fluctuation in both spot and futures market are found to be the same. The result is further supported by the monthly minimum variance hedge ratio indicating that the market is increasingly moving towards efficiency. In such an efficient market structure futures can be used as an instrument of hedging to offset the spot market exposure. A lower basis risk in comparison to spot price risk, as established in the study would provide an additional advantages for the hedger to enter the derivative market.

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### RESEARCH ARTICLE

#### REMOTE ISCHEMIC PRECONDITIONING AND N-ACETYLCYSTEINE IN AUTOLOGOUS OVARIAN TRANSPLANTATION IN RATS.

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#### *Abstract*

**Background:** Ovarian cryopreservation is a relevant approach to fertility preservation, even though it is an invasive and still experimental procedure. Graft's vulnerability for ischemia and reperfusion injury before the neovascularization is the most important factor to determinate the viability of transplanted tissue, therefore in order to reduce this injury, many techniques were described as remote ischemic pre-conditioning (R-IPC) and early administration of N-acetylcysteine (NAC). The aim of this study was to evaluate the effects of remote ischemic preconditioning and N-acetylcysteine on autologous ovarian transplant in rats.

**Materials and Methods:** 25 female *Rattus norvegicus* (Wistar) were distributed into five experimental groups (n=5): (1) control (CG); (2) ovarian transplantation (GTx); (3) ovarian transplantation + R-IPC; (4) Ovarian transplantation + NAC and (5) Ovarian transplantation + R-IPC + NAC. On the 15<sup>th</sup> post-operative day, blood was collected from inferior vena cava for estradiol and progesterone serum analysis and ovarian grafts were removed for histopathology.

**Results:** Estradiol levels between groups showed no statistical difference, however treatment with R-IPC promoted higher progesterone levels. Ovarian graft morphology indicated that NAC treatment increased secondary follicles and promoted atretic follicles as observed in transplant group. R-IPC treatment reduced atretic follicles.

**Conclusions:** NAC and R-IPC treatments showed protective effects regarding follicles preservation and ovarian function.

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#### **Introduction:-**

The side effects and long-term consequences of chemotherapy and radiation on fertility should not be ignored, cumulative risk of premature ovarian failure can be 60% higher after alkylating chemotherapy [1]. Many diagnostic methods and treatments for cancer may involve combinations of surgery, alkylating chemotherapy, radiotherapy, and transplantation of bone marrow, which offer negative impacts on ovarian function, such as fibrosis [2], affecting

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the patient's fertility. Thereafter, ovarian protection reserve and prevention of infertility became the primary quality of life issue for patients [3].

Mature oocyte and embryo banking are generally recommended before cancer treatment for fertility preservation in women. American Society for Reproductive Medicine has confirmed its safety, however, gamete or zygote banking is not a feasible option for prepubertal girls or fertile women who cannot delay therapy [4]. Thus, ovarian tissue cryopreservation is one relevant approach, even though this procedure is invasive and still experimental for young patients, requiring laparoscopic surgery [5].

Currently, it is known that graft's vulnerability for ischemia and reperfusion injury before the neovascularization is the most important factor to determinate the viability of transplanted tissue. Even though the reperfusion benefits are unquestionable, the reintroduction of oxygen in a ischemic environment initiate a complex chain of events that culminate in additional tissue injury, among which are highlighting the migration, adhesion and leukocyte activation and production of oxygen free radicals [6]. This process constitutes the main obstacle for ovarian transplant, this injury may occur after transplant, resulting in follicular death mass [7].

Many techniques were described as ischemic preconditioning (PreC) and postconditioning (PosC) which consist in short cycles of ischemia and reperfusion before or after a major ischemia period. These procedures have also been applied, successfully, in other organs as gut, myocardial and liver. These cycles can also be applied in distant organs and tissues undergoing ischemia index, and this is known as remote pre (rPreC) and post (rPosC) conditioning, that also obtained success to reduce the reperfusion trauma in many organs [8-10].

Likewise, the early application of N-acetylcysteine (NAC) is related to beneficial effects in ovarian graft preservation [11]. This substance is a tiol of low molecular weight derivated of cysteine and acts removing reactive oxygen species, in addition to improving nitric oxide activity and regulating microcirculation [12].

Thereby, there are some literature reports about PreC and NAC positive effects on preservation of ovarian graft. Thus, the aim of this study was to evaluate the effects of remote ischemic pre-conditioning and N-acetylcysteine on autologous ovarian transplant in rats.

## **Methods:-**

### **Animals:-**

25 female Wistar rats (Evandro Chagas Institute), were used at the age of 120 days and weighing 250-350g. The rats were kept under constant temperature (20-22°C) in a room with controlled lighting (12/12 hours of light/dark cycle) and received water and food ad libitum. Procedures were approved by Ethics Committee on Animal Use of Pará State University (UEPA), Protocol No. 32/2015.

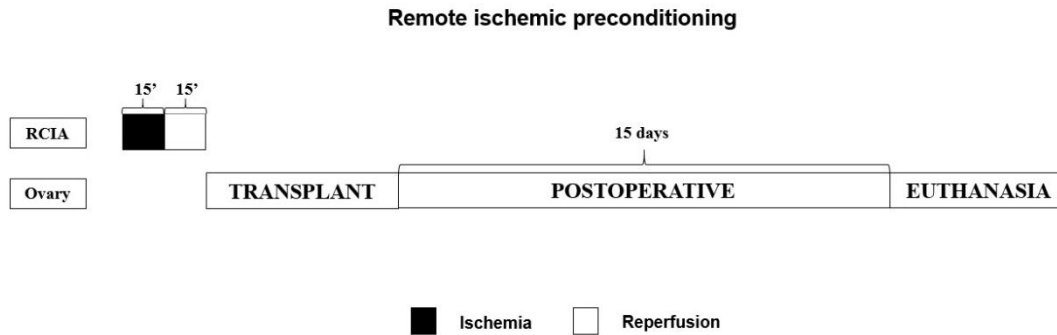
### **Experimental Protocol:-**

Rats were anesthetized by intraperitoneal injection of ketamine hydrochloride (70mg/kg) and xylazine (10 mg/kg). Then, they were placed on an electric heating pad to prevent hypothermia. Procedures were performed under surgical microscope (DF Vasconcellos 900, Brazil) set to a 10x magnification.

The animals were distributed into five study groups (n=5): (1) control: animals subjected only to midline laparotomy and a 2cm incision over the inguinal fold; (2) ovarian transplantation (GTx); and (3) ovarian transplantation + R-IPC; (4) Ovarian transplantation + NAC and (5) Ovarian transplantation + R-IPC + NAC. On 15<sup>th</sup> postoperative day [11], animals were euthanized with a lethal dose of previously used anesthetics.

### **Remote Ischemic Preconditioning (R-IPC):-**

After tricotomy and polyvinylpyrrolidone iodine antiseptis, a medial laparotomy was made and the R-IPC was performed by clamping the common right iliac artery using a vascular microclamp for 15 minutes of occlusion and 15 minutes of reperfusion (Fig. 1) [13], before undergoing other procedures (oophorectomy and transplantation).



**Fig. 1:-** Representation of remote ischemic preconditioning. RCIA – right common iliac artery.

#### **Oophorectomy:-**

A bilateral exeresis of meso-ovarium was made between two 5-0 silk suture ligatures. After being freed from foreign tissue, the ovary to be transplanted was washed in physiological solution (0.9% NaCl).

#### **Autologous Transplantation of the Ovary:-**

After oophorectomy and washing with 0.9% saline solution, a 2cm incision over the inguinal right fold was made. The femoral vessels were identified and then the right ovary was fixed among those structures using 6-0 nylon thread with no vascular anastomosis, under a microsurgical microscope.

#### **Administration of N-acetylcysteine (NAC):-**

One hour before ovarian transplantation, animals were treated subcutaneously - along the dorsum - with 1200mg/kg of NAC [11]. The non-treated groups, namely controls, GTx and R-IPC were treated with 0.9% Sodium chloride solution at the same volume.

#### **Serum analysis:-**

On the 15<sup>th</sup> post-operative day [11], blood samples were collected from the inferior vena cava for estradiol and progesterone serum levels (tested with kits in a solid-phase, competitive, immunofluorimetry and radioimmunoassay, respectively)

#### **Histopathology:-**

Ovarian grafts were surgically removed from the inguinal region and fixed in 10% formaldehyde. The sections were dewaxed and gradually hydrated before being stained with hematoxylin-eosin. For histological evaluation, a protocol based on D'Acampora et al (2004) [14].

#### **Statistical analysis:-**

BioEstat 5.4 was used and to confirm normal distribution samples by Kolmogorov-Smirnov test. Data are expressed as means  $\pm$  SE. ANOVA with post hoc Student's paired T-test was applied to renal function and oxidative stress, whereas the histopathological parameters by Kruskal-Wallis with post hoc Newman-Keuls. Values of  $p < 0.05$  were considered statistically significant.

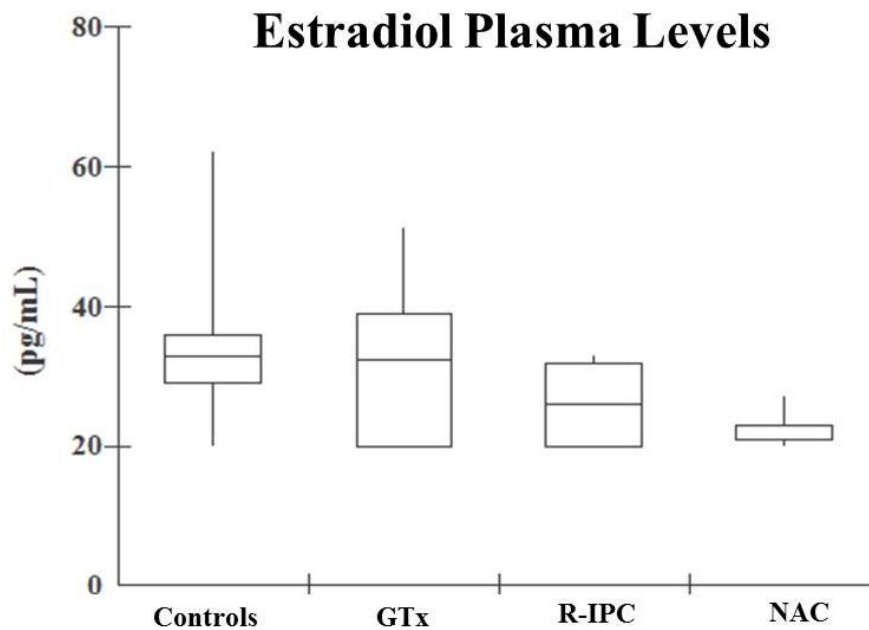
#### **Results:-**

All animals of R-IPC+NAC died within 24 hours after the procedure. The levels of estradiol hormone between groups showed no statistical difference (Fig. 2), however, progesterone plasma levels were significantly lower in both GTx ( $p < 0,05$ ) and NAC ( $p < 0,01$ ) when compared with controls group (Fig. 3). Therefore, the R-IPC has presented the most similar levels of progesterone when compared to controls.

Ovarian graft morphology indicated that NAC treatment promoted atretic follicles as transplant group and increased the number of secondary follicles (Fig. 4). Treatment with R-IPC promoted less atretic follicles, but primordial follicle, primary follicle, mature follicle and degenerated and functional corpora lutea were similar among groups.

**Table 1:-** Histological analysis according to groups. Kruskal-Wallis (Newman-Keuls) test; \*p<0.05 vs controls.

Parameters	Control	GTx	R-IPC	NAC	p-value
Primordial Follicles	0.4	0.0	0.0	0.0	0.9343
Primary Follicles	0.2	0.2	0.0	0.2	0.9340
Secondary Follicles	2.4	1.0*	0.6*	1.4	0.0309
Mature Follicles (de Graaf)	1.4	0.4	0.2	0.4	0.0781
Atretic Follicles	0.0	0.8*	0.2	0.8*	0.0458
Functional Corpora Lutea	2.2	0.0*	0.0*	0.4*	0.0086
Degenerated Corpora Lutea	0.0	0.8	0.4	0.4	0.3828
Newly formed vessels	0.0	1.0*	1.0*	1.0*	0.0003
Granulation tissue	0.0	0.2	0.2	0.2	0.9340

**Fig. 2:-** Estradiol plasma levels in pg/ml. ANOVA, p=0.2294.

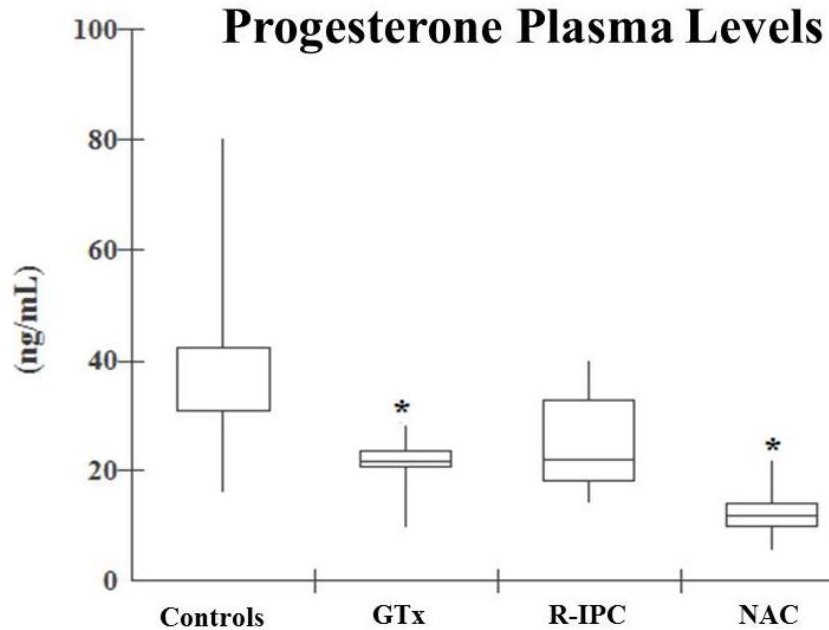


Fig. 3:- Progesterone plasma levels in ng/ml. ANOVA test with Tukey test post-hoc. \*  $p < 0,05$

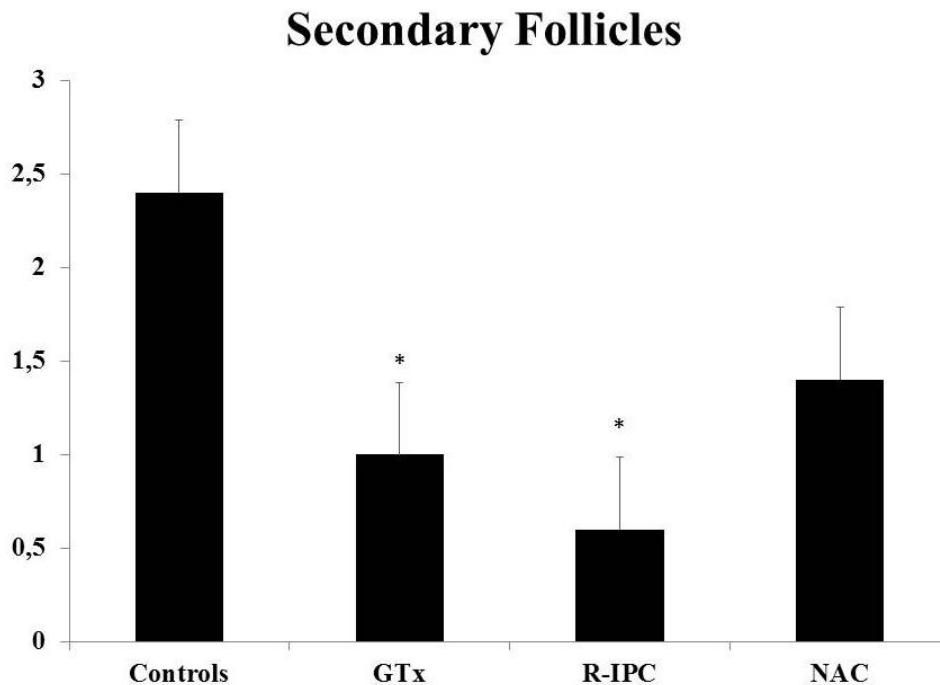


Fig. 4:- Number of Secondary follicles. Rats previously treated with R-IPC showed decrease in number of secondary follicle in graft. Kruskal-Wallis (Newman-Keuls) test; \*,  $p < 0.05$  vs controls.

#### Discussion:-

Successful fertility preservation through ovarian graft transplantation depends mainly on rapid reestablishment of vascularization and perfusion to the graft. Decreasing post transplantation hypoxia will protect the primordial follicle reserve and ensure the highest chance for retrieving mature oocytes for in vitro fertilization [14].

Regarding transplantation site, several were described: retroperitoneum [13,16,17], kidney capsules [4], greater omentum [18], fat pad [19] and inguinal region[20], to transplant the graft next to larger vessels, in areas that promote better vascularization, is important to allow its viability. Therefore, in the present study the authors choose to perform the technique of autotransplantation to the inguinal region that, according to Ceschin et al (2004) [20], demonstrated functionality and viability in 100% of analyzed slices.

In the present study, the effects of NAC and R-IPC on rat ovarian tissue after heterotopic autotransplantation were investigated. The association of both treatments was unviable, leading to death of all five animals from R-IPC+NAC group, possibly, a collateral effect of an overdose of NAC, which has been associated in other studies with decrease in prothrombin index and anaphylactoid reactions [21]. Therefore, it has been demonstrated that NAC significantly inhibits the protective mechanism of pre-conditioning for organs such as the myocardium [22].

The results also indicated that treatment with R-IPC, significantly improved the hormonal levels of progesterone, although did not reach the same level found on control group. R-IPC leads to earlier re-initiation of ovarian activity and increases the number of cycles in fresh graft, which can be related to a compensatory effect after I/R injury during the transplant when growth factors are produced to establish graft angiogenesis. The established neovascularization may stimulate the graft to re-initiate its function [23] which justifies the findings.

Damous et al (2009) [16] when studying the effect of R-IPC on rat's estradiol serum levels after ovary transplantation concluded that R-IPC increased estradiol levels in most animals, reaching an average of 65 pg/mL. This data was not confirmed by the present study (graphic 1) because, according to Damous, this increase was seen 72 hours post transplantation returning to lower levels similar to the other groups at seven days. Therefore, as the euthanasia, in this study, was performed at the 15<sup>th</sup> day such increase had already ceased.

In addition, others studies demonstrated that 21 days after transplantation, serum FSH levels reaches the same as the fresh control [17], explaining why the serum estradiol levels were similar. However, Mahmoodi et al (2015) [12] postulated that the treatment with n-acetylcysteine actually improved estradiol concentration at the 28<sup>th</sup> post-operative day because of its anti-oxidant properties, these discordant results might be explained by the difference on treatment protocol used (lower doses administered for a longer period) or variations in hormone measurements induced by natural animal diversity or by environmental stress or handling, that could have led to inconclusive results.

As our study indicated, the number of follicles in the autografted groups compared with the control groups decreased considerably, which confirms previous reports [23,24]. This could be explained because in the first days of transplantation, granulosa cells and oocytes, particularly in developing follicles, undergo apoptosis as a result of ischemia and reperfusion injury induced by free radicals and lipid peroxidation. This can lead to the degeneration and atresia of follicles and disruption in folliculogenesis and oogenesis, which eventually decreases the ovary volume and size and also the number of follicles [12].

Meanwhile, treatment with NAC resulted in a higher number of secondary follicles compared with the GTx and R-IPC groups, through preventing initial tissue degeneration and follicle atresia as a result of its ability to delay or inhibit apoptosis of ovary cells in the time of hypoxia and also to reduce the ischemia-reperfusion injury through its antioxidant ability and increasing the glutathione reservoir [12].

Although the association of NAC and R-IPC was not possible in the study, this still represents an interesting result, as it will serve as an example so that such protocol will not be used in other researches, which creates possibilities for new studies with lower concentrations of NAC or reduced I/R time.

### **Conclusion:-**

NAC and R-IPC separately had protective effects towards follicles and ovarian function preservation. However, further examinations are needed to translate our results to clinical trials of human ovarian transplantation, along with suitable modifications as oral administration, which provide an easier route of administration in human patients.

### **Acknowledgment:-**

The authors declare no conflict of interest



**Disclosure:-**

All authors declare no financial and personal relationships with other people or organizations.

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### RESEARCH ARTICLE

#### RISK REDUCTION MASTECTOMY A NEW STRATEGY FOR PRIMARY AND SECONDARY PREVENTION OF BREAST CANCER– A LITERATURE REVIEW.

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#### Abstract

**Background:** In the last decade there has been a marked increase in the number of women requiring risk reduction mastectomy either before the development of breast cancer in high risk population or following the diagnosis of unilateral breast cancer. The breast surgeon and the oncologist are usually faced with difficult questions regarding the impact and the outcome of the various strategies that are used for risk reduction. This includes prophylactic mastectomy, close surveillance programs or chemoprevention. The outcome of these strategies and their effects on disease relapse and survival particularly prophylactic mastectomy either bilateral risk reduction mastectomy (brm) for primary prevention or contralateral risk reduction mastectomy (crrm) for secondary prevention remains challenging and an area of great interest.

**Methods and data sources:** a narrative literature review was performed using the available electronic database. This was intended to assess the available tools for risk assessment in addition to the impact of prophylactic mastectomy (bilateral in high risk individuals or contralateral in unilateral breast cancer patients) on the following:

1. Breast cancer risk reduction & outcome.
2. Decision making process in women at a high risk for bilateral or contralateral breast cancer.
3. Patients satisfaction and psychological status after surgery.

**Conclusion:** Risk reduction prophylactic mastectomy in the form of bilateral or contralateral mastectomy is considered one useful strategy in patients at a high risk of breast cancer or with patients with unilateral breast cancer respectively. This strategy is recommended in some national and international guidelines.

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#### Introduction:-

Prophylactic mastectomy is defined as the removal of the breast in the absence of malignant disease. The aim is to reduce the risk of breast cancer occurrence either for primary or secondary prevention strategy (1).

Prophylactic mastectomy (PM) may be considered for women thought to be at a high risk for developing breast cancer, either due to a strong family history or in the presence of lobular carcinoma in situ or in known cases with BRCA1 or BRCA2 mutation or for those with TP53 (Li Fraumeni Syndrome), PTEN (Cowden syndrome, Bannayan-Riely-Ruvalcaba syndrome), CDH1, and STK11 or in those with a lifetime risk 20% or greater using risk assessment tools or in those patients who received radiation therapy to the chest between 10 and 30 years of age or finally in those with extensive mammographic abnormalities (extensive calcifications) where adequate biopsy or excision is impossible (2).Annex (1) & (2).

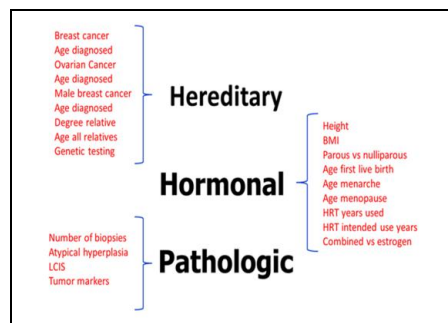
To be mentioned, Prophylactic mastectomy is generally considered investigational for other indications including but not limited to contralateral prophylactic mastectomy in women with breast cancer without any high risk criteria (3).LCIS is both a risk factor for breast cancer, including unilateral or bilateral cancer, and in some cases, it is a precursor for invasive lobular cancer.For those who develop invasive cancer, up to 35% may have bilateral cancer. Therefore, bilateral PM may be performed to eliminate the risk for development of breast cancer on the other hand; chemoprevention surveillance or oopherectomy are alternative risk reduction strategies. PMs are typically bilateral but can also describe a unilateral mastectomy as in patients who have previously undergone or are currently undergoing mastectomy in the opposite/contralateral breast for an invasive cancer (i.e.,CPM). The use of CPM has risen in recent years in the United States. An analysis of data from the National Cancer Data Base found that the rate of CPM in women diagnosed with unilateral stage I-III breast cancer increased from approximately 4% in 1998 to 9.4% in 2002 (4,5).

The discussion for PM is a complicated one. It includes risk-benefit analysis with estimation of the patient’s risk of breast cancer, typically based on the patient’s family history of breast cancer and other factors as well. Several models are available to assess the risk, this includes the Claus model, Gail and BRCAPRO models. Breast cancer history in first- and second-degree relatives is used to estimate breast cancer risk in the Claus model. The Gail model uses the following 5 risk factors: age at evaluation, age at menarche, age at first live birth, number of breast biopsies, and number of first-degree relatives with breast cancer. BRCAPRO considers hereditary and pathologic factors as well . Moreover, the choice of PM is based on patient tolerance for risk, consideration of changes to appearance and need for additional cosmetic surgery, and the risk reduction offered by PM versus other options (6,7). There is no standardized method for determining a woman’s risk of breast cancer that incorporates all possible risk factors. There are validated risk prediction models, but most of them are based primarily on family history (8,9). Figure 1, 2.However, some known individual risk factors confer a high risk by themselves. Annexure (3). See table 1 for more details.

- a) Lobular carcinoma in situ or
- b) A known BRCA1 or BRCA2 mutation or
- c) Another gene mutation associated with high risk, e.g., TP53 (Li-Fraumeni syndrome), PTEN (Cowden syndrome, Bannayan-Riley-Ruvalcaba syndrome), CDH1, and STK11 or
- d) High risk (lifetime risk about 20% or greater) of developing breast cancer as identified by models that are largely defined by family history or
- e) Received radiotherapy to the chest between 10 and 30 years of age.

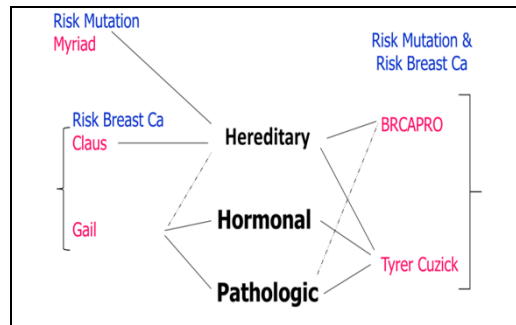
**Table 1:** List of factors known to indicate a high risk of breast cancer

A number of other factors may increase the risk of breast cancer but do not by themselves indicate high risk. It is possible that combinations of these factors may be indicative of high risk, but it is not possible to give quantitative estimates of risk. As a result, it may be necessary to individualize the estimate of risk, taking into account there numerous risk factors (10).



**Fig. 1:** Classification of breast cancer Risk Factors

Surgical options for prophylactic mastectomy include subcutaneous mastectomy (Skins or nipple sparing mastectomy) or total mastectomy, usually followed by breast reconstruction. Subcutaneous mastectomy is performed via an inframammary incision through which the breast tissue is resected, sparing the nipple-areolar complex. Historically, subcutaneous mastectomy was performed more commonly than total mastectomy, the latter procedure removes the majority of the breast tissue along with the nipple areolar complex through an elliptical skin incision. Given current nipple reconstruction techniques, total mastectomy is the preferred prophylactic procedure now a days. In both procedures a small amount of breast tissue is usually left. This can develop into cancer later. The tissue left behind is usually in the axilla, inframammary fold, and skin flaps. This issue must be clearly explained to the patient, the physician should reiterate that the risk of breast cancer, therefore, cannot be completely eradicated with prophylactic mastectomy (11,13).



**Fig. 2:** Assessment tools for Breast Cancer Risk

This review article is destined to evaluate the role of BRRM; CRRM in general as well as the complication of PM, in addition to the Psychological impact of the procedure as well as the survival and follow-up program after the risk reduction mastectomy.

### Methodology:-

In this article we reviewed the prevailing trends for using bilateral risk reduction mastectomy (BRRM) and unilateral risk reduction mastectomy (URRM) for primary and secondary prevention of breast cancer.

We electronically searched on PubMed, Medline, Medscape, Cochran, Health finder and Index databases of science Citations. Papers, bibliographies relevant studies published during the years of 2005 to 2015 are included in this review. The aim was to further define and clarify the following issues.

1. Current indicators for risk reeducation mastectomy prophylactic mastectomy (Bilateral or contralateral)
2. Risk assessment tools
3. Surgical techniques and its complications
4. Patient's satisfaction and psychosocial status after surgery
5. Outcome and survival results.

### Discussion:-

#### Bilateral Risk Reduction Mastectomy (BRRM):-

Prophylactic mastectomy (PM) is generally considered for patients with a family history of breast cancer. The Assessment largely focused on a 1999 retrospective cohort analysis which concludes that approximately 13 moderate-risk women should undergo PM to prevent 1 cancer. Furthermore for women at high risk of breast cancer, the reduction in the incidence of breast cancer ranged from 90% to 94%. The author concluded that 4 to 8 high-risk women would need to proceed with PM to prevent 1 occurrence of breast cancer (14).

A 2010 Cochrane review examined the impact of PM on mortality and other health outcomes. No Randomized controlled trials (RCTs) were identified. Thirty-nine observational studies with some methodological limitations were identified in the literature review. The studies presented data on 7384 women with a wide range of risk factors for breast cancer who underwent PM. Studies on the incidence of breast cancer and/or disease specific mortality reported risk reductions after bilateral PM, particularly for those with BRCA 1/2 mutations. The authors concluded that the available observational data suggested that bilateral PM reduces the rate of breast cancer mortality.

However, more rigorous studies (preferably RCTs) are still needed to confirm these findings; Furthermore, bilateral PM should only be considered among patients at very high risk of disease (15).

In 2014, the National Comprehensive Cancer Network stated that PM should only be considered in high-risk women, defined as having a BRCA1 or BRCA2 mutation or another gene mutation associated with increased risk (e.g., PTEN, TP53, CDH1, STK11), a compelling family history. It may also be considered in women with lobular carcinoma in situ (LCIS) or prior thoracic radiotherapy before 30 years of age. Also it is advisable in patients with additional genetic mutations that have been associated with a high rate of cancer include TP53 (Li Fraumeni syndrome) and PTEN (Cowden and Bannayan-Riley-Ruvalcaba syndromes) (16). NB: In patients who received prior radiotherapy to the chest between the ages of 10 and 30 years of age, the increased risk of breast cancer can reach almost 30% by age 55 years. Patients with incidental LCI are considered at an increased risk for breast cancer.

#### **Contralateral Risk Reduction Mastectomy (CRRM):-**

The potential impact of CPM on survival is related to its association with a reduced risk of subsequent primary breast cancer in the other breast (i.e., contralateral breast cancer [CBC]). The U.S. Surveillance, Epidemiology and End Results (SEER) database, annual rates of CBC were stable between 1975 and 1985, later on the rates declined about 3% per year. In 1990, the annual decline in CBC rates was seen in women with estrogen receptor-positive cancer, with no decrease in those with estrogen receptor-negative cancer. The investigators suggested that the decrease in CBC rates in estrogen receptor-positive cancer may be attributed in part to the wide use in adjuvant hormone therapies (17).

Molina-Montes et al published a systematic review on the risk of a second primary breast cancer in women with and without BRCA1 or BRCA2 mutations. Twenty studies were included; 12 retrospective cohort studies, 2 prospective cohort studies, and 6 case-control studies. The majority of studies included only women who had undergone genetic testing. A meta-analysis reported that the cumulative risk of a second primary breast cancer at 5 years after initial diagnosis was 14% (95% CI, 9% to 19%) in BRCA1 or BRCA2 mutation carriers and 3% (95% CI, 2% to 5%) in noncarriers. The Cumulative risks of a second primary cancer at 10 years after initial diagnosis was 22% (95% CI, 18% to 27%) in BRCA1 or BRCA2 mutation carriers and 5% (95% CI, 3% to 7%) in non-carriers (18).

#### **Complications of Prophylactic Mastectomy:-**

##### **Surgical Complications:**

Surgical Complications following prophylactic mastectomy may be immediate or delayed. Gabriel et al. reported a 5-year complication rate of 30% in 92 women undergoing prophylactic mastectomy and implant reconstruction. Immediate complications included necrosis of the skin, nipple-areolar complex (with subcutaneous mastectomy), infection, wound dehiscence, hematoma or seroma, and pain. Later complications include capsular contracture, implant rupture or leakage, asymmetry or unsatisfactory cosmetic outcome, and lack of sensitivity of the overlying skin (19).

Zion et al reported the experience of women who underwent prophylactic mastectomy and reconstruction with implants at the Mayo Clinic and subsequently required reoperation. Of 592 women who had bilateral prophylactic mastectomy and implant reconstruction, 52% required reoperation over a median follow-up of 14.2 years; 95% of these women had subcutaneous mastectomy. They also studied 502 women with a personal and family history of breast cancer who had undergone contralateral prophylactic mastectomy and reconstruction with implants along with therapeutic mastectomy for the affected breast. In this group, 39% required reoperation over a median follow-up of 8.8 years; 62% had subcutaneous mastectomy, and 38% underwent a total mastectomy. The Indications for reoperation were as follows. (a) Implant-related concerns (50% to 60%) includes, implant rupture or leakage or capsular contracture nodule excision (4% to 10%). (b) Non-implant-related aesthetic concerns (15% to 23%) like, revision of the scar or nipple-areolar revision (20).

In 2015, Silva et al published a large multicenter study including 20,501 women with unilateral breast cancer from the American College of Surgeons National Surgery Quality Improvement Program (NSQIP) database. A total of 13,268 (64.7%) women underwent unilateral mastectomy and 7233 (35.3%) had bilateral mastectomy. The analysis did not report on high-risk factors such as BRCA mutation status or family history. All women had breast reconstruction; a higher proportion of women who had unilateral mastectomy (19.5%) than bilateral mastectomy (8.9%) had autologous reconstruction; the remainder had implant-based reconstruction. The authors conducted analyses controlling for confounding variables (i.e. age, race smoking, diabetes, chronic pulmonary disease,

hypertension) and stratifying by type of implant. The rate of overall complications was significantly higher for women who had a bilateral versus unilateral mastectomy, regardless of reconstruction type. Among women with implant reconstructions, overall complication rates were 10.1% after bilateral mastectomy and 8.8% after unilateral mastectomy (adjusted odd ratio [OR], 1.20; 95% CI, 1.08 to 1.33). In women with autologous reconstructions, overall complication rates were 21.2% after bilateral mastectomy and 14.7% after unilateral mastectomy (adjusted OR=1.60; 95% CI, 1.28 to 1.99). The most common complication was reoperation within 30 days, followed by surgical site complications. Transfusion rates were also significantly higher ( $p<0.001$ ) in women with bilateral versus unilateral mastectomies who had either type of reconstruction. The rates of medical complications were relatively low approximately 1% of women who had implant reconstructions and 3% of women who had autologous reconstructions experienced a medical complication (ie, pneumonia, renal insufficiency or failure, sepsis, urinary tract infection, venous thromboembolism) and did not differ significantly for unilateral versus bilateral mastectomies. Several single-center studies have also found significantly higher surgical complication rates after bilateral than unilateral mastectomy (21).

Miller et al, in 2013 included 600 women with unilateral breast cancer, CPM remained associated with a significantly higher risk of any complication (OR=1.53; 95% CI, 1.04 to 2.25) and a significantly higher risk of major complications (OR=2.66; 95% CI, 1.37 to 5.19) than unilateral mastectomy. Eck et al in 2014 assessed 352 women with unilateral breast cancer, 94 (27%) women had complications, 48 (14%) in the unilateral mastectomy group and 46 (13%) in the bilateral mastectomy group.(15) The difference between groups was not statistically significant ( $p=0.11$ ), but this study may have been underpowered. They found a significant delay in adjuvant therapy after surgical complications. Women with complications waited longer before receiving adjuvant therapy than those without complications (49 days vs. 40 days,  $p<0.001$ ) (22).

#### **Psychosocial Issues:-**

In the literature, there are lots of accumulating data reported by questionnaire, Frost et al assessed long-term satisfaction as well as psychological and social function in 572 of 609 women (94% participation) with a family history of breast cancer following bilateral prophylactic mastectomy at the Mayo Clinic between 1960 and 1993. Family history of breast cancer was the most commonly cited reason for prophylactic mastectomy. The most frequent combination of reasons was family history, physician advice, and nodular breasts (23).

In the study, 74% of the women reported a diminished level of emotional concern regarding the development of breast cancer. The majority of women reported no change or even favorable response in regarding their emotional stability, degree of stress, self-esteem, sexual relationships, and feelings of femininity. However, 36% were unsatisfied with their body appearance after prophylactic mastectomy. The degree of satisfaction after prophylactic mastectomy was assessed by the following; body appearance, level of stress, implant-related problems, and the need for reconstruction after prophylactic mastectomy. To be mentioned the physician's advice as the primary reason for undergoing prophylactic mastectomy was associated with dissatisfaction. Stefanek et al. reported, it was found that cancer-related worry, prior breast biopsies, and subjective risk estimates were the most significant variables in the group undergoing prophylactic mastectomy. Women completing the procedure with strong support from families and friends (and those following formal risk counseling) were most satisfied with their decision (24)

Hatcher et al. in a prospective trial studied the psychosocial impact of bilateral prophylactic mastectomy through questionnaires and semi structured interviews. He assessed 143 women at increased risk of breast cancer who were offered bilateral prophylactic mastectomy. (79 women) accepted, (64 women) declined, and 11 others deferred making a decision. Follow-up interviews were conducted at 6 and 18 months. Psychological morbidity and anxiety were high before surgery and decreased significantly after surgery in the group that underwent a bilateral prophylactic mastectomy. On the other hand, it remained high in the group that opted for regular surveillance. The researchers noted that women who chose surgery were more likely to have undergone prior breast biopsies or genetic testing. After surgery, these women maintained a positive body image and reported few or no changes in sexual function. Furthermore, women who chose prophylactic mastectomy strongly believed that the procedure would significantly reduce their chances of developing breast cancer. Generally, the acceptors tended to report higher lifetime risks of developing the disease than the decliners. Hatcher et al. stressed on the importance of Genetic counseling. They reiterate that it is mandatory prior to making any decision regarding prophylactic mastectomy. This is to ensure accurate risk assessment and to inform the audience about their risk (25).

**Survival:-****Bilateral Risk Reduction Mastectomy:-**

**Mayo Clinic Study**—In an effort to quantify the risk reduction associated with prophylactic mastectomy, Hartmann et al. at the Mayo Clinic performed a retrospective cohort analysis of 639 women with a family history of breast cancer who had undergone prophylactic mastectomy between 1960 and 1993. Women were assigned retrospectively to either a moderate-risk group (425 women) or high-risk group (214 women) based on the extent of their family history of breast cancer. Follow-up was available for 99% of the cohort for a minimum of 2 years; median follow-up was 14 years (9,095 person-years). The investigators compared the total number of breast cancers observed among study participants with the total number predicted by the Gail model (for the moderate-risk group) and by a nested sister control study (for the high-risk group). The Gail model predicted that 37.4 women in the moderate-risk group would develop breast cancer by the median follow-up of 14 years. In the study, only four of these women developed the disease, representing an 89.5% reduction ( $P < .00001$ ) in incidence following prophylactic mastectomy. The Gail model also predicted that 10.4 women in the moderate-risk group would die of breast cancer, but, in fact, no deaths from breast cancer occurred in these women (26).

Regarding the high-risk group, 3 of the 214 women developed breast cancer after prophylactic mastectomy. From their sisters' experiences, 30 breast cancers were predicted in these high-risk women. Thus, prophylactic mastectomy was associated with a 90% reduction in the risk of breast cancer in high-risk women. Similarly, compared with the expected number of breast cancer deaths, prophylactic mastectomy in the high-risk group resulted in an 81% to 94% reduction in breast cancer mortality.

**Dutch Study**— This is a prospective study that evaluated 139 BRCA1 or BRCA2 carriers. All women were followed at the Rotterdam Family Cancer Clinic. None had a history of breast cancer. A total of 76 of these women accepted to undergo prophylactic mastectomy, and 63 remained under close surveillance. The mean follow-up was  $2.9 \pm 1.4$  years. No cases of breast cancer were observed in the prophylactic mastectomy group, compared to eight cases in the surveillance group (hazard ratio: 0; 95% confidence interval [CI]: 0-0.36). Out of the eight cases, four were interval cancers diagnosed between scheduled screening tests. Four of the cancers spread to the axillary lymph nodes, Seven were estrogen-receptor and progesterone-receptor negative. The interval from initiation of surveillance to the diagnosis of cancer ranged from 2 to 42 months. The researchers concluded that in women with a BRCA1 or BRCA2 mutation, at 3 years of follow-up, prophylactic bilateral total mastectomy reduced the incidence of breast cancer with a relative risk reduction of 100%, (absolute risk reduction of 12.7%) (27).

**Contralateral Risk Reduction Mastectomy:-**

A systematic review and meta-analysis of studies on CPM was published in 2014 by Fayanju et al. The authors searched for published studies that compared the incidence of CBC in women with unilateral disease who did and did not undergo CPM. Fourteen observational studies met eligibility criteria and were included in the meta analysis. In a meta-analysis of 4 studies, mortality from breast cancer was lower in the group that had CPM (relative risk [RR], 0.69; 95% CI, 0.56 to 0.85). Moreover, in a meta-analysis of data from 6 studies, overall survival (OS) was significantly higher in patients who underwent CPM ( $n=10,666$ ) than those who had no CPM ( $n=145,490$ ) (RR=1.09; 95% CI, 1.06 to 1.11). The authors also conducted a subgroup analysis by risk level in which all patients were BRCA mutation carriers and studies in which all patients had a family history of breast cancer (4 studies). Those were categorized as indicating higher familial/genetic risk. Together, the studies included 618 patients who had CPM and 1318 patients who did not. In a meta-analysis limited to these 4 studies, neither OS nor mortality from breast cancer differed significantly among women who had or did not have CPM. The relative risk of breast cancer mortality with and without CPM was 0.66 (95% CI, 0.27 to 1.64). Regarding the OS with and without CPM, the relative risk was 1.09 (95% CI, 0.97 to 1.24). The absolute reduction in the risk of metachronous breast cancer did not differ in women with and without CPM when data from all 8 studies were analyzed (risk difference [RD], -18.0%; 95% CI, -42.0% to 5.9%, but was significantly lower in women with CPM in the 4 studies exclusively enrolling women at increased familial/genetic risk (RD = -24.0%; 95% CI, -35.6% to -12.4%). The authors stated that the improvement in survival after CPM in the general breast cancer population was likely not due to a decreased incidence of contralateral breast cancer, but rather was secondary to selection bias (as CPM recipients may be otherwise healthier and have better access to health care than the other group who declined the procedure (28).

Kruper et al in a large dataset from the SEER database in 2014 studied CBC and survival outcomes. The investigators conducted a case-control analysis including 28,015 CPM patients and 28,015 unilateral mastectomy patients, matched on age group, race/ethnicity, extent of surgery, tumor grade, tumor classification, node



classification, estrogen receptor status, and propensity score. The investigators were not able to match for BRCA or other mutation status. When all matched patients were included, disease-specific survival (DSS) and OS were significantly lower in women who underwent unilateral mastectomy compared with CPM. For DSS, the hazard ratio (HR) was 0.83 (95% CI, 0.77 to 0.90); for OS, it was 0.77 (95% CI, 0.73 to 0.82). Presumably, CPM would increase survival by lowering the risk of CBC. The authors conducted another analysis excluding women diagnosed with CBC; the remaining sample was still large (25,924 women with unilateral mastectomy and 26,299 women with CPM). In the analysis excluding women with CBC, DSS and OS remained significantly lower in women who had unilateral mastectomy versus CPM. For DSS, the HR was 0.87 (95% CI, 0.80 to 0.94); for OS, it was 0.76 (95% CI, 0.71 to 0.81). The investigators suggested that the survival benefits found in CBC patients was not due to prevention of CBC, but instead to selection bias (e.g., healthier women choosing CBC). A limitation of the analysis was the inability to control for risk factors including gene mutation status, family history, and a history of radiotherapy to the chest between ages 10 and 30 years (29). In 2013, Yao et al evaluated OS after CPM by analyzing data from the National Cancer Data Base. The data were collected from 1450 Commission of Cancer-accredited cancer programs. The analysis included 219,983 women who had mastectomy for unilateral breast cancer; 14,994 (7%) of these women underwent CPM at the time of their mastectomy. The investigators did not report risk factors such as known genetic mutations. The 5-year OS rate was 80%. In an analysis adjusting for confounding factors, the risk of death was significantly lower in women who had CPM than in women who did not. The adjusted HR for OS was 0.88 (95% CI, 0.83 to 0.93). The absolute risk of death over 5 years with CPM was 2.0% lower than without CPM. In a subgroup analyses, there was a survival benefit after CPM for individuals aged 18 to 49 years and aged 50 to 69 years, but not for those 70 years or older. There was also a survival benefit for women with stage I and II tumors, but not for stage III tumors. Pesce et al. in 2014, focused on the subgroup of patients who were young (with stage I or II breast cancer. A total of 4338 (29.7%) of 14,627 women in this subgroup had CPM at the time of mastectomy. Median follow-up was 6.1 years. In a multivariate analysis controlling for potentially confounding factors, OS did not differ significantly among patients who underwent unilateral mastectomy and those who also had CPM (HR=0.93; 95% CI, 0.79 to 1.09). Moreover, among women younger than 45 years with estrogen receptor-negative cancer, there was no significant improvement in OS in those who had CPM versus unilateral mastectomy (HR=1.13; 95% CI, 0.90 to 1.42) (30).

**Follow-up after Prophylactic Mastectomy:-**It is very important to mention that Prophylactic mastectomy does not completely eliminate the risk of subsequent breast cancer. Hence, it is mandatory that women treated with this procedure undergo long-term follow-up, perform regular, monthly examination of the chest wall, and undergo annual clinical examination. Annual mammography should be strongly considered in women who have had subcutaneous mastectomy. This has been an area of controversy. Those in favor stress that the residual breast tissue warrants a thorough clinical and radiologic assessment to enable early detection of malignancy. However, those against annual mammography believe that the thin layer of the residual breast tissue can be easily palpated on clinical examination of the chest wall and that annual mammography does not provide any additional benefit (31).

**In Summary:-**

The following are the current practice guidelines and position statements to be taken in to consideration.

1. **National Comprehensive Cancer Network (NCCN 2016) :**“Risk-reduction mastectomy should generally be considered only in women with a genetic mutation conferring a high risk history for breast cancer, compelling family history, or possibly with LCIS [lobular carcinoma in situ] or prior thoracic radiation therapy at < 30 years of age. The value of risk-reduction mastectomy in women with deleterious mutations in other genes associated with a 2-fold or greater risk for breast cancer (based on large epidemiologic studies) in the absence of a compelling family history of breast cancer is unknown.”The guideline states: “the small benefits from contralateral prophylactic mastectomy for women with unilateral breast cancer must be balanced with the risk of recurrent disease from the known ipsilateral breast cancer, psychological and social issues of bilateral mastectomy, and the risks of contra lateral mastectomy. The use of a prophylactic contralateral mastectomy to a breast treated with breast-conserving therapy is very strongly discouraged.” Genes that confer more than 20% risk of breast cancer include BRAC1, BRCA2, ATM, CDH1, CHEK2, PALB2, PTEN, STK11, and TP53 (32).
2. **Society of Surgical Oncology (SSO) 2007 :**The Society of Surgical Oncology developed a position statement on PM in 1993 and updated it in 2007.The position statement states that bilateral PM is potentially indicated in patients with: Known BRCA 1 or 2 mutations or other genes that strongly predispose susceptibility to breast cancer,A history of multiple first-degree relatives with breast cancer history or multiple successive generations of breast and/or ovarian cancer, or Biopsy-confirmed, high-risk histology such as atypical ductal or lobular hyperplasia or LCIS. The position statement also stated that CPM may be potentially indicated in patients: With

high risk (as previously defined) of contralateral breast cancer, In whom surveillance would be difficult such as with dense breast tissue or diffuse indeterminate microcalcifications, or to improve symmetry (33).

3. **National Cancer Institute (NCI) 2012:**The fact sheet of NCI, issued in 2012 provided the following information: “Prophylactic surgery to remove both breasts (called bilateral prophylactic mastectomy) can reduce the risk of breast cancer in women who have a strong family history of breast and/or ovarian cancer, who have a deleterious (disease-causing) mutation in the BRCA1 gene or the BRCA2 gene, or who have certain breast cancer-associated mutations in other genes, such as TP53 and PTEN.” (34)

### Conclusion:-

Bilateral & contralateral risk reduction mastectomy is one risk reduction measure for patients at a high risk of breast cancer or contralateral cancer respectively. Accurate risk assessment by a trained genetic counselor is an obligatory first step, as many women overestimate their risk of breast cancer. It is a highly personal decision that must, therefore, be preceded by an in-depth discussion with the patient by a multidisciplinary team regarding the benefits of the procedure vs the potential surgical and psychological risks. In addition, it is imperative that these women be informed of alternative management options, including chemoprevention, increased surveillance, and prophylactic oophorectomy.

**Annex (1) :**The following personal and/or family characteristics suggest a high-risk individual who would be a candidate for genetic testing:

- a. Age onset of breast cancer  $\leq 50$
- b. Triple negative tumor (ER-PR-HER2-) and age  $\leq 60$
- c. Ashkenazi Jewish heritage and breast cancer any age
- d. Two or more primary breast cancers (cancers can be asynchronous, synchronous, bilateral, or multicentric)
- e. First-degree relative with breast cancer age  $\leq 50$
- f. Two relatives on the same side of the family with breast cancer and/or pancreatic cancer
- g. Family or personal history of ovarian cancer, fallopian cancer, or primary peritoneal cancer
- h. Male Breast Cancer
- i. Known mutation carrier in the family

**Annex (2):-**Patients without a personal history of Breast Cancer: Patients should be made aware that testing an affected relative first when available can be more informative than testing themselves since a negative result will not give them more insight into their family history. If an affected relative is not available, patients should be reminded of the limitations of testing. Ideally, a three-generation pedigree including maternal and paternal lineage should be obtained. This information can be used to guide the type of testing to be performed and the selection of patients who may benefit from further counseling with a CGC. Patients without a personal history of breast cancer meet criteria for genetic testing if they have the following history:

- a) First-or second-degree relative with early age onset of breast cancer  $\leq 45$ .
- b) Ashkenazi Jewish heritage and family history of breast cancer any age
- c) Two or primary breast cancers (cancers can be asynchronous, synchronous, bilateral or multicentric) in a single family member
- d) Two or more relatives on the same side of the family with breast cancer and/or pancreatic cancer
- e) Family or personal history of ovarian cancer, fallopian cancer, or primary peritoneal cancer
- f) Male Breast Cancer
- g) Known mutation carrier in the family

### Annex (3):-Risk Assessment Tools

In addition to National Comprehensive Cancer Network (NCCN) guidelines for identifying patients appropriate for genetic testing, there are numerous models and online calculators available to predict the likelihood of carrying a BRCA1 or BRCA2 mutation based on family and personal history. In general, patients with a 5-10% or greater likelihood of carrying one of these genes should be recommended to be considered for testing and/or genetic counseling.

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### RESEARCH ARTICLE

#### SEISMIC ANALYSIS OF RC ELEVATED RECTANGULAR WATER TANK USING IS 1893 (PART2):2006 DRAFT CODE

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 Seismic Zones, Excel Sheet and  
 STAAD.pro

#### Abstract

The tank is considered two degrees of freedom system with a large mass is located at the top of supported system or frame supported system. The behavior of tank under earthquake loading is greatly depending on the staging height and seismic zones. And also seismic forces dependent on staging height. Present studying is shown the effect of staging height on seismic behavior of R.C elevated rectangular water tank. The elevated water tank has 300 m<sup>3</sup> capacity, various staging height such as (6m, 9m, 12m, 15m, 18m and 21m) and also different seismic zones such as II, III, IV & V were studied in STAAD.pro analysis package and Excel sheet developed program. The spring mass model subjected two degrees of freedom as per IS 1893 (part2):2006 draft code. Analysis carried out by considering the liquid mass is divided into two parts consisting of the convective and impulsive masses. Parameter of studying such as maximum displacement, maximum base shear, maximum overturning moment, quantity of concrete and amount of reinforcement for different staging height and seismic zones. in the case of studying for finding out maximum base shear and overturning moment by using Excel sheet and maximum displacement, quantity of concrete and quantity of reinforcement with STAAD.pro analysis package were used and the result of the studying were plotted in the graphs.

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#### Introduction:-

Water tank is an important and strategic structure and it should remain functional during earthquakes to overcome the water demand due to fire etc. Water tanks are different from the building, because the huge mass of water is located at the top of supporting system. During the earthquake the mass of water is considered two parts such as impulsive and convective liquid mass. The good understanding of the behavior of water tank during seismic activity is necessary in order to evaluate the forces exerted due to earthquake and response of water tank. in the case of elevated water tank resistance against earthquake force is largely dependent of the supporting system. Staging of the elevated water tank is considered to be the critical element subjected to the lateral forces (seismic forces). when the tank partially filled with water, the tank is subjected to horizontal seismic acceleration and sloshing waves generates which exerts hydrodynamic forces on wall and the base of water tank. to calculate these hydrodynamic forces spring mass model suggested as per IS 1893(part2) :2006 draft code can be used. in the case of water tank, behavior of tank

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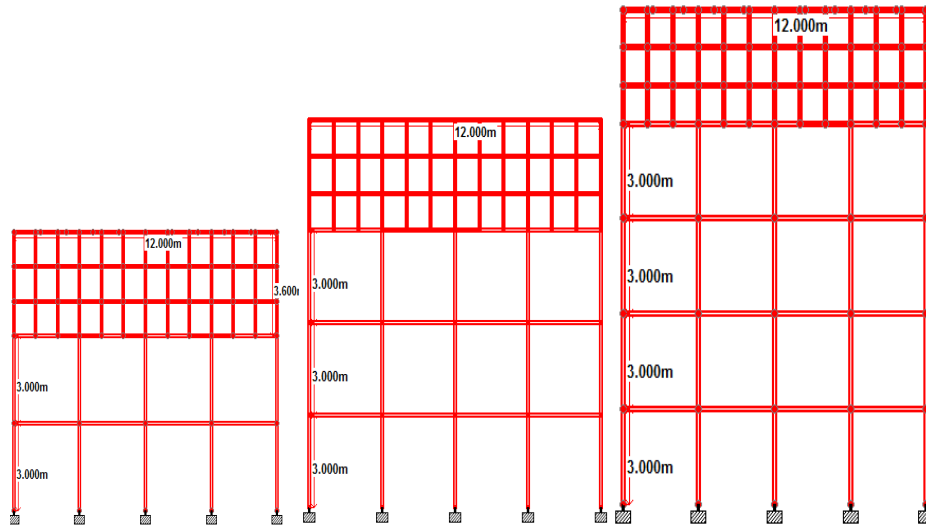
under hydrodynamic and hydrostatic forces are considered is greatly dependent on the configuration of staging its height and stiffness.

**Methodology:-**

In the present studying different staging height and seismic zones was considered for the same capacity of water and configuration of tank. The R.C elevated rectangular tank is selected with 300m<sup>3</sup> capacity and analysis in the II, III, IV&V seismic zones. Tank is analyzed by using Excel sheet developed program and STAAD.pro analysis package and performance with respect to maximum base shear, maximum overturning moment ,maximum displacement, quantity of concrete and quantity of steel are presented. Six different staging heights are considered for studying such as 6m, 9m, 12m, 15m, 18m and 21m.The foundation depths are kept same for finding out the effect of staging height on seismic behavior of elevated water tank.

**Table.1:-Analysis Data**

Soil type	Medium
Importance factor	1.5
Response reduction factor for SMRF	2.5
Seismic zones	II,III,IV &V
Size of columns	1.0m*0.8m
Size of tie beam	0.8m*0.5m
Height of staging	6m,9m,12m,15m,18m &21m
Depth of foundation	1.5m
Thickness of wall	0.32m
Thickness of base slab	0.32m



**Fig. 1:-Elevation of Different Staging Height of Water Tank**

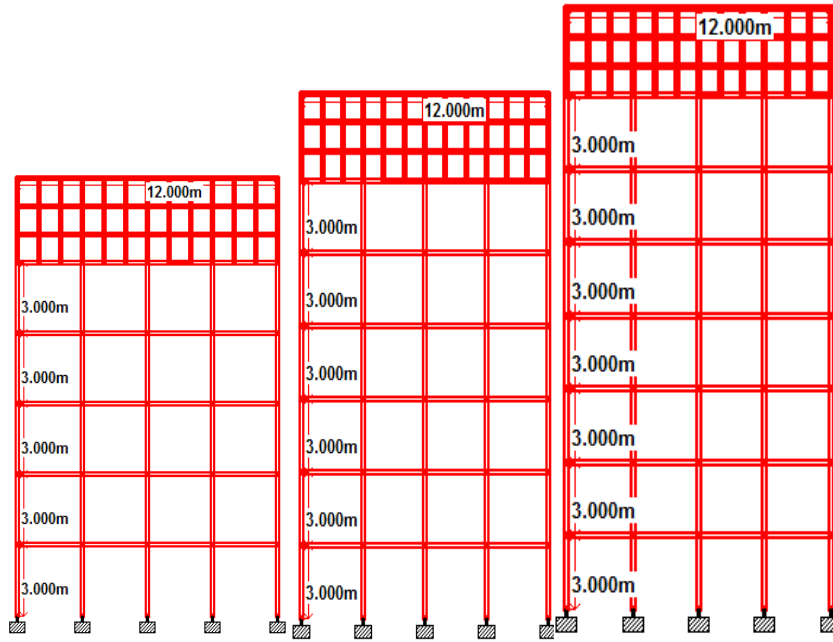


Fig. 2:-Elevation of Different Staging Height of Water Tank

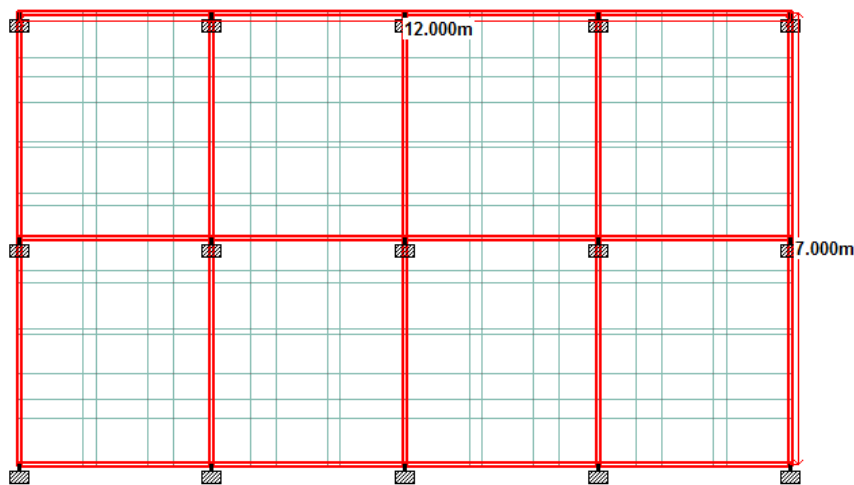


Fig. 3:-Plan of Water Tank

### Analysis:-

Seismic coefficient analysis or equivalent static analysis was carried out and found out the response of the R.C elevated rectangular tank on the above models as shown before. The calculation procedure two spring mass models for every model are considered as per IS 1893( part 2):2006 draft code.And response of the elevated water tank (base shear, overturning moment and displacement) is summarized below. Comparison between each of the following models are made based on analysis results and plotted in graphical format.

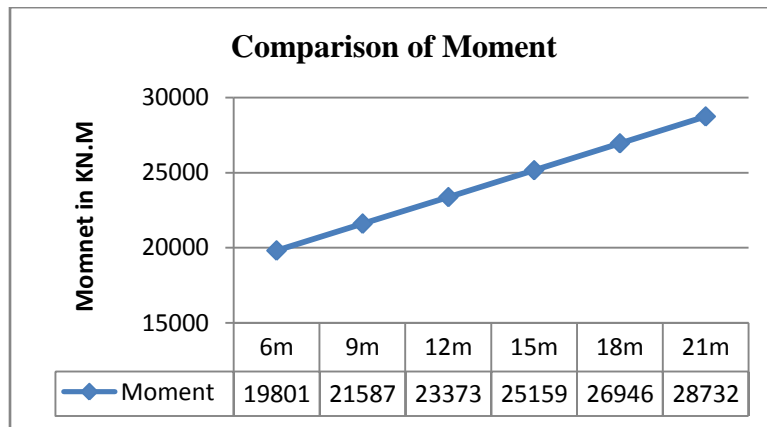
For analysis of this studying were used STAAD.pro and Excel sheets, to find out the value of maximum base shear and overturning moment used Excel sheet as per IS 1893(part 2) :2006 draft code according the mentioned code two model masses model was made. Liquid mass is divided into two parts such as impulsive and convective mass.Analysis carried out and the value of maximum base shear and over turning moment were found out and plotted in the graphs. But for finding out the value of displacement was used the STAAD.pro package and found out the maximum displacement at the top of the water tank.

**TABLE.2:-**Maximum Base Shear, Overturning Moment Displacement, Concrete Quantity and Steel Quantity

Zone	Height (m)	Width (m)	Ratio L/B	Length (m)	Staging (m)	MaxBase Shear(KN)	Max Moment (KN.M)	Displacement (mm)	Concrete (m3)	Steel (Kg)
II	3.6	7	1.3	12	6	388	8250	1.874	157.2	77302
					9	424	8994	3.034	221.6	110091
					12	459	9738	4.653	286	142879
					15	495	10483	6.754	350.4	173936
					18	530	11227	8.641	414.8	204751
					21	565	11972	10.173	479.2	238191
III					6	621	13291	2.527	157.2	77302
					9	678	14391	4.383	221.6	110480
					12	735	15582	6.973	286	151936
					15	791	16773	10.335	350.4	190740
					18	848	17964	13.335	414.8	224895
					21	905	19150	15.805	479.2	260340
IV					6	932	19801	3.390	157.2	78223
					9	1017	21587	6.181	221.6	121183
					12	1102	23373	10.067	286	159901
					15	1187	25159	15.11	350.4	206616
					18	1272	26946	19.64	414.8	254768
					21	1357	28732	23.315	479.2	298164
V	6	1398	29701	4.705	157.2	84511				
	9	1526	32380	8.879	221.6	131217				
	12	1653	35060	14.708	286	185833				
	15	1781	37739	22.272	350.4	257231				
	18	1908	40419	29.067	414.8	318211				
	21	2036	43098	34.579	479.2	377731				

**Results and Discussion:-**

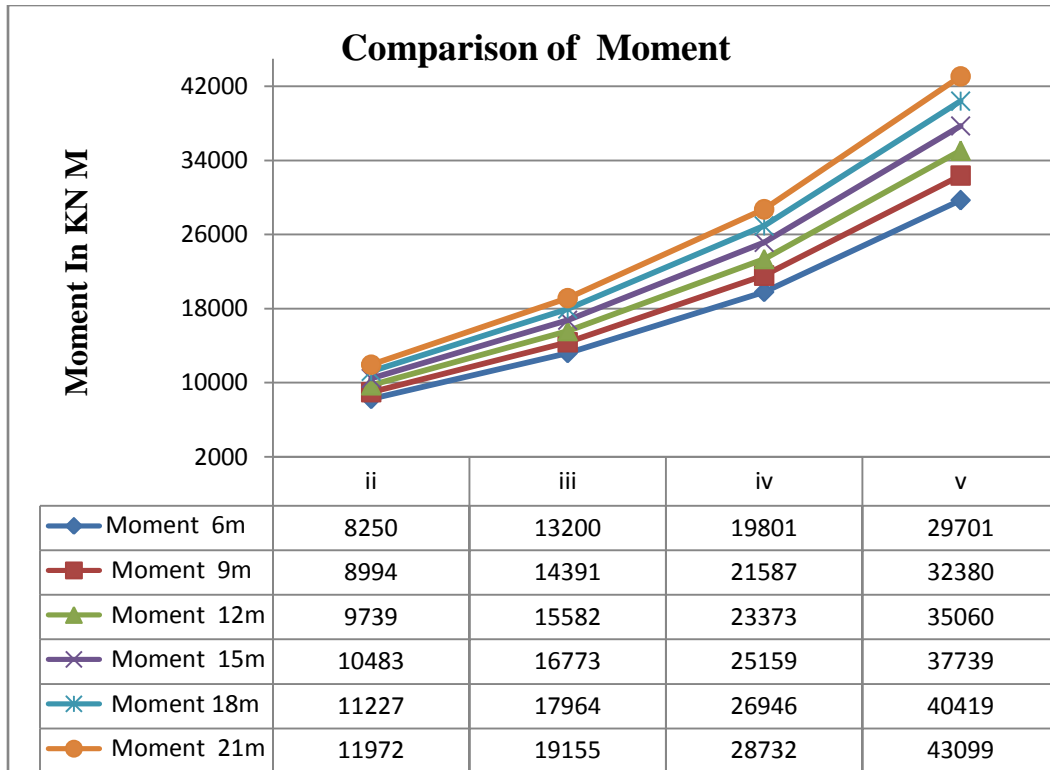
Maximum base shear, overturning moment and displacement with seismic coefficient static analysis are presented in the graphs as following .they are observed that maximum base shear, overturning moment and displacement increase as staging height and seismic zones is increased.



**GRAPH1:-** Variation of Moment in IV Seismic Zone and Different Staging Height

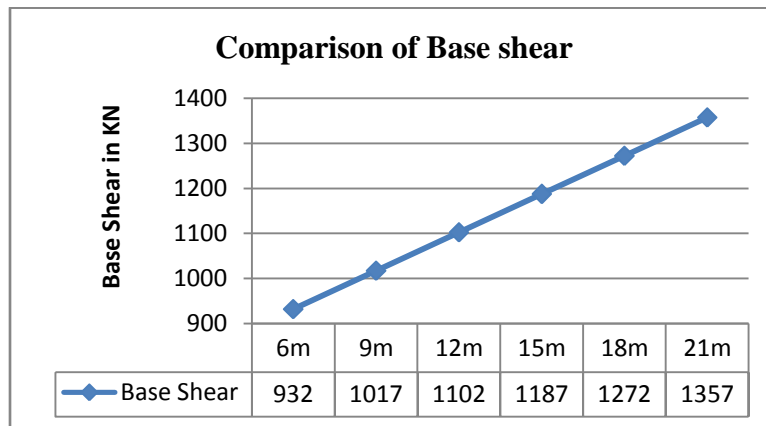
As the above graph is plotted as shown there is a gradual increased overturning moment as increase the staging height in IV seismic zone.





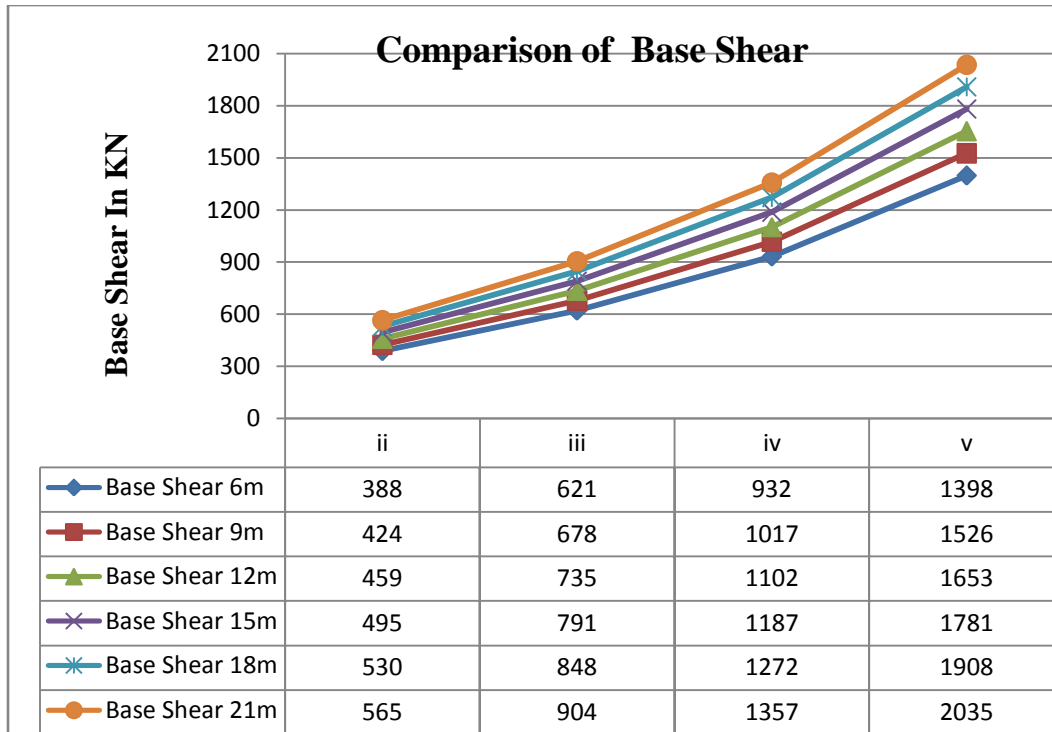
**GRAPH2:-** Variation of Moment in Different Sesimic Zones and Staging Height

As the above graph is plotted as shown there is a gradual increased the moment as increase in the different seismic zones. Also when the seismic zones are increased the values of moments between two staging heights are increased.



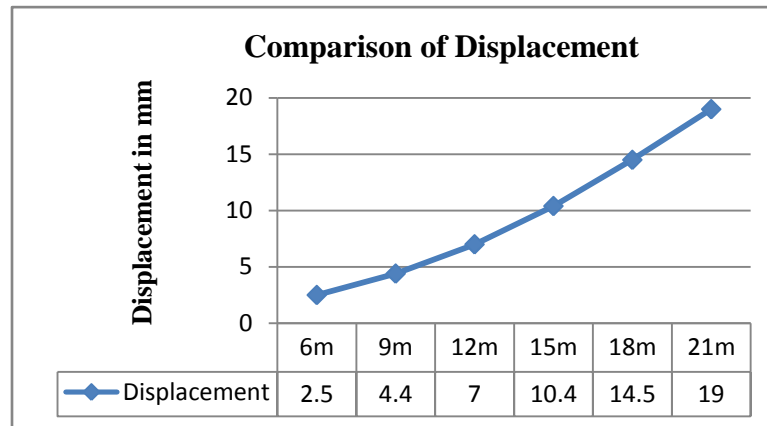
**GRAPH3:-** Variation of Base Shear in IV Seismic Zone and Different Staging Height

As the above graph is plotted shows there is a gradual increased base shear as increase the staging height in IV seismic zone.



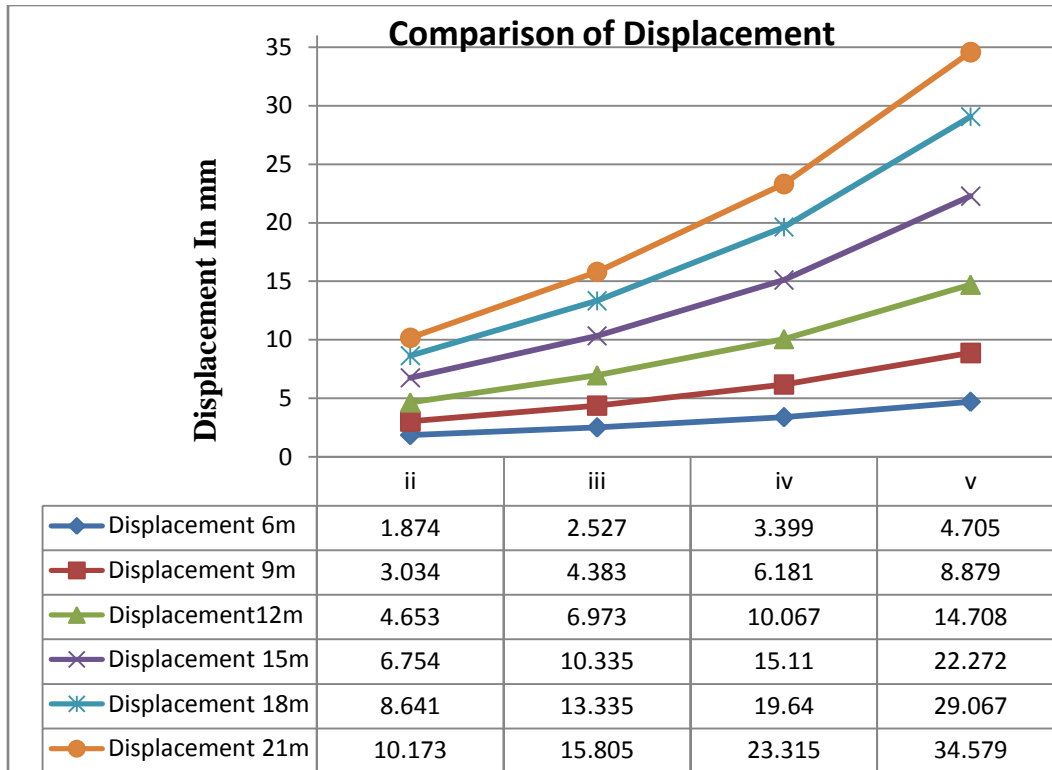
**GRAPH4:-** Variation of Base Shear in Different Seismic Zones and Staging Height

As the above graph is plotted shows there is a gradual increased the base shear as increase staging height in the different seismic zones. Also when the seismic zones are increased the values of base shear between two staging heights are increased.



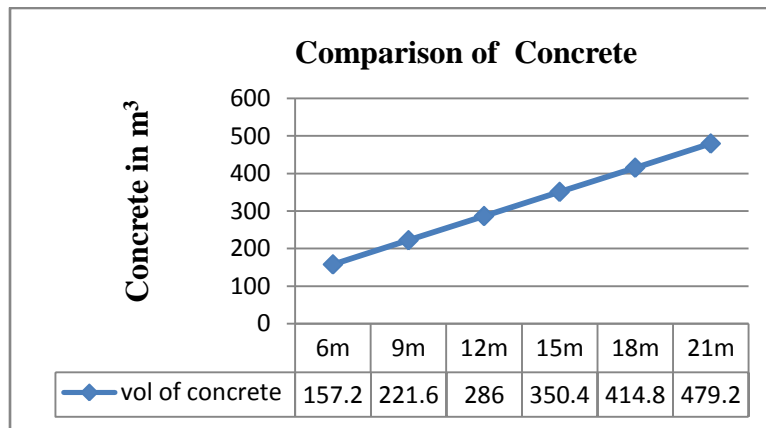
**GRAPH5:-** Variation of Displacement in IV Seismic Zone and Different Staging Height

As the above graph is plotted shows there is a gradual increased displacement as increase the staging height in IV seismic zone. Displacement shows the requirement of enough columns and sufficient supporting system.



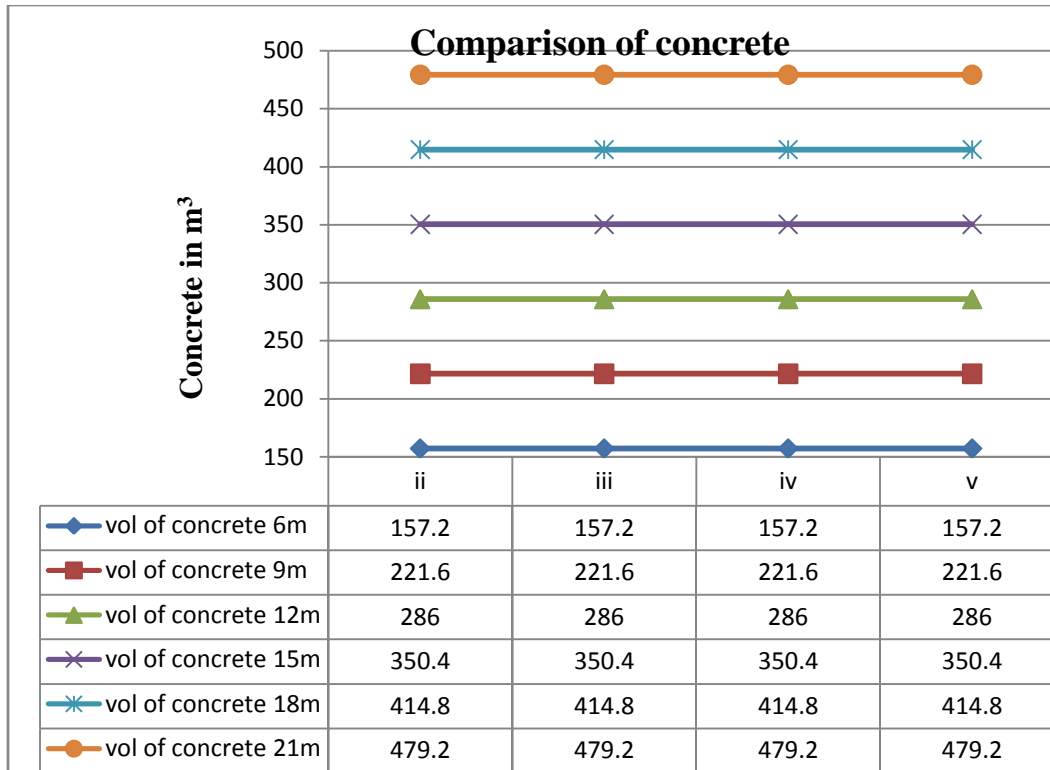
**GRAPH6:-** Variation of Horizontal Displacement in Different Seismic Zones and Staging Height

As the above graph is plotted shows there is a gradual increase in the displacement as increase in the different seismic zones. By increasing the height of the staging the displacement increase this value shows when increasing the staging height the column and supporting system need more and these columns and supporting systems are not sufficient.



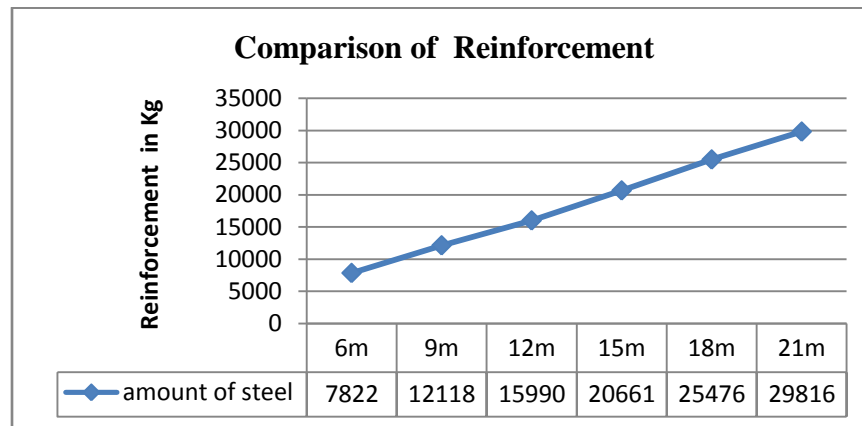
**GRAPH 7:-** Variation of Concrete Quantity in IV Seismic Zone and Different Staging Height

As the above graph is plotted is shown there is a gradual increased quantity of concrete as increase the staging height in IV seismic zone.



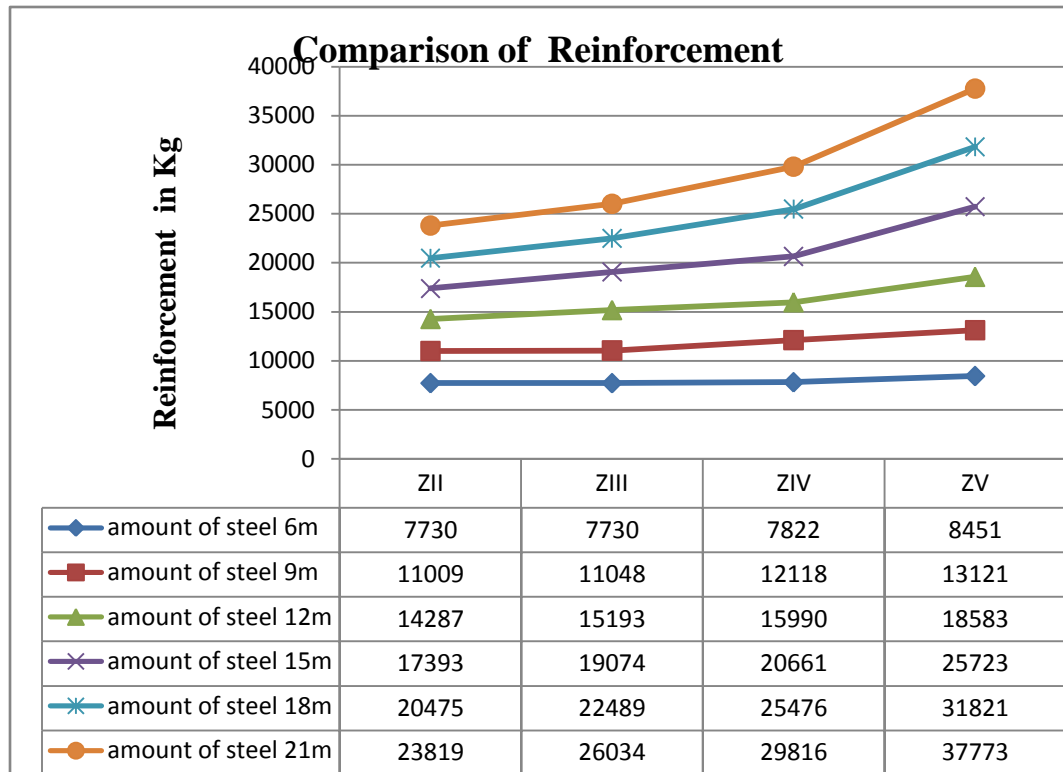
**GRAPH 8:-** Variation of Concrete Quantity in Different Seismic Zones and Staging Height

As the above graph is plotted is shown the concrete quantity is remained constant, while the seismic zones are increased because the cross section of the structure is not changed.



**GRAPH 9:-** Variation of Displacement in IV Seismic Zone and Different Staging Height

As the above graph is plotted shows there is a gradual increased quantity of steel is increased the staging height in IV seismic zone.



**GRAPH10:-** Variation of Steel Quantity in Different Seismic Zones and Staging Height

As per the above graph is plotted shows there is a gradual increase in the quantity of reinforcement as increase the different seismic zones. By increasing the staging height the amount of steel is increased. Because we did not change the cross section of the structure therefore the earthquake forces also undergo by reinforcement.

**Conclusion:-**

The elevated water tank has 300 m<sup>3</sup> capacity, various staging height such as (6m, 9m, 12m, 15m, 18m and 21m) and also considered in different seismic zones such as II, III, IV & V were studied in STAAD.pro analysis package and Excel sheet developed program. The spring mass model is subjected to two degrees of freedom system as per IS 1893 (part 2):2006 draft code. The conclusions are made as per comparing of the results:

1. Base shear, overturning moment and displacement are increased with increasing the staging height and seismic zones. Because when the structure height is increased the mass and distance between the center of gravity and ground level is increased as per IS 1893 (part 2) :2006.
2. The values of the base shear and overturning moment are slightly become more. And also when the structure height becomes more the displacement values are proportional becoming more, because the structure comes flexible and displacement value shows the requirement of columns and sufficient supporting system.
3. Values of maximum base shear, maximum overturning moment and maximum horizontal displacement have been shown the Response of elevated water tank.
4. In the case of studying seismic zones such as II, III, IV and V are changed, the geometry of structure is remained constant therefore the quantity of concrete is not changed, but the reinforcement quantity is increased due to increasing seismic zones. Software able to provide the requirement of reinforcement to resist the seismic forces without any changing of the cross section.

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### RESEARCH ARTICLE

## THE EFFECT OF ORGANIZATIONAL SERVICE ORIENTATION, STRATEGIC LEADERSHIP AND STRATEGIC COMPETENCE ON THE ORGANIZATIONAL PERFORMANCE OF PRIVATE UNIVERSITY.

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Performance

### Abstract

Competitions happened in many different fields of Industry, both in manufacture and service areas, including education industries around the globe. Universities need to create people who are competitive and have capabilities to match with the need of the industries. Having understanding about an organizational service orientation became important to the most of service organizations. Few researches relating to the study of organizational service orientation showed there were positive relationship between organizational service orientation and organizational performance. This study reviewed diverse empirical literatures on organizational service orientation, strategic leadership and strategic competence and their effects on organizational performance. This study find that having a service orientation will give better performance for an organization. The ability of strategic leaders to have strategic competence will also increase organizational performance.

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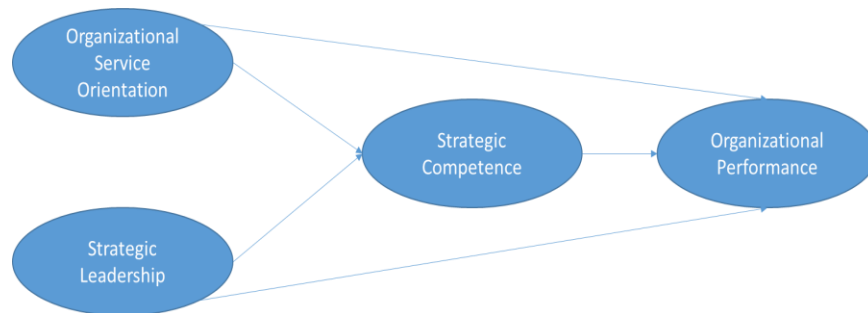
### Introduction:-

Nowadays competitions happened in many different fields of Industry, both in manufacture and service areas. Organizations need to have the right strategy to be able to survive and not only surviving but also expand in this highly competitive market for long term. The competitive challenges also effect education industries around the globe. Universities need to create people who are competitive and have capabilities that are match with the need of the industries. The ability of universites to improve their graduates quality through learning process become significantly important in recent years. Leaders at educational industries are expected to be more strategic in their leadership and lead their institutions to face the challenges. Universites are expected to be able to adopt the changes, develop and make improvement through their organization by creating their competitive advntges (Henderson & Ccoburn, 1994). The ability to create competitive advantages, will need strategic competence possessed by the universites' leaders. Baker et al. (1997) explained that strategic competence is "The accuracy/alignment between company business strategic and its external competitive environment." Strategic competence is defined as an ability to understand strategy (Fauré & Rouleau (2011). Strategic competence is the main key for an institution to support its competitive position. Davies (2006) explained that universities who have the focus strategically were those able to use strategic approaches and strategic processes (include strategic planning) and they also have strategic leadership skills.

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Other challenge faced by the universities, especially private universities, relates to the services they give to their students. Educations as part of the service industries need to pay attention to the services that they give to their customers. Nowadays, students not only feel enough if they will only get the education itself but they also want the universities provide and give services that will satisfy them. Private universities need to have standards in giving the services to the students and each level of all the departments need to have the same understanding to practice the same standard. Handriana (1998) explained that perception of the same service standard across the whole department and being understood by everyone inside the private university will produce service quality as the standard that they understand together. The same service standard can only be reached if everyone has the same perception toward the concept of service standard itself. It is part of the management responsibility to make sure that service standard desired is well communicated to all level in the organization. Lytle et al. (1998) explained the concept of organizational service orientation as a form of policies, practices and procedures to support and give reward for all behaviors that focus on service, to those who are able to give the best services. García et al. (2011) supported the work of Lytle that organizational service system has an influence toward job satisfaction. However, Little & Dean (2006) work did not support the work of Lytle et al. (1998). They found that organizational service orientation did not have significant impact toward service quality. Figure 1 shows the conceptual framework indicating the The effect of Organizational Service Orientation, Strategic Leadership and Strategic Competence on The Organizational Performance of Private Universities.



**Figure 1:-** Conceptual Research Framework

## Literature Review:-

### Higher Education:-

According to Indonesia Acts 2012 No 12 chapter 1(2), higher education is the level of education after high school, which include the programmes of diploma, bachelor, master, doctor, profession and specialist conducted by universities based on Indonesia cultures. Soehendro (1996) explained the basic foundations of universities in Indonesia consists of four functions:

1. Universities as a tool to produce labors that have specific qualifications to have productive functions in the society.
2. Universities as a tool to educate and train conceptors and researchers.
3. Universities as a tool to conduct learning process that is efficient, effective and productive ways.
4. Universities as a tool to pursue better life quality for the society.

Further, Soehendro (1996) explained that the functions attached to the universities are education, research and community service, when those functions are being conducted well will produce graduates. The graduates who will help the society through their knowledge and contribution.

### Organizational Culture in Services:-

Culture has playing an important role in the success of organization both financial and position in the market. Peters & Waterman (1982) in their book "In Search of Excellence" explained that each organization needs to have values and beliefs for it to survive and achieve success. Values and beliefs will influence organization policies and actions. Hofstede (1997) explained values as the center of culture in an organization. Values and norms were not something that we could observed directly, however we could see values and norms in practices, procedures and behaviors that



were moved by values and norms. Beitelspacher (2011) mentioned service culture as a culture that focused to the customers.

“Service culture should be meant as a customer–centric culture, which aims at exceeding customer expectations, and is strongly focused on providing superior customer value. Service culture will lead to better customer perception of service quality, as well as having a beneficial impact on customer market loyalty, repurchase intentions and customer satisfaction.”

When an organization tries to give the best service to the customers, even can do something beyond its customers expectation, then the action will bring customers’ loyalty (Beitelspacher, 2011). Parasuraman et al. (1996) defined service quality as service received by customers that has fulfilled the expectation of customers toward quality.

### **Organizational Service Orientation:-**

A concept about organizational culture which can described the ability of organization in giving excellent services to the customers is Organizational Service Orientation. Classical approach for quality management like TQM, in general is only focused on quality internally. TQM approach studies how the best activities conducted by the people inside the organization. Furthermore, other research about service quality mostly only consider the factor of service’s experience received by customers (Mukherjee & Malhotra, 2006). Very few discussions about service quality from customers perspectives. Organizational service orientation tried to see the quality of service not only based on the experience but also from the perspective of customers toward services. Organizational service orientation manifested in the behavior and attitude of employees that effect directly to the quality of service process given by customers. Lytle et al. (1998) in Urban (2012) defined organizational service orientation as:

“An organization–wide embracing of a basic set of relatively enduring organizational practices, policies and procedures intended to support and reward service–giving behaviours that create and deliver service excellence. At the visible level it is reflected by genuine attention to customer needs, as well as sharing, helping, assisting, and giving support to customers.”

According to Lytle et al. (1998), organizational service orientation consist of four areas of service, which are:

1. Service Leadership Practices.
2. Service Encounter Practices
3. Service System Practices
4. Human Resoure Management Practices

Further, Lytle et al. (1998) in Urban (2012) tried to explain more for those four areas of service. Leadership in theory of management science is the main and first requirement needed for the growth of an organization. Besides leadership, the ability of the organization to have strong vision and long-term orientation also factors for the successful of organization. Lytle et al. (1998) also explained about Service Encounter Field as:

“Customer treatment and staff empowerment. How a service provider looks after customers is the first and the most important predicator of the quality perceived. In the literature output there is a conformity of opinion that says that to get delighted customers it is required to allow direct contact staff to act with very unconstrained manners. Only in this case will employees be able to react flexibility to customers’ needs and provide superior service.”

Customers will have satisfaction if employees can have good relationship with customers and have the authority to act in order to fulfill the need of customers. Employees need to have empowerment from the organization to make decisions. All services given by the organization to its customers come from a system within the organization. According to Deming, an expert in quality management (1994), inside the system there should be a potential to fix the quality. Lytle et al. (1998) explained three areas related to Service System Practices, which are:

1. Service failure prevention and recovery practices
2. Service standard communication practices
3. High levels of service technology adaptation

The other important factor in Organizational Service Orientation is the factor of human resource. Literature about organizational behavior, especially the study that related to human resource management influence how service orientation is studied. Lytle et al. (1998) explained that

“An organization’s ability to produce external service quality is directly related to issues of internal service quality. These issues are typically studied in terms of employee attitudes, personalities, beliefs, and behaviors. Hiring, training, and rewarding service oriented behaviors have a direct and positive influence on service quality and organizational performance. Therefore, an organizational service orientation would involve a focus on service-oriented human resource management throughout the organization.”

Wahlers & James (1994) explained that accurate strategy in service quality is the important factor that will effect competitive advantage if planned and implemented correctly. Service quality is the confidence for the service received (Tjiptono, 2005). If private universities can create the right service quality as their strategy then they can create their competitive advantage. Costumer satisfaction is an aftersales evaluation, in which alternative chosen is giving the result as it is expected or beyond expectation to the customers (Tjiptono, 2005). Zeithaml in Chang & Chen (1998) showed that service quality has a very strong impact to the customers’ behavior, such as product loyalty, the willingness to pay more for the products and customers tend not to shift their preferences if they are happy with the services.

Homburg et al. (2002) and Walker (2007) also said that Organizational Service Orientation plays an important part for the success of the organization. Service orientation has a positive influence toward service quality given by the organization. Lytle & Timmerman (2006) explained that service orientation, like service quality image and organizational commitment, has an influence to return on asset for banking sectors. Yoon et al. (2007) also found that service orientation influenced the characteristics of performance such as repeat buying, positive word of mouth for health industry. Organizational Service Orientation also stated as “common denominator” for the attributes of educational services industry to be responsible for customer satisfaction (Walker, 2007). Organizational Service Orientation plays an important role to achieve business performance at service organization. If employees happy and satisfied with their job, they will give a better service to their customers (Garcia et al., 2011). Organizational Service Orientation effect service quality and customers loyalty that will lead to better financial performance (Urban, 2012). However, Little & Dean (2006) found that Organizational Service Orientation did not have any influence on the service quality at the telecommunication companies.

#### **Characteristics of Service Quality in The Universities;-**

Lupiyoadi & Hamdani (2006) explained four characteristics of service quality owned by universities, which are:

1. University is service organization, during the process of delivering the service will required supporting tools like: classrooms, chairs, tables, books and laboratories.
2. Service given will need the present of customers as users, where students as customers need to come to the institution to receive the service.
3. Receivers of service are people, so services at university is categorized as high contact system. Customers and suppliers will interact all the time for the process of delivering the service. Therefore, students as customers have to be part of the system.
4. The relationship with customers will be based on member relationship, where customers will become the member for a particular educational institution.

A good service quality for private universities will make students and society satisfy and they are willing to inform to others by having word of mouth promotion. When the service quality is good then automatically the number of applicants will increase. The improvement of service quality is expected to increase numbers of new students (Firmansyah et al., 2014). Gordon & Partington (1993) mentioned three criteria in measuring service quality, which were outcome-related, process-related and image-related criteria.

#### **Leadership:-**

Leadership has become an important topic in the literature to study organizational behavior. Lee & Chuang (2009) found that a great leader not only bring inspiration to his subordinates in improving efficiency, but also fulfill their need in the process to achieve organizational goal. Stogdill (1957) defined leadership as an individual behavior to lead a group to achieve the same target. Fry (2003) explained leadership as a strategy to lead by offering motivation that will build, improve staff’s potential to grow and develop. Sanders & Davey (2011) conducted the exposition for leadership theories based on their evolution concepts towards these categories leadership: trait theories, behavioral theories, contingency theories, transactional theories and contemporary (transformational) theories. The purpose was to identify main elements from effectiveness and leadership constructs and connected with effectiveness of

organization. Sanders & Davey (2011) said that those theories in general were able to explain the construct of effective leadership, however overall it was not found in the literature explicitly the connection that connected those theories into a model that link effectiveness of leadership and effectiveness of organization. Synthesis of leadership theories showed three important elements to build effective leadership, which are task focus, people focus and development focus (Sanders & Davey, 2011). Task focus involved the process to achieve goals of the group (purpose, objective and result). People focus included consideration, participation in decision making, care for the need of subordinates, justice, respect, trust, fair rewards. Development focus included the period needed to set new pattern adjusted to the condition where organization operated. Effectiveness organization considered as main tool to connect leadership theory with the construct strategic leadership and effectiveness of leadership need to be defined in the context of effectiveness of organization if it wanted to be considered as something strategic (Lear, 2012). Sanders & Davey (2011) used the term “meta-model” for strategic leadership because the framework that they used described several theories about strategic leadership and they tried to combine theories in a comprehensive paradigm that connect interpersonal relationship of those theories and the connectivity with effective leadership and effective organization. In meta-model, effectiveness organization used as the main measurement for effectiveness leadership.

### **Strategic Leadership:-**

Hitt et al. (2005) in Serfontein (2009) said that strategic leadership is assumed as a visioner leadership because he is willing to take a risk. Strategic leadership assumes that visioner leadership and managerial leadership can fill in each other and strategic leadership will combine both equally. Strategic leadership has a belief in the ability of strategic leader to change the organization in order to fulfill the changing environment where an organization operated (Rowe, 2001). Strategic leadership is a combination of synergy between managerial leadership and visioner. It is the ability to influence others to have the willingness to make daily decisions which leads to the organization’s ability for long term and at the same time stabilize the short term finances (Rowe, 2001). Boal & Hooijberg (2001) said that the core of strategic leadership involved the learning and changing process to have good managerial wisdom.

Strategic leadership at higher education will always involved the moral purpose of the organization, which is a question: ” why we do what we are doing now?”. The important key for leaders at private institutions who take the strategic role that they need to have a mindset change to move further from details operational activities perspective to develop a comprehensive and wide organizational perspective. Strategic leader at private institutions in three to five years, need to be able to see and identify their main theme for their long term development which they want to achieve. Then, plan backward those plans to their yearly plan (Davies & Davies, 2010). Davies (2006) said schools which were able strategically were those who could act effectively from education side in the short term, however they also have clear framework and able to process the framework into goal and moral vision expected by the organization both in medium and long run period. Nthini (2013) said that there was a high correlation between strategic leadership and customer satisfaction, return on investment, net profit margin and low employee’s turnover. An effective strategic leadership will lead to the improvement of organizational performance.

### **Personal Attributes of Strategic Leader:-**

Davies& Davies (2010) explained three characteristics of strategic leader:

1. Strategic leaders are strategic thinkers
2. Strategic leaders are strategic learners
3. Strategic leaders are values driven

Strategic thinking is a tool to develop a strategic perspective that see things from different perspective. Garratt (2003) gave explanation about strategic thinking as:

“Strategic thinking is the process by which an organisation’s direction–givers can rise above the daily managerial processes and crises to gain different perspectives...Such perspectives should be both future–oriented and historically understood. Strategic thinkers must have the skills of looking...forwards...while knowing where their organisation is now, so that wise risks can be taken while avoiding having to repeat the mistakes of the past.”

Strategic leader is also someone who will lead in learning. If a leader does not seeking new knowledge all the time then he will be considered fail to bring the organization to develop and the most important, he fails to become a model for others. Hughes & Beatty (2005) explained the learning process for the strategic leaders, which are:

1. Looking at the big picture–what can I learn from the broader environment?

2. Looking for patterns over time—how can I learn from data and find patterns in the data in order to extract useful information?
3. Looking for complex interactions—how can I synergise and learn from interrelationships?
4. Understanding what cause what—learning that it may be more complex than it seems!
5. Making time for reflection!

Strategic process also needs to have the base of values and beliefs. Bennis & Nanus (1985) in the classical view about vision explained that the creation of a vision and its meaning were the characteristics that shaped a leader. Bennis & Nanus explained that by focusing attention on a vision, the leader operated on the emotional and spiritual resources of the organization, on its values, commitment, and aspirations. Leaders often inspired their followers to high levels of achievement by showing them how their work contributes to worthwhile ends. It is an emotional appeal to some of the most fundamental of human needs—the need to be important, to make a difference, to feel useful, to be part of a successful and worthwhile enterprise. Brubaker (2005) explained that leader who can share his vision clearly and can be trusted will “Create a condition where others will feel inspired and have commitment toward something bigger from themselves.”

### **Competencies:-**

#### **Spencer & Spencer (1993) defined competencies as:-**

An underlying characteristic of an individual that is causally related to criterion-referenced effective and/or superior performance in a job or situation. Underlying characteristic meant “the competency is a fairly deep and enduring part of a person’s personality and can predict behavior in a wide variety of situations and job tasks”; causally related meant, “a competency causes or predicts behavior and performance”; and criterion-referenced meant “the competency actually predicts who does something well or poorly, as measured on a specific criterion or standard”

According to Robbins (2001) competencies are an individual capability to do various tasks in a job. Veithzal (2004) added that the whole ability of individual consists of two factors which are intellectual ability and physical ability. Intellectual ability is the ability of someone that is related to IQ and EQ or relate to the intelligence in knowledge and emotion. Veithzal (2004) explained seven dimensions that shape the intellectual ability:

1. Numeric ability: the ability to count quick and accurate
2. Verbal understanding: the ability to understand what he reads, hears and connect one word to another word
3. Conceptual speediness: the ability to recognize similarities and different visual quick and accurate
4. Inductive logic: the ability to recognize logic sequence in problems and then solve the problems
5. Deductive logic: the ability to use logic and examine the implication of an argument
6. Dimension visualization: the ability to visualize how an object will look like when the setting is changed
7. Memory: the ability to keep and recall back past experiences

Vathanophas &Thaingam (2007) explained the four basic characteristics needed for competencies:-

1. Knowledge, information owned by someone in a specific area
2. Skills, the ability to do physical and mental tasks
3. Traits, physical characteristics and consistent response for information and situation
4. Self-concept, include behavior, values or self-image

#### **Strategic Competence:-**

Sparrow & Hodgkinson (2006) defined strategic competence as an ability to get, store, repeat, interpret and act based on relevant information to be able to survive at the long term and for the benefit of the organization. Grant (1996) mentioned that competency represents the influence of characteristics organization and individual. Competence makes the organization proactively able to recognize signals that identify weaknesses in the organization to be changed. Trejo et al. (2002) tried to measure competence by using an approach that focus on resources owned by organization. Competence development in organization has taken form in several development models. The model that commonly used is system approach or strategic human resources management. Boyatzis (1982) used system approach to display competence role in the market sector. Boyatzis (1982) said that organization has to try to reach efficiency. To be able to reach efficiency, organization need to have competencies, job demand and consistent organizational environment. If the three factors didn’t support each other, it will make inefficiency occurred.

**Seija Ollila (2008) explained about strategic leadership as follow:-**

Competence is a combination of skills which an individual can use to complete the given task. In this quickly changing world, competence is the foundation of durable success and forward-looking possibilities. Competence is based on knowledge, know-how and attitudes, which are combined with cultural identity, shared visions organizational structure, and management processes

Organizational strategic competence will combined individual skill inside the organization with culture, vision, structure and management process within the organization. Durand (2000) defined competence as:

“A capability to act. New competence, which is tied to the changing requirements of the environment, is born in interaction with an individual and his/her working area. An organization tries to achieve the goals of building, exploiting and maintaining competence. Competence also refers to the willingness of an organization to maintain and coordinate organizational assets and capabilities to achieve the goals.”

Therefore, building up a capability for an organization is a process, in which the organization is able to change its resources and facilities and looking at the readiness of that capability to coordinate and arrange so that the new way will be achieved (Sanchez & Heene, 1997; Sanchez, 2001; Sanchez & Heene, 2004). Strategy as a concept define willingness, objectives and direction to achieve what the organization need. Strategic management needs a systematic thinking process, connecting all interactive relationships and sees things comprehensively. Main objective is making sure an organization future vitality (Porter, 1996; Kirjavainen & Laakso- Manninen, 2000; Hannus, 2004). When leadership has strong strategic competence, the organization will have a better performance (Lerner & Almor, 2002). According to Sanchez (2004) Strategic Competence-based Management is a management process where tangible and intangible assets will be coordinated for their usage according to the goal the organization wants to achieve. Ansoff (1984) and Butler et al. (1991) explained that in the process of making the strategies, culture values also influence and the process will also evaluate the current strategies and measure how the development of the new strategies. Knight (2001) explained about strategic competence as a function of main strategic such as: R&D, product quality development, marketing and distribution. Alhawari & Al-Jarrah (2012) defined strategic competence into four competencies, which are: (1) Shared vision (2) Cooperation (3) Empowerment (4) Innovation. Sveiby (1990) described competence of an organization into three main components:

1. Human Capital is the shared knowledge and competence that is connected to working tasks
2. Work Motivation and Ability
3. Commitment

Ollila (2008) explained about the competence in a way that easy to be understood in the concept of human resource, which was:

“The success of an organization is the consequence of human actions. In human capital, individual capacities make up one perspective. The social capital as a concept involves, beside human capital, a communal viewpoint which refers to the relations between human beings, customers, interest groups, management systems and norms. It is included in both the human and structural capitals and it can also be defined as a wider complex. When thinking about the societal consequences, trust and social capital are the key factors in communication, learning and innovations. The structural capital is the data which belongs to an organization and includes procedures, systems, technology, and organizational structure.”

**Organizational Performance:-**

Performance is a concept that is difficult to be disclosed explicitly because the performance concept is usually understood implicitly. Performance related to a specific concept will deliver specific approach or measurement (Firmansyah, 2014). Performance of private university is a result that should be able to measure. Performance for each individual in the private university influenced by the ability and willingness. According to Fishbein & Ajzen (1995) in Firmansyah (2014) and Gibson (1994), the concept of theory of attitude showed that each behavior conducted because of intention. Every behavior triggered by certain intention. Intention that was not supported by situation, mostly would not become an action. Therefore, individual effort was the trigger to create work behavior so that a meaningful performance was also created (Firmansyah, 2014). Organizational performance talks about the ability of the organization to achieve what is the purposes of the organization, like higher profit, product quality, increase of market share, better financial result and the ability to survive at a certain period of time by using the right strategy to act (Koontz & Donnel, 1993). According to Alwi (2009), measurement of employee performance is the

result of comparison between the actual and expected employee's performance. Dessler in Alwi (2009) explained several factors that can be used as tools to measure the performance of lecturers, those are:

1. Work quality, accuracy, appearance
2. Work quantity, number of outputs and contributions
3. Supervision needed, suggestion and improvement
4. Timely attendance
5. Consensus, maintenance of the facilities used

Further, McGrath & MacMillan (2000) and Teece et al. (1997) explained that there was a relationship between leadership style and organizational performance. Effective leadership behavior will facilitate performance increase at times when organization facing new challenges. Griffin (1987) described performance as organization being effective and shows level of productivity gained from the resources owned by the organization. According to Prieto and Revilla (2006) performance can be categorized into two which are financial and non-financial performance. Performance measurement needs to be done in more comprehensive method.

#### **Performance Measurement:-**

Organizational performance is an indicator that can be used to measure achievement from goals and outcomes. Result from the performance assessment should be able to measured and assess clearly. Kaplan & Norton (1996) explained that organizational performance has a broad concept and not only focus to profit or other financial performances. Modern business environment need different types of goal's orientation. New management approach is focused on stakeholder's perspective (Atkinson et al., 1997; Berman et al., 1999; Harrison & Freeman, 1999; Hillman & Keim, 2001; Sirgy, 2002; Riahi-Belkaoui, 2003; Tangem, 2004). The involvement of stakeholders is to make sure that organizational performance is will not only be looked at the financial indicator.

The first method used to evaluate individual performance and now being used widely at the universities, introduced by Armstrong & Baron (1998). Performance appraisal also known as merit rating. This method is an organization mechanism to measure the performance of individuals to make sure that each member of the organization doing what organization wants them to do. Hernaus et al. (2008) measure the organizational performance by looking at the stakeholder perspective that focused on four perspectives, which are: (1) Financial's view, (2) Employee's view, (3) Supplier's view, (4) Customer's view. Perspective used similar to the approach of balance scorecard introduced by Kaplan & Norton (1996). The difference between the two approaches is, Kaplan & Norton looked at Internal Business Process while Hernaus et al. (2008) approached it from the perspective of Supplier's view.

#### **Conclusion:-**

This paper analyzed the effect of Organizational Service Orientation, Strategic Leadership and Strategic Competence on the Organizational Performance at Private Universities in Indonesia. There were many studies have been conducted to measure the factors that affected organizational performance. Researchers have examined that even on the manufacture companies, the variable effected the increasing of performance not only product's quality but also services that the organization given to their customers. In order for the organization to give the excellent services, all the members of the organization must understand the important of service factor to their customers. Organization also needs to have leader who has a leadership skills that will enable him/her to think strategically and able to make strategic decision so what the organization wants toward service excellent will be achieved.

This paper showed that there is strong relationship between Organizational Service Orientation and Organizational Performance. Service orientation influenced the characteristics of performance such as repeat buying, positive word of mouth (Yoon et al., 2007). Organizational Service Orientation plays an important role to achieve business performance, especially at service organization. If employees happy and satisfied with their job, they will give a better service to their customers (Garcia et al., 2011). Research found that there was a high correlation between Strategic Leadership and customer satisfaction, return on investment, net profit margin and low employee's turnover (Nthini, 2013). An effective Strategic Leadership will lead to the improvement of Organizational Performance. There is also strong relationship between Strategic Competence with Organizational Performance. Research found when leadership has strong competence, it will lead to the increase of Organizational Performance (Lerner & Almor, 2002). This research wanted to add the previous studies related to the Organizational Service Orientation, Service Leadership and Service Competence toward the Organizational Performance on higher education organizations. Moreover as an organization in higher education, there will be more direct contact with customers, compare to the other organizations.

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### RESEARCH ARTICLE

#### ANALYSIS OF HYPOLIPIDEMIC EFFECT OF *RHINACANTHUS NASUTUS*(LINN) KURZ IN HIGH FAT DIET INDUCED HYPERLIPIDEMIC RAT.

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Hyperlipidemia, Medicinal plant  
*Rhinacanthus nasutus*, High fat diet.

#### Abstract

**Objective:** To evaluate the hypolipidemic effect of *Rhinacanthus nasutus* (*R.nasutus*) in high fat diet induced (HFD) hyperlipidemic rats.  
**Methods:** The methanol leaf extract of *R.nasutus* was tested for hyperlipidemic effect in the albino rats at the selected optimum dosage of 200 mg/kg body weight orally. Adult male albino rats of six numbers in each group were undertaken to study, and evaluated.  
**Results:** In group II animals, fed with high fat diet the activity levels of serum total cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL), very low density lipoprotein-cholesterol (VLDL) were significantly enhanced when compared to normal rat. *Rhinacanthus nasutus* methanolic leaf extract (RNM) group III treated rats showed depleted levels of the lipid molecules.  
**Conclusion:** It could be concluded that the methanol leaf extract of *R.nasutus* exhibited a significant hypolipidemic effect on HFD induced hyperlipidemia in rats.

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#### Introduction:-

Diseases of the cardiovascular system are the most common cause of death. Lifestyle changes have a significant impact on the health of the people. The modernization of societies appears to result in a dietary pattern that is high in saturated fats, refined sugars and is low in fiber content. (Brai, *et al.* 2007) [1]. It is now established that hyperlipidemia represents a major risk factor for the premature development of atherosclerosis and its cardiovascular complications. Hyperlipidemia is a disorder characterized by an increase in blood lipoprotein or cholesterol levels. Atherosclerosis is a common condition in both developed and developing countries and is recognized to be an inflammatory condition leading to the development of ischemic heart diseases, cerebrovascular diseases and peripheral vascular diseases. Cardiovascular diseases (CVD) account for 31% deaths worldwide in 2015(WHO 2015) [2]. The major risk factor of CVD is hypertension, hypercholesterolemia, diabetics and obesity. The death of UK people due to heart problems were 28 and 26, in male and females, respectively, in 2015. Hypertensive individual number in India is projected to increase two fold by 2025. (Kearney, *et al.* 2005) [3].

Hyperlipidemia contributes drastic threat towards the spread and expansion of atherosclerosis and coronary heart diseases (CHD). Significant increase of lipid profiles is responsible for the onset of CHD. Ischemic heart disease is a major risk factor in the pathogenesis of preoperative adverse cardiovascular events which lead to significant morbidity and mortality within the high risk surgical patient population.(Howard-Alpe,*et al.* 2006) [4]. Recent studies have shown that lipid associated disorders are not only attributed to the total serum cholesterol, but also to its distribution among different lipoproteins. The low density lipoproteins (LDL) are the major carriers of cholesterol

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towards tissues having atherogenic potential, while the high density lipoproteins (HDL) carry cholesterol from peripheral tissues to the liver. HDL thus gives protection against many cardiac problems and obesity, although genetic factors recline behind these lipid disorders.(Sattivel.*et al*,2000) [5]. The treatment of hyperlipidemia depends on the patient's cholesterol profile. Many antihyperlipidemic agents like statins, fib rates, niacin, bile acids, ezitimibe etc. reduce cholesterol level in different conditions. (Durrington .*et al* 2003)[6].

Currently available hypolipidemic drugs have been associated with a number of side effects. The consumption of synthetic drugs leads to hyperuricemia, diarrhoea, nausea, myositis, gastric irritation, flushing, dry skin and abnormal liver function.(Speight.*et al* 1987) [7]. Only two drugs, orlistat and sibutramine, have been approved for long-term use in significantly obese patients by the U.S. Food and Drug Administration. The other drugs showed adverse effects including gastro-intestinal discomforts, flatulence, and diarrhea.

Since ancient times plants have been exemplary sources of medicine because they constitute raw materials as drugs for treating various ailments of human beings. So, there has been significant development in the fields of synthetic drug chemistry and antibiotics based on plant products isolation and characterization. During the last two decades, considerable changes have taken place in the medicinal system all over the world. Because of the general awareness of the widespread toxicity and harmful after-effects associated with the long term use of synthetic drugs and antibiotics, drugs from natural sources are being preferred.

According to the World Health Organization (WHO 1977) [8], a medicinal plant is a plant in which, one or more of its organs contains substances that can be used for the synthesis of useful drugs. This definition distinguishes those plants whose therapeutic properties and constituents have been established scientifically from plants that are regarded as medicinal but which have not yet been subjected to thorough investigation. The term herbal drug determines the part/parts of a plant used for preparing medicines (for example: leaves, flowers, seeds, roots, barks, stems, etc.).

Medicinal plants contain biologically active chemical substances such as saponins, tannins, essential oils, flavonoids, alkaloids and other secondary metabolites.( Harborne. *et al*, 1973, Harborne. *et al*,1996) [9,10], which have curative properties to almost all living organisms. These complex chemical substances has reported that plants also contain certain other compounds that moderate the effects of the active ingredients. The plant derived preparations have long been used as traditional remedies and in folklore medicine for the treatment of hyperlipidemia in many parts of the world.

Recently, the search for appropriate antihyperlipidemic agents have been again focused on plants because of less toxicity, easy availability and absorption in the body so that they may be better for treatment than currently used drugs. Traditional system of medicine like Ayurveda, Unani and Chinese prescribe numerous herbal drugs for CVD.

At present herbal hypolipidemics related to plants have gained importance to fill the lacunae created by herbal drugs because they are generally considered to be less toxic and less prone to side effects than drugs manufactured by chemical synthesis. The potential therapeutic and preventive benefits of plant-based medications have been the subject of extensive studies, and many natural constituents have been uncovered with significant pharmacologic activity, including agents with antiglycemic, hypolipidemic and antihypertensive properties.( Kumari, Son. *et al*, 2007) [11,12].

***Rhinacanthus nasutus (Linn) Kurz***, a medicinal plant, belongs to Acanthaceae family, is a shrub and is well known for its medicinal uses, commonly called as Nagamalli in Telugu. This plant is widely distributed in some parts of the subcontinent India and in the region of Southeast Asia and China. The plant is small, slender, shrub and 1-2 meter height. Various parts of this plant have been used for the treatment of eczema, pulmonary tuberculosis, herpes, hepatitis, diabetes, hypertension, skin diseases, ring worms, cancer, scurvy, leprosy and obesity. The plant leaves, roots and seeds also used as an antidote for snake bites.(Visweswara.*et al* 2010, Yesilbursad *et al*, 2005) [13-15]. In the present study, we investigated the effect of *R.nasutus* methanol leaf extracts on the reduction of cholesterol level in serum of wistar rats.

## Materials and Methods:-

### Plant material:-

The fresh whole plant of *Rhinacanthus nasutus* (Linn) Kurz were collected from Tirumala forest, Tirupathi, Chittoor (Dt) Andhra Pradesh, India, identified and authenticated by Department of Botany, SV University, Tirupati.

### Plant extracts preparation:-

The *Rhinacanthus* leaves were collected, washed through tap water and shade dried at room temperature and made powder using grinder. The powdered plant material was macerated with hexane, ethyl acetate, methanol and water, separately. The extract of each was then filtered with filter paper (Whatman No. 1) and the filtrates was kept under reduced pressure using rota evaporator at 40°C was concentrated and stored for further study at 4°C. Preliminary screening test of each extract powder was performed at dosages of 50, 100, 150, 200, mg/kg body weight of rat. Among the four extracts, methanolic extract found to contain much of hyperlipidemic activity. Hence, the methanol leaf extract was selected and tested for hypolipidemic effect in the wistar rats at the selected optimum dosage of 200mg/kg body weight and administered orally.

### Animals:-

Adult male albino rats of wistar strain weighing about 120±15g were purchased from Sri Venkateswara Enterprises, Bangalore. The animals were kept in polypropylene cages (six in each cage) at an ambient temperature of (25±2) °C and at 55%-65% relative humidity. A (12±1) h light and dark schedule was maintained in the animal house till the animals were acclimatized to the laboratory conditions. They were fed with commercially available rat chow (Hindustan Lever Ltd., Bangalore, India) and had free access to water. The experiments were designed and conducted in accordance with the ethical committee.

### Development of high fat diet fed rats:-

Rat was fed with two dietary regiment such as normal pellet diet (NPD) and high fat pellet diet (HFD). The rats were fed either with NPD or HFD (58% fat, 25% protein and 17% carbohydrate, as a percentage of total kcal) adlibitum respectively, for the initial period of 2 weeks. (Srinivasan. *et al*, 2004) [16]. The composition and preparation of HFD were made as per the method (Reed . *et al*, 2000).[17].

### Experimental Design:-

The studies were conducted in six groups as said below by taking six animals in each group.

Group 1: Control animals fed with normal diet.

Group 2: High fat prepared diet fed rats.

Group 3: Both HFD +RMLE 200mg/kg b.wt fed rats.

Group 4: Both HFD+Orlistat 25mg/kgb.wt drug as a standard fed rats.

Group5: RNMLE alone as plant product control.

Group6: Orlistat alone as drug control.

All feeding studies were made for six weeks of period. The dose material was suspended in distilled water and given orally using a gastric gavage.

### Collection of blood and preparation of serum samples:-

At the end of the experimental period, blood samples were collected from the retro orbital plexus in vials. The blood samples were allowed to clot for 10 min at room temperature and then centrifuged at 3500 xg for 15 min. The clear, non hemolysed serum samples thus obtained were collected and stored at -20°C until biochemical assays were carried out.

### Estimation of biochemical constituents of lipids in rats serum:-

The biochemical estimations were carried out in our lab by using the following methods. Serum total cholesterol CHOD-POD method [18], triglyceride GPO-POD method using ethyl-N-(3- sulfopropyl)-m-anisidine sodium (ESPAS) [19], serum high density lipoprotein, serum low density lipoprotein and serum very low density lipoprotein by CHO-Phospho method [20].

### Statistical Analysis:-

The results were expressed in mean ± standard deviation. Statistical analysis was carried out by using one way ANOVA as in standard statistical software package of social science (SPSS).

## Results:-

To study the hypolipidemic effect of the methanolic leaf extract of *R.nasutus* on the high fat diet induced male albino rats, the levels of serum total cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL), serum high density lipoprotein (HDL) and very low density lipoprotein-cholesterol (VLDL-C) were analysed in experimental animals. In group II animals, the levels of serum total cholesterol, triglycerides, low density lipoprotein and very low density lipoprotein cholesterol were significantly elevated as compared to that of normal groups, when they were fed with HFD (Table 1). On the other hand the serum level of serum high density lipoproteins (HDL) were significantly depleted in the HFD fed rat.

In group- III *R.nasutus* (200 mg/kg body weight) supplemented later with HFD fed rat showed a significant depletion in the levels of total cholesterol, triglycerides, low density lipoprotein and very low density lipoprotein-cholesterol as compared to normal group (Table:1). The level of HDL was significantly augmented in plant extract treated group.

**Table 1:-** Effect of the methanolic leaf extract of *R.nasutus* on serum lipid profile levels (mg/dL), in HFD induced rat.

Group	Treatment	Total cholesterol mg/dl	Tri-Glycerides (mg/dl)	HDL-C (mg/dl)	LDL-C (mg/dl)	VLDL-C (mg/dl)
I	Control	88.2±4.29*	74.73±5.02*	42.32±4.62*	33.65±6.0*	13.81±1.65*
II	HFD	195.9±10.90*	109.2±8.25*	34.97±4.50*	141.5±13.20*	21.59±1.04*
III	RNM+HFD (200mg/kg)	154.28±10.81**	89.32±4.91**	43.27±4.69**	75.28±11.14**	17.32±0.95**
IV	Orlistat+HFD (25mg/kg)	107.1±10.62**	80.26±4.07*	45.07±4.71**	46.41±10.23**	14.53±0.92**
VI	RNM (alone)	77.25±6.75	125±5.72	47.5±3.25	58.0±8.38	11.5±1.01
V	Orlistat (alone)	69.32±4.72	98.2±3.52	40.3±2.6	42.9±9.3	10.52±1.06

Data represent mean±standard deviation (SD). Values are not sharing a common superscript (\*) differ significant at  $p \leq 0.05$ .

In group- IV the HFD+Orlistat administered, rats did not show any significant alterations in their levels as compared to that of normal animals. GroupV and GroupVI rats were of respective control of RNME and Orlistat, which showed almost equivalent values to normal rats.

The animals of normal and other treatments were weighed for weight gain at the starting of experiment and then to every two weeks till the 6th week of the experimentation. Using the electronic balance, body weight loss or gain of rats that were fed on experimental diets with or without RNM were shown in (Table 2).

**Table 2:-** Effect of *R.nasutus* and orlistat on body weight (grams) of rats fed with high fat diets

Obese markers (Body weight)	control	High fat diet	HFD+RNM	HFD+Orlistat	RNM (alone)	Orlistat (alone)
0 <sup>th</sup> week	158.27±7.90*	157.52±8.49*	157.90±8.64*	158.13±6.20*	158.1±7.5	158.0±7.20
2 <sup>nd</sup> week	188.34±7.31*	201.79±6.32*	182.96±8.32*	179.44±7.11*	152±6.85	150±6.8
4 <sup>th</sup> week	217.10±8.41*	240.01±9.71*	212.85±7.90*	217.80±11.40*	147±6.29	145±6.53
6 <sup>th</sup> week	239.42±10.0*	280.27±10.9*	238.60±8.39*	248.01±11.74*	140.6±6.2	135±6.27

Data represent mean±standard deviation (SD). Values are not sharing a common superscript (\*) differ significant at  $p \leq 0.05$  RNM: Rhinacanthus nasutus methonolic extract.

The body weights of rats fed with HFD were significantly increased with time, and percentage increase was 151% for control, 178% for high fat fed diet rats, 151% for HFD and RNM rats, 157% for Orlistat treated with HFD, 88% with RNM alone, and 85% with Orlistat alone were in rats. In contrast, non-significant differences were observed in

rats. The increase in body weight was 21 to 27% higher in HFD rats than RNM or Orlistat treated animals which is almost equal to normal, and the loss weight in the presence of RNM and Orlistat alone was ranged from 63 to 66%. All these results are significant with  $P \leq 0.05$ .

## Discussion:-

### Dietary fat and other risk factors:-

Diet is a source of energy for growth and metabolic activities. Fat is an energy rich molecule used in diet after two macro molecules such as carbohydrate and protein, and fat is essential to maintain the integrity of cell and cell membranes. This molecule under normal conditions is essential and excess intake of it causes several problems to humans. The main ingredients of lipids are free fatty acids, triglycerides, cholesterol, phospholipids and lipoproteins. The lipoproteins may carry cholesterol and also have essential fatty acids. The animals feed containing more of lipids either be consumed during exercise or stored in cells. Because of storage of fatty materials in cells there is possibility to acquire lysosomal lipidosis and due to this storage, the liver and spleen shall be enlarged. These disorders are treated with medications by using compounds like Gabapentin, Carbamazepine, Orlistat, Statins etc. The plant products are also used as medications to treat hyperlipidemia and retain the physical characters.

*R. nasutus* a well known traditional medicinal plant, possesses diverse biological and pharmacological activities including reducing blood glucose and serum lipids. It has long been used to treat diabetes mellitus and related hyperlipidemia. Hypercholesterolemia, a high cholesterol diet caused oxidative stress which increase serum LDL levels to result in increased risk for development of atherosclerosis.( Chander. *et al* 2003) [21]. Cholesterol is synthesized in all animal tissue to produce various steroids and aldosterones. Increased amount of cholesterol leads to cardiovascular diseases particularly coronary heart disease (CHD) and coronary artery disease (CAD)( Aparna. *et al* 2003) [22]. In hyperlipidemia, cholesterol feeding has often been used to elevate serum or tissue cholesterol levels and assess hypercholesterolemia-related metabolic disturbances in different animal models. Ma Angeles. *et al* 1999) [23]. The humans premature death in India is due to hyperlipidemias and atherosclerosis.

In the present study, feeding of rats with energy rich feed has resulted in increased TC, TG and LDL cholesterol levels (Table.1). This model was used to study the potential of hypolipidemic effect of supplementations of *R. nasutus* that contained significant amounts of antioxidants properties. From this study, we found that the daily oral administration of *R. nasutus* supplement diet showed a positive result on significant reduction of total cholesterol levels in plasma after 6 weeks of administration. This result is in agreement with literature where depleted level of HFD fed hyperlipidemia found in the rats upon treatment of *R.nasutus* extract.

Low density lipoprotein is a atherogenic risk factor and plays a role in several steps of atherosclerosis. A decrease in oxidative stress and removal of LDL from oxidation might therefore be a strategy with great promise for prevention of atherosclerosis associated cardiovascular disease. The intense interest in this area results in part from the generally low toxicity of antioxidants and the hope that treatment with antioxidants might be additive with cholesterol lowering regimes. The increase of HDL on treatment of *R. nasutus* may serve HDL as directly anti-androgenic and it is believed to remove cholesterol from the developing lesions.

The HFD treated rats also showed an increase as 2 fold of cholesterol, 1.47 fold of triglycerides, 4.3 fold LDL-C and 1.56 fold of VLDL-C increase and 0.81 fold decrease of HDL-C. However the RNM mixed HFD showed 1.26 fold of cholesterol, 1.22 fold of triglycerides, 1.88 fold of LDL-C, 1.24 fold of VLDL-C decrease, and 1.23 fold increase of HDL-C in serum of blood (Table-1). Hence the mixture of RNM has potential to decrease various fat molecules and increase in HDL moiety.

The small particles less than chylomicrons are VLDL which are rich in triglycerides though to a lesser extent VLDL particles sizes vary widely, with a concomitant variation of the chemical composition. The larger particles are rich in triglycerides and in apo-c, and the smaller particles depletion of TG and surface materials result from the hydrolysis of VLDL by lipoprotein lipase activity. VLDL is the main carrier of triglycerides and it is less harmful than but still can damage the arterial lining. In the present study serum TG levels were significantly elevated in HFD rat. The excess of fat diet increased the TG level which is one of the causes of hardening of arteries. In conclusion, it could be said that the methanolic leaf extract of *R. nasutus* exhibited a significant hypolipidemic activity by increasing VLDL, HDL, and by decreasing TC, TG (free) and LDL in serum of blood.

**Conclusion:-**

Result of present study has revealed that the methanolic extract of *R. nasutus* leaves can improve the serum lipid profile in rats by decreasing serum TC, TG, LDL-C and increasing serum HDL-C, and thus improving the atherogenic index. These findings provide some biochemical basis for the use of leaf extract of *R. nasutus* as antihyperlipidemic agent because of its preventive and curative effect against hyperlipidemia. Further studies are required to gain more insight into the possible mechanism of action.

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### RESEARCH ARTICLE

## TRANSFER PRICING: CONCEPTS, EVOLUTION, METHODS, EXISTING GUIDELINES AND ITS EFFECTS IN DEVELOPING COUNTRIES.

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Transfer pricing, OECD Countries, Tax and Developing Countries.

#### Abstract

Transfer pricing is high on the agenda because globalization has lifted the level of cross-border trade between related entities to new heights. It is estimated that, worldwide, about 2/3 of all business transactions take place within a group. In the absence of Transfer Pricing legislation, both tax administrations and MNEs have only limited guidance they can refer to when determining transfer pricing in related-party transactions. However, we find that developing countries encounter particular problems when dealing with transfer pricing. Local tax administrations are often inexperienced with regard to transfer pricing and lack basic understanding in the field. The paper indicates that, despite strong affinity to the OECD standards, the scope of existing transfer pricing legislation or draft transfer pricing legislation is in part significantly broader as regards the definition of related parties than is outlined in the OECD Guidelines. From a transfer pricing policy perspective

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#### Introduction:-

Transfer pricing is a main issue for multinational corporations (Chan and Chow, 1997) and it has been known as the number one challenge facing the world's leading companies (2010 Global Transfer Pricing Survey, Ernst and Young). Transfer pricing has also been as a major issue facing countries around the world, as they strive to retain the tax revenue from multinational corporations conducting business in their countries and step up their efforts in the enforcement of transfer policy legislation and regulations. Furthermore, the choice of transfer pricing methods and transfer pricing practices are very important considerations in the development of corporate strategy and in assessing the long-term sustainability of a multinational corporation (Gresik, 2001). Transfer pricing is a current, contentious issue for multinational corporations.

In principle a transfer price should match either what the seller would charge an independent, arm's length customer, or what the buyer would pay an independent, arm's length supplier (Smith, A. Chambers, I. Nichols, J. And Ying, Q. 2003). While unrealistic transfer prices do Although the OECD Model Tax Convention and the OECD Transfer Pricing guidelines recommend the use of the 3 'arm's length principle', strict application of the principle is often problematic in practice (Bartelsman & Beetsma, 2003). Transfer pricing is the major tool for corporate tax avoidance.

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**Existing Guidance and Initiatives On Transfer Pricing Documentation: -**

Existing transfer pricing documentation rules can be divided into two groups. The first of these are the rules of individual countries. Such rules are adopted through local legislation or regulation and are enforced by local country tax administrations (Cernic, 2008). In some, but not all, countries, compliance with transfer pricing documentation rules is encouraged by adoption of a complementary penalty regime.

Some countries have a single set of transfer pricing documentation rules that are intended to comprehensively elicit the relevant transfer pricing information. Other countries segregate transfer pricing documentation rules from other information reporting requirements that may be relevant for transfer pricing purposes.

The aim of this documentation package ("the Package") is to allow taxpayers in PATA member countries (Australia, Canada, Japan and the United States) to create one set of transfer pricing documentation for multinational enterprise (MNE) that will satisfy the documentary requirements of each respective jurisdiction thus avoiding the imposition of penalties on the taxpayer for having insufficient transfer pricing documentation (Anderson and others. 2003).

**Evolution of Transfer Pricing: -**

This section aims to trace the history and the reasons for transfer pricing taxation regimes. It is important to note that transfer pricing essentially involves the application of economic principles to a fluid marketplace. Thus new approaches and techniques that help arrive at the appropriate transfer price from the perspective of one or more factors in the system continue to be developed.

The OECD Transfer Pricing Guidelines (OECD Guidelines) as amended and up dated, were first published in 1995; this followed previous OECD reports on transfer pricing in 1979 and 1984. The OECD Guidelines are recommendations addressed to enterprises operating in OECD countries (Cernic 2008). And have largely been followed in domestic transfer pricing regulations of these countries. Another transfer pricing framework of note which has evolved over time is represented by the USA Transfer Pricing Regulations (26 USC 482).

Parent companies of large MNE groups usually have intermediary or sub-holdings in several countries around the world (Buus and Brada, 2010) From a management perspective, the decision-making in MNE groups may range from highly centralized structures to highly decentralized structures with profit responsibility allocated to individual group members. Such group structures typically include

- Research and development (R&D) and services that may be concentrated in centres operating for the whole group or specific parts of the group;
- Intangibles, developed by entities of the MNE group; these may be concentrated around certain group members;
- Finance and "captive insurance companies which may operate as insurers or internal finance companies; and
- Production units, where the production or assembly of final products may take place in many countries around the world.

**The Methods of Transfer Pricing: -**

Advised to be used in OECD countries are (among others):

1. comparable uncontrolled price method.
2. comparable resale price method.
3. cost plus method.
4. profit split method.

Which in all cases directly or indirectly use a premise that the fair transfer price is on the level of price achieved at the market transaction, which are at marginal cost only in extraordinary cases (perfectly competitive market of the intermediate product).

The problem of transfer prices and their effect on the possibility of active fiscal policy is compelling, as (Bartelsman and Beetsma. 2003) show Nevertheless the number and size of possible tax evasions is greater at commodities, which are not standardized (not quoted), whereas at the commodities traded at the commodity exchanges the variance of transfer price and difference between transfer price and arms-length price is substantially smaller (Bernard, Jensen and Schott, 2006),

Even the measurement becomes a problem in this globalized world, because the size and number of transactions inside MNE is so large that it influences the benchmarks used for derivation of arms-length price (Eden and Rodrigues, 2004).

**The OECD Guidelines: -**

The OECD has made considerable efforts in offering an international standard for levelling the playing field in the area of TP. The members of the OECD, which are mainly developed countries but also include some developing countries, have agreed common methods and practices in the area of TP, which are outlined in the OECD Guidelines. In particular, the OECD Guidelines outline five methods to determine the arm's length nature of transfer prices:

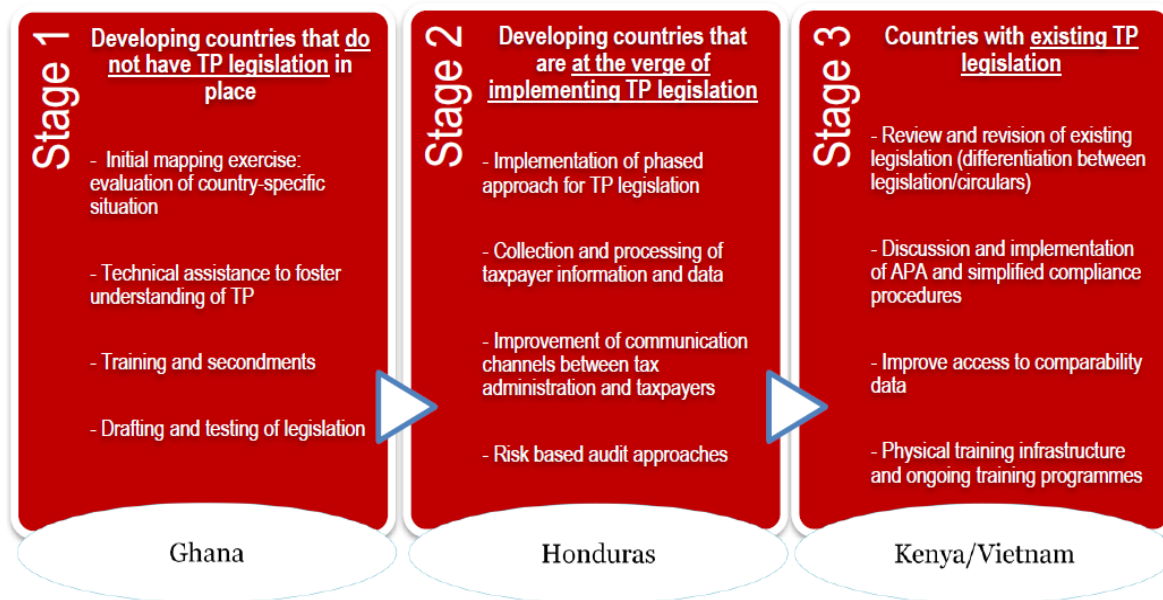
1. **Comparable Uncontrolled Price (CUP) Method:** This is based on the comparison of prices charged in a controlled transaction to the price charged in an uncontrolled transaction in comparable circumstances for comparable products and services.
2. **Resale price method (RPM);** which is based on the resale price at which a product purchased from a related party is sold to an independent enterprise. The transfer price of the inter-company transaction is calculated by deducting the resale price margin from the resale price in the uncontrolled transaction.
3. **Cost plus method (CPM);** which uses the costs incurred by the supplier of property/services in a controlled transaction. A mark-up taking into consideration the functions performed, risks assumed and assets employed is added to the costs to determine the arm's length price in the controlled transaction.
4. **Transactional net margin method (TNMM);** which examines the net profit margin relative to an appropriate base (e.g. cost, sales, assets) realized from a controlled transaction.
5. **Profit split method (PSM);** which is based on identification and appropriate split of the profit realized by related entities from a controlled transaction.

**A General Approach to Transfer Pricing Reform in Developing Countries: -**

Given the differing levels of progress in some countries by comparison with others, it is difficult to set down a one-size-fits-all approach. Accordingly, the costs of technical assistance programmer for different countries can vary significantly. A thorough analysis of the specific needs for each developing country with regard to its TP practices is necessary in order that available donor resources are used as efficiently as possible.

However, prior to donor support being provided, it should be analyzed at what stage of development the country is with regard to both the preconditions and TP-specific legislation (see Figure 1). Experience from other countries such as the USA, China and India show that the process of TP reform is lengthy and that it requires ongoing training and support

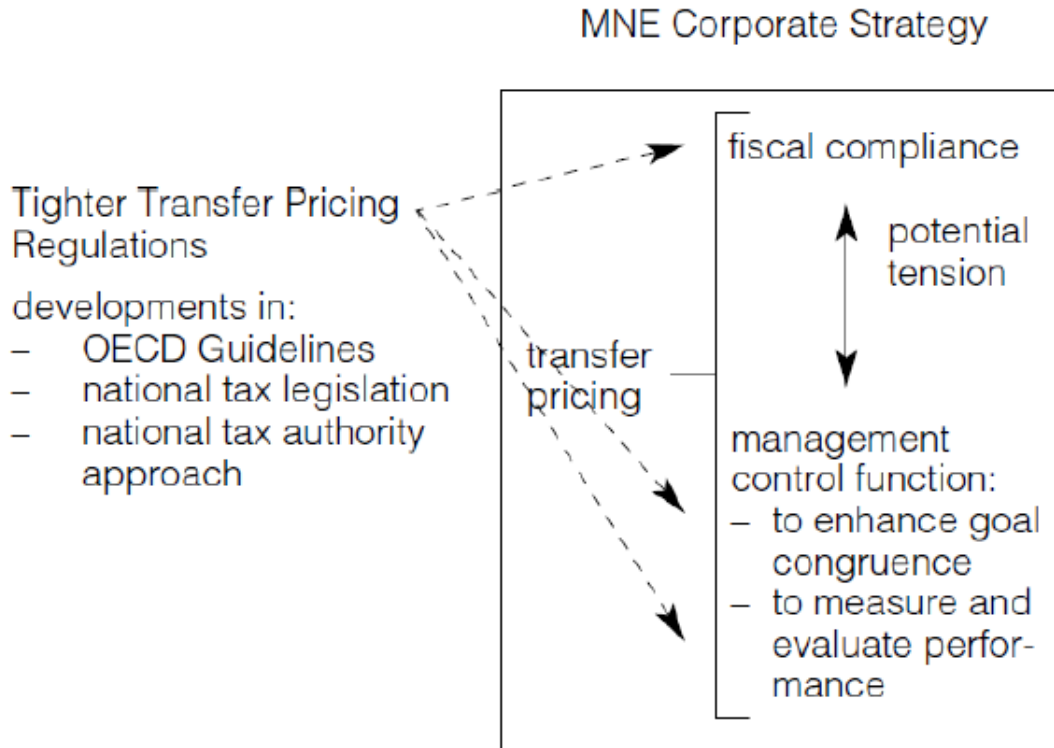
In general, developing countries without any kind of TP experience should be assisted in becoming acquainted with the arm's length principle on a high level. Based on this, a TP strategy should be developed that takes into account country-specific circumstances and outlines the different steps in introducing TP legislation. Special attention should be paid to the recruitment and training of specialized TP staff. Issues such as risk-assessment procedures for audit purposes and APA or simplified compliance procedures are equally important, but should form part of subsequent efforts



#### **Transfer Pricing and the Investment Climate: -**

The issue that has to be wrestled with is this—what is the fair price for those transactions, in particular (from the development perspective) when you bear in mind the real economic engagement of the multinational in a particular developing country, and where the multinational’s profits are truly being made. This finding provides more direct evidence that transfer pricing is occurring since it considers the direct relationship between the taxes faced by affiliates abroad and their actual intra firm trade transactions (Clausing, 2001). If transfer pricing does not reflect the true profits earned in that country, the country is unfairly deprived of funds and opportunities for development. And, of course, it is ultimately the people of that country who bear the costs, in food, water, health and education especially.

A study by Cools finds that “the empirical findings confirmed that, because of the real threat of audits and penalties, the tax requirements of transfer pricing play a prominent role in the multinational enterprise’s decision-making process” (see figure 1). As an increasing number of countries introduce transfer pricing legislation and increase the resources available to their tax administrations for transfer pricing audits (see below), the role of the tax requirements of transfer pricing will only increase.



(Cools, 2003).

#### **Transfer pricing developments in selected countries with established transfer pricing regimes:-**

##### **Australia: -**

On November 1, 2011, the Treasury released a consultation paper on proposed changes to Australia's transfer pricing rules intended to bring them in line with Australian and international developments (Australian Treasury 2011). The paper outlines the history of transfer pricing rules and proposes a number of areas for change. Suggested changes include the introduction of an arm's length standard that reflects international norms, interpretation of new rules in a manner that best secures consistency with guidance from the Organization for Economic Co-operation and Development (OECD) and application of the new rules on a self-assessment basis. On 22 November 2012 an expose draft was released that included draft legislation and explanatory memorandum (Australian Treasury 2012).

##### **United Kingdom:-**

In June 2008, Her Majesty's Revenue & Customs (HMRC) issued its "Guidelines for the Conduct of Transfer Pricing Enquiries," which included the creation of a specialized transfer pricing group, a transfer pricing review board, and a risk-based approach to transfer pricing enquiries. In late 2010, HMRC also issued guidance to its field teams on more extensive use of penalties in transfer pricing cases.

##### **United States:-**

The Internal Revenue Service (IRS) added 1,200 employees in 2009 to deal with international issues, with another 800 added through the end of 2010. The IRS has established a goal of achieving a staff of 120 transfer pricing economists, the largest number in its history. As part of its transfer pricing focus, in December 2009 the IRS announced a number of important changes, including creation of a transfer pricing practice, establishment of a transfer pricing council to coordinate transfer pricing reviews, and establishment of a tiered approach to targeting intercompany transactions based on their potential for abuse (Ernst & Young 2011).

##### **Conclusion: -**

a transfer price is used to determine costs. Setting transfer prices enables multinational corporations to attribute net profit or loss before tax among the countries where they do business. Developing countries have particular difficulty in obtaining reliable comparable data for the purposes of determining transfer prices. A wide range of actions is possible to assist in this regard, with some of these actions building on work already done by the OECD or other

stakeholders. Given the broad range of possible actions, further prioritization based on country needs and resource availability will be necessary.

Existing transfer pricing documentation rules can be divided into two groups. The first of these are the rules of individual countries. The second group of documentation rules and guidelines are those adopted by international organizations in an attempt to simplify and streamline the patchwork of local country rules. The OECD Guidelines are recommendations addressed to enterprises operating in OECD countries and have largely been followed in domestic transfer pricing regulations of these countries. The members of the OECD, which are mainly developed countries but also include some developing countries, have agreed common methods and practices in the area of TP, which are outlined in the OECD Guidelines.

The OECD Guidelines outline five methods to determine the arm's length nature of transfer prices. Applying the arm's length principle to review transfer prices set in transactions between associated enterprises often requires a comparison to be made between these prices and the prices set in similar transactions between independent enterprises in similar circumstances. In general, developing countries without any kind of TP experience should be assisted in becoming acquainted with the arm's length principle on a high level.

Finally, it can be concluded that transfer pricing is occurring since it considers the direct relationship between the taxes faced by affiliates abroad and their actual intra firm trade transactions. If transfer pricing does not reflect the true profits earned in that country, the country is unfairly deprived of funds and opportunities for development.

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### RESEARCH ARTICLE

#### BIOSYNTHESIS OF POLY- $\beta$ -HYDROXYBUTYRATE AND DISTRIBUTION OF *phbC* GENE IN LACTOBACILLUS PLANTARUM.

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poly- $\beta$ -hydroxybutyrate, *Lactobacillus*, *phbC* gene, bioplastics.

#### Abstract

Accumulation of synthetic plastics in the environment has become a worldwide problem. Polyhydroxy alkananoates (PHA) are biodegradable plastics, an alternative to petroleum-based synthetic plastics. In this investigation, the best known PHA, poly- $\beta$ -hydroxybutyrate (PHB) accumulating strains of *Lactobacillus plantarum* were isolated from various food and environmental samples using MRS agar medium. Among the 31 isolates, 22 strains were identified as *Lactobacilli* by comparing the biochemical profile with *Lactobacillus plantarum* MTCC6160. The *L. plantarum* strains were confirmed with 16S rRNA identification method and 11 among the 22 *Lactobacillus* strains were revealed the characteristic band at 735 bp. The partially amplified product was sequenced and the comparison of the sequence in NCBI BLAST obtained 94% similarity with the strain, *L. plantarum* IMAU70089. The isolated strains of *L. plantarum* was subjected to PHB production using nitrogen limited minimal medium (NLMM). The inclusion bodies were stained with Sudan Black B and the organism was also plated on Nile blue A medium, revealed the presence of a lipid material, which was confirmed as PHB by the analysis of molecular fragments by FTIR spectroscopy in comparison with reference material. In addition, the existence of *phbC* gene (578 bp) was identified, which encodes the enzyme, PHB synthase for accumulating PHB. This investigation confirmed that 1 mg of the cell dry weight constitutes the maximum of 40.4  $\mu$ g of PHB. This study revealed that *L. plantarum* has been recognized as a good candidate for PHB.

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#### Introduction:-

Synthetic plastics produced from the petrochemical source are non-degradable and cause waste disposal problems leading to environmental pollution (Muller et al., 2001). Polyhydroxyalkanoates and their copolymeric derivatives have emerged as very attractive substitutes for synthetic plastics due to their complete

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biodegradability (Kumar and Prabakaran, 2006) and similar physical properties to synthetic plastics (Chee et al., 2010).

Polyhydroxyalkanoates comprise a large class of polyesters that is synthesized by many bacteria as an intracellular carbon and energy compound (Lee and Chang, 1994). PHBs are synthesized when the cells surrounding contains unbalanced growth conditions such as limited concentrations of oxygen, nitrogen, phosphorous, sulfur or trace elements like magnesium, calcium, ferrous and high concentrations of carbon.

PHB is a linear polyester of D (-)  $\beta$ -hydroxybutyrate and the best-known polymers of polyhydroxyalkanoates. Bacteria produce PHAs with average molecular mass up to  $4.0 \times 10^6$  Da with a polydispersity of around 2.0. Many organisms accumulate polyoxoesters of short carbon chain length hydroxyalkonic acids comprising of three to five carbon atoms called polyhydroxybutyrates.

More than 250 different microorganisms are reported to accumulate PHB. Only several of these such as *Alcaligeneseutrophus* (Kim et al., 1994), *Alcaligenes latus* (Yamane et al., 1996), *Azotobactervinelandii* (Page and Knosp 1989), methylotrophs (Kim et al., 1996), *Pseudomonas oleovorans* (Brandl et al., 1988) and recombinant *Escherichia coli* (Lee and Chang, 1994) are suitable for the production of PHAs to a high concentration with high productivity.

The major focus of many investigators is to make their production economically competitive with polypropylenes. Many soil and environmental microorganisms were estimated for the PHB production by many researchers, very less study were reported in *Lactobacillus*. Hence, this study is an attempt to reveal the percentage production of PHB in *L. plantarum* isolated from the food and environmental sources. These are capable of supplying rich protein and also they have the ability to accumulate some amount of PHB. Biosynthetic processes of producing polymers are often financially uncompetitive. Thus, research has focused on modifying microorganisms to improve product yields and increase substrate ranges. Many controlling factors need to be considered in an effort to modify metabolic fluxes responsible for bioplastic production.

The *phbC* gene is responsible for the production of PHB synthase in an organism apart from *phbA* and *phbB* which are responsible for the production of  $\beta$ -ketothiolase and acetoacetyl-CoA reductase respectively (Sharma et al., 2007). Identification of these genes is the confirmation of PHB production in the respective strain.

## Materials and Methods:-

### Sample collection:-

The food and environmental samples such as raw milk (n=6), pasteurized milk (n=6), butter (n=3), cheese (n=1), curd (n=6), buttermilk (n=3), grey water (n=4) and soil (n=2) were collected from various locations in Erode, South India in sterile screw cap tubes and processed within 3 h from the time of collection.

### Isolation and presumptive identification:-

The collected samples were serially diluted (tenfold dilution) and 0.1 mL of each dilution was plated on sterile de Man Rogosa Sharpe (MRS) medium by spread plate technique (Emmanuel et al., 2005). The plates were maintained under an aerobic condition at 30°C for 24-48 h. The purified cultures were preserved and maintained at -4°C in MRS agar slants.

The presumptive Identification of *Lactobacilli* was carried out based on the microscopic, cultural, and biochemical identification methods. *L. plantarum* MTCC 6160 (Microbial type culture collection, IMTECH, India) was used as reference strain in this study.

Isolates were identified microscopically on the basis of Gram staining, endospore staining, motility test, and phenotypically on the basis of Kovac's oxidase and catalase test, followed by a series of biochemical tests such as indole production, methyl red test, Voges-Proskauer test, utilization of citrate, reduction of nitrate to nitrite and H<sub>2</sub>S production, urease and carbohydrate fermentation.

### Extraction of genomic DNA:-

Aliquots of 1 mL of 24 h cultures grown in MRS broth were centrifuged at 6000 rpm for 15 min at 4°C in Eppendorf tubes. The supernatant was discarded and the pellet was suspended in 467  $\mu$ L of TE buffer (10 mM Tris

base and 0.5 mM EDTA), 30  $\mu$ L of 10% sodium dodecyl sulfate, 3  $\mu$ L of proteinase k and incubated at 37°C for 1 h. An equal volume (500  $\mu$ L) of phenol–chloroform (24:1) was added to the content and mixed gently. The tubes were centrifuged at 10000 rpm for 10 min at 4°C. The upper aqueous phase was transferred to a fresh Eppendorf tube. The DNA from the aqueous phase was precipitated by the addition of one-tenth the volume of 3 M sodium acetate and 330  $\mu$ L the volume of ice-cold isopropanol. The precipitated DNA was pelleted by centrifugation at 3000 rpm for 3 min at 4°C and the DNA was washed with 70% ethanol and the pellet was air dried.

#### **PCR amplification of 16S rRNA gene:-**

Unique primers were designed for the amplification of the genes coding for the 16S rRNA of *Lactobacillus plantarum*. Primers were designed from the conserved regions and searched for their uniqueness and specificity to the respective 16S rRNA gene from different *Lactobacillus plantarum* by basic local alignment search tool (BLAST). A 750 bp fragment from the *Lactobacillus plantarum* encoding 16SrRNA gene was identified by using a primer set. The amplification was performed with forward primer, 5'-TTCATCCGAATAACCC-3' and reverse primer, 5'-CGACAGTAACGGAGGT-3'.

The PCR reaction was performed in 25  $\mu$ L reaction volume containing 2 $\mu$ L of template DNA (20 ng  $\mu$ L<sup>-1</sup>), 1  $\mu$ L (1  $\mu$ M) each of forwarding primer and reverse primer, 12.5  $\mu$ L of PCR master mix (Fermentas, USA) contains 0.05 U/ $\mu$ L TaqDNA polymerase, reaction buffer, 4 mM MgCl<sub>2</sub>, 0.4 M of each dNTP (dATP, dCTP, dGTP and dTTP) and 8.5  $\mu$ L of nuclease-free water. The reaction conditions were as follows: initial denaturation at 94°C for 5 min, 30 cycles of amplification, each consisting of denaturation at 94°C for 1 min, annealing at 57.9°C for 1 min, elongation at 72°C for 1 min followed by a final extension at 72°C for 10 min.

The PCR products (10  $\mu$ L) were electrophoresed in 1.5% agarose gel for 2 h at 50V in the Tris-acetate-EDTA buffer. The size of the amplification products was determined by comparison with 100 bp DNA ladder (Helini biomolecules, Chennai). Amplified products under optimum conditions with expected size were purified using purification kit (Qiagen, India) and sequenced. The generated nucleotide sequences were subjected to further analysis.

#### **Screening of PHB producers:-**

A pure culture of Lactobacilli grown in 250 mL flasks containing 50 mL of nitrogen limited minimal medium (NLMM) comprised of the following (per liter); 3.8 g Na<sub>2</sub>HPO<sub>4</sub>, 2.65 g KH<sub>2</sub>PO<sub>4</sub>, 2 g NH<sub>4</sub>Cl, 0.2 g MgSO<sub>4</sub>, 2 g fructose and 1 mL trace minerals. Trace element solution contains (per liter): 5 g EDTA, 2.2 g ZnSO<sub>4</sub>, 5.4 g CaCl<sub>2</sub>, 5.6 g MgCl<sub>2</sub>, 0.05 g boric acid, 4.79 g FeSO<sub>4</sub>, 22.4 g (NH<sub>4</sub>)<sub>6</sub>MoO<sub>24</sub>, 1.6 g CoCl<sub>2</sub>, and 1.57 g CuSO<sub>4</sub>. The pH of the media was maintained at 7.0. The culture flask was kept in a shaker at 250 rpm at 37°C for 48 h. The PHB producers were screened microscopically for the presence of metachromatic granules by Sudan black B staining method (Burdon, 1946) and also by colony morphology by inoculating the isolated strain on nutrient agar medium supplemented with 1% Nile blue A (Ostle et al., 1982).

#### **Extraction of PHB:-**

The PHB was extracted from the 24-72h old cultures of *L. plantarum*. The bacterial cultures were harvested from 20 mL by centrifugation at 6000 rpm for 15 min. The cell pellet was dried at 40  $\pm$  1°C for 24 h and the dry cell weight was estimated. The cell pellet was suspended in 5 mL of sodium hypochlorite, 5 mL of chloroform and incubated at 30°C for 1 h. Then the incubated content was centrifuged at 1500 rpm for 15 min at room temperature. Three phases were obtained, the lower PHB containing chloroform phase was recovered without disturbing the other phases. Chloroform was evaporated and the PHB crystals on the walls of the tubes were collected and stored.

#### **Qualitative estimation of PHB:-**

The extracted PHB was estimated qualitatively by TLC. The extracted PHB was dissolved in chloroform and 50  $\mu$ L samples were loaded on the TLC plate and chromatogram was developed with a solvent system consisting of benzene and ethyl acetate (1:1). The resolved spot was visualized by exposing the dried plate to iodine vapor for 10 min. The R<sub>f</sub> value of the spot with greenish brown color was measured (Kumar and Prabakaran, 2006).

PHB was qualitatively estimated using FTIR spectrophotometer. The PHB from five different strains were selected randomly for analysis. (Kumar and Prabakaran, 2006). The pure form of PHB (1 mg) was thoroughly mixed with 15 mg KBr (Spectroscopic grade) and the treated pellet was dried at 100°C for 4 hrs. The FTIR spectrum of the compound was analyzed in the range of 400-4000 cm<sup>-1</sup> in a Perkin-Elmer (USA) model 1720 FTIR spectrometer.



**Quantitative estimation of PHB:-**

The production of PHB by *L. plantarum* was estimated as crotonic acid. The extracted PHB crystals were dissolved in 5 mL of chloroform and converted to crotonic acid by the addition of 5 mL of concentrated sulfuric acid and boiled at 100°C for 10min. Then the tubes were cooled to 25°C and the absorbance was measured at 235 nm using a UV-spectrophotometer and a standard graph were plotted with pure crotonic acid in the dilutions of 1-10 µg mL.

**PCR amplification of *phbC* gene:-**

The production of PHB in *L. plantarum* was confirmed by PCR amplification of *phbC* gene which encodes PHB synthase using the primers F1- 5' CGCAATCCCCTTGATAAG 3' and R1- 5' CGCTTTTCAGGATCAATGTC 3' (Labmate Asia, India). The amplification was performed in 20 µL reaction mixtures, containing 10 µL of PCR master mix (Fermentas, USA) contains 0.05 U/µL Taq DNA polymerase, reaction buffer, 4 mM MgCl<sub>2</sub>, 0.4 M of each dNTP (dATP, dCTP, dGTP and dTTP), 5 µL of nuclease-free water, 1.5 µL (1 µM) each of forward and reverse primer and 2 µL of template DNA (20 ng µL<sup>-1</sup>). The DNA amplification was performed using a thermal cycler (MJ Research, Model PTC 100 Watertown, Mass., USA). The amplification conditions were initial denaturation at 94°C for 5 min, 30 cycles of amplification, each consisting of denaturation at 94°C for 1 min, primer annealing at 52.3°C for 1 min, and elongation at 72°C for 1 min followed by a final elongation of 72°C for 5 min. Following amplification, the PCR products were subjected to horizontal agarose gel electrophoresis through 1.5% agarose gel supplemented with ethidium bromide solution (0.5 µg/mL). The size of the amplification products was determined by comparison with 100 bp DNA ladder (Helini biomolecules, Chennai).

**Results:-****Isolation and identification:-**

The distribution of Lactic acid bacteria was enumerated in each sample (n=31). The percentage incidence of *Lactobacilli* was analyzed and tabulated (Table 1). The microscopic identification confirmed the presence of Gram-positive rod, non-spore forming, and non-motile bacteria. On MRS agar plates *Lactobacilli* showed pure white, regular, and small (2 to 3 mm diameter) colonies. The *L. Plantarum* strains were identified by biochemical profiling by comparing with the MTCC6160. Among the 31 isolates 22 isolates were identified as *Lactobacilli* by biochemical profiling and 11 among the 22 *Lactobacilli* were confirmed to be *L. plantarum* by 16S rRNA identification method. The PCR amplification of 16S rRNA revealed the characteristic band at 735 bp for all the strains. The partially amplified product of one among the 11 isolates was sequenced and designated as *L. plantarum* H1 by comparing phylogenetically with the other *Lactobacillus* strains using public databases (Fig. 1). The comparison of the sequence in NCBI BLAST obtained 94% similarity with the sequence of the strain *L. plantarum* strain IMAU70089 16S ribosomal RNA gene, and their phylogenetic analysis positioned the strain nearer to *L. plantarum* (6Q131205).

**The forward sequence of the 16S rRNA gene of *L. plantarum*:-**

>read seq. input (1), 409 bases, 29A496B6 checksum.

```
CAAATGACCACGTTTTTCCCATCCTGGCGGACGGGTGAGTAACGCGTAGGAATCTATCCGTGGGGTG
GGGGATAACTCTGGGAAACTGGAGCTAATACCGCATGATACCTGAGGGTCAAAGGCGCAAGTCGCCT
GCGGAGGAGCCTGCGTTTGATTAGCTTGTGGTGGGGTAATGGCCTACCAAGGCGATGATCAATAGCT
GGTCTGAGAGGATGATCAGCCACACTGGGACTGAGACACGGCCCAGACTCCTACGGGAGGCAGCAGT
GGGGAATATTGGACAATGGGGCAACCCTGATCCCCAATGCCCGTGTGTGAATAAGTTTTCTATTGT
ACAGTTTTCCGACATGATACAGGCCGTAATCTACACATATCTGCATCGAGAGGCCACTTCAGACCAGT
ACG
```

**The Reverse sequence of the 16srRNA gene of *L. plantarum*:-**

>read seq. input (1), 223 bases, 784537BC checksum.

```
ACACGTCGAGTGAATACTGCCGGGATTTTACATCTGACTGTACAACCGCCTACACGCCCTTTACGCC
AGTCGTTCCGAGAAACGCTAGCCCCCTTCGTATTACCGCGGCTGCTGGCACGAAGTTAGCCGGGGCTT
CTTCTGCGGGTACCGTCATCATCGTCCCCGCCGAAAGTGCTTTACATCCGAAAACCTTCTTCAAACGGC
TTGTGGAAAAGTGAGCC
```

**Screening for PHB producers:-**

The PHB accumulated in the cells was microscopically observed as blue stained metachromatic granules against the pink background of the cells and the colonies were observed as blue color in the Nutrient agar with 1% Nile blue A solution. Among the 11, 8 isolates were reported to be PHB producers using presumptive screening methods (Table

2). About 72.7 % of PHB producers among the strains of *L. plantarum* was reported based on Sudan Black B staining and Nile blue A method indicates a maximum probability of PHB in these strains.

#### Qualitative estimation of PHB:-

A single spot on TLC of extracted PHB granules indicates the purity of the molecule and the obtained  $R_f$  values of 0.81 is higher than the normal. The  $R_f$  value of the PHB molecule increases with its rate of polymerization and the decrease in therate of propanolysis(Panda et al., 2008). In this study, the sample is not processed by propanolysis, the value higher.

PHB samples of five strains were randomly selected for FTIR analysis. Comparison of the FTIR results with standard PHB revealed the similarity that exists in the functional group of the molecule. The IR analysis showed the presence of  $\text{CH}_2\text{-CH}_3\text{-C=O}$  methyl ester groups confirmed that the extract was PHB. The C-O bond shows thestrong and broadband at  $1047\text{-}1089\text{ cm}^{-1}$ . The bands found at  $1442\text{-}1488\text{ cm}^{-1}$  correspond to the asymmetrical C-H bending vibration in  $\text{CH}_3$  group, while the series of bands found between  $1000\text{-}1200\text{ cm}^{-1}$  correspond to the stretching of the C-O bond of the ester group. The values of C=O were observed between  $1626.05\text{-}1637.62\text{ cm}^{-1}$ . The values of C=O are slightly lower than the standard value 1712 and this may be due to polymerization of the molecules (Kadouri et al., 2002). The absorption band at and around  $3450\text{ cm}^{-1}$  corresponds to the terminal OH group (Fig. 2) (Table 3).

#### Extraction and Quantitative estimation of PHB:-

The overall dry weight of the cell was found to be 0.5-1.0 mg. The PHB accumulation of different strains of *L. plantarum* was estimated against the standard crotonic acid curve and the values were tabulated (Table 4). The PHB accumulated was found to increase with nutrient stress and varied considerably with the strains. After 24 h of nutrient stress, the concentration of PHB increased in all the strains. The strain produced PHB from a range between 0.2-8.8  $\mu\text{g/mL}$ . Highest accumulation of 8.8  $\mu\text{g/mL}$  was found in *L. plantarum* H and *L. plantarum* 12 and the lowest and negotiable concentration of 0.2  $\mu\text{g/mL}$  was produced in *L. plantarum* 05.

#### Confirmation of PHB producers by PCR Method:-

The isolates which accumulating the PHB in higher amount (LP01, LP02, LP03, LPH1 and LP12) were analyzed for the presence of PHB synthase encoding gene, *phbC* by PCR amplification using unique primers. The conserved sequence of *phb C* gene available in all the strains. The bands in the region of 585bp revealed the presence of *phbC* gene (Kadouri et al., 2002) and the ability of the strains to produce PHB. The amplified DNA products also revealed the minor diversification among the strains.

**Table 1:-**Distribution of lactic acid bacteria and percentage incidence of *Lactobacilli*

S. No.	Samples	No. of Samples collected	Lactic acid bacteria Incidence (X $10^4\text{ cfu mL}^{-1}$ )		Number of <i>Lactobacilli</i> Isolated	%
			Maximum	Minimum		
1.	Curd	6	53	19	6	100
2.	Raw milk	6	17	12	4	67
3.	Pasteurized milk	6	9	1	2	33
4.	Butter	3	67	22	2	33
5.	Butter milk	3	19	5	3	100
6.	Cheese	1	12	0	1	100
7.	Grey water	4	7	2	3	75
8.	Soil	2	8	6	1	50

**Table 2:-**PHB screening of *Lactobacillus plantarum*

Strain No.	Sudan black B	Nile blue A
LP01	+	+
LP02	+	+
LP03	+	+
LP05	+	+
LP07	+	+
LP10	-	-

LP12	+	+
LP21	+	+
LP25	-	-
LP27	-	-
LP31	+	+
<i>L. plantarum</i> MTCC6160	+	+

+ PHB producers; - Non-PHB producers

**Table 3:-IR spectrum of PHB**

Samples	Peak region	Comments
LP 01	3384.22-3439.34	Intramolecular hydrogen bonding
	2924.18-3056.31	CH <sub>2</sub> stretch
	1626.05-1637.62	C=O
	1258.59	O-H tertiary alcohol
	1061.85	C-O stretching
LP 03	2925.15-3549.14	Intramolecular hydrogen bonding
	2925.14-3549.14	CH <sub>2</sub> stretch
	1636.65-1619.25	C=O
	1255.70	O-H tertiary alcohol
	1063.78	C-O stretching
LP 05	3240.52-3266.56	Intramolecular hydrogen bonding
	2924.18-3087.17	CH <sub>2</sub> stretch
	1636.65	C=O
	1255.70	O-H tertiary alcohol
	1063.78	C-O stretching
LP 12	3388.08-3482.59	Intramolecular hydrogen bonding
	2923.22-2956.97	CH <sub>2</sub> stretch
	1636.65	C=O
	1065.51	O-H tertiary alcohol
	1066.71	C-O stretching
LP31	2856.67-3562.64	Intramolecular hydrogen bonding
	2923.22-2956.97	CH <sub>2</sub> stretch
	1637.62-1618.37	C=O
	1256.67	O-H tertiary alcohol
	1062.81	C-O stretching

**Table 5:-Quantitative estimation of PHB of *L. plantarum* in NLMM broth**

Bacteria	Crotonic acid concentration (µg/mL) under stress		
	24 h	48 h	72 h
<i>L.plantarum</i> 01	3.0	4.3	4.4
<i>L.plantarum</i> 02	4.7	5.6	7.4
<i>L.plantarum</i> 03	1.5	2.3	4.3
<i>L.plantarum</i> 05	0.2	1.2	3.1
<i>L.plantarum</i> H1	5.7	8.8	8.8
<i>L.plantarum</i> 12	3.9	5.4	8.8
<i>L.plantarum</i> 21	0.7	2.4	3.9
<i>L.plantarum</i> 31	2.7	5.7	5.9

Fig. 1:-Phylogenetic tree of *Lactobacilli*.

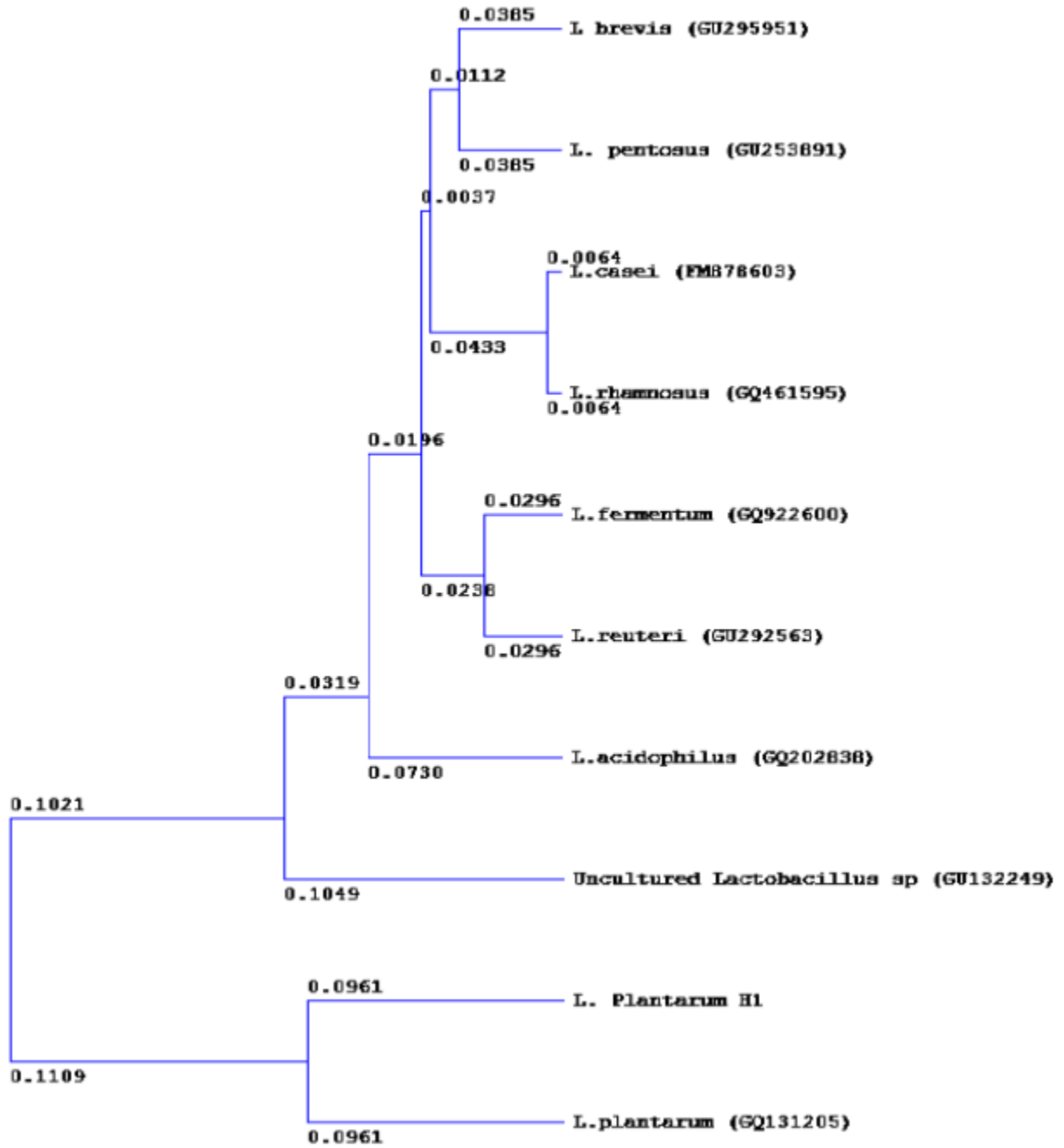


Fig. 2:-FTIR spectrum of PHB (*L.plantarum*01)

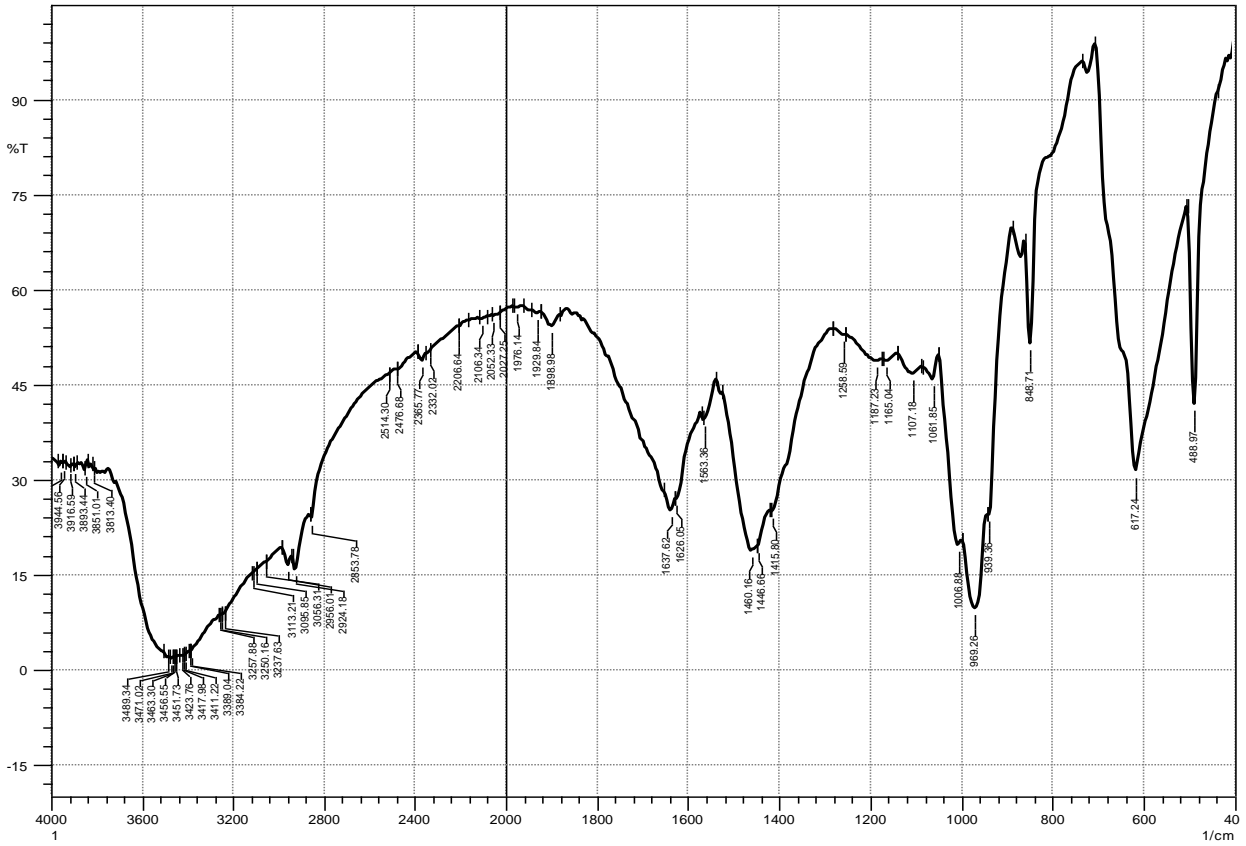
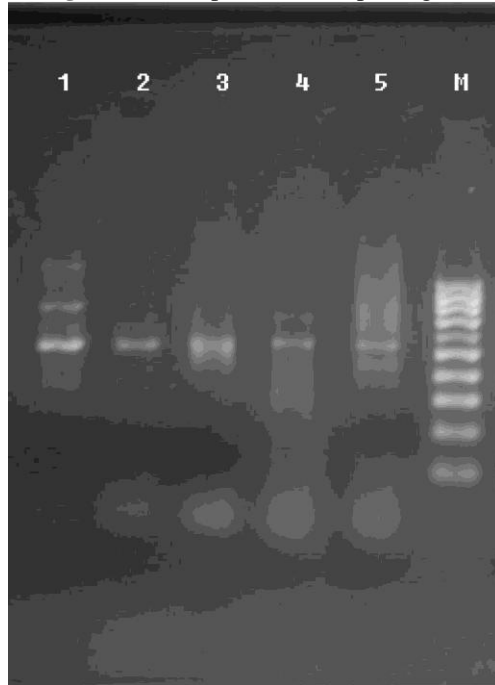


Fig. 3:-PCRAmplification of phbC gene



From Lane 1 - LP01, LP02, LP03, LPH1, LP12, Marker

**Conclusion:-**

The wide difference between the rates of PHB production in same species indicates that there are several factors that influence the PHB production among the strains. The accumulation of PHB in *Lactobacillus* was not the highest among all the organisms but the *L. plantarum* produced a considerable amount of PHB and to be considered as a part in the choice of organisms for PHB production. The results conclude that nutrient stress conditions can be considered as an optimization parameter for PHB production in high yield. This investigation confirmed that 1mg of the cell dry weight constitutes the maximum of 40.4 µg of PHB.

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## RESEARCH ARTICLE

### ISOLATION AND CHARACTERIZATION OF A NOVEL SAPONIN FROM *ROSMARINUS OFFICINALIS* L. (LAMIACEAE).

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*Rosmarinus officinalis* L., Rosemary, Saponins, HPTLC, HPLC, UV, FTIR, HR-LCMS

#### Abstract

Rosemary (*Rosmarinus officinalis* L.), a spice and medicinal herb of Lamiaceae family with a characteristic aromatic smell, is widely used around the world and accepted as one of the spices with the highest antioxidant activity. The aim of this research was to identify and isolate the unknown saponins from the leaves of *R. officinalis* L. using HPTLC, HPLC, UV, FTIR and HR-LCMS techniques. The saponins were identified by High Performance Thin Layer Chromatography (HPTLC) and confirmed by HPLC. On the basis of spectral data analysis, the structure of the new saponin isolated by HPTLC from methanol extract of leaves of *R. officinalis* L. has been formulated by UV, FTIR and HR -LCMS spectral analysis as 1alpha-hydroxy-18-(4-hydroxy-4-methyl-2-pentynoxy)-23,24,25,26,27-pentanorvitamin D3/1alpha-hydr. This is a new saponin isolated from *R. officinalis* L. and being reported for the first time.

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#### Introduction:-

*Rosmarinus officinalis* L.(Lamiaceae), Rosemary, is a perennial herb native to the Mediterranean region but is widely distributed in many parts of the world. It grows as a shrub or herbaceous plant with about 0.8 to 2m height (Atik bekkara *et al.*, 2007). This plant prefers dry and arid regions, hills and low mountains, calcareous, shale, clay and rocky substrates (El Amrani *et al.*, 1997). The herb *R. officinalis* L. has been used as a food spice and medicine since ancient times. The fragrance of the leaf has been said to enhance memory. Rosemary oil was applied to the skin to treat muscle and joint pain and taken internally to promote abortions. Its use since ancient times in traditional medicine is justified by its antiseptic (Bult *et al.*, 1985), antirheumatic (Makino *et al.*, 2000), anti-inflammatory, antispasmodic (Juhas *et al.*, 2009; Beninca *et al.*, 2011), antimicrobial and anti-hepatotoxic properties (Stefanovits-Banyai *et al.*, 2003). Its appreciation as a spice for seasoning and food preservation (Arnold *et al.*, 1997) is supported by a very high antioxidant activity (Wang *et al.*, 2008). This antioxidant activity of *R. officinalis* L. is due to its phenolic compounds including: carnosic acid, carnosol, rosmarinic acid and hydroxycinnamic acid ester (Inatani *et al.*, 1983). Aerial parts of *R. officinalis* L. are orally used to relieve renal colic and dysmenorrhoea (Gonzalez-Trujano *et al.*, 2007). Recent research shows that *R. officinalis* L. extracts possess strong anticancer properties (Vassiliki *et al.*, 2013).

Nowadays market demand of the plant is growing, as it is used in several medicinal products. *R. officinalis* L. is indigenous to South Europe and Asia but it is also cultivated in Mediterranean basin and India (WHO, 2007). It is

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used as carminative, rubifacient, stimulant and as flavouring agent for liniments, hair lotions, inhaler, soaps and cosmetics (Kokate *et al.*, 2010). Rosemary leaves have many traditional uses based on their antibacterial and spasmolytic actions. Used orally for the treatment of dyspeptic complaints (British Herbal,1996), and in external applications for supportive management of rheumatic complaints and circulatory disorders (Blumenthal,1998). It is used as a cholagogue, diaphoretic, digestant, diuretic, emmenagogue, laxative and tonic (Bedevian,1994; Farnsworth, 2005) also used in the management of headache, menstrual disorders, nervous menstrual complaints, tiredness, defective memory, sprains and bruises (Hagers, 2003; Asia *et al.*,2013)

It is described in cases of congestion of the liver, inflammation of the gall bladder, gastric lavage, in some cases of jaundice, fatigue, physical and intellectual weakness following the diseases debilitating to the body, migraine, dizziness, palpitations, jittering, strikes, heartburn, carminative and as an antiseptic (Antoine, 1998). Many compounds have been isolated from *R. officinalis* L. including flavones, diterpenes, steroids, and triterpenes.

Saponins are natural high-molecular-weight glycosides of triterpene or steroids with a very wide distribution in the plant kingdom (Hostettmann and Marston, 1995). Saponins exhibits a range of biological activities (Oleszek and Marston, 2000) which include, anticholesterolemic (Oakenfull, 1981), anti-inflammatory, anti-parasitic and antiviral (Just *et al.*,1998; Traore *et al.*,2000). Saponins are also effective against drug-resistant cancer cells (Cheung *et al.*,2005). The great structural diversity of saponins, novel bioactivities which is relevant to the pharmaceutical industry, the challenges of identification, are now opening new opportunities or newer trends for exploitation of novel saponins. Hence the aim of the current investigation was to identify and characterize active saponins from the leaves of medicinally important plant *R. officinalis* L.

### Materials and Methods:-

The fresh plants of *R. officinalis* L. were collected from Ooty, Tamil Nadu, India. The plant materials were identified and authenticated by Dr. K.V. George, Emeritus Scientist (KSCSTE), Department of Botany, St.Berchmans College, Changanacherry, Kerala. The voucher specimen (Voucher No.N/PG/074) is deposited in the herbarium of New Udaya Pharmacy & Ayurvedic Laboratories, Cochin, Kerala, India.

### Sample preparation:-

About 10 gm of the powdered sample was taken in a thimble and extracted with 250 ml methanol in a soxhlet apparatus. The extract was then concentrated in a Rotary Vacuum Evaporator to a volume of 30 ml and stored in small air tight brown bottles. This methanolic extract was used for the screening and isolation of compound.

### High Performance Thin Layer Chromatography (HPTLC):-

HPTLC is a flexible, reliable, and cost-efficient separation technique ideally suited for the analysis of botanicals and herbal drugs. HPTLC studies were carried out using the method described by Wagner *et al.* (1996). Methanol extract of the selected plant was subjected to HPTLC (CAMAG, Switzerland) analysis. A Camag HPTLC instrument consisting of Linomat V automatic spotter equipped with a 100  $\mu$ L syringe connected to a nitrogen cylinder, Scanner-III, twin-trough developing chambers, and viewing cabinet with dual wavelength UV lamps (Camag, Muttenz, Switzerland) were used. Before analysis, HPTLC plates were cleaned by predevelopment with methanol and activated at 110°C for 5min for solvent removal. Plant extract were spotted on a silica gel 60F<sub>254</sub> (Merck, Germany) TLC plate. The plate was air dried and then developed by using the solvent system Chloroform: Acetic acid: Methanol: Water (6.4:3.2:1.2:0.8) (v/v/v/v) as mobile phase in a CAMAG- twin-trough glass chamber (20x10x4) previously saturated with mobile phase vapour for 20 minutes. After developing the plate, it was dried and scanned using Scanner 3 (CAMAG, Switzerland) at 275 nm using WinCATS software. Chromatograms were evaluated before and after spraying with Anisaldehyde – sulphuric acid reagent. After derivatization, plate was dried in hot air oven for 5 minutes at 105° C and viewed under UV at 366 nm.

### High Performance Liquid Chromatography (HPLC):-

High Performance Liquid Chromatography was used to analyse the isolated fraction obtained from HPTLC. Sample was dissolved in HPLC grade methanol in concentration of about 1-10 $\mu$ g/ml, 20 $\mu$ l of the solution was injected in the column RP-C18 and analyzed by PDA detector. The wavelength range was 250 - 500nm. Thermo HPLC system consisted of Quaternary gradient pumps (LC – 10ATvp), Photodiode Array (PDA) and detector (SPD – M10Avp) with built-in system controller. The analysis was performed on a 25 cm x 4.6 mm, 5  $\mu$ m particle size CNW, Athena C18-WP column. The data acquisition was done on Chrom Quest 5 software. The isolated compound from HPTLC was analyzed by using Methanol: Acetonitrile (95:5) as mobile phase.



**Characterization of isolated compound:-**

The isolated compound was characterized by UV, FTIR and HR-LCMS analysis

**UV Spectroscopy:-**

The absorbance of the isolated compound was read using one cm cell in a UV – Vis - NIR spectrophotometer (Varian, Cary 5000, Netherlands). The instrument have a spectral range of 175 nm to 3300 nm, wavelength accuracy of  $\pm 0.1$  nm (UV –Vis),  $\pm 0.4$  nm (NIR), wavelength reproducibility of 0.025nm and a limiting resolution of 0.05nm(UV-Vis), 0.2nm(NIR).The maximum range of absorbance of isolated compound in the methanolic solution was noted by comparing it against HPLC grade methanol as a blank. Separated components (1 mg each) were dissolved in methanol and recorded the spectrum in the range of 200 to 500 nm using a UV double beam spectrophotometer.

**Fourier Transform Infra Red spectrometer (FTIR):-**

FTIR analysis was carried out using Thermo Nicolet, Avatar 370 spectrophotometer system, which was used to detect the characteristic peaks and their functional groups. The spectral range was between 4000-400  $\text{cm}^{-1}$  and resolution was  $4\text{cm}^{-1}$  with KBr beam splitter, DTGS Detector and HATR Assembly for convenience of measurement. The finger print region extended between 400 – 1600  $\text{cm}^{-1}$ . The spectrum of the isolated compound was elucidated against a blank of HPLC grade methanol.

**High Resolution Liquid Chromatograph Mass Spectrometer (HR–LCMS):-**

Further structural analysis was aided with HR-LCMS (High Resolution liquid chromatography-mass spectrometry) with a mass spectrometer using High Resolution. Liquid chromatography coupled with mass spectrometry (LC/MS) is a powerful technique for the analysis of complex botanical extracts. HPLC is efficient in separating chemical compounds in a mixture, and MS provides abundant information for structural elucidation of the compounds. The LCMS analysis provides the molecular weight information for the components of the extract. MS dissociations give further structural information on the target compounds (Chen *et al.*, 2007). Therefore, the combination of HPLC and MS facilitates rapid and accurate identification of chemical compounds in medicinal herbs, especially when a pure standard is unavailable. The HR–LCMS analysis was performed using Agilent Technologies, USA, model 1290 Infinity UHPLC System, 1260 infinity Nano HPLC with Chipcube, 6550 iFunnel Q-TOFs. The mass range is between 50-3200 amu, resolution is 40000 FWHM, high mass accuracy typically less than 1ppm, sensitivity 1 pg. reserpine S/N 100:1, direct infusion for mass analysis (MS, MS /MS), binary nano HP- LC system with mass as detector. The analytical column was an octadecylsilane C18, 250 x 4.6 mm ID, 5  $\mu\text{m}$  particle size protected by a compatible guard column. For the characterization of isolated compound the HPLC method was same as that used in HPLC with CNW, Athena C18-WP column.

**Results:-****High Performance Thin Layer Chromatography (HPTLC):-**

HPTLC of methanol extract of *R.officinalis* L. was carried out to confirm its nature by analyzing TLC chromatograms and to isolate active saponin ingredients from the extract. TLC of methanol extract of *R. officinalis* L. revealed the presence of 5 compounds (corresponding to 5 spots) having R<sub>f</sub> values of 0.26, 0.42, 0.50, 0.59 and 0.68 respectively when a solvent phase of Chloroform: Acetic acid: Methanol: Water (6.4:3.2:1.2:0.8) was used (Fig:1). Compound having R<sub>f</sub> of 0.59 was most prominent and showed clear spot (orange spot) when sprayed using Anisaldehyde – sulphuric acid reagent. Hence, this particular spot was selected for further identification and purification.

**High Performance Liquid Chromatography (HPLC):-**

HPLC of isolated compound from the methanol extract obtained by HPTLC was carried out to confirm its nature by analyzing HPLC chromatograms. The sharpness of peak, its retention time (R<sub>t</sub> min), height and percent area were recorded. The HPLC chromatogram of isolated compound shown only one peak with prominent significant height 303889 and percent area (> 100%) at the retention time 3.372 (R<sub>t</sub> min) (Fig 2).

**Characterization of the isolated compound:-****UV & Fourier Transform Infra red Spectrophotometry (FTIR):-**

UV spectra displayed characteristic absorption band at 260 nm. Data of IR spectrum (KBr,  $\text{cm}^{-1}$ ) exhibited absorption in the range from 3374.61  $\text{cm}^{-1}$  to 662.59  $\text{cm}^{-1}$ . The functional group and the chemical bond

corresponding to each peak are tabulated in Table 1. The FTIR spectrum indicated the presence of C-H, O-H and C=O bonds in the isolated compound (Fig 3).

#### High Resolution Liquid Chromatograph Mass Spectrometer (HR-LCMS) :-

Thus from the FTIR and HR-LCMS chromatogram obtained, the chemical compound isolated from the aerial parts of *R. officinalis* L. is identified as a saponin compound with molecular formula:

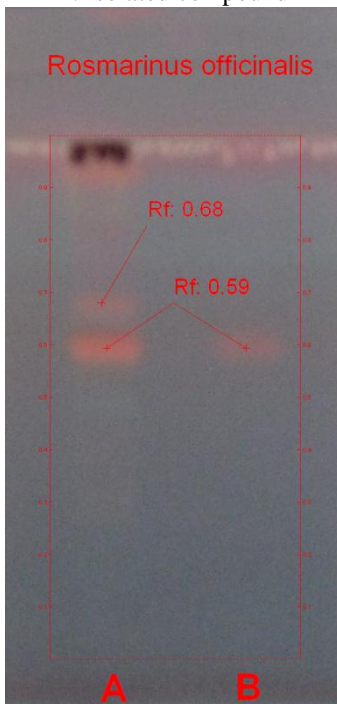
1alpha-hydroxy-18-(4-hydroxy-4-methyl-2-pentynyloxy)-23,24,25,26,27-pentanorvitaminD3/1alpha-hydr.

The molecular structure of the chemical compound in Fig.4.

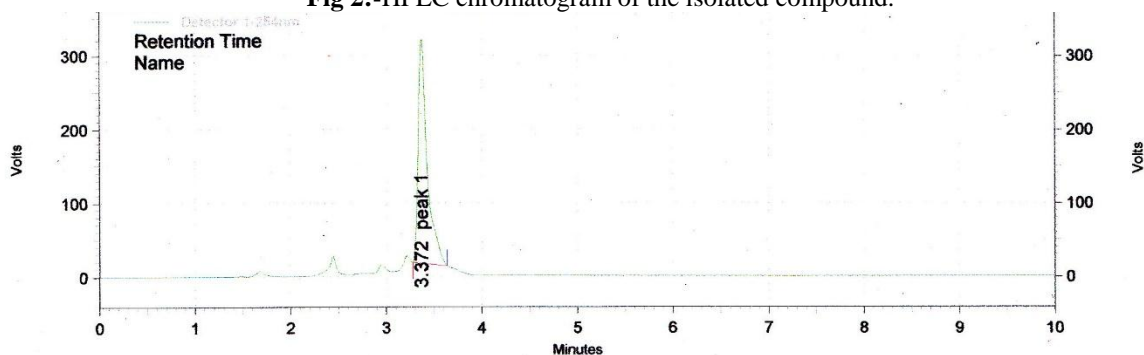
**Fig 1:-** HPTLC chromatogram of *Rosmarinus officinalis* L. After dervatization UV366nm

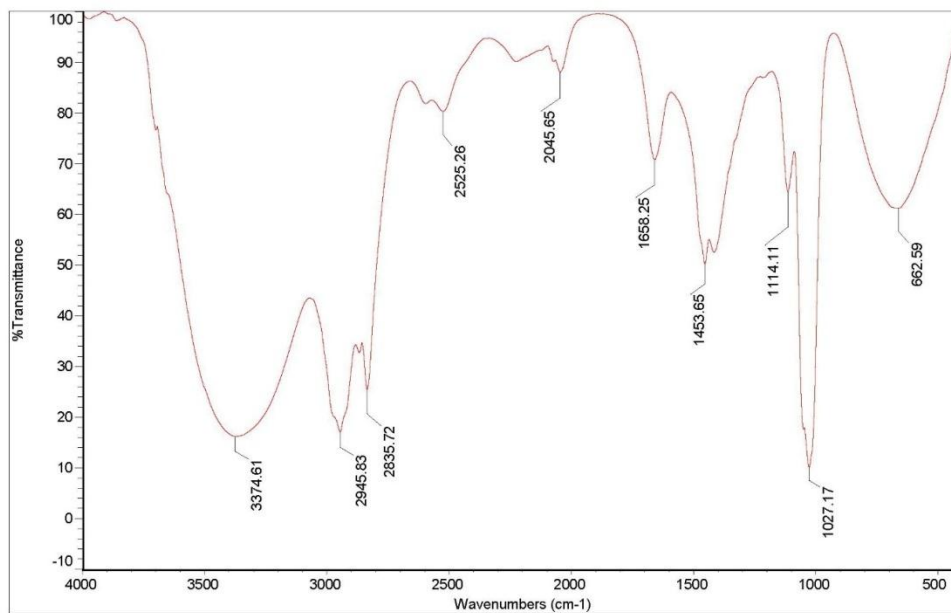
A. Crude methanolic extract

B. Isolated compound

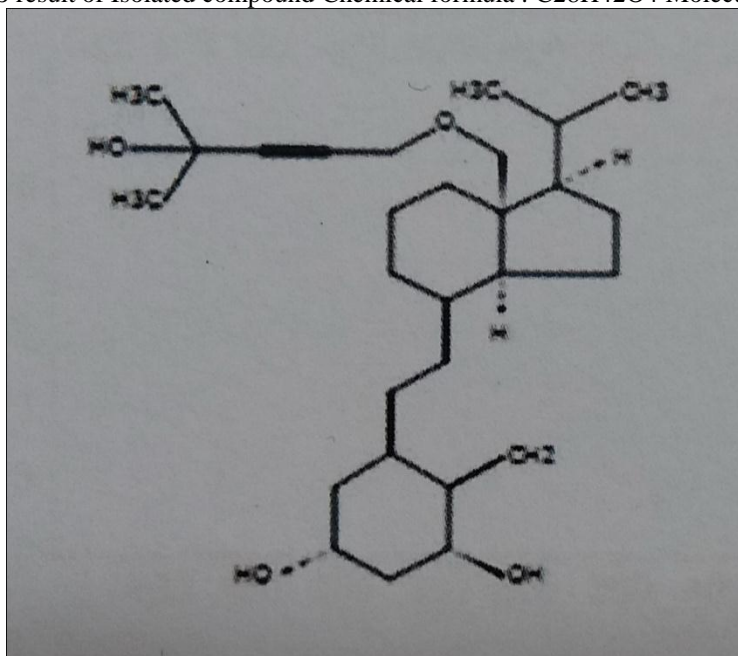


**Fig 2:-** HPLC chromatogram of the isolated compound.



**Fig 3:-**FTIR spectra of the isolated compound.**Table 1:-** Interpretation of IR spectra.

Frequency (cm <sup>-1</sup> )	Functional Group
662.59	-C≡C-H: C-H bend
1027.17	=C-H stretch
1453.65	C-H bend
1658.25	C=O stretch
2945.83	C-H stretch
3374.61	O-H stretch, H-bonded

**Fig 4:-** HR- LCMS result of Isolated compound Chemical formula : C<sub>28</sub>H<sub>42</sub>O<sub>4</sub> Molecular weight : 442.31

### Discussion:-

In recent years, although technology and medicine have developed extensively due to decrease in natural richness and other drawbacks, some countries have made it obligatory to use natural products for many goals (Erturk *et al.*,2003). For this reason we have chosen an important medicinal plant *R. officinalis* L., which is a herb and spice with incredible medicinal properties. In the above studies, saponins were extracted from the plant by HPTLC and HPLC and UV, FTIR and HR-LCMS techniques were carried out to investigate unknown saponins present in the methanol extract.

Renukappa *et al.* (1999) have applied LC-NMR (liquid chromatography-nuclear magnetic resonance) and LC-mass and LC-coupled bioassay to determine two anthelmintic dammarane-type triterpenoidal saponins, significantly active against *Caenorhabditis elegans* from a crude fraction of *Bacopa monniera*. Earlier studies on the biological activities of saponins were limited to crude extracts containing saponins as well as other polar constituents. The advent of modern sophisticated methods of isolation and structure elucidation has attracted great interest of scientific community to study structure activity relationships (Garai,2014). Nyberg *et al.*(2003) also applied solid phase extraction followed by NMR and MALDI-TOF mass spectrometry on chromatographic fractions QH-A and QH- B of immuno adjuvant active saponins to identify 28 different saponins of *Quillaja saponaria*. Three new olean type triterpenoid saponins were isolated by 1D and 2D NMR and MS spectroscopic data from the aerial parts of *Eclipta prostrata* ( L.) by Xi *et al.* (2014). Zhang *et al.* (2002) identified a new saponin as a ginsenoside-Ro derivative containing a polyacetylene side chain by spectroscopic means including 1D and 2D NMR.

In conclusion, we can state that the present study revealed the presence of saponins in *R. officinalis* L. leaves which were confirmed by various characterization studies. Chemical markers are now applicable in many research areas, which include authentication of species, identification of adulterants, structure elucidation and purity determination of medicinal plants. So this isolated saponin can be used as a chemical marker in *R. officinalis* L. which can be exploited more in future. Hence an attempt was made to isolate, purify and characterize the unknown saponins which can be used as markers and can serve as a powerful tool for the standardization of the extracts.

### Conclusion:-

The methanol extract of *Rosmarinus officinalis* L.(Rosemary) revealed the structure of compound as 1alpha-hydroxy-18-(4-hydroxy-4-methyl-2-pentynyloxy)-23,24,25,26,27-pentanorvitamin D3/1alpha-hydr. and is found to be a Saponin moiety which can be used as marker compound. Further studies need to be conducted for its pharmacological activity.

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### RESEARCH ARTICLE

#### EMPOWERMENT OF INDIGENOUS WOMEN AND SOCIAL EXCLUSION IN COMBATING POVERTY IN THE STATE OF VERACRUZ MEXICO.

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#### Abstract

In Mexico, the Productive Organization Program for Indigenous Women (POPMI) seeks the empowerment of productive capacities in indigenous women. Our study analyzes POPMI outreach, focusing our attention on women beneficiaries who present a high degree of social exclusion and multidimensional poverty in the State of Veracruz. In the study area, the 542 indigenous women benefited in POPMI, presented a condition of multidimensional poverty and a degree of social exclusion: very high, high and medium, they represent only 22.19% of the total beneficiaries of this program In 2010, since at the state level a total of 2,243 indigenous women were cared for. The results show that the localities where the condition of multidimensional poverty and very high, medium and high levels of social exclusion have been excluded in the coverage of POPMI.

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#### Introduction:-

Recent studies have shown that the indigenous population has been subject to social exclusion, a situation that aggravates their situation of multidimensional poverty (Medel, 2106), making it difficult for them to become socially integrated, access the formal labor market, health services, Education and housing. (Tetreault, 2012; Rionda, 2010; Barba, 2009; Del Popolo et al., 2009; World Bank, 2004; Appasamy et al., 2003) indicate that the indigenous population is subject to social exclusion Due to factors such as: (i) their ethnic status; (ii) their gender status; and (iii) their multidimensional poverty condition. In Mexico, as part of a strategy to combat poverty, the federal government seeks to achieve labor insertion, generation of productive projects and income, access to credit, microcredit and organization for the production of indigenous women. The empowerment of their productive capacities in indigenous women. According to Braddotti (1998), the indigenous women's empowerment strategy seeks to generate the conditions for the construction of their human development and their communities, by increasing their productive capacities in order to achieve personal and community development, A situation that implies a redefinition in its power structure (Batliwala, 1997: 194) and of intragroups and intergroups. The empowerment of indigenous women is aimed at overcoming unfavorable conditions of multidimensional poverty,

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gender and ethnicity that prevent access to social and market benefits. One of the strategies for combating poverty,<sup>1</sup> Which seeks to contribute to improving living conditions and social position in indigenous women, through the development of productive projects, providing them with training and economic resources for the operation of the same<sup>2</sup> Is the Productive Organization Program for Indigenous Women.

It should be noted that in accordance with the Rules of Operation of POPMI its scope of operation is defined in the following:<sup>3</sup>

1. In localities with 40% and more of indigenous population, and that show a high or very high marginalization, and are outside the municipal head offices;
2. In localities of interest and determined by the Planning and Consultation Unit under the National Commission for the Development of Indigenous Peoples (CDI).
3. In localities located in the municipalities that are in the National System for the Crusade against Hunger, with 40% and more of indigenous population and with a high or very high degree of marginalization.
4. In localities where an Indigenous Micro-regional Development Plan of the CDI has been developed.

Here we have to ask ourselves: What is the scope of POPMI as a strategy for the empowerment of indigenous women in places with multidimensional poverty and social exclusion? This article seeks to analyze the scope of the Productive Organization Program for Indigenous Women, focusing attention on indigenous women beneficiaries who present a high degree of social exclusion and multidimensional poverty.

The main objective of the present work is to identify scenarios in order to define lines of priority attention in support of the strategy for the empowerment of indigenous women in the State of Veracruz, as well as to provide information about the characteristics of indigenous women who were Beneficiaries in 2010, based on the analysis of the degree of multidimensional poverty and social exclusion.

#### **Empowerment of indigenous women in Mexico:-**

The first efforts to achieve the empowerment of women in rural Mexico have been through the support of civil associations, as documented (Olivares, 2006; Zapata et al., 2003 (2002), and in the literature (Martínez et al. In the public sphere, it is from the year 2004 when the Social Development Law is established, which defines, among others, the guideline on social development and assign responsibilities, rules of operation and definition of the target population that Is a beneficiary of the various social programs. In the case of POPMI, from 2004 onwards it emerged as a program with rules of operation and a guide for executing agencies.<sup>4</sup>

- According to the final report of the POPMI Evaluation of Consistency and Results 2007, the importance of the program was noted in the following areas:
- Nearly 40% of indigenous women benefiting from POPMI in 2007 and 2008 indicate that they have improved their living conditions compared to the initial year.
- By the end of 2009, it is estimated that at least 20% of the groups benefiting from indigenous women by POPMI since 2007 were still in operation.
- Of the total number of women organized and trained with an approved project in 2008, at least 30% have received training for the development of their project at the end of the year. Of the total of women's groups with

<sup>1</sup> See. INMUJERES. Productive Organization Program for Indigenous Women (POPMI). Retrieved from: <http://padrones.inmujeres.gob.mx/programaio.php?idPrograma=7>

<sup>2</sup> Productive Organization Program for Indigenous Women (POPMI) is a federal program run by the National Commission for the Development of Indigenous Peoples (CDI), which provides economic support for productive activities such as livestock, agriculture, aquaculture, forestry, handicrafts And services such as bakeries, grocery stores, stationery, among others, indigenous women's groups belonging to communities classified as marginalized, where the products derived from these activities can be for consumption or for marketing, technical assistance And training. See. [Http://www2.cdi.gob.mx/menu\\_1.html](Http://www2.cdi.gob.mx/menu_1.html)

<sup>3</sup> See. AGREEMENT for Modification to the Rules of Operation of the Productive Organization Program for Indigenous Women (POPMI), in charge of the General Coordination of Promotion of Indigenous Development for fiscal year 2013.) Retrieved from: [http://www2.cdi.gob.Mx/popmi\\_reglas\\_de\\_operacion\\_2013.pdf](http://www2.cdi.gob.Mx/popmi_reglas_de_operacion_2013.pdf)

<sup>4</sup> See. Center for Studies on the Advancement of Women and Gender Equity. Public policies, federal programs and budget targeting women from 2006 to 2009. Recovered from: [Http://www.diputados.gob.mx/documentos/CEAMEG/POLITICAS\\_CEAMEG.pdf](Http://www.diputados.gob.mx/documentos/CEAMEG/POLITICAS_CEAMEG.pdf)

a project authorized in 2008, at least 40% received information and training for the development of their project and on issues of equity, gender, rights and interculturality "<sup>5</sup>

As a strategy, the POPMI aims to replace the status of indigenous beneficiary women traditionally considered as passive subjects by the active actors, as is the proposal of (Sen, 2003: 44), in this way, the value of networks Social, grassroots organization and cooperative productive schemes in support of indigenous women.<sup>6</sup> However, it is important to note that at present, the operation of federal social development programs and their impact on the empowerment of indigenous women has not been analyzed, through the direct benefit of the public resources applied in the localities Which present multidimensional poverty and social exclusion.

At the national level, in 2014, 46.2% of the population is in poverty, of which 9.5% are in extreme poverty. At the state level, in the year 2014 in State of Veracruz 58.0% of the population is located in a condition of poverty, which represents 4.4 million people; While extreme poverty represented 17.2%, or 1.3 million in extreme poverty.<sup>7</sup> It is important to note that the poverty condition is more evident in the indigenous population than in the non-indigenous population. In this way, in the year 2014, 73.2% of the indigenous population was found to be in poverty, while only 43.2% of the non-indigenous population is in this condition. From the information provided by CONEVAL, it can be observed that in the year 2014, the states that increased levels of poverty and extreme poverty are: Morelos, Veracruz, Oaxaca, State of Mexico, Sinaloa, Coahuila, Hidalgo, Baja California Sur.<sup>8</sup> The State of Veracruz's Poverty and Assessment Report 2014, of the 32 entities, ranked the seventh in percentage of the population in poverty and the fourth in percentage of the population in extreme poverty.<sup>9</sup> Therefore, it is located within the ten institutions with the highest poverty in the country, where in 186 municipalities out of a total of 212, that is, 87.7% are in poverty.

#### **Theoretical framework:-**

Social exclusion as a social phenomenon has been addressed by: Medel (2016); Tetreault (2012); Rionda (2010); Del Popolo et al. (2009); Barba (2009); Laparra et. to the. (2007); Hickey (2007); Sen and Kliksberg (2007); Subirats et al. (2004); Uquillas et al. (2003); Estivill (2003); Sen (2003); Cabrera (2002); Sen (2000); Barry (1998); Appasamy et al. (1996); Castel (1995); Renes (1993); Donzelot (1992).

#### **Social exclusion:-**

The concept of social exclusion has to do with the process through which individuals or groups are totally or partially excluded from the society where they live, being that this category refers not only to the lack of employment. In this sense Subirats *et al.* (2004: 17) recognize that social exclusion is related to employment and the welfare state. While with Donzelot (1992); Renes (1993); Castel (1995) recognizes that social exclusion is not a concept of economic theory, its central paradigm being: scarcity, situation that leads to raise the issue in terms of poverty / wealth, equality / inequality in the possession and use of the goods produced. Barry (1998) points out that there is an association between income dispersion and social exclusion, and that public policy can make the difference between the degree of inequality that manifests itself in social exclusion. In a broader sense Sen and

<sup>5</sup> See. Autonomous University of Chapingo (2008). Final report: From the POPMI 2007 consistency and results evaluation p. 152.

<sup>6</sup> The POPMI program includes the equity and gender approach which seeks to encourage indigenous women who are assisted in the program to provide knowledge of their rights, seeking to raise their self-esteem and contribute to the empowerment of indigenous women in areas of very high and high marginalization And with little or no organizational experience, giving them the unique opportunity to organize themselves around a productive project to develop their skills and abilities and to integrate themselves with superior forms of organization that allow them to improve their quality of life. Final report: From the 2007 consistency and results evaluation of POPMI Op. Cit. Pp.10.

<sup>7</sup> See. CONEVAL (2015) Measuring poverty in Mexico and in the states. 2014. Retrieved from: [Http://www.coneval.gob.mx/Medicion/Documents/Pobreza%202014\\_CONEVAL\\_web.pdf](http://www.coneval.gob.mx/Medicion/Documents/Pobreza%202014_CONEVAL_web.pdf) consulted on April 7, 2016

<sup>8</sup> See. CONEVAL. Measuring poverty in Mexico and in the federative entities. 2014

<sup>9</sup> Medel-Ramírez Carlos. (2013) "Multidimensional Poverty, Indigenous Population and Social Exclusion in Mexico: A Look at the National Crusade against Hunger Program (SINHAMBRE 2013)" Retrieved from: [Http://www.academia.edu/7085028/Pobreza\\_multidimensional\\_poblaci%C3%B3n\\_ind%C3%ADgena\\_y\\_exclusi%C3%B3n\\_social\\_en\\_Mexico\\_Una\\_mirada\\_al\\_Programa\\_Cruzada\\_Nacional\\_contra\\_el\\_Hambre\\_SINHAMBRE\\_2013\\_](http://www.academia.edu/7085028/Pobreza_multidimensional_poblaci%C3%B3n_ind%C3%ADgena_y_exclusi%C3%B3n_social_en_Mexico_Una_mirada_al_Programa_Cruzada_Nacional_contra_el_Hambre_SINHAMBRE_2013_)



Klikberg (2007:27) consider that the set of deprivations or deficiencies not only corresponds to the material or economic aspect, but can also extend to other dimensions, that is, that limit the development of capacities in the people to lead a full and dignified life in the society in which they live, this set is what is called social exclusion. Finally, we agree with Hickey and du Toit (2007:3) in the sense that the phenomenon of social exclusion must recognize the perspective of class, ethnicity and gender, a situation that generates a multidimensional analysis of poverty, (2016a:134) proposes to integrate social exclusion as a missing dimension in the study and measurement of multidimensional poverty of Alkire-Foster (2007). For purposes of the present work, it is considered: **Definition 1. Social exclusion** is the "combination of various factors of social disadvantage or vulnerability that affect individuals and / or groups, which prevent or hinder access to mechanisms for development and social integration, as well as protection systems Social. "(Subirats et al., 2004: 19)

The phenomenon of social exclusion occurs both in the population living in poverty and in the one that does not have this condition. Estivill (2003: 20) points out in this regard that social exclusion and poverty are not equivalent. "You can be poor and not excluded and, conversely, not all the excluded are poor... although there is a broad circle in which poor and excluded people coincide." The measurement proposal is presented in Laparra et. Al (2007: 27) in pointing out that social exclusion is analyzed from the economic, political and social dimensions. In the economic dimension, social exclusion is manifested by the lack of access to the labor market and its normal salaries and wages, reflecting a decline in the share of consumption, a situation that generates poverty and economic deprivation. Cabrera, (2002: 84) refers that social exclusion is a social process of a structural character and that even in the presence of abundance, the limitation of access to goods and opportunities is observed. This is why (Sen and Klikberg, 2007) summarize that social exclusion reflects a set of deficiencies or deprivations, which is not only totally limited to the material or economic, but can extend to other dimensions that limit people's capacities to Lead a full, dignified and decent life in the society in which they live. In (Medel, 2016) a methodological proposal is presented for the estimation of the social exclusion index from the adaptation (Subirats et al., 2004: 19) and from the considerations of (Sen and Klikberg, 2007).

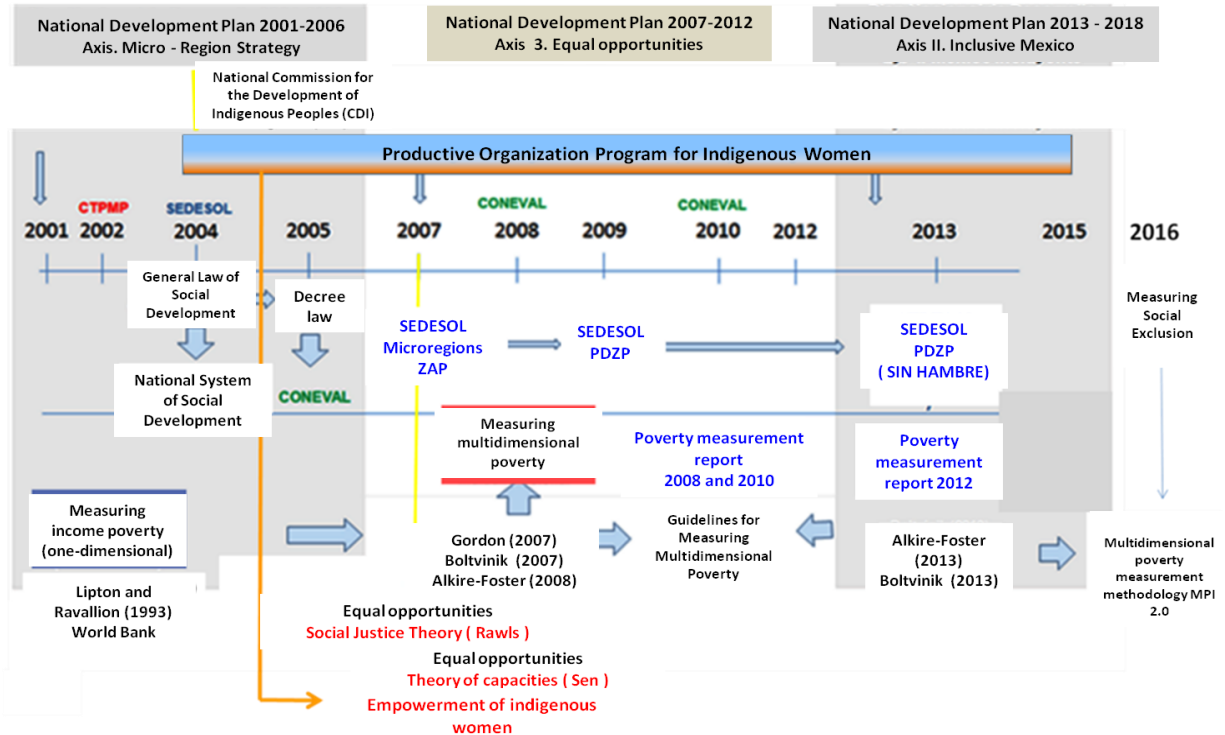
#### **Multidimensional Poverty:-**

In Mexico, poverty is a subject that has been extensively studied; however, the multidimensional poverty approach is relatively new. It is from (Sen, 2000: 3) that poverty is conceived as the deprivation of basic capacities and not only in terms of low income. In the logic proposed by Sen (Boltvinik, 2013: 25) defines poverty as a multidimensional process and Alkire-Foster (2007: 15) present a methodology that allows identifying two cuts, identified with the poverty line and deprivation In people identified as poor. In Mexico, the responsibility for determining the methodological criteria for the measurement of multidimensional poverty rests, by constitutional mandate in the Secretariat of Social Development (SEDESOL) supported by the National Council for the Evaluation of Social Development Policy (CONEVAL), which define To multidimensional poverty in the following terms: **Definition 2. Multidimensional poverty.** "A person is in poverty when he / she has at least one social deficit (in the six indicators of educational backwardness, access to health services, access to social security, quality and housing spaces, basic housing services and Access to food) and their income is insufficient to acquire the goods and services they require to meet their food and non-food needs. "<sup>10</sup>

As an institutional strategy that seeks to reduce vulnerability and increase the capacities of the poor and marginalized sectors, in order to promote human and sustainable development, in accordance with the National Development Plan 2001-2006, Based on the strategy that sought to promote the active participation of indigenous peoples in national development, in order to combat lags and marginalization respecting their uses and customs. The following Graph 1 shows the evolution of the multidimensional poverty approach and the empowerment of indigenous women in Mexico.

<sup>10</sup> See. CONEVAL. [Http://www.coneval.org.mx/Medicion/Paginas/Glosario.aspx](http://www.coneval.org.mx/Medicion/Paginas/Glosario.aspx)

**Graph 1:-** Evolution of the multidimensional poverty approach and Empowerment of indigenous women in Mexico. 2004-2016.



Source: Own elaboration. Adapted from Medel-Ramírez C. (2016). "Evaluation of the degree of social exclusion and multidimensional poverty in the indigenous communities in the State of Veracruz: The case of the program of development of priority areas." (Doctoral thesis). Economy faculty. PhD in Public Finance. Universidad Veracruzana. Mexico.

### Empowerment:-

POPMI emerged in 2004, being the responsibility of the National Commission for the Development of Indigenous Peoples (CDI), its main objective is to promote and finance the implementation of productive projects for indigenous women, through the promotion of processes Which, in addition to providing them with employment and income alternatives, will have an impact on their living conditions and social position, thereby achieving empowerment. Friedman (1992: 12) states in the following terms: **Definition 3. Empowerment** "... is a process related to access and control of three types of powers: a) social, understood as access to the basis of productive wealth; b) the political, or access of individuals to the decision-making process, especially those that affect their own future; And c) the psychological, understood in the sense of individual potentiality and capacity." In recent years the priority of the Mexican State and one of its central objectives in social policy is the fight against poverty. In this way, one of the strategies seeks to achieve the empowerment of the population in poverty, and particularly, in indigenous women. There is now an academic debate on how to measure social exclusion and multidimensional poverty. In this sense, (Medel, 2016) presents the methodological proposal to incorporate as a relevant dimension in the study of multidimensional poverty to social exclusion, in order to seek an explanation of the current situation of multidimensional poverty, and in particular the one that is manifested in the localities of the State of Veracruz that register a high degree of presence of native speakers.

### Methodology:-

#### Definition of the area of study:-

The study area is the State of Veracruz in Mexico and corresponds to the localities with population that present a high degree of presence of native speakers, with a very high or high degree of social exclusion and multidimensional poverty in the Year 2010. A first survey of the area of study is determined by the incorporation in POPMI, thus identifying indigenous women who are beneficiaries of a program that seeks their productive empowerment in the State of Veracruz.

**Sources of information:-**

The level of consultation of information corresponds to that presented at the level of territorial integration and whose level of disaggregation corresponds to the localities of the State of Veracruz. The data source corresponds to that contained in the statistical information of the General Census of Population and Housing of the year 2010 issued by the National Institute of Statistics and Geography (INEGI), as well as the information for 2010 of the Productive Organization Program for Indigenous Women (POPMI) issued by the National Commission for the Development of Indigenous Peoples (CDI). The estimation of the degree of social exclusion and multidimensional poverty at the local level for the year 2010 is presented in (Medel, 2016b) below is a brief description.

**Index of social exclusion:-**

The index of social exclusion (ES) is constructed as a weighted sum of 16 variables. For its construction, the main component method is used and the coefficients of the first component are weights. The selection of the variables is an adaptation proposed by (Medel, 2016b) of (Subirats, 2004). The data source corresponds to the statistical information contained in the General Census of Population and Housing for 2010.

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ID.	Key	Description
1	% 15y+ana	Percentage of population aged 15 years and over illiterate.
2	% 6a14nesc	Percentage of the population aged 6 to 14 years who do not attend school.
3	% 15y+basinc	Percentage of population aged 15 and over who have incomplete basic education.
4	% ssersalud	Percentage of population without right to health service.
5	% Vpt	Percentage of dwellings with ground floor.
6	% Vssersan	Percentage of households without health care.
7	% Vsagua	Percentage of private dwellings that do not have piped water.
8	% Vsdren	Percentage of inhabited private dwellings that do not have drainage.
9	% Vselec	Percentage of private dwellings inhabited that do not have electricity.
10	% Vslav	Percentage of private dwellings that do not have a washing machine.
11	% Vsref	Percentage of private dwellings that do not have a refrigerator.
12	% Pconlim	Percentage of population with disabilities.
13	% Pdesocup	Percentage of unoccupied population.
14	% GPLIm	Degree of presence of indigenous language.
15	% Ghacin	Degree of overcrowding in housing.
16	% Psrel	Percentage of population aged 5 years and over non-Catholic (includes non-religious).

In the estimation of social exclusion index the multivariate statistical technique is used using principal components. The information was processed with the application software Statgraphics Centurion XVII version 17.0.16 (32 bits) and XLSTAT Version 2015.4.01.22368.

**Social exclusion index** = 0.339966 \*% 15y + ana + 0.159867 \*% 6a14nesc + 0.313252 \*% 15y + basinc + 0.0631256 \*% ssersalud + 0.297299 \*% Vpt + 0.146342 \*% Vssersan + 0.150605 \*% Vsagua + 0.276032 \*% Vsdren + 0.321636 \*% Vselec + 0.386768 \*% Vslav + 0.414214 \*% Vsref - 0.00415242 \*% Pconlim - 0.00461739 \*% Pdesocup + 0.171148 \* GPLIm + 0.306127 \*% Ghacin + 0.0204543 \*% Psrel

Where the values of the variables in the equation have been standardized by subtracting their mean and dividing them by their standard deviations, this is shown in Graph 2.



**The multidimensional poverty index is constructed according to the Alkire-Foster method:**

Multidimensional poverty index =  $M_0 = H \times A$

**Where:**

H = The percentage of people who are poor, shows the incidence of multidimensional poverty.

A = The average of the proportion of weighted deprivations suffered by the poor. It shows the intensity of people's poverty - the joint distribution of their deprivation, where:

Being thus

$$M_0 = \mu(g^0(k)) = \frac{\sum_{i=1}^n \sum_{j=1}^d g_{ij}^0(k)}{nd}$$

The multidimensional poverty index satisfies properties such as consistency by subgroups, dimensional monotonicity, focus on poverty and deprivation. Since it is desired to have a multidimensional poverty index to analyze the periods 2000 and 2010 which allows the comparability of information through different periods in time and taking into account that satisfying the homogeneity of the information, the data source corresponds to the General Census of Population and Housing 2000 and 2010.

**Study population.-** In 2010, out of a total of 12,162 localities analyzed at the state level, 49.95% were placed in multidimensional poverty, ie 6,075 localities. Within this group 2,274 localities showed in addition to the condition of multidimensional poverty, a degree of social exclusion with levels: very high, high and medium.<sup>11</sup>

**Be:-**

Tot\_Loc = Total locations in 2010 in the State of Veracruz (12,162 locations)

A first dimension of the study area is done by identifying the condition of multidimensional poverty (<sup>poor</sup> IPM)<sup>12</sup>

**Where:-**

<sup>Poor</sup> IMP = Multidimensional poverty index, where its "multidimensional poor" status is identified.

A second dimension, corresponds to the localities that show a degree of exclusion Very High, High and Medium.

**Where:-**

GES<sup>Very High, High, Medium</sup> = Degree of exclusion Very High, High, Medium

A third item corresponds to the localities benefited and that operated in the Productive Organization Program for Indigenous Women (POPMI).

**Be:**

% APOPMI<sub>loc</sub> = Level of coverage of POPMI to give attention to localities that are multidimensional poor and have a very high, high and medium degree of social exclusion.

**Where:**

% APOPMI<sub>loc</sub> = [(POPMI<sub>loc</sub> IPM Poor Multidimensional, GES<sup>Very High, High, Medium</sup>) / POPMI<sub>loc</sub>] x 100

**where:**

POPMI<sub>loc</sub> IPM Poor multidimensional, GES<sup>Muy high, High, Medium</sup>) = Locations that are multidimensional poor and have a very high, high and medium Degree of Social Exclusion.

<sup>11</sup> See. Medel-Ramírez C. (2016a) "Evaluation of the degree of social exclusion and multidimensional poverty in indigenous communities in the State of Veracruz: The case of the program of development of priority areas." *Op. Cit.*

<sup>12</sup> The multidimensional poverty index (MPI) corresponds to that developed by Alkire-Foster (2007) and the Oxford Poverty & Human Development Initiative (OPHI), an indicator that reflects the deprivation of households in different dimensions. In this sense, the MPI allows to observe patterns of poverty different from those of monetary poverty, reflecting different sets of deprivations. The estimates referred to here for 2010 incorporate as a relevant dimension, social exclusion. Section 3.4.1 Multidimensional Poverty Index at the Local Level for the State of Veracruz, In: Medel-Ramírez C. (2016a) "Evaluation of the degree of social exclusion and multidimensional poverty in indigenous communities in the State of Veracruz: The case of Program for the development of priority areas." *Op.cit.* Pp. 115-137.

**and:**

POPMI<sub>loc</sub> = Locations incorporated in the Productive Organization Program for Indigenous Women (POPMI) in 2010.

**Where:**

% APOPMI<sub>loc</sub> = [(POPMI<sub>loc</sub> IPM Poor Multidimensional, GES<sup>Very High, High, Medium</sup>) / POPMI<sub>loc</sub>] x 100

**Where:**

(POPMI<sub>loc</sub> IPM Poor multidimensional, GES<sup>Muy high, High, Medium</sup>) = Locations that are multidimensional poor and have a very high, high and medium Degree of Social Exclusion.

**and:**

POPMI<sub>loc</sub> = Locations incorporated in the Productive Organization Program for Indigenous Women (POPMI) in 2010.

According to information provided by the CDI, in 2010 POPMI operated in 55 municipalities out of a total of 212, covering 196 localities in the State of Veracruz benefiting 2,443 indigenous women, with a contribution of 20,128,492.60 pesos for projects aimed at empowerment Indigenous women.

**Results and Discussion:-**

In order to evaluate the scope of the POPMI, as a strategy of productive empowerment of indigenous women, in the State of Veracruz in 2010, localities showing conditions of multidimensional poverty and social exclusion, the following results are presented, see below Table 1.

**Table 1:-** Localities in the State of Veracruz of Ignacio de la Llave, according to condition of multidimensional poverty, exclusion and participation in the Productive Organization Program for Indigenous Women (POPMI), 2010.

Characteristic of the location according to the selected condition	Number of locations
1. Number of places of study / 1	12,162
2. Locations according to the condition of multidimensional poverty: / 2	
— Poor multidimensional	6,075
— Not poor multidimensional	6 087
3. Localities according to the condition of multidimensional poverty and degree of social exclusion: / 3	
— In a condition of multidimensional poverty and with a high degree of social exclusion, high and medium.	2,274
— In a multidimensional poverty condition with a degree of social exclusion: Low and Very Low.	3,801
4. Productive Organization Program for Indigenous Women (POPMI)	
— Locations participating in POPMI / 4	197
— Locations participating in POPMI in a condition of multidimensional poverty and with a high degree of social exclusion, high and medium. /2. 3. 4	47

Source: Own elaboration, based on the following information:

INEGI. Territorial integration of the State of Veracruz of Ignacio de la Llave. 2010.

2/3 Medel-Ramírez C. (2016a) "Evaluation of the degree of social exclusion and multidimensional poverty in the indigenous communities in the State of Veracruz: The case of the program of development of priority areas" (Doctoral Thesis). Economy faculty. PhD in Public Finance. Universidad Veracruzana. Mexico. March 2016.

/ 4 National Commission for the Development of Indigenous Peoples. Productive Organization Program for Indigenous Women (POPMI). 2010.

It stands out in the year 2010 of the 12,162 localities, 6,075 localities present a multidimensional poverty condition, which represents 49.95% of the total localities in the State.

In a first estimate, the number of localities in a multidimensional poverty condition with a degree of social exclusion: very high, high or medium is 2,274. In 2010, 197 localities of the State of Veracruz participated in the POPMI, of these only 47 localities present a condition of multidimensional poverty and very high, medium or high degree of exclusion; In the following municipalities: Chicontepec, Atlahuilco, Coxquihui, Filomeno Mata, Hueyapan de Ocampo, Iamatlán, Ixcatepec, Los Reyes, Mecatlán, Pajapan, Papantla, Santiago Sochiapan, Soledad Atzompa, Tehuipango, Temapache, Tequila, Texcatepec, Tezonapa, Tlaquilpa, Xoxocotla, Zongolica, Zontecomatlán de López and Fuentes. POPMI localities in a multidimensional poverty situation and also show a degree of social exclusion: very high, high and medium, represent 23.86% of the total number of localities that operated in the program in 2010 (Table 2).

**Table 2:-** Number of Indigenous Women Benefited in the State of Veracruz de Ignacio de la Llave, according to the condition of multidimensional poverty, exclusion and participation in the Productive Organization Program for Indigenous Women (POPMI), 2010.

Indigenous women participating in POPMI according to selected characteristics	Total
<b>1. Productive Organization Program for Indigenous Women (POPMI)</b>	
— Number of indigenous women participating in POPMI / 4	2,443
— Number of indigenous women participating in POPMI in multidimensional poverty.	1,389
— Number of indigenous women participating in POPMI who are not in a multidimensional poverty condition.	1,054
— Number of indigenous women participating in POPMI in a situation of multidimensional poverty and with very high, medium and high degree of social exclusion. /2. 3. 4	542
— Number of indigenous women participating in POPMI in a multidimensional poverty condition with low social exclusion / 2/3/4	847

Source: Own elaboration, based on the following information:

/ 1 INEGI. Territorial integration of the State of Veracruz of Ignacio de la Llave. 2010.

/ 2/3 Medel-Ramírez C. (2016a) "Evaluation of the degree of social exclusion and multidimensional poverty in the indigenous communities in the State of Veracruz: The case of the program of development of priority areas" (Doctoral Thesis). Economy faculty. PhD in Public Finance. Universidad Veracruzana. Mexico. March 2016.

/ 4 National Commission for the Development of Indigenous Peoples. Productive Organization Program for Indigenous Women (POPMI). 2010.

In 2010 2,443 indigenous women were beneficiaries in POPMI, of which 56.86% were in multidimensional poverty, that is, 1,389 indigenous women benefited in POPMI in 2010 were placed in a condition of multidimensional poverty (See Table 2). With regard to indigenous women who were in a situation of multidimensional poverty and who participated in POPMI in 2010, only 39.02% had a very high, high and / or medium degree of social exclusion, which corresponds to 542 indigenous women benefited. While 60.98% correspond to indigenous women who showed a low degree of social exclusion. Table 3 shows that the total amount applied in the program of 20,128,493.00 pesos, of which 11,241,656.00 pesos were channeled to localities in situation of multidimensional poverty, however, it is important to note that only 4,460,016.00 pesos were channeled for generation Of productive projects of indigenous women who present a condition of multidimensional poverty and very high, medium or high degree of social exclusion, a figure that represents only 22.16% for the population in vulnerable situations. It is also noted that 58.86% of the allocation of POPMI resources is allocated to the population of Nahuatl, 13.35%, for Totonaco speakers, 5.16%, Otomí speakers, 4.00%, Popoluca, 0.80%, Tepehua and Others with 17.83%. See Table 3 below.

**Table 3:-** Total amount allocated in the Program Productive Organization for Indigenous Women (POPMI) 2010 according to condition of multidimensional poverty, social exclusion and indigenous language.

Characteristics of POPMI according to selected conditions	Total (Pesos)
<b>1. Productive Organization Program for Indigenous Women (POPMI). /1</b>	20,128,493
<b>2. Applied in localities according to the condition of multidimensional poverty / 2</b>	
— Poor multidimensional	11,241,656
— Not poor multidimensional	8,886,837
<b>3. Applied in localities according to the condition of multidimensional poverty and degree of social exclusion: / 1/2</b>	
— In a condition of multidimensional poverty and with a high degree of social exclusion, high and medium.	4,460,016
— In a multidimensional poverty condition with a degree of social exclusion: Low and Very Low.	6,781,640
<b>4. Applied in localities according to the condition of multidimensional poverty, degree of social exclusion very high, high and medium and indigenous language: / 1/2</b>	2,625,202
— Nahuatl	595,311
— Totonaco	230,300
— Otomí	178,315
— Popoluca	35,860
— Tepehua	795,028
— Others	

Source: Own elaboration, based on the following information:

/ 1 National Commission for the Development of Indigenous Peoples. Productive Organization Program for Indigenous Women (POPMI). 2010.

/ 2 Medel- Ramírez C. (2016a) "Evaluation of the degree of social exclusion and multidimensional poverty in indigenous communities in the State of Veracruz: The case of the program of development of priority areas." Op. Cit.

In the following table 4, it is observed that the total resources allocated in the POPMI 20,128,493 pesos were distributed in localities in situation of multidimensional poverty the sum of 11,241,656 pesos, which represents 55.85%. Regarding the sum of resources allocated to POPMI to indigenous women who are placed in a multidimensional poverty condition, it is observed that 4,370,585 pesos were allocated to those that showed a high level of social exclusion, high and medium, as a whole Represented 34.59% of the resources allocated under this category. On the other hand, 6,871,071 pesos were allocated, that is, 61.12% were applied to the benefit of indigenous women who were placed in a condition of low social exclusion.

According to the social problems detected in the localities of origin of indigenous women benefited in POPMI in 2010, it is highlighted that of the total resources allocated in POPMI, 28.13% were allocated to indigenous women whose social problems identified correspond to the Economic area, in which 5,661,998 pesos were allocated. Of this last figure, 69.20% is destined in localities where a lack of employment or emigration was identified; and 19.08% went to localities where poverty or marginalization was identified.



**Table 4:-** Total amount allocated in the Program Productive Organization for Indigenous Women (POPMI) 2010 according to the condition of multidimensional poverty, social exclusion and social problems of economic area identified in the locality.

Characteristics of POPMI according to selected conditions	Total (Pesos)
<b>1. Productive Organization Program for Indigenous Women (POPMI). /1</b>	20,128,493
<b>2. Applied to locations in multidimensional poverty conditions: / 2</b>	
— Poor multidimensional	11,241,656
<b>3. Applied in localities in multidimensional poverty condition according to degree of social exclusion</b>	
— Very high degree of social exclusion	75,835
— Degree of high social exclusion	165,220
— Degree of average social exclusion	4,129,530
— Degree of low social exclusion	6,871,071
<b>4. Applied to localities in multidimensional poverty condition according to social problems of an economic nature detected in the locality: / 1/2</b>	5,661,998
— Lack of employment or emigration	3,917,972
— Poverty or marginalization	1,080,472
— Lack of road or transportation	364,579
— Drought, flood or adverse weather	130,000
— Lack of financial resources	93,140
— Irregularity or dispute related to land tenure	75,835

Source: Own elaboration, based on the following information:

/ 1 National Commission for the Development of Indigenous Peoples. Productive Organization Program for Indigenous Women (POPMI). 2010.

/ 2 Medel-Ramírez C. (2016a) "Evaluation of the degree of social exclusion and multidimensional poverty in indigenous communities in the State of Veracruz: The case of the program of development of priority areas." Op. Cit.

In 2010, the total number of indigenous women benefited in POPMI was 2,443; For its part, the number of indigenous women in multidimensional poverty and with a high level of social exclusion, high and medium, correspond only to 542 beneficiaries in POPMI in that year. See Table 5.

The resources granted by the POPMI were distributed mainly among indigenous women aged 30 to 39 years, which represents 27.09%; For its part, support for indigenous women aged 60 and over represented only 6.95%.

The next Table 5 shows the analysis of multidimensional poverty throughout the period 2000 and 2010, which correspond to 2,443 indigenous women beneficiaries in the POPMI program, classified according to the multidimensional poverty condition shown in the locality corresponding to the year 2010.

**Table 5:-** Number of Women benefited from the Program Productive Organization for Indigenous Women (POPMI) / 1 according to their condition of multidimensional poverty / 2, exclusion / 3 in localities of the State of Veracruz, from 2000 to 2010.

Evolution of the condition of multidimensional poverty	2000	2010	Estimate
Number of women benefited in localities that improved their condition of multidimensional poverty.	Poor multidimensional	Not poor multidimensional	619
Number of Women benefited in localities that worsened their condition of multidimensional poverty.	Not poor multidimensional	Poor multidimensional	504
Number of Women benefited in localities that maintain positive stability in their condition of multidimensional poverty.	Not poor multidimensional	Not poor multidimensional	424

Number of Women benefited in localities that maintain negative stability in their condition of multidimensional poverty.	Poor multidimensional	Poor multidimensional	885
Number of Women benefited in localities without comparability in the year 2000 to 2010.	Not comparable	Not comparable	11
Total of women benefited in POPMI.			2,443

Source: Own elaboration, based on the following information:

/ 1 National Commission for the Development of Indigenous Peoples. Productive Organization Program for Indigenous Women (POPMI). 2010.

/ 2 Medel-Ramírez C. (2016a) "Evaluation of the degree of social exclusion and multidimensional poverty in indigenous communities in the State of Veracruz: The case of the program of development of priority areas." Op. Cit.

/ 3 The degree of exclusion is considered very high, high and medium.

"Not comparable" means is not available for comparability 2000 to 2010.

Of these, 619 indigenous women benefited from the POPMI program were located in villages that show an improvement in their multidimensional poverty status, from a multidimensional poverty in 2000 to a multidimensional non-poor in 2010. From the localities that present this characteristic are the municipality of Cosamaloapan de Carpio when registering 65 indigenous women benefited in the POPMI followed by Chicontepec with 52, Uxpanapa and Coyutla with 47 each.

For its part, 424 indigenous women benefited in the POPMI were located localities that show a favorable position since in 2000 they were non-poor multidimensional and this condition is maintained in 2010. The municipality of Tatahuicapan de Juárez registered 53 indigenous women, Uxpanapa with 47, Coyutla with 42, Playa Vicente with 38 and Chicontepec with 33.

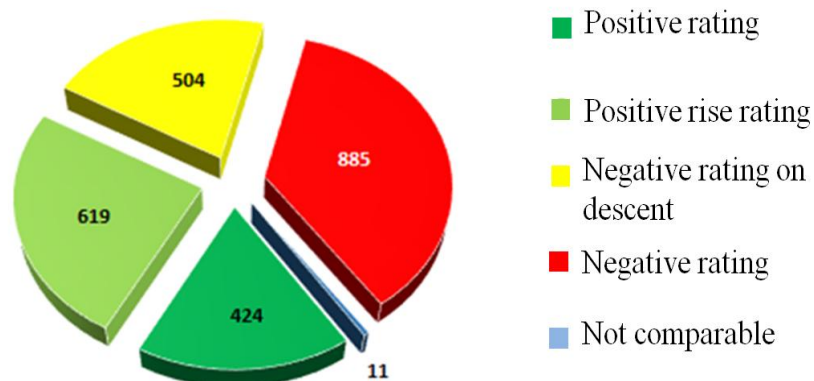
Of the 504 indigenous women who were beneficiaries of the POPMI program, locations were found that showed a deterioration since they were non-poor multidimensional in 2000 and in 2010 presented a multidimensional poor condition. The municipality of Chiconamel stands out, with 62 indigenous women benefiting from POPMI, Tlachichilco, Tehuipango and Hueyapan de Ocampo with 32; And Papantla with 27.

Finally, 885 indigenous women benefited in the POPMI are placed in an unfavorable situation since they presented a condition of poor multidimensional in the year 2000 and in the year 2010. The municipality of Papantla registered 100 beneficiary indigenous women, Soledad Atzompa with 77, Chicontepec with 58, Hueyapan de Ocampo with 53 and Mecatlán with 36.

In order to achieve a comparability between the years 2000 and 2010, 5 levels of qualification of the localities are identified according to their condition of multidimensional poverty: a). With positive qualification, they correspond to those localities that were identified as non-poor multidimensional, both in the year 2000 and in the year 2010; B). With a positive rating on the rise, they correspond to those localities that were identified as multidimensional poor in the year 2000 and as non-poor multidimensional ones in the year 2010; C). With negative qualification in decline, they correspond to those localities that were identified as multidimensional non-poor in the year 2000 and as multidimensional poor in the year 2010; D). With negative qualification, they correspond to those localities that were identified as multidimensional poor both in the year 2000 and in the year 2010; And e). Not comparable, they correspond to those localities that do not have information for comparability between the year 2000 and 2010. Thus, according to the information in Graph 3, the following is observed:

- 885 indigenous women benefited from the POPMI program were located in localities that show a negative condition with respect to their multidimensional poverty, that is, they correspond to localities that were identified as multidimensional poor in the year 2000 and that in 2010 maintained That condition.
- 504 indigenous women benefited were located in localities that show a declining negative condition with respect to their condition of multidimensional poverty, that is to say that they correspond to localities that were identified as non-poor multidimensional in the year 2000 and that in the year 2010 they were identified As multidimensional poor.

**Graph 3:-** Distribution of indigenous women beneficiaries in the POPMI program according to the locality's qualification regarding their condition of multidimensional poverty in the period 2000-2010.



**Source:**

/ 1 National Commission for the Development of Indigenous Peoples. Productive Organization Program for Indigenous Women (POPMI). 2010.

/ 2 Medel-Ramírez C. (2016) "Evaluation of the degree of social exclusion and multidimensional poverty in indigenous communities in the State of Veracruz: The case of the program of development of priority areas." Op. Cit.

- 619 indigenous women benefited were located in localities that show a positive condition on the rise with respect to their condition of multidimensional poverty, that is, they correspond to localities that were identified as multidimensional poor in the year 2000 and that in the year were identified as not Poor multidimensional in the year 2010.
- 424 indigenous women benefited were located in localities that show a positive condition with respect to their condition of multidimensional poverty, that is, they correspond to localities that were identified as multidimensional non-poor in both 2000 and 2010.
- And finally, 11 indigenous women benefited were located in localities that do not have information for comparability between 2000 and 2010.

**Conclusions:-**

The analysis of multidimensional poverty is an important factor in analyzing the distribution of federal public resources applied in the operation of the POPMI program, since it allows the identification of scenarios, based on information from the period 2000 to 2010, since it establishes Strategies for the empowerment of indigenous women, with the following lines of priority attention:

- a. Give attention to the 504 localities that worsened their condition of multidimensional poverty in 2010;
- b. Give priority attention to the 885 localities that present a negative stagnation in their condition of multidimensional poverty.
- c. Strengthen support for the empowerment of indigenous women in 619 localities that improved their condition of multidimensional poverty.
- d. Continue to promote support in the 424 localities that maintain positive stability in their multidimensional poverty situation.

**From the obtained results we conclude that:-**

1. Locations in the State of Veracruz where indigenous presence and multidimensional poverty and high levels of social exclusion have been excluded in the strategy proposed by the Productive Organization Program for Indigenous Women (POPMI) in the State of Veracruz.
2. The status of indigenous language speaker in localities with high or very high levels of marginalization, as well as high or very high rates of social backwardness are factors that condition a high rate of social exclusion, since the condition of The condition of having a high degree of indigenous presence (% GPLIloc) and having a social backwardness index (RS = high or very high) is a detonating factor to have a high social exclusion rate.
3. The fight against poverty, while recognizing its multidimensional character, examines the degree of social exclusion in localities with a high presence of indigenous language speakers, since the selection criteria in the rules of operation of the POPMI for the transfer of federal public resource applied in PDZP at localities level is exclusive.

4. The current social expenditure policy aimed at seeking the empowerment of productive capacities in the indigenous population; And increasing the capacities of indigenous women, who are placed in unfavorable conditions of both multidimensional poverty and social exclusion, does not solve the problem of social exclusion.

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### RESEARCH ARTICLE

#### MEASUREMENT OF PREOPERATIVE ANXIETY AND DETECTION OF PATIENTS' ANESTHETIC CONCERNS USING VAS.

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Anxiety, Preoperative anxiety, VAS, Assessing anxiety

#### Abstract

**Background:** Preoperative anxiety is unpleasant feeling; it is considered to be normal event in patients waiting for surgery. Preoperative anxiety has adverse effects on patients, recovery and outcomes of operation. It can cause delay in recovery, post-operative pain and nausea, also it may cause increasing in anesthesia dose given to patients. There are many factors increase anxiety before surgery; one is the gender, where females experience more anxiety than males. Preoperative anxiety can be decreased by increasing awareness of patients about surgery nature, anesthesia and the development in surgery techniques.

**Aim:** The objective of this study is to measure preoperative anxiety and identifies certain patient characteristics that predispose to high anxiety, and describes the quantity and quality of anxiety that patients experience preoperatively.

**Methods:** This study was conducted on 190 patients post operatively. A visual analogue scale questionnaire containing 10 questions was used to record patients, answers.

**Results:** Patients experienced preoperative anxiety with different degrees and woman was more anxious than man.

**Conclusion:** Preoperative anxiety is very common in candidates of surgery.

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#### Introduction:-

Surgery is associated with patient anxiety. Anxiety is known as unpleasant feeling which may leads to avoidance of patient to perform planned operation (Yilmaz et al, 2011). Anxiety is a result of anticipation of threatening event (Hernández-Palazón et al, 2015), here operation is the event. Patients consider that day of surgery is the most threatening day in their lives (Nigussie et al, 2014). The time prior to operation is critical and it is a provoking cause for anxiety for patients (Johnston, 1989; Domar et al, 1989). Preoperative anxiety is a tension secondary to many events such as surgery, disease and hospitalization (Yilmaz et al, 2011). Preoperative anxiety represents 11 % to 80% in adults (Maranets et al, 1999) it has higher effect on women especially young and it affects candidates of major surgery (Roomruangwong et al, 2012), patients without previous exposure to operations (Kim et al, 2010) and it differs according to type of surgery (Maranets et al, 1999). It was found that anxiety incidence in patients of cardiac surgery was 94% (Hernández-Palazón et al, 2015), while other studies (Navarro-García et al, 2011; Martin et

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al, 2004; Pochard et al, 1996; Underwood et al, 1993) reported that incidence rate of anxiety ranged from 20% to 35%. Preoperative anxiety ranges from 60-90% in western population (Saini et al, 2016). Most candidates of surgery experience preoperative anxiety (Johnston, 1989; Domar et al, 1989; Badner et al, 1990). Actually preoperative anxiety is not unusual reaction of patient waiting for surgery (Yilmaz et al, 2011). Once the surgery is planned and determined,

patients' anxiety begins and it increases by entering hospital (Klopfenstein et al, 2000). There are many factors that can affect the degree of patients' anxiety including prior exposure to surgery, age, gender and education (Badner et al, 1990). Anxiety cause changes in sympathetic, parasympathetic and endocrine stimulation (Matthias et al, 2012). Preoperative anxiety is related to many adverse events such as delayed jaw relaxation, autonomic fluctuations, coughing during induction of anesthesia, increased pain, nausea and increased risk for infection (Nigussie et al, 2014). Anxious and non-anxious patients respond variously to anesthesia. Larger doses of anesthesia and postoperative drugs are required for anxious patients (Jafar et al, 2012), also they may need to stay longer in hospital (Matthias et al, 2012) because they experienced delay in recovery as a result of anxiety (Nigussie et al, 2014). Prolongation of mechanical ventilation also was mentioned (Hernández-Palazón et al, 2015), for all these reasons it is important to measure anxiety for those patients waiting for surgery. Visual Analogue Scale is one of many ways to evaluate anxiety (Jafar et al, 2012). It is used to evaluate anxiety preoperatively and it is a useful and easy method to be applied, also it allows determination of anxiety level in different surgical patients [Kindler et al, 2000; Boker et al, 2002; Millar et al, 1995; Oddershede et al, 2014; Perks et al, 2009; Shafer et al, 1996]. So the aim of this study is to measure preoperative anxiety before operation and describes the quantity of anxiety that patients experience preoperatively using visual analogue scale.

### **Materials and Methods Subjects:-**

This cross sectional observational study was performed on 190 patients in the period from 20<sup>th</sup> January 2017 to 7<sup>th</sup> February 2017 from Yamama Hospital in Riyadh, an approval from the hospital was obtained to perform this study. This study was performed after operation, participants were asked to answer the questions they all agreed and welcomed. There was no exclusion in this study where all participants answered all questions.

### **Patient Questionnaire:-**

A scored visual analogue scale questionnaire containing 10 questions was established to record the answers of patients and quantify anxiety. The score scale ranged from 0 to 10, zero= no anxiety while 10= extreme anxiety. A very good reliability and internal consistency of the items in the questionnaire were obtained according to the Cronbach's alpha at 0.833.

### **Statistical analysis:-**

Data were analyzed by using Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA). Continuous variables were expressed as mean  $\pm$  standard deviation and categorical variables were expressed as percentages. The t-test was used for continuous variables. The Cronbach's alpha was used to assess reliability and internal consistency of the items in the questionnaire, the Cronbach's alpha was scored at 0.833. P-value <0.05 was considered statistically significant.

### **Results:-**

This study was conducted on 190 patients after performing their operations; the females were dominant in this study than males where the male number was 85 (44.74%) while female number was 105 (55.26%). The mean age of participants was  $33.10 \pm 9.81$ , most of them were Saudi 176 (92.63%) and only 14 (7.37%) were non Saudi. Most of individuals were from Urban areas 185 (97.37%) and high educational level 126 (66.32%) while those from rural areas were 5 (2.63%) only and secondary school education or less level was 64 (33.68%). The results of questions were represented by mean  $\pm$  SD. Anxiety scoring started from zero which means no anxiety ascending to reach 10 which mean the maximum anxiety, the mean of each question for this study did not exceed 5. In the present study, no awaking was the more concern in patients (mean =4.91) followed by fearing of physical and mental harm after operation (mean=4.78) then awareness during anesthesia (mean=4.58), the next concern was post-operative pain (mean=4.54), however the last fearing was being at mercy of medical stuff (mean=3.11), while post-operative nausea and vomiting (mean=3.97) was higher than waiting for surgery (Mean=3.56). The results of questionnaire are summarized in table 1 for all subjects and regarding sex.

**Table 1:-** Mean of each question in the questionnaire for all subjects and each gender

Item number	Statement	All subjects N=190	Male N=85	Female N=105	*P-value
		Mean(SD)	Mean(SD)	Mean(SD)	
Q1	waiting for the operation	3.56 (2.96)	3.12 (1.79)	3.92 (3.61)	<0.001
Q2	Being at the mercy of medical staff	3.11 (2.80)	3.00 (2.00)	3.19 (3.32)	0.047
Q3	Results of the operation	4.04 (3.18)	4.28 (2.76)	3.84 (3.49)	0.626
Q4	Postoperative pain	4.56 (2.84)	4.39 (2.36)	4.70 (3.19)	0.328
Q5	Discomfort after the operation	4.53 (2.75)	4.92 (2.17)	4.21 (3.12)	0.447
Q6	Postoperative nausea and vomiting	3.97 (2.92)	4.88 (2.71)	3.24 (2.88)	0.067
Q7	Not knowing what is happening	4.54 (3.09)	5.62 (2.82)	3.67 (3.04)	<0.001
Q8	Physical/mental harm after the operation	4.78 (3.91)	6.44 (3.67)	3.44 (3.59)	<0.001
Q9	No awakening from anesthesia	4.91 (4.06)	6.38 (3.82)	3.72 (3.87)	<0.001
Q10	Awareness during anesthesia	4.58 (3.78)	6.22 (3.74)	3.25 (3.27)	<0.001
Total score for all items out of 100		42.57 (23.60)	49.25 (22.27)	37.17 (23.36)	<0.001

\*P-value <0.05 was considered statistically significant.

An assessment for anxiety score was performed to investigate the anxiety level of patients before surgery. Severe anxiety at a range of 76-100 represents 58 (30.53%) of individuals in this study, while higher percent of persons experienced a moderate anxiety 72 (37.89%) at rang of 51-75 of scores, mild anxiety at arrange of 25-50 was in 60 (31.58%) of participants, all subjects suffered from anxiety with different degrees, table2.

**Table 2:-**Assessing Anxiety score of patients before surgery

Range of score	Interpretation of score	Frequency(%)	
76-100	Severe Anxiety	58	(30.53)
51-75	Moderate	72	(37.89)
25-50	Mild	60	(31.58)
< 25	None to slight	0	(0.00)

## Discussion:-

Anxiety is a usual reaction to stress and it is common in candidates for surgery (Jafar et al, 2012). It is known as preoperative anxiety. Preoperative anxiety is related to an alteration in neuroendocrine response which cause deleterious postoperatively (Ai et al, 2005; Pearson et al, 2005). Improving surgical outcome related to reducing preoperative anxiety (Roomruangwonget al, 2000). An ideal assessing tool for preoperative anxiety must be short, easy, reliable and accurate tool to measure anxiety. Visual Analogue Scale (VAS) questionnaire is valid to measure anxiety (Matthias et al, 2012) because it is short, easy, simple and reliable for the measurement of preoperative anxiety (Elkins et al, 2004; Kindler et al, 2000), for these reasons we used VAS in this study to assess anxiety. The most common reasons for preoperative anxiety are fearing of mistakes in operation that can harm patients, this reason represents 64%, fearing from not waking up and represents 58.4% and only 8% represents worrying about post-operative nausea and vomiting (Nigussie et al, 2014). Also waiting for operation, worrying about the physical and mental harm (Perks et al, 2009), fear of the surgery and postoperative pain (Caumo et al, 2001) are reported. In a study by Kindler et al (Kindler et al, 2000), they found that waiting for the operation, being at the mercy of medical staff, result of the operation and postoperative pain were the first to fourth respectively in order as causes of anxiety, however in our study these four reasons ranked in different order. No awaking, physical and mental harm after operation, awareness during anesthesia and post-operative pain were the top reasons of anxiety respectively in our patients, while being at the mercy of medical staff was the last one. The concern about not awaking was the first reason for anxiety in our study, this may be due to low level of awareness of patients about operation nature and the development in operation techniques. In a study of United States (Bondy et al, 1999), it was reported that the



preoperative anxiety was reduced by giving information to the patients about procedures. Kiyohara et al (2004) study showed that patients, who received information about the surgical procedure, had lower anxiety levels. Also a study in India (Vandana et al, 2009), reported the same results about developing less preoperative anxiety from patients who received information about surgery than those who were not informed, so providing patients with information about disease and operation will decrease preoperative anxiety. Awareness during anesthesia was one of the 4 top concerns causing anxiety, actually it was the third in order, so it is important to increase patient awareness about anesthesia technique and safety by visiting anesthesiologist before surgery to decrease their fearing. The last reason in the present study was being at the mercy of medical staff, while study by Kindler et al (2000) showed that last concern was awareness during anesthesia, this differences in results may returns to differences in culture, public awareness and education levels, although there is difference in ordering of anxiety reasons, preoperative anxiety still exist whatever its cause. In a study by Jawaid et al (2007) and MacClean et al (1990), they reported that patient's highest concern was post-operative pain, while in the present study its order was number four. The 7<sup>th</sup> concern in our patients was the results of operation, while in a study by Akinsulore et al (2015), this reason was the first in their patients and the third in Jawaid study (Jawaid et al, 2007). A study in Port Harcourt Teaching Hospital in southeastern Nigeria (Ebirim et al, 2010) and a study by Nigussie et al (2014), they found that Worrying about post-operative nausea and vomiting was the last concern of patients, this is near to our findings in the current study where this concern ranked the 8<sup>th</sup> one of 10 concerns. Many studies (Saini et al, 2016; Perks et al, 2009; Jawaid et al, 2007; Norris et al, 1967; Karanci et al, 2003) reported that female gender is one of many factors associated with preoperative anxiety. In a study by Yilmaz et al (2011), they reported that anxiety scores were higher among females than males. Additionally Jafar and Khan (2012) found that Females were more anxious than males with preoperative anxiety, these results are in agreement with ours. In the present study females experienced more anxiety than males (P-value < 0.001). However Nishimori et al (2002) showed that there is no association between gender and anxiety. Also another studies (Hernández-Palazón et al, 2015; Navarro-García et al, 2011) reported that there was no significant difference between males and females regarding the incidence of anxiety. Several studies (Matthias et al, 2012; Nishimori et al, 2002; Berth et al, 2007; Sirinan et al, 2000) mentioned that Females were more anxious about anesthesia than males, this in agreement with our study, where females had a fear of no awaking from anesthesia and awareness during anesthesia than males. By assessing anxiety in this study, we found that moderate anxiety was dominant in patients (37.89%) while mild anxiety was experienced by 31.58 % of our patients, severe anxiety represented 30.53 % of the individuals of this study. In study by (Kalkhoran et al, 2007), they found that 66.7% of patients had moderate anxiety. Other studies reported that surgical patients have moderate to severe anxiety (Karanci et al, 2003; Yardak et al, 2004; Akkas et al, 2004).

### Conclusion:-

In conclusion, preoperative anxiety is very common in candidates of surgery but with different degrees. Females are more anxious than males, so it is important to decrease patient anxiety before operation.

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## RESEARCH ARTICLE

### INFLUENCE OF DIELECTRIC CONSTANT ON PROTONATION EQUILIBRIA OF MERCAPTOSUCCINIC ACID, L-DOPA AND 1, 10-PHENANTHROLINE IN AQUEOUS SOLUTIONS OF DIMETHYLFORMAMIDE

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#### Abstract

The protonation constant values of mercaptosuccinic acid, L-dopa and 1, 10-phenanthroline were determined in dimethylformamide (0-60% v/v) at 303.0 K at ionic strength of 0.16 mol L<sup>-1</sup> using pH-metric technique. The protonation constants were calculated with the computer program MINQUAD75 and selection of the best fit models was based on the statistical parameters. The log K values were found to increase of the organic solvent content. The linear variations of the protonation constants with the reciprocal of the dielectric constant of the medium have been attributed to the dominance of electrostatic forces. Distribution of species, protonation equilibria and effect of influential parameters on the protonation constants have also been presented.

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#### Introduction:-

Mercaptosuccinic acid (MSA) or thiomalic acid (HOOC-CH (SH)-CH<sub>2</sub>-COOH) is a dicarboxylic acid containing a thiol functional group (-SH group) instead of an -OH group in malic acid [1]. It is also used as a building block in the synthesis of novel polyanionic inhibitors of human immunodeficiency virus and other viruses [2], and as a starting material in the synthesis of isocysteine, an important non-proteinogenic amino acid in a potent peptide inhibitor of stromelysin [3]. In addition, sodium salt of the anionic Au (I) complex of 2-mercaptosuccinic acid is an effective anti-arthritis drug [4-9]. MSA is widely applied in industry and technology as corrosion inhibitor, electrolyte for electroplating bath, and components of bleach-fixing baths for photographic films and as an active material for depilatories and hair strengthening [10]. L-dopa (L-3, 4-dihydroxyphenylalanine) is a naturally occurring dietary supplement and psychoactive drug found in certain kinds of food and herbs, and is synthesized from the essential precursor to the neurotransmitters dopamine, norepinephrine (noradrenalin) and epinephrine (adrenaline). Dopa is used as pro-drug to increase dopamine levels in the treatment of Parkinson's disease [11, 12], since it is able to cross the blood-brain barrier whereas dopamine itself cannot. 1, 10-Phenanthroline (phen) is an organic compound. It is a bi-dentate ligand in coordination chemistry, it forms strong complexes with many metal ions. Phen, an N-donor ligand with planar aromatic rings is known [13-19] to form protonated species in acidic solution .i.e., H (phen)<sup>+</sup> and H(phen)<sup>2+</sup> in the pH range of 2.0-9.0, and H<sub>2</sub>(phen)<sup>2+</sup> at [H<sup>+</sup>] > 1 mol dm<sup>-3</sup>. Due to hydrophobicity of aromatic rings in phen, the solubility of the neutral species is low in water which remarkably increases in organic solvents and also in aqua-organic mixtures.

In this paper, the protonation constants of mercaptosuccinic acid, dopa and phen [20] have been determined pH metrically in aqueous solutions of dimethylformamide (dmf) which is a common solvent for chemical reactions.

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## Experimental:-

### Chemicals and Standard Solutions:-

All the chemicals used in this investigation were of Analytical Reagent grade purity. Triple-distilled deionised water was used for the preparation of all the solutions. 0.05 M solution of mercaptosuccinic acid (Himedia), L-dopa (Himedia), 1, 10-phenanthroline (Merck, Germany) was prepared by maintaining 0.05 M nitric acid concentration to increase the solubility. Dimethylformamide (Merck, Germany) was used as received. 0.2 M nitric acid solution was prepared. 2.0 M sodium nitrate (Merck, Germany) was prepared to maintain the ionic strength in the titrand. 0.4 M sodium nitrate (Merck, Germany) was used as titrant. The acid and base solutions were standardized by standard methods. Thus, the concentration of the alkali was determined by titrating it with the standard oxalic acid and potassium hydrogen phthalate solutions, while the normality of nitric acid was determined using standardized sodium hydroxide and the primary standard borax solutions. In assessing the errors analysis of variance of one way classification (ANOVA) using the computer program COST [21]. The concentration of the carbonate-free sodium hydroxide solution was determined by titrating it against nitric acid solution using the gran plot method [22].

### Alkalimetric Titrations:-

The pH measurements proton-ligand system were carried out in the aqueous media containing varying compositions of organic solvent (dmf) in the pH range of 0-60% v/v maintaining an ionic strength of 0.16 M with sodium nitrate at  $303.0 \pm 0.1$  K using a digital pH meter ELICO (readability 0.01) with mechanical stirring carried by a teflon stirrer. The glass electrode was equilibrated in a well stirred dmf-water mixtures containing alkali to check the complete equilibration of the glass electrode. The calomel electrode was refilled with dmf-water mixtures periodically. Potassium hydrogen phthalate (0.05M) and borax (0.01M) solutions were used to calibrate the pH meter. In each titration, the titrand consisted of approximately 1mmol of nitric acid in a total volume of 50ml. The amounts of MSA, L-dopa, phen in the titrands ranged between 0.25 and 0.375, 0.50 mmols. The glass electrode was equilibrated in a well stirred organic solvent-water mixture containing inert electrolyte for several days. At regular intervals, the strong acid was titrated against alkali to check the complete equilibration of the glass electrode. The details of the experimental procedure and titration assembly used in our laboratory have been given elsewhere [23].

## Results and Discussion:-

### Best fit Model:-

The computer program SCPHD [24] was used to calculate the correction factor applied to pH meter dial reading to calculate approximate protonation constants of mercaptosuccinic acid, L-Dopa, and 1,10-phenanthroline. The best fit chemical model for each system investigated was arrived at using non-linear least-squares method in the initial refinement and reliable convergence of Marquardt algorithm [25]. The variation of stepwise constants was analyzed mainly on electrostatic grounds on the basis of solute-solute and solute-solvent interactions. The results of best fit models that contain the type of species and overall protonation constants of MSA, dopa, phen along with some important statistical parameters are given in Table 1. A low standard deviation in  $\log \beta$  indicates the precision of these parameters. The small values of  $U_{\text{corr}}$  (the sum of the squares of deviations in concentrations of ligand and hydrogen ion at all experimental points) corrected for degrees of freedom, indicate that the experimental data can be represented by the model. Small values of mean, standard deviation and mean deviation for the system confirm that the residuals are around a zero mean with little dispersion.

For an ideal normal distribution, the values of kurtosis and skewness should be three and zero, respectively. The kurtosis values in the present study indicate that the residuals form leptokurtic patterns. The values of skewness recorded in the table are between -1.66 and 1.14. These data evince that the residuals form part of a normal distribution; hence, least squares method can be applied to the present data. The sufficiency of the model is further evident from the low crystallographic R values. Thus, the statistical parameters show that best fit models represent the acid base equilibria of MSA, dopa, phen in dmf-water mixtures. The primary alkalimetric titration data were stimulated and compared with the experimental alkalimetric titration data, to verify the sufficiency of the model. The overlap of the typical experimental and simulated titrations data given in Figure 1 indicates that the proposed models correctly represent the experimental data collected from the refinements carried in the pH range of 2.0-12.0.

### Effect of systematic errors on best fit model:-

Any variation in the corrections of ingredients like alkali, mineral acid and the ligand effects the magnitude of protonation constants. Such parameters are termed influential parameters. MINQUAD75 does not have provision to study the effect of systematic errors in the influential parameters on the magnitude of protonation constant. In order

to rely upon the best fit chemical model for critical evaluation and application under varied experimental conditions with different accuracies of data acquisition, an investigation was made by introducing pessimistic errors in the concentrations of mineral acid, alkali, and ligand. The results of a typical system given in Table 2, emphasize that the errors in the concentrations of alkali and mineral acid affect the protonation constants with increased errors in the concentrations of the ingredients corroborate the appropriateness of the experimental conditions. Statistically the best chemical models that represent acid–base equilibria under study should have very low standard deviation in their protonation constant ( $\log \beta$ ) values that indicate the precision of the parameters. The increased standard deviation in protonation constants and even rejection of some species on introduction of errors confirms the correctness of the proposed models. This type of investigation is significant as the data acquisition was done under varied experimental conditions with different accuracies.

#### **Protonation Equilibria:-**

The stepwise protonation constants and number of equilibria can be determined from the secondary formation functions such as average number of protons bound per mole of ligand ( $nH$ ). The pH values at half integral of  $nH$  correspond to the protonation constants of the ligand and the number of half integrals in the pH range of the study corresponds to the number of equilibria. Thus, three half integrals (0.5, 1.5, and 2.5) versus pH in the case of MSA [figure 2(b)] and of dopa [figure 4(b)] conform the presence of three protonation–deprotonation equilibria. The maximum value of MSA and dopa in the formation curve figure 2(b) and 4(b) is three, which clearly shows that MSA and dopa has three bound protons per molecule and the half integral (0.5) of phen [figure 6(b)], emphasize the presence of one protonation-deprotonation equilibria in the pH range of present study.

The typical distribution plots figure [2(a),4(a),6(a)] produced using protonation constants from the best fit table 1, show the existence of  $LH_3, LH_2, LH$  and  $L$  species in case of MSA and  $LH_4^+, LH_3, LH_2^-$ , and  $LH^{2-}$  in dopa and  $LH^+$  in the case of phen.  $LH^+$  is the most predominant species in the case of phen [figure 6(a)] at a pH 3.5-11.0 and  $LH$  in case of MSA [figure 2(a)] at pH 2.0-9.0 respectively, and of dopa [figure 4(a)] it is  $LH_3$  at a pH range of 2.0-11.0.

#### **Effect of Solvent:-**

The reaction medium is one of the most important influencing factors in determining the equilibrium constants. The solvent effect on protonation constants could be explained on the basis of dielectric constant of the medium, solvent structure, preferential solvation and microscopic parameters. The variation of protonation constants or change in free energy with the organic solvent content depends upon two factors; electrostatic one, which can be estimated by Borns equation and non electrostatic one, which includes specific solute solvent interactions. When the electrostatic effects dominate the equilibrium proceeds, according to Borns equation [26], the energy of electrostatic interaction is related inversely to dielectric constant [27]. Hence, the logarithm of stepwise protonation constants ( $\log K$ ) should vary linearly as a function of the reciprocal of the dielectric constant of the medium. It is observed that in DMF media the  $\log K$  values of MSA, dopa and phen increase linearly as a content of organic containing pure water as a solvent [28-31] but small differences are possibly due to the different experimental procedures, temperature and different background electrolytes used. In this study the linear variation of  $\log K$  values as a function of  $1/D$  (figure 8) in mixtures shows that the dominance of electrostatic interactions. This linear increase can be attributed to ion association reaction, solute solvent interactions and solvent basicity (acidity) effects.

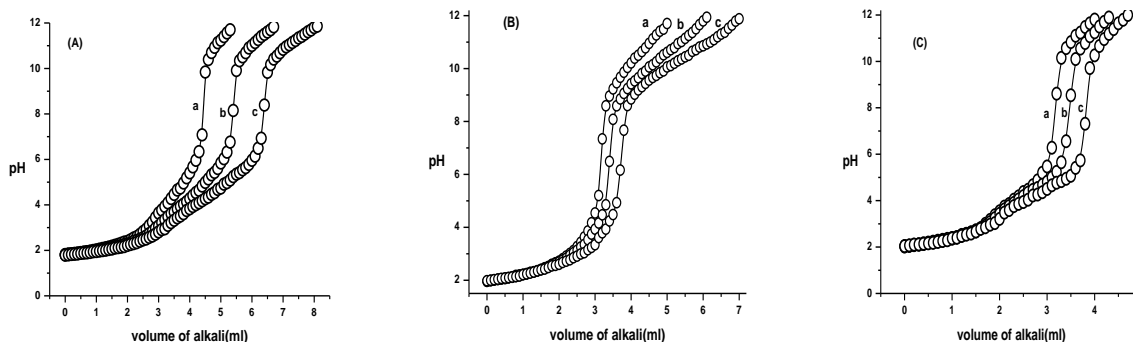
**Table 1:- Best fit chemical model of protonation equilibria of L- dopa, mercaptosuccinic acid and 1,10-phenanthroline in 0-60% DMF –water mixtures. Temperature 303.0K and ionic strength 0.16mol L<sup>-1</sup>**

%v/v DMF	Logβ <sub>m</sub> lxh(SD)			NP	U <sub>corr</sub> X 10 <sup>8</sup>	Skewness	Kurtosis	χ <sup>2</sup>	R-Factor	pH range
	LH <sub>3</sub>	LH <sub>2</sub>	LH							
<b>L –dopa</b>										
0.0	10.20(02)	19.37(02)	20.53(04)	82	9.3	-0.44	5.14	11.61	0.011347	1.6-1.9 8.49-10.5
10	10.21(07)	19.26(03)	21.82(05)	28	5.7	0.17	5.33	14.29	0.012959	2.5-3.0 9.5-10.00
20	10.55(09)	20.05(06)	23.55(08)	42	6.833	0.18	4.05	3.81	0.014946	3.0-4.9 8.9-10.0
30	10.67(03)	20.25(02)	24.06(07)	54	8.137	0.12	2.05	24.44	0.17293	3.0-3.7 8.4-10.5
40	10.77(04)	20.36(03)	24.62(06)	67	9.205	1.29	6.52	27.55	0.016183	3.0-5.2 8.5-10.5
50	10.79(03)	20.57(02)	25.40(04)	44	4.761	0.24	3.16	4.18	0.013365	4.3-5.6 9.4-10.5
60	10.80(03)	20.51(02)	25.73(04)	56	5.469	0.45	4.84	14.29	0.014436	4.5-6.7 8.8-10.5
<b>Mercaptosuccinic acid</b>										
0.0	9.97(04)	14.35(05)	17.16(06)	87	42.70	-0.09	4.27	28.11	0.021880	2.5-3.1 4.0-9.8
10	10.08(02)	14.49(04)	17.27(08)	66	14.66	0.86	6.31	15.52	0.029044	3.0-10.5
20	10.18(02)	14.72(03)	17.69(04)	98	10.10	-2.45	12.32	89.71	0.018642	2.1-6.0 9.0-11.0
30	10.33(01)	15.36(03)	19.27(04)	103	7.086	1.14	6.10	16.14	0.017858	3.1-11.5
40	10.47(04)	15.57(08)	19.35(09)	70	41.19	-0.07	3.14	21.49	0.042931	3.5-9.5 9.5-11.0
50	10.54(04)	16.31(07)	20.98(08)	80	40.21	-0.89	6.18	9.20	0.042971	4.3-7.5 9.5-11.5
60	10.81(04)	17.12(08)	22.43(09)	69	45.83	-1.66	11.48	9.01	0.041196	4.75-6.9 10.5-11.5
<b>1,10-phenanthroline</b>										
0.0			4.92(02)	21	14.881	-0.39	2.78	3.71	0.042746	3.6-6.0
10			4.95(01)	18	40.302	-0.09	3.42	1.78	0.019978	3.5-5.0
20			4.98(03)	19	24.404	-0.7	2.82	11.26	0.054809	4.4-6.5
30			5.01(03)	20	37.047	-0.21	2.48	2.00	0.06992	4.6-6.0
40			5.06(03)	20	31.488	-0.56	2.83	3.26	0.061957	4.5-6.0
50			5.18(05)	17	61.037	-0.81	3.04	4.59	0.088476	4.8-6.0
60			5.24(07)	12	90.34	-0.86	3.11	6.67	0.102526	4.8-5.5

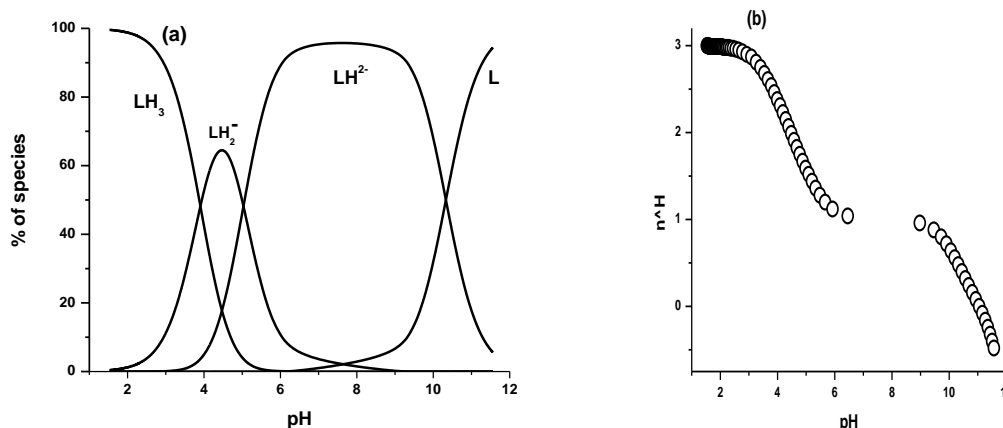
$U_{\text{cor}} = U/(NP-m)*10^8$ ; where m is the no. of species and NP is number of experimental points, SD is the standard deviation.

**Table 2: Effect of errors in influential parameters on protonation constants of Mercaptosuccinic acid, dopa and 1, 10- phenanthroline in 30% v/v DMF-water mixtures.**

Ingredient	% of error	Mercaptosuccinic acid			L-Dopa			1-10 phenanthroline
		$\beta_1$ (SD)	$\beta_2$ (SD)	$\beta_3$ (SD)	$\beta_1$ (SD)	$\beta_2$ (SD)	$\beta_3$ (SD)	$\beta_1$ (SD)
Alkali	0	10.33(01)	15.36(03)	19.27(03)	10.67(03)	20.25(02)	24.06(07)	5.01(03)
	-5	11.01(01)	16.56(05)	20.68(06)	10.88(06)	20.76(04)	24.97(13)	5.32(05)
	-2	10.60(01)	15.82(03)	19.81(03)	10.77(04)	20.46(03)	24.41(08)	5.13(04)
	2	10.05(03)	14.91(05)	18.73(06)	10.41(03)	19.71(03)	23.24(08)	4.90(03)
	5	9.60(08)	14.22(12)	17.94(13)	10.57(03)	20.03(02)	23.73(06)	4.73(03)
Acid	-5	9.93(03)	14.68(03)	18.38(07)	10.51(03)	19.82(03)	23.27(08)	4.69(03)
	-2	10.17(02)	15.09(04)	18.91(04)	10.61(03)	20.085(02)	23.74(07)	4.88(03)
	2	10.48(01)	15.63(03)	19.62(03)	10.78(06)	20.63(03)	25.01(19)	5.15(04)
	5	10.70(02)	16.04(04)	20.15(05)	10.73(04)	20.41(02)	24.40(09)	5.36(06)
Ligand	-5	10.01(03)	14.89(06)	18.80(06)	10.57(03)	20.13(02)	24.03(09)	5.06(04)
	-2	10.20(02)	15.18(03)	19.08(03)	10.63(03)	20.20(02)	24.05(08)	5.03(04)
	2	10.44(01)	15.54(02)	19.44(02)	10.77(04)	20.37(03)	24.10(06)	4.99(03)
	5	10.61(01)	15.80(02)	19.71(02)	10.71(04)	20.30(02)	24.08(07)	4.97(03)



**Figure 1:-** simulated (o) and experimental (solid line) of (A) mercaptosuccinic acid (B) L-Dopa and (C) 1, 10-phenanthroline in 30% v/v dimethylformamide : (a) 0.25 (b) 0.375 (c) 0.5mmol, respectively.



**Figure 2:-** (a) Distribution diagram of mercaptosuccinic acid and (b) formation function of mercaptosuccinic acid in 30% v/v in dmf-water mixture.



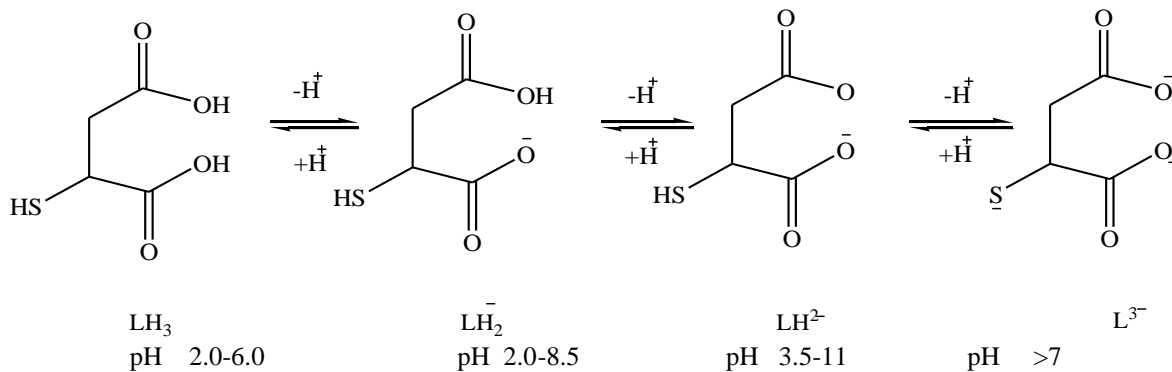


Figure 3:- Protonation - deprotonation equilibria of MSA

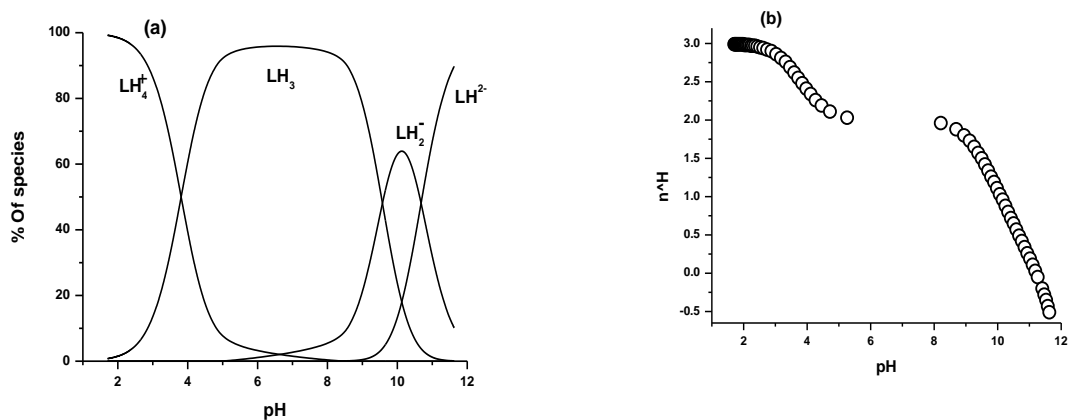


Figure 4:- (a) Distribution diagram of dopa and (b) formation function of dopa in 30% v/v in DMF-water mixture

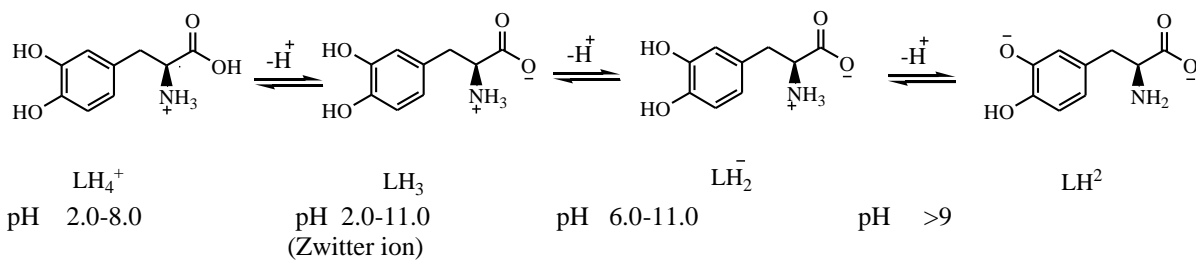


Figure 5:- protonation –deprotonation equilibria of dopa

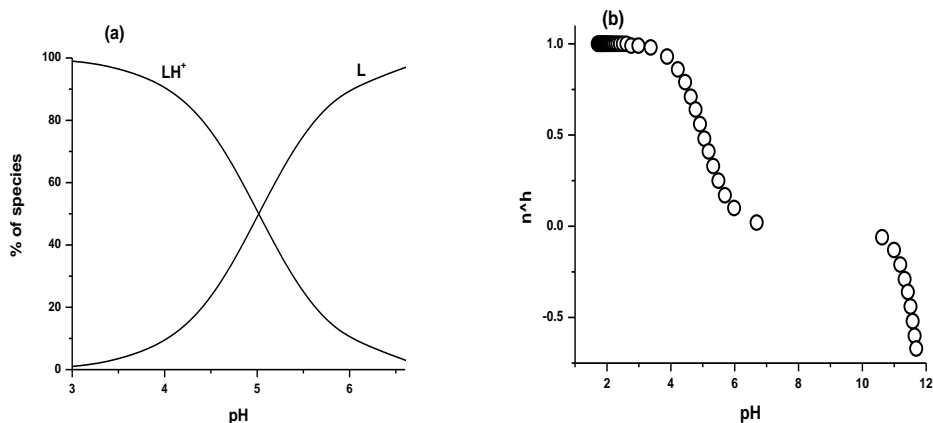


Figure 6:- (a) Distribution diagram and (b) formation function of phen in 30% v/v in DMF-water mixture

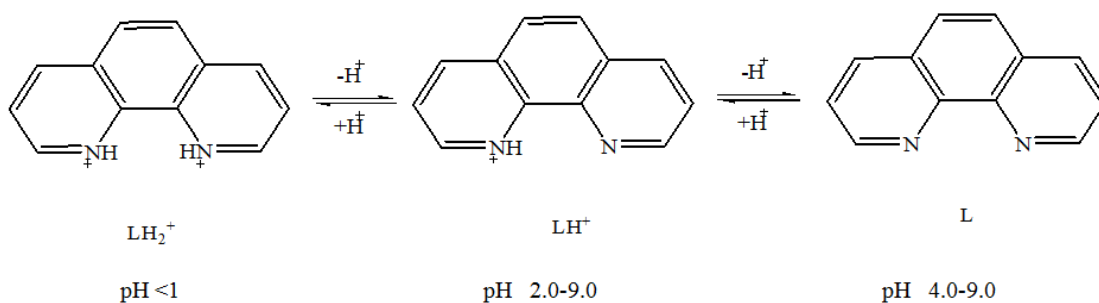


Figure 7:- Protonation-deprotonation equilibria of phen

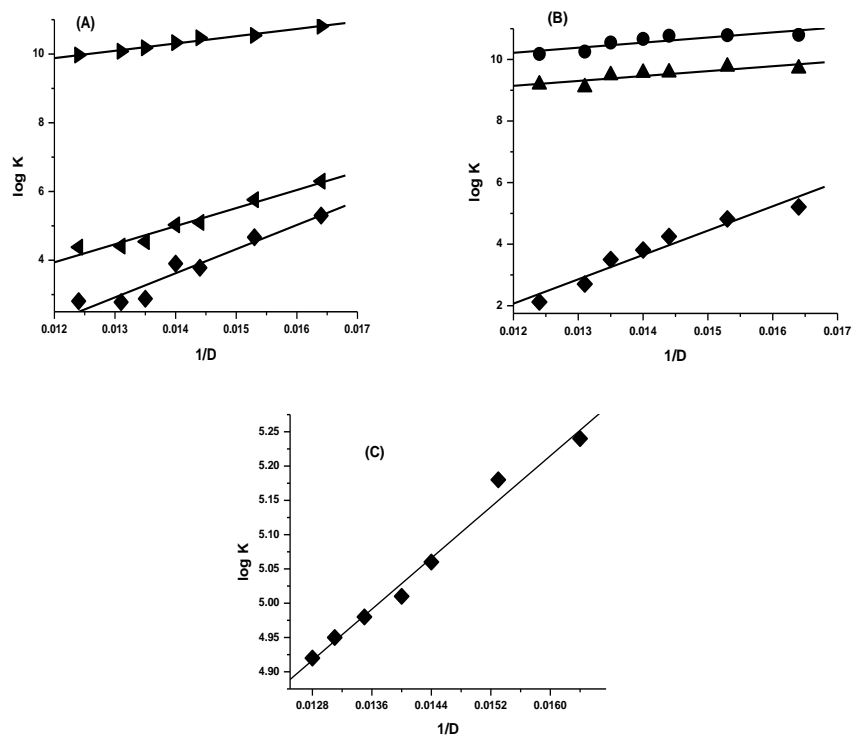


Figure 8:- variation of stepwise protonation constants ( $\log K$ ) of (A) MSA, (B) dopa and (C) phen with reciprocal of dielectric constant ( $1/D$ ) in DMF medium.

**Conclusions:-**

1. MSA has three dissociable protons which exists in  $LH_3$  form at low pH gets deprotonated with the formation of  $LH_2^-$ ,  $LH^{2-}$  and  $L^{3-}$  species successively, with increase in pH.
2. Dopa has three dissociable protons and one amino group which can associate with a proton. It exists as  $LH^{4+}$  at low pH and gets deprotonated with the formation of  $LH_3$ ,  $LH_2^-$  and  $LH^{2-}$  successively with increase in pH.
3. Phen forms  $LH_2$  at low pH and gets deprotonated with the formation of  $LH^+$  and  $L^{2-}$  with increase in pH.
4. The linear variation of log values of stepwise protonation constants with decreasing dielectric constant of the media confirms the dominance of electrostatic forces in the protonation-deprotonation equilibria of MSA.
5. The log values of protonation constants of dopa increase linearly with decreasing dielectric constant of dmf-water mixtures. This indicates the dominance of electrostatic forces in the protonation-deprotonation equilibria.
6. Phen exhibits linear trend indicating the dominance of electrostatic forces.
7. The effect of systematic errors in the influential parameters on the protonation constants shows that the errors in the concentrations of alkali and mineral acid affect the protonation constants more than those in the concentration of ligand solutions.

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### RESEARCH ARTICLE

#### WE REPORT A CASE OF THIRTY THREE YEAR OLD MALE WITH SUB-HEPATIC LARGE HYDATID CYST WITH FAT CONTENT WITH NO CLEAR BILIARY COMMUNICATION.

Dr. Ghadeer Ismail Sindi and Dr. Ashjan Ahmad.

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#### Abstract

Hydatid disease is parasitic infection caused by echinococcus granulosus (larvae of a tapeworm). It occurs usually in the Endemic Areas: Mediterranean countries, Middle East, Australia, Southern part of South America, New Zealand and intensive endemic in Central Asia particularly China and rarely in Northern Europe. It usually affects the liver, lung and there are a few cases of uncommon location in other parts of the body. It can be detected by US, CT, MRI. It is classified into 4 types based on the radiological appearance: **type 1** simple cyst with no internal architecture with or without hydatid sand or septal, **type 2** cyst with daughter cysts and matrix (**A**- round daughter cysts at periphery, **B**- larger, irregularly shaped daughter cysts occupying the entire volume of the mother cyst, **C**- oval masses with scattered calcification and occasional daughter cysts), **type 3** dead cyst with total calcification, **type 4** complicated cyst with rupture and superinfection. We report a rare case of a man with sub-hepatic large hydatid cyst with fat content with no clear biliary communication in CT imaging. CT imaging showed a large cystic non-enhancing lesion in the porta hepatica level extending down, compressing the pancreas, the inferior vena cava and displacing the stomach as well with fluid-fat level (-90 to -110 HU) and small globules of fat density within it. Only a few cases have been reported for hydatid cyst with fat globules within it. Only 1 report of 3 cases reported in 2012 described the presence of fat in the context of rupture of the hydatid cyst into the biliary tree and 1 case reported in 2016 with rupture of biliary radical into hydatid cyst.

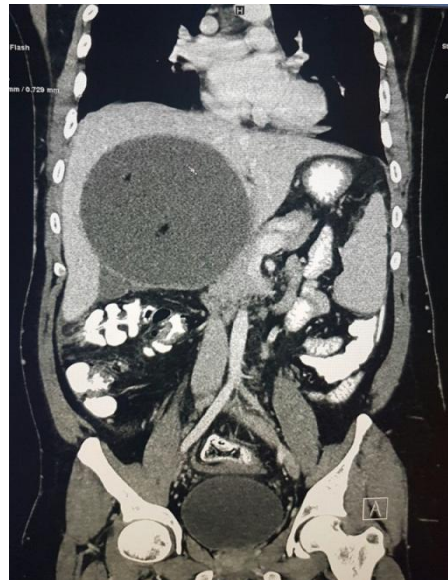
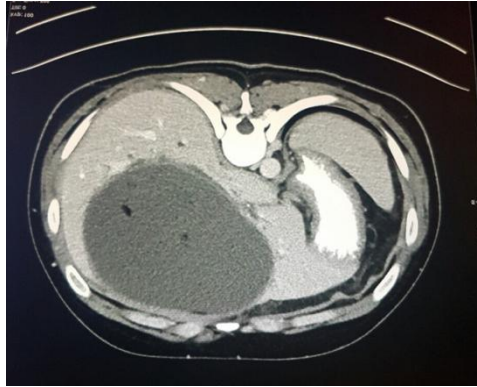
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#### Case report:-

Thirty three year old male patient with previous history of contact with animals presented to AL-Noor Specialist Hospital, Makkah, Saudi Arabia with abdominal pain and distention for 1 month in January 2017. Labs: hemoglobin:11.9 mean platelet volume:10.8 hematocrit:36.3 WBC:4.81 mean corpuscular volume:79.6 Eosinophils:9.6 monocytes :6.4 RBC:4.56 MCH:26.1 RDW-CV:15.2 total protein:9.8 blood glucose:88 urea:42 Echinococcal antibody :>1024 HCV Ab:negative Hbs Ag:negative.

CT imaging showed a large cystic non-enhancing lesion in the porta hepatica level extending down, compressing the pancreas, the inferior vena cava and displacing the stomach as well with fluid-fat level (-90 to -110 HU) and small

globules of fat density within it. Another cyst was noted above the urinary bladder which showed enhancing internal membranes. No calcification nor daughter cysts were detected. These CT findings were not very typical for hydatid cyst so we did MRI and it showed same previously described findings, evidence of water-lily sign in the sub-hepatic cyst and clear fat plane separating between the liver and the cyst. So the diagnosis of intra-abdominal multiple complicated hydatid cyst was made. The patient was managed conservatively with Metronidazole 500mg tablet, Ciprofloxacin 500mg tablet, Albendazole 400 mg tablet, Hydrocortisone 100 mg vial.

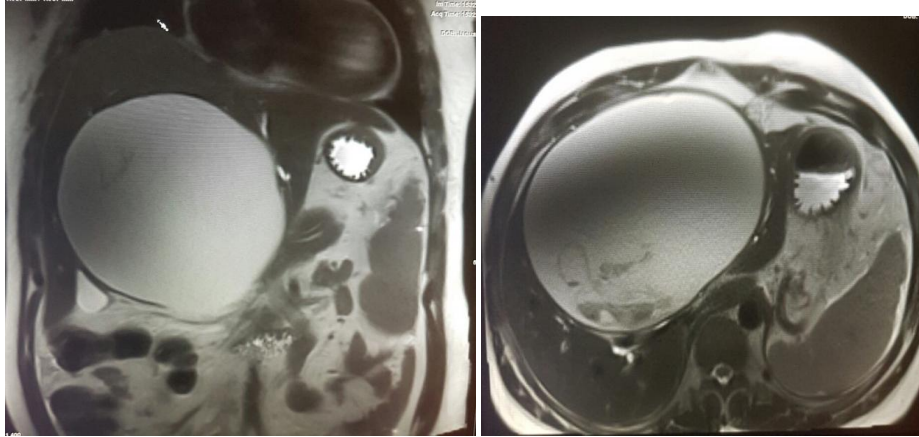


**CT of abdomen:**

**Show large cystic non enhancing lesion with small globules of fat density within it.**



**CT- show fat fluid level.**



MRI – Show water lily sign.

### Discussion:-

Hydatid disease is a worldwide disease involving the liver in 70% of cases, produced by *Echinococcus granulosus* (larvae of tapeworm). Diagnosis is based on radiological findings of different types of hydatid cysts. One of the rare findings is the presence of fat within a hydatid cyst. Three cases reported in 2012 described the presence of fat in the context of rupture of the hydatid cyst into the biliary tree, and one case reported in 2016 with rupture of a biliary radical into a hydatid cyst. This case describes a sub-hepatic large hydatid cyst with fat content and no clear biliary communication.

### Conclusion:-

A hydatid cyst with fat inside it is a rare finding. It can be due to the process of degeneration of the hydatid membrane or communication of the cyst with the biliary tree. Although it rarely happens, it can occur.

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### RESEARCH ARTICLE

#### REHABILITATION OF PATIENT WITH SQUAMOUS CELL CARCINOMA

Dr. Nazia Majeed Zargar, Dr. Falak Naz and Dr. Jawahir Ahmed Ganai.

#### Manuscript Info

##### Manuscript History

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#### Abstract

**Introduction:** Several methods have been advocated for reconstructing maxillectomy defects. The use of an obturator prosthesis is one of them. Effective obturation of maxillary defects produces sufficient separation of the oral and nasal cavity to improve the quality and intelligibility of speech.

**Prodecure:** A patient aged 65years presented to Government Dental College and Hospital, Srinagar with the chief complaint of swelling in the right posterior region of palate. Patient was completely edentulous in both the arches. Clinical examination revealed a large granular swelling involving the right postero- lateral portion of hard palate and posterior alveolar ridge. Patient was referred to the Department of Prosthodontics for construction of maxillary obturator. Prosthodontic rehabilitation of the defect was organized into three stages of treatment. Firstly an immediate surgical obturator was fabricated which was placed after the surgical removal of tumour. After 2 weeks impressions were made and an interim obturator was fabricated. After 3 months of healing a patient was given a definitive prosthesis.

**Conclusion:** Quality of life of patients with maxillary defects can be improved with the provision of a properly designed obturator. The prosthetic obturator can restore mastication, swallowing, esthetic particularly the midface, resonance and speech. Patients with maxillofacial defects who undergo rehabilitation can resume their social habits in the normal way.

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#### Introduction:-

The maxilla is a functional and esthetic keystone of the mid-face forming part of the mid-facial elements which are the orbit, the zygomatico-maxillary complex, the nasal unit and the stomato-maxillary complex<sup>1</sup>. Maxillofacial defects may be a result of congenital malformations, trauma or surgical resection of tumors. The primary objective of rehabilitating these defects is to eliminate the disease and to improve the quality of life for these individuals<sup>2</sup>. Malignant neoplasms of upper gingiva and hard palate nearly account for 1-5% of total occurrence in the oral cavity; two third of the lesions which involve these areas are squamous cell carcinomas<sup>3</sup>. Unfortunately they spread to adjacent structures, by the time they are diagnosed. The recommended treatment for these type of lesions are alveolectomy, palatotomy, partial/total maxillectomy, depending on the aggressiveness & location of the actual lesion, its histotype, patient's age and general health status. The post-surgical effect usually has serious consequences as it disturbs both form and function of normal stomatognathic system. Rehabilitation of these acquired maxillary defects can be accomplished by using various type of micro-vascularised flap or by prosthetic



means. Surgical reconstructions are usually considered when extensions of the defects are small. For larger defect, prosthetic rehabilitation seems to be a better alternative, since more risks are involved for survival of the graft<sup>4</sup>. Several methods have been advocated for reconstructing these defects. The use of an obturator prosthesis is one of them. Effective obturation of maxillary defects produces sufficient separation of the oral and nasal cavity to improve the quality and intelligibility of speech. It also enhances masticatory function, deglutition and esthetics. Prosthetic intervention should occur at the time of surgical resection and will be necessary for the remainder of the patients life<sup>5,6</sup>. This present report describes a prosthodontic rehabilitation of a patient with squamous cell carcinoma in the maxilla.

### Case Report:-

A patient aged 65 years presented to Government Dental College and Hospital, Srinagar with the chief complaint of swelling in the right posterior region of palate. Patient was completely edentulous in both the arches and presented a history of cigarette smoking from last 35 years. Clinical examination revealed a large granular swelling involving the right postero-lateral portion of hard palate and posterior alveolar ridge (Fig 1). An incisional biopsy was performed and the sample was sent for histopathological examination which revealed undifferentiated squamous cell carcinoma. Patient was referred to the Department of Prosthodontics for construction of maxillary obturator.

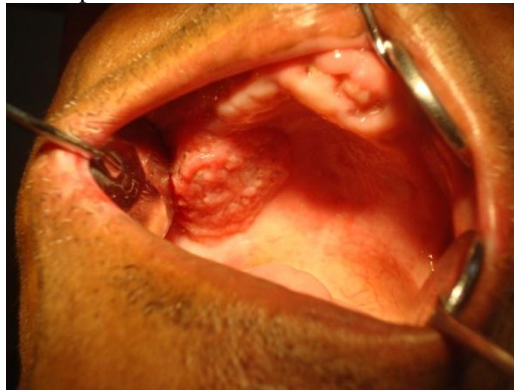


Figure 1:-



Figure 2:-





**Figure 3:-**



**Figure 4:-**



**Figure 5:-**



**Figure 6:-**



Figure 7:-



Figure 8:-

#### Procedure:-

The pre-operative impression was made using an irreversible hydrocolloid material (Zhermack) in a modified perforated stock tray. The impression was poured with dental stone to produce the cast. The cast was sent to the surgeon to delineate area of resection and an immediate surgical obturator was fabricated using clear auto polymerizing resin (Fig 2,3). In the operating room resection of the maxilla was done to remove the tumor (Fig4) and a surgical closure was attempted using the remaining and neighbouring soft tissues (Fig 5).

The defect was large and the available tissues were not sufficient to completely close the defect. The surgical obturator was inserted immediately after resection of the maxilla and held in position using sutures in the canine fossa region (Fig 5). After two weeks the clinical intra and extraoral examination revealed a good initial healing at the defect site. The extraoral suture was removed at the surgery department. The fabrication of an interim obturator was initialized. The usual steps in fabricating the conventional acrylic partial denture were followed. Surgical obturator served as a custom tray for impression making. Elastomeric impression material was used for recording the details of the defect site (putty polyvinyl silicone followed by a light body wash). Impression was beaded and boxed and poured for fabrication of cast on which an interim obturator was fabricated using heat polymerizing acrylic resin (Fig 6-8). Finally after a period of 3 months patient was provided with a definitive prosthesis.

#### Discussion:-

Rehabilitation of patients with acquired maxillary defects is relatively simpler than rehabilitation of defects in the mandible, and pleasing as well as accepted outcomes can be identified at the end of treatment. On the other hand, great efforts should be given in dealing with large defects to obtain the substantial requirements for retention and support of the prostheses<sup>7</sup>. Two primary objectives of maxillo-facial prosthodontists in carrying out rehabilitation is to restore the functions of mastication, deglutition, speech and to achieve normal oro-facial appearance<sup>8</sup>.

The aggressive nature and pattern of undifferentiated squamous cell carcinoma in the maxilla makes it difficult to remove completely, which explains the high recurrence rate of this type of tumor. For this reason, rehabilitation with

prosthetic obturator is preferred. Moreover, the economic factor plays an important role which should be taken into account during treatment decision. Our patient had a low financial income making it difficult for him to meet more advanced treatment modalities.

In this article Prosthodontic rehabilitation of the defect was organized into three stages of treatment. For each step a different type of obturator was fabricated. To start with a simplified version of the obturator in the form of an acrylic plate and gradually converting it to make the intermediate/definite obturator proved to be helpful in relatively faster adaptation of patient to such bigger prosthesis. Quality of life of patients with maxillary defects could obviously be improved with the provision of a properly designed obturator. The prosthetic obturator can restore mastication, swallowing, esthetic particularly the midface, resonance and speech. Patients with maxillofacial defects who undergo rehabilitation can resume their social habits in the normalway<sup>9</sup>.

### **Conclusion:-**

Rehabilitation of patients with oral-nasal communication comprises the same steps as those for making conventional prostheses, which does not exclude the need to observe the individuality of each case in the planning and the need to take additional care when taking impressions and installing the appliance. Rehabilitation of such patients provides the tools with which they can resume their daily life such as talking and eating properly.

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### RESEARCH ARTICLE

#### Chronic-Post Operative Pain.

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##### Key words:-

post operative pain , surgery , chronic , Pain

#### Abstract

**Background:** Majority of the patients suffering from chronic post-surgical pain have the assumption that the surgeon made an error or that something went wrong. in this study we will focus on the risk-factors and other dimensions of chronic post-operational pain that could help reduce the number of patients afflicted by the illness.

**Objective :** to reduce the post operative pain , This paper will also focus on the risk-factors and other dimensions of chronic post-operational pain that could help reduce the number of patients afflicted by the illness.

**methodology :** This study used secondary data, which is data that is already collected and recorded by another person that is readily available from other sources

**Results :** Chronic post-operative pain remains a common occurrence . Enhancing the control of acute post-surgical pain is among the strategies that can go a long way in the forestalling of chronic post-operative pain

**Conclusion:** Chronic post-operative pain remains a common occurrence. In the past few decades, the research standard has markedly developed although much work still needs to get done, mostly in the areas of risk factors and mechanisms

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#### Introduction:-

One of the first papers discussing chronic post-operative pain was by Crombie et al. (1998). it is important to note that the research standard with regard to outcomes was quite poor. An example of such a study was one research that was done with the aim of identifying the repercussions following a hernia surgery. The methodology section showed ways of performing a hernia repair but did not indicate the number of patients that were used as subjects in the study. The issue of pain was totally ignored in the study.

In the past decade, there have been many great papers and one of the important observations is that one study in the British Medical Journal that reviewed inguinal hernia. In Wallace et al. (1996), the researchers mention that chronic pain is among the most serious yet common issue that afflicts patients in the long term following the surgical repair of inguinal hernia. This study among others shows the acknowledgement of chronic pain as one of the important outcomes of surgery.

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Research from the recent past shows that there is a shift in emphasis from just counting the subjects in the study to actually examining the risk factors as well as the likelihood of prevention.

### **Objectives:-**

The purpose of this paper is not to do what other papers have tried to do in the past, but to use recent publications to show areas that are controversial and interesting. This paper will also focus on the risk-factors and other dimensions of chronic post-operational pain that could help reduce the number of patients afflicted by the illness.

### **Research Problems:-**

There are a number of problems that arise in the study of chronic post-operational pain. The first involves the definition or the original problem-definition (Turk et al., 1999). The following are some of the characteristics of chronic post-operational pain. First, the pain needs to be the outcome of a surgical procedure. Second, the pain must have lasted for not less than two months. Third, other things that could have caused the pain need to get excluded, such as persistent malignancy after a cancer surgery or persistent infection. Finally, the likelihood that this pain is a continuation of a pre-existent problem needs to be considered and an attempt made at excluding it. This is a grey area in surgery because the surgery itself may increase the effects of a pre-existing condition, causing a lot of pain.

If the numbers shown above are accurate, then pain clinics should get a huge number of such individuals. It remains critical to remember that research on the effects of surgery where prolonged pain is primarily under study find a greater incidence than cases where it is not. Could it be that patients fail to mention chronic post-surgical pain until they are asked or is it that such studies overestimate the incidence? In case the incidence of chronic post-surgical pain is as high as other studies portray it to be, then what happens to these patients? Could it be that they are suffering silently or receiving the appropriate primary care?

### **Mechanisms:-**

Very little is understood regarding the mechanisms of chronic post-surgical pain. Different pain syndromes result from different mechanisms even when considering the same operation. For example, after the amputation of the lower limb, patients may experience different kinds of pain such as stump pain, phantom pain or back pain. It is clear that majority of the syndromes are neuropathic and are the outcomes of changes to the nervous system following the injury. Surgery needs to be considered as an injury, but one that is performed for beneficial reasons.

### **Literature Review:-**

Majority of the patients suffering from chronic post-surgical pain have the assumption that the surgeon made an error or that something went wrong. Normally, this is not the case and it shows that educating patients on chronic post-surgical pain would go a long way in helping them deal with the problem. Patients who normally feel that the reason behind their chronic pain is the result of a mistake made during the surgery usually suffer from more distress and behavioral disturbance. Moreover, they respond poorly to medication while having low prospects of success with regards to future medications.

According to Turk and Okifuji (1999), patients who hold the belief that they got injured during the surgical procedure suffered from lower pain thresholds, deconditioning, lower tolerance and lower activity. Eliminating the behavior of assigning blame can assist doctors and patients. It looks like long-lasting pain following an operation remains inevitable in a certain number of instances such as an infection to a wound. If this is the case and chronic post-surgical pain gets discussed in an open environment and is made part of the information that patients receive just before surgery, the grief that comes later will be avoided.

One of the area that requires particular attention is injury to nerves. It normally is presumed that nervous injury is the outcome of many neuropathic post-operational syndromes of pain.. According to Richardson et al. (1999), there is a point prevalence of neuralgia that occurs after thoracotomy.

A number of papers written by Nottingham et al. (2008) looked at this issue. The initial paper demonstrated that individuals with rib retraction in the course of thoracotomy get damage to intercostal nerves. The damage arises at a number of stages and may be the result of dispersion of the ribs, which is the outcome of ischemia, pressure that is applied directly as well as broadening. The next study found that long-lasting pain was not only common, but also resulted in a high level of ill health.

Chronic pain was linked to pain that was more chronic and persistent and had substantial impacts on the lives of the patients.

The suggestion in this case is that there is a more serious etiology for pain that arises after thoracotomy that is neuropathic to intercostal nerves alone. With regard to the pain following a mastectomy, Carpenter (1999) argues that the risk factor that is generally accepted of impairment to intercostobrachial nerves mainly remains circumstantial. In the study by Carpenter (1999), two individuals who underwent a lumpectomy procedure with no external dismemberment developed post-mastectomy pain syndrome. The case was the same for four women whose intercostobrachial nerve got spared. Several studies done on breast surgery have looked at the ramifications of preservation of the intercostobrachial nerve.

In another study, which was a controlled randomized trial, Abdullah et al. (1998) looked at the effects of maintaining or sacrificing the intercostobrachial nerve in the course of axillary allowance. The researchers discovered that for several reasons, the possibility of preserving the nerve was nonexistent.

After twelve weeks, the symptoms deteriorated for the two groups, but mostly within the group that had their nerves preserved. There were also two individuals who suffered from sensory-loss objectively and, thus, had no symptoms. On the other hand, patients that had sensory symptoms lacked a sensory deficit in an objective manner. Moreover, other studies show similar outcomes (Tasmuth et al., 1996). In one research that involved 38 patients suffering from ipsilateral pain in their arms following a mastectomy. Vecht et al. (1993) found that eight individuals among the patients were found to have pain after the surgery.

Every patient underwent a dissection in the auxiliary node and the researchers found another eight causes in the rest of the patients. A study conducted to examine patients who went through axillary operation though without any chemotherapy or radiotherapy showed no signs of recurrence. However, seventy percent of patients reported numbness while only thirty percent said that they felt pain. According to Polinsky (1994), 81% of the patients that underwent an axillary operation said that they felt numb. On the other hand, only 22 to 32 percent said that they felt pain according to the type of surgery.

A study done to compare the psychophysical examination of patients suffering from pain following a mastectomy procedure and those who felt no pain after undergoing the same surgery, Gottrup et al. (2000) discovered that patients in either group had lowered sensitivity to pinprick and thermal stimuli. There was a reduction of the pressure-pain threshold within the pain group. However, the pain-free subjects did not experience any change. Gottrup et al. (2000) then concluded that repetitive stimulation using pinpricks in the area surrounding the scar resulted in an increase in the intensity of the pain.

The intensity of the pain was linked with impulsive intensity of pain. The fact that the surgeons avoid major nerve trunks is not sufficient reason to avoid chronic post-operational pain. Moreover, the sectioning of nerves does not always lead to chronic post-operational pain. It is impossible to conduct operations without causing injury to parts of the nerve system at a certain point.

#### **Risk Factors and Prevention:-**

Whenever one intends to forestall an event, they would like to understand the factors that contribute to its manifestation. It remains unnecessary to totally understand the causation. Apart from Anesthetics, John Snow also pioneered the field of Epidemiology.

#### **Methodology:-**

A systematic review was conducted using an electronic search of Google Scholar, Medline, Embase, and Scopus to identify studies evaluating Chronic post operative pain After choosing the relevant database, We included all types of study (Randomized Control Trials, descriptive and cohort studies). All the studies found based on the keywords and published between 1986 and 2013 and in English language were included in the review. In case the variables were incompatible with the core of this research paper, the papers were left out.

This would ensure that the findings and arguments of the authors quoted in this paper could be compared to find similarities and differences in the data... The researchers finally ended up with a set of 32 papers that met all the

above criteria and that were subsequently used to come up with the following findings, discussions and conclusions.

### **Findings and Discussion:-**

While it may be difficult to understand in detail what causes chronic post-surgical pain, it is possible to come up with strategies that lower its occurrence. It remains a mystery why among people who have undergone the same surgical procedure, some feel pain, while others feel no pain. The source of chronic post-operational pain is complicated. However, the thing that is known is that the chronic pain is related to injury as well as a function alteration. Nonetheless, psychological and social factors remain very crucial.

The occurrence as well as seriousness of serious pain following a surgical operation does not directly link to the magnitude of the procedure. According to Brandsborg et al. (2008), a number of research studies indicate that surgery in itself has a serious risk for causing long-term and chronic pain. This occurs after a serious procedure like a thoracotomy or amputation, but even following minor surgical operations as well.

The risk factors for chronic post-surgical pain can be classified into medical as well as patient factors. Every patient has a unique genotype, past experience, medical history, psychosocial circumstances and beliefs regarding the problem. Factors within the environment that act on the patient will include the anesthesia, type of surgery, perioperative analgesia as well as other treatments.

### **Demographic Factors:-**

When it comes to hernia repair and breast surgery, an increase in age appears to lower the risk of experience chronic post-surgical pain. With regard to breast surgery, for example, patients of a younger age tend to develop tumors that are larger than that of people in their advanced years. Younger patients tend to experience long-term postoperative pain. According to Smith et al. (1997), an incidence of chronic pain following a mastectomy was around 26 percent for individuals of at least seventy years of age, 40% for those between fifty and sixty-nine years and 65 percent for those between thirty and forty-nine years old.

### **Psychosocial Factors:-**

There exist numerous papers regarding the effect of psychological and social factors on chronic post-surgical pain.

A study conducted by Taenzer et al. (1986) points out that healthcare providers who wish to identify patient at risk who experiences chronic post-operative pain is advised to think of the typical emotions that the patient experiences and not what the patient feels prior to the operation. Tasmuth et al. (1996) also conducted a study where women who underwent breast cancer surgery found heightened levels of depression and anxiety prior to surgery compared to other healthy women. However, one year after the surgical procedure, the levels of anxiety among these women had returned to normal. However, in patients that experienced chronic post-surgical pain, depression was higher.

A study was conducted by Jess et al. (1998) on patients with laparoscopic cholecystectomy and discovered greater neuroticism levels after one year among patients who experienced chronic post-surgical pain.

Fear of surgery was connected to poor global recovery as well as the quality of life after six months. Nonetheless, the psychological factors which appear as risk factors in chronic post-surgical pain lack a similar association as acute pain. With regard to serious pain generally, the life quality is affected more through cognitive factors, mostly the catastrophizing of pain more than its intensity. There is a likelihood that psychosocial factors play an important role in chronic post-operational pain.

### **Preoperative Pain:-**

A number of studies on hernia surgery suggest that pain prior to the operation is a key risk factor for serious post-operational pain (Wallace et al., 1996; Poobalan et al., 2001; Poleshuck et al., 2006). According to Page et al. (2009), who conducted a properly-designed study on this topic, established that approximately 25 percent did not experience any pain at rest prior to their hernia repair. 50 percent of the subjects experienced mild pain while the others experienced pain that may be considered mild to moderate.

Some of the patients who did not experience any pain before the operation felt pain afterwards while 5 percent noted that their daily lives were worse twelve months after the surgical operation. In a study on post-amputation pain, Nikolajsen et al. (1997) established an association between pain prior to the amputation and a heightened risk of



phantom and stump pain in just three months following the operation. Keller et al. (2000) established that 48 percent of individuals under narcotic analgesics prior to thoracotomy felt chronic post-surgical pain and among these, only 5 percent were not under narcotics.

Kroner et al. (1989) established a correlation between phantom breast pain and pain prior to the operation. Pain intensity prior to the total hip replacement appears not to have any correlation with chronic post-operational pain.

#### **Serious Postoperative Pain:-**

Most studies show that there is a correlation between chronic post-operational pain and acute post-operational pain. The first study that established a link between chronic post-operative pain and acute post-surgical pain was done by Kalso et al. (1992). Richardson et al. (1999) indicated that acute post-surgical pain was linked to chronic pain following a thoracotomy operation. In a paper meant to study the risk factors of chronic post-operative pain, Katz et al. (2005) concluded that early post-surgical pain was the main factor which predicted pain in the long term.

#### **Surgical Factors:-**

Regardless of the fact that the size of the surgical procedure cannot be easily correlated with chronic post-operative pain, the type of operation as well as its performance has an effect on the occurrence of chronic post-surgical pain. Peters et al. (2006) established general chronic pain as well as poor outcomes in operations that lasted at least three hours.

#### **Prevention:-**

Due to the difficulty encountered in treating post-surgical pain, there is the need to focus on prevention. As at now, there is little evidence of strategies that prove effective. This shows that there is a need for further research. Nonetheless, there are two strategies.

#### **Effectively Managing Post-Operative Pain:-**

There is evidence that there exists a strong correlation between chronic post-surgical pain as well as acute postoperative pain. However, proof of a causative link is yet to be established. A patient may receive a good perioperative analgesia that should be part of the program in perioperative comprehensive care due to several medical, humanitarian and ethical concerns. As shown in the above paragraphs, the selection of the analgesic and anesthetic regimen that will best offer a recovery program that is free from surgery is still in development.

#### **Surgery as a Risk Factor:-**

When it comes to chronic post-operative pain, one of the important risk factors is surgery. As of today, the only known method that can help in the reduction of the number of chronic post-surgical syndrome cases is the reduction of the frequency of surgical procedures done. Considering phantom pain, for instance, the best case to lower its incidence would be through the prevention of amputation procedures. Amputations of the lower limb are usually the outcome of vascular disease that is related to smoking and diabetes.

Nikolajsen et al. (1997) concluded that the pain incidence following an operation for breast augmentation lies at 13 percent, alternating from 21 percent to 50 percent based on the type of operation. The study also established a 22 percent incidence in surgical procedures meant to do breast reductions. There are many adverts on cosmetic surgery. However, these adverts fail to mention that chronic pain is a complication of the surgical procedure.

#### **Conclusion:-**

Chronic post-operative pain remains a common occurrence. In the past few decades, the research standard has markedly developed although much work still needs to get done, mostly in the areas of risk factors and mechanisms. Enhancing the control of acute post-surgical pain is among the strategies that can go a long way in the forestalling of chronic post-operative pain. Nonetheless, there are numerous organizational, technical as well as cultural barriers that need to be overcome so as to make the suggested improvements. There is a need for educating medical professions as well as the general public on the problem. If patients as well as doctors learn about the risks, some patients may be deterred from undergoing unnecessary and inappropriate procedures.



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### RESEARCH ARTICLE

#### A SYSTEMATIC REVIEW STUDYING THE EFFECT OF DIFFERENT FRAMEWORK MATERIALS ON THE RETENTION OF IMPLANT TELESCOPIC OVERDENTURES.

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#### Manuscript Info

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Dental implants, Telescopic overdenture, Retention, Implant supported overdenture, Prosthesis retention.

#### Abstract

The aim of this study is to systematically evaluate and compare between implant-supported telescopic retained overdentures reinforced by framework made of different materials in terms of retention. Search was made in 3 databases including PubMed, Ebscohost and Google scholar, title and abstract were screened to select studies related to telescopic overdenture and measuring its retention. Articles which did not follow the inclusion criteria were excluded. Included papers were then read carefully for a second stage filter, this was followed by manual searching of bibliography of selected articles. The search resulted in 15 included papers. These studies aimed to study the impact of the manufacturing technique and the recently introduced variable materials of the telescopic crowns on the retentive forces.

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#### Introduction:-

Patients with conventional denture mostly complain from poor denture retention and stability especially in the mandibular denture. Problems with complete denture prostheses arise from the inability to function with the mandibular prostheses. Reasons that affect successful use of a complete denture in the mandible include; the mobility of the floor of the mouth, alveolar ridge lined with thin mucosa, decreased support area and the mobility of the mandible.<sup>[1]</sup>

Implant-supported overdentures are an accepted and reliable treatment for edentulous jaws. Clinical studies have revealed high implant and prosthesis survival rates over observational periods of up to 10 years and a high level of patient satisfaction, as well as an improvement in quality of life compared to conventional dentures.<sup>[2]</sup>

Attachments used in conjunction with implants were found to enhance the retention, stability and support of overdentures. The commonly used attachment systems connecting overdentures and implants have included bars of different designs, studs and telescopic systems. The concept of implant retained telescopic overdentures has been shown to be effective in prosthesis stabilization with regard to horizontal forces in cases of advanced atrophy of the alveolar crest.

The focus of attention in implant dentistry is shifting from "survival" to "quality of survival." Highly aesthetic restorations are becoming important criteria for the definition of success, thus non-metallic materials are now available, which imply the use of new technology and all with the advantages of superior esthetics and reduced potential for allergic reactions.<sup>[3]</sup>

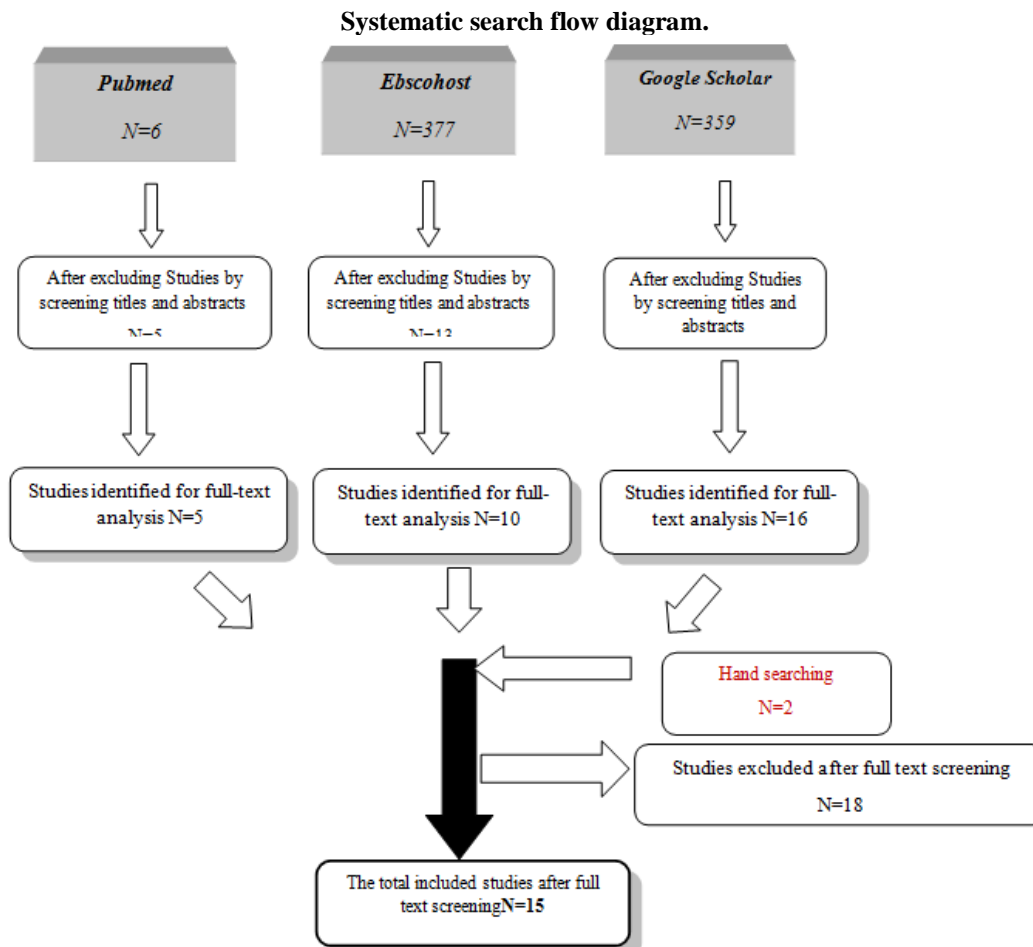
Our arising question will be in completely edentulous patient, will the material of telescopic implants overdenture have an impact on the retention?

## Materials and Methods:-

### Search Strategy:-

An Electronic Search of the literature was performed on PubMed, Ebscohost and Google scholar, using the following search terms :

1. Dental implants (Dental implants, Implants, Osseointegrated dental implants, Toothless overdenture, Implant supported overdenture, Osseointegrated implants)
2. Telescopic overdenture( Konus crown, Conus crown, Dental telescopic retainer, Dental telescope, Denture retention, Prosthesis retention, Denture prosthesis retention)
3. Retention (Retention denture, Denture dislodgment, Denture retentivity, Dental telescopic retainer, Denture retention, Prosthesis retention, Dental prosthesis retention, Dental prosthesis displacement)
4. Hand search was done on the bibliography of the included papers. Last hand search was performed on the 19th of February – 2017.



### Selection criteria:-

### Inclusion criteria:-

1. Completely and partially edentulous patient
2. Mandibular and maxillary telescopic overdenture.
3. In vivo and in vitro studies.

**Exclusion criteria:-**

- a. Medically compromised patient.
- b. Studies on animals.

**Study Selection:-**

Retrieved titles were all screened, and all papers that met the inclusion criteria were selected. Abstracts of all headings chosen were screened and obtained for inclusion criteria. After abstracts were screened, full text studies were retrieved for the selected papers. In case both the heading and the abstract of an article wasn't enough to obtain data needed to make a decision regarding inclusion criteria, full texts were retrieved. Full text papers meeting inclusion criteria were screened upon their methodology and results. Two reviewers performed the screening procedure.

**Results:-**

A total of 742 titles were identified by the electronic search. After initial titles and abstracts screening, 701 irrelevant articles were excluded and a total of 41 articles were selected for full-text screening, 2 additional articles were found through hand searching<sup>[4, 5]</sup>. After full text screening, 15 articles<sup>[4-18]</sup> were included in the present analysis.

The 15 articles included in this study were published in a period ranging from 2003-2016 except one article at 1996<sup>[8]</sup>. They differed widely with respect to methodology, study designs and outcomes. So the possibility of attempting a meta-analysis was eliminated.

The demographic data of the included articles were presented in (Table 1). The included studies showed the variability in the manufacturing method of the telescoping crowns (CAD/CAM milling, casting, electroforming, electroplating) as well as the difference of the materials of the primary and the secondary copings. The variable materials used in the following studies were zirconium, gold, PEEK (polyetheretherketone), titanium and cobalt chromium interchangeably. Surface roughness and the degree of taper were also revealed (Table 2).

The specifications of the copings beside the variation in the materials used between the primary and the secondary copings had an influence on the retentive forces during the follow up period (Table 3).

**Table 1:-**Table of demographic findings.

Studies	Age range	Sex	Settings	Mandible or Maxilla
<b>Grossman AC. Et al. 2007</b> Treatment with Double Crown–Retained Removable PartialDentures and Oral Health–Related Quality of Life in Middleand High-Aged Patients	Mean age 65	63.3% m 37.7 %f	Prosthodontic department of the university of Heidelberg, Germany	Mandible and maxilla
<b>Uludag B. et al. 2008</b> Fabrication of Zirconium Primary Copings to Provide retention for a Mandibular Telescopic Overdenture	58	female	Department of prosthodontics Ankara university	Mandible
<b>Besimo C et al. 1996</b> Retention force changes in implant-supported titaniumtelescope crowns over long-term use <i>in vitro</i>				
<b>Bayer S et al. 2012</b> Telescopic crowns: Extra-oral and intraoral retention force measurement-In vitro ,in vivo correlation	Meanage59	23 partially edentulous patients	University of Bonn, Germany	15 maxillary and 10 mandibular

<b>Singh K &amp; Gupta N 2012</b> Telescopic Denture- A treatment modality for minimizing the conventional removable complete denture problems	52 years old	male	private dental center	maxillary telescopic denture mandibular bar supported overdenture
<b>Kwon H B &amp; Lee SH 2006</b> The Comparison Of Initial Retentive Force in Different Double Crown Systems			N/A	N/A
<b>Jin Yi Y &amp; Park JC 2003</b> Cause Of Technical Failures Of Conical Crown-Retained Denture (CCRD)	43 – 66 years old	Males	Department of prosthodontics and research institute of oral science, College of dentistry, Kangnung National University	Mandible
<b>Sakai Y et al. 2011</b> Effects of surface roughness and tapered angle of cone crown telescopic system on retentive force	N/A	3 models were prepared:- 1 <sup>st</sup> group :-2 of them with same surface roughness ( <b>smooth</b> ) and taper (4, 5 degrees) 2 <sup>nd</sup> group:- with different roughness ( <b>rough</b> ) than the 1 <sup>st</sup> group and taper 6 degrees made of two different cone crown :- a)prefabricated b)CAD/CAM milled	N/A	N/A
<b>Mansour S et al. 2016</b> All-ceramic one-piece telescopic abutments for implant-supported overdentures	N/A	females	Martin-Luther university Hollo-Weitenbergcentre for Dentistry and Oral Medicine/ Department of prosthodontics	1 <sup>st</sup> case: Edentulous maxilla Partially edentulous mandible 2 <sup>nd</sup> case: Edentulous maxilla Partially edentulous mandible
<b>Gurbulak AG et al. 2012</b> Evaluation of the Retention Force of Double Conical Crowns Used in Combination with a Galvanofarming and Casting Fabrication Technique				

<b>Riera JJG et al. 2006</b> Alternative Designs in Implant-Retained Maxillary Overdentures: The Telescopic Approach	60-year-old	male	N/A	-restore the maxilla with an implant-supported overdenture , using seven implants -The mandibular arch would have an implant-supported fixed ceramometal restoration (8 implants in the mandible)
<b>Bayer S et al. 2010</b> Retention force measurement of telescopic crowns	43 patient	N/A	Department of Prosthodontics, Preclinical Education and Dental Materials Science	N/A
<b>Stock V et al. 2016</b> PEEK Primary Crowns with Cobalt-Chromium, Zirconia and Galvanic Secondary Crowns with Different Tapers—A Comparison of Retention Forces		90 double crowns (i) 30 CoCr-crowns milled (ii) 30 ZrO <sub>2</sub> -crowns milled from Ceramill ZI (iii) 30 GAL-crowns made using electroforming	N/A	
<b>Turp I et al. 2014</b> Retention and surface changes of zirconia primary crowns with secondary crowns of different materials		12 groups, each containing six samples, consisting of: (i) gold alloy 1ry crown electroformed gold 2ry crowns (ii) zirconia 1ry crown-electroformed gold 2ry crowns (iii) zirconia 1ry crown-casted non-precious alloy 2ry crowns conus angles of 0°, 2°, 4°, and 6°.		
<b>Pietruski J K et al. 2013</b> Retention force assessment in conical crowns in different material combinations		12 crown pairs of two different connections : (i) gold casting alloy/gold casting alloy (ii) gold casting alloy/gold electroforming alloy. with the cone angles of 2°, 4° and 6°.		

Tables 2 &amp; 3:- showing Methodology and Results

STUDIES	Methododology	ASESSEMENT
<b>Grossman AC et al.</b>	2 groups: 1- 2ry crowns made by galvanofarming technique with 0 degree 1ry crown 2- 1ry crown with 6 degrees	He measures retention which has an impact on the Oral Health Related Quality of Life (OHRQoL) with oral health impact profile (OHIP)
<b>Uludag B et al.</b>	A mandibular telescopic overdenture retained by electroformed 2ry copings with zirconia 1ry coping	
<b>Besimo C et al.</b>	2 groups The experiment is made on 40 specimens which are divided into 2 groups (20 each) in the first group the primary coping was made from gold while the second group made of pure titanium. Each twenty were divided into two equal groups. In the first group the cone angle was 5.5 degrees while the second group was 6.5 degrees. Five of the secondary copings were fabricated from Cr-Co and the other five from gold alloys. The secondary coping was placed on the inner coping with a force of 20 N which correspond to the average masticatory force. Insertion separation cycled was 10000. Saliva substitute was used.	Retention
<b>Bayer S et al 2011</b>	In vitro part: he used artificial saliva In vivo measurements were performed 4-6 weeks after the denture insertion. The attachment was cast into type IV gold alloy. The specifications of the secondary coping: 0.4-0.5 mm-sand blasted-further finishing of the inner surface was performed using burnishers with different levels of roughness. Tapering was 1-2degrees Before measurement the telescopic crowns were cleaned of adherent food or plaque. The point of measurement should not be located further than the distal surface of the second premolar. The retentive force was measured for the inical separation of the telescopic crowns approximately from the first 0.1 mm of separation	Retention
<b>Singh K &amp; Gupta N</b>	Maxillary right and left canine , mandibular right and left canine and mandibular right premolar- -Intentional RCT then long abutments were prepared 2-5 degrees, while short abutments parallel. -secondary coping with metalprojections (retention beads) for mechanical interlocking to denture surface.	
<b>Kwon H B &amp; Lee SH</b>	10 dies for double crowns were fabricated. Two kinds of inner crown were fabricated. Five inner crowns were fabricated for hybrid crowns and 5 others were made for conus crowns. Five inner crowns for hybrid crowns had a 3 mm parallel axial wall gingivally and a 3 mm inclined plane, which conformed to the outer contour of prepared teeth occlusally. Five inner crowns for conus crowns with heights of 6mm and	



	<p>a cone angle of 2 degrees were fabricated.</p> <p>An inner crown was placed into the holding apparatus of a universal testing machine , and the outer crown was placed onto the inner crown and connected to the holding apparatus of a universal testing machine.</p> <p>Compressive force was applied to the inner-outer crown assembly at a cross head speed of 100cm/min until full seating was achieved, and then tensile strength was measured at the same cross head speed. For all measurements, artificial saliva was introduced between the outer and inner crowns.</p>	
<b>Jin Yi Y &amp; Park C</b>	<p><b>1<sup>st</sup> group:-</b> When inner copings were luted to the abutments, it was found that excessive force was required for insertion and removal of the denture. The patient complained of the pain and difficulties of insertion and removal of a denture.</p> <p><b>2<sup>nd</sup> group:-</b> internal gaps were found both between the outer and inner crown of right first premolar, and between the residual ridge and free-end denture base . Even after relining procedure, fit and retentive force of retainers were still insufficient.</p>	Problems were experienced with overdenture especially those related to retention.
<b>Sakai Y et al.</b>	<p>-The average surface roughnesses of the smooth and rough surfaces of the inner crown were 0.1 and 1.5 <math>\mu\text{m}</math>, respectively; those of the outer crown were 0.1 and 1.2 <math>\mu\text{m}</math>, respectively. The 4 and 5° inner and outer crowns were prepared only with a smooth surface.</p> <p>- During measuring the retentive force the piston of the test machine applied a 100-N load on the test assembly, moved 2.5 mm upward to separate the outer crown at a separation speed of 50 mm/min, and then returned downward to insert the outer crown until 100-N load applied.</p> <p>- One thousand consecutive cycles of separation and insertion were performed at 10 cycles/minute. This test set-up permitted separation to be performed and evaluated in the axial direction only.</p>	This study evaluated the effect of surface roughness and tapered angle of cone crowns on retentive force.
<b>Mansour S et al.</b>	<p>1<sup>st</sup> case:- 6 implants in maxilla 3 implants in mandible to complete unilateral arch -One piece abutment (highly electroplated) and framework were milled into zirconium by a special CAD/CAM system then cemented as a 1ry coping.</p> <p>2<sup>nd</sup> case:- -combined teeth and implant -coping are milled with CAD/CAM then cemented</p>	The aim of this study was to present the application of all ceramic CAD/CAM milled zirconia one piece implant telescopic abutments in complex clinical situations.
<b>Gurbulak AG et al.</b>	<p>The maxillary right second premolar was prepared using commercially available models.</p> <p>-A tapered conus angle of 3° and a chamfer width of 1 mm were created using a parallelometer for the master metal die.</p> <p>-10 models were used for each group.</p> <p>- inner surfaces of the 1ry crowns and outer surfaces of the 2ry crowns were sandblasted with 110<math>\mu\text{m}</math> aluminum oxide particles for the evaluation of the initial retention force and weight. To simulate wear, specimens were inserted in specially designed wear equipment (The crowns were inserted and separated 3285 times in a horizontal direction,</p>	To measure an in vitro retention force of doubleconical crowns fabricated using primary galvanofforming and secondary casting techniques and those fabricated using primary casting and secondary galvanofforming techniques under simulated clinical

	<p>to simulate a patient's removal and replacement of the denture three times daily for 3 years.) The tests were performed in artificial saliva to lubricate the double crowns during the wear process.</p> <p><b>GROUP A</b></p> <ul style="list-style-type: none"> <li>❖ 1ry coping:- galvanoformed (gold)</li> <li>2ry coping:- non-noble (nickel chromium)</li> <li>❖ After the wear test retention <b>decreased</b> by 66%.</li> </ul> <p><b>GROUP B</b></p> <ul style="list-style-type: none"> <li>❖ 1ry coping:- non-noble (nickel chromium)</li> <li>2ry coping:-galvanoformed (gold)</li> <li>❖ Before the wear test it is three times higher in retention</li> <li>❖ After the wear test retention <b>increased</b> by 134%.</li> </ul>	<p>conditions before and after a wear test.</p>
<b>Riera JJG et al.</b>	<p>-Minimum milling height and taper would have to exceed 4 mm with a 2-degree taper for long-term stability. -The abutments (primary structures) and the Galvano-copings (secondary structures) were replaced on the master cast and a 1-mm coat of wax was placed on the external surface of the coping to provide a relief for cement.</p>	<p>Alternative prosthetic retentive means were assessed.</p>
<b>Bayer S et al.</b>	<p>The double crowns were fabricated from high-gold-content Type 4 alloys. The crowns had a preparation of 1–2°. A specifically designed measuring device was used. The retentive forces were measured with and without lubrication by a saliva substitute. The measured values were analyzed according to the type of tooth (incisors, canines, premolars, and molars). Thermoplastic material was filled into the primary telescopic crowns to provide an adequate retention on the inside of the crown. Spring-hard steel wires were provided with retention and fixed in position in the thermoplastic material. The wires were manually aligned parallel to the milling or withdrawal direction of the telescopic crown. The surfaces of primary and secondary telescopic crowns were cleaned with alcohol. The primary crowns were inserted into the secondary crowns using a ball plugger, which was pressed onto the Kerr material. The retention force was then measured by inserting the measuring stylus into the wire retention and by withdrawing the telescopic crown axially. Additionally, a comparison between lubricated and non-lubricated telescopic crowns was done.</p>	
<b>Stock V et al.</b>	<p>Retentive Force was measured in a pull-off test (20 pull-offs/specimen)</p>	<p>To measure an in vitro retention force of double conical crowns fabricated using different materials primary and secondary crowns with different taper (0, 1, and 2 degrees).</p>
<b>Turp I et al.</b>	<p>Samples were subjected to 10,000 insertion–separation cycles in artificial saliva and retention force was measured. X-ray diffraction and scanning electron</p>	<p>To evaluate zirconia as a substitute for gold alloy in primary crowns facing</p>

	microscopeanalysis were performed on the sample surfaces.	secondary crowns manufacturedwith different materials, in terms of long-term retention force changes, wear, and phase transformation.
<b>Pietruski J K et al.</b>	Experiment of 10.000 in-and-out cycles was performed using a new device which allows the retentive force to be measured in continuous way without necessity of moving the samples to another device.	To measure an in vitro retention force of double conical crowns fabricated using different materials primary and secondary crowns with different taper (2°, 4° and 6°).

Studies	Results	Histomorphometric Analysis
<b>Grossman AC. Et al.</b>	The difference in OHIP before treatment and 6 and 9 months later was significant (was better after treatment) The author mentioned that treatment planning should be based on objective factors including not only solid evidence for clinical performance but also patient satisfaction and OHRQoL.	-Patients in the Galvanoformed group rated the retention ( $P = .04$ ). -The difference between the groups was not significant at any time. With the exception of assessment of overall denturefunction in the Galvanoformed group,all other ratings had a median of 10,indicating a very high satisfaction of patients in both groups.
<b>Uludag B. et al.</b>	He mentioned that the electroformed crowns had a superior fit in comparison to conventional cast crown. Also he mentioned that the main advantage of zirconia copings lies in the elimination of the galvanic currents and thermal protection of the abutment teeth. However they are bulky compared to the conventional casted copings.	N/A
<b>Besimo C et al.</b>	The mean initial retentive force of the pure titanium telescopic crowns didn't differ statistically from the values obtained from samples with secondary crowns cast in a gold or a cr-co alloy. Retention increased in the pure titanium and gold unlike cr-co regardless of the angle. This is attributed to the mechanical adaptation at the interface between the inner and outer crowns. Such force characteristics might be the result of different physical properties of the various materials used ( elastic modulus) The delayed wear of the telescopic crowns might also have been associated with the low force used to seat the outer crown onto the inner crown	N/A
<b>Bayer S et al.</b>	The retention force measured intraorally is higher than the extra oral values measured	-The in vitro median value of 1.97 N to the in vivo median value of 4.70 N by the Mann-Whitney test showed a significant

		<p>difference(<math>p &lt; 0.0001</math>).</p> <p>-To compare the data of both groups, a Spearman test was performed. The result of the test showed a Spearman's <math>q = 0.5052</math>. This means that the values are highly correlated with each other.</p>
Singh K & Gupta N	<p>Tooth supported removable overdentures with telescopic crowns provide better retention, stability, support, stable occlusion, decrease in the forward sliding of the prosthesis and better proprioceptive reflexes allowing better control of mandibular movements which increase chewing efficiency and phonetics. Also the rate of the residual ridge resorption was decreased.</p>	N/A
Kwon H B & Lee SH	<p>The initial retentive force of double crown was affected by the type of the double crown system.</p> <p>Conus was better than the hybrid regarding the retention.</p>	<p>The average retentive force in group 2 (CONICAL), in which the hybrid outer crowns was used showed higher value than those of group 1 (HYBRID) (<math>p = .0198</math>).</p>
Jin Yi Y & Park C	<p>Insufficient or excessive retention in conical crown retained denture is common. Gap between inner coping and outer crown or removal difficulty, besides incomplete seating of denture found in conical crown-retained denture were assumed from the laboratory processing error occurred during coping transfer procedure from the mouth to the model. To prevent this problem, secure anchoring of inner coping and re-examination and milling of convergence angle was recommended on the master model from pick-up impression.</p>	N/A
SAKAI Y et al.	<p>-Regarding the effect of tapered angle on retentive force, the smaller the tapered angle of the cone crowns the greater the retentive force was.</p> <p>-The retentive force in the cone crown telescopic system is considered to be generated mainly by the residual elastic strain in the outer crown. This elastic strain occurs due to the deformation of the outer crown on the inner crown when occlusal force is applied firmly, and remains when the occlusal force is separated because of the existence of the inner crown.</p> <p>-The retentive force of the cone crown telescopic system is produced by not only residual elastic strain due to friction but also other factors such as the micro interlocking effect especially when it is metal to metal.</p> <p>-The wear resistance of gold alloy was 3.4 times greater than that of pure titanium, therefore the wear resistance of (titanium alloy with 6% aluminum and 7% niobium is) not better than that of gold alloy.</p> <p>-The experimental cone crown telescopic system was designed for dental implants. The greater retentive force of the cone crown telescopic system has been suggested to</p>	<p>The effects of tapered angle on retentive forces were analyzed by nested 2-way ANOVA, selecting combinations of tapered angle and number of cycles of insertion and separation, and Tukey's HSD test using statistical software.</p> <p>The significance level was set at 0.05.</p>

	bind implant to the abutments tightly; consequently, a secondary splinting effect could benefit the Osseointegration of immediately loaded implants.	
Mansour S et al.	It was demonstrated that there are applications of zirconia in implants dentistry while cementing of telescopic crowns to implants' abutments which is controversial to the one-piece milled telescopic abutments as an alternatives and economically treatment option. Longitudinal studies have to prove the success of this method.	N/A
Gurbulak AG et al.	<p>- The retention force of a telescopic crown is influenced by factors of abutment tooth preparation, such as taper angle, height, and marginal design, and also by factors associated with the fabrication process, such as milling speed, degree of cutter wear, polishing, casting technique, and setting method also the contact surface pressure ,surface roughness and the static frictional coefficient (SFC) have a great influence on the retention <i>thus</i> it could be controlled by changing the taper angle of the double crown and the thickness of the secondary crown.</p> <p>The reasons that group B is higher in retention after the wear test than group A is:-</p> <ol style="list-style-type: none"> <li>1-Galvanoformed crowns fit precisely to dental restorations and also improve marginal fitting due to the elastic deformation.</li> <li>2- Contact surface pressure and cone angle did not vary, but the difference in crown materials caused a variation in SFC. Retentive forces in conical double crowns are generated by the residual elastic strain in the secondary crown, which correlates with the SFC.</li> <li>3-Change in weight after the wear test.</li> <li>4-Smooth surface of 2ry coping (after the wear test) in group B increased contact unlike internal beads in group A.</li> <li>5-Plastic deformation occurring increased the actual contact area.</li> </ol> <p>As a conclusion secondary coping is more influential in the retention beside the advantages of the galvanofforming technique weremanifested in the secondary crown but not in the primary crown.</p>	In group A, the wear test had a significant influence on the retentive force ( $p < 0.05$ ), but wear produced no significant difference in weight ( $p > 0.05$ ). In group B, the wear test had a significant influence on the retentive force ( $p < 0.05$ ), and wear produced a significant difference in weight ( $p < 0.05$ ).
Riera JGG et al.	<p>-Prosthetic restoration of the edentulous maxilla with osseointegrated implants and a telescopic detachable prosthesis using Galvanic copings was presented as an alternative to traditional retention techniques for overdentures.</p> <p>-The use of basic parallel-milling techniques and electroforming permitted the fabrication of a prosthesis with significant retention and few moving parts, further minimizing potential maintenance.</p>	N/A
Bayer S et al.	<p>-No statistically significant difference between lubricated and unlubricated specimens was found.</p> <p>-The results indicate that retention force values of telescopic crowns, measured in clinical practice, are often much lower than those cited in the literature.</p> <p>-The measurements also show a wide range. Whether this proves to be a problem for the patient's quality of life or not can however only be established by a comparison of the presented results with a follow-up study involving</p>	<p>-The median retention force value was calculated for each telescopic crown and differentiated according to the type of tooth showed that the measurements do not differ significantly (Kruskal-Wallis test, <math>p = 0.6334</math>).</p> <p>-The statistical analysis was</p>

	measurement of intraoral retention and determination by e.g. oral health impact profile	performed by a Mann–Whitney test. It showed that there was no significant difference between the measurements with and without saliva lubrication (p=0.0506).
Stock V et al.	CoCr and ZrO <sub>2</sub> mainly adhere through friction and wedging, whereas galvanic crowns basically adhere by hydraulic adhesion. It can be assumed that the variation in the results is not only material related, but also especially related to the manufacturing techniques. The viscosity of the applied saliva, as well as the chamfer design, may influence the hydraulic adhesion and, thus, the retention force as well.	Cobalt Chromium CoCr and Zirconium dioxide ZrO <sub>2</sub> both present a high elastic modulus (200 GPa) and are rigid and stable (280 HV 10; 1200 HV 10). PEEK, in contrast, is soft and ductile (110 HV 5/20) and shows a low elastic modulus (4 GPa). Putting a CoCr or ZrO <sub>2</sub> secondary crown on a PEEK primary crown could lead to a strong wedging due to the flexibility of PEEK and the differences in elastic modulus. This could be a possible explanation as to why 2 degree tapered crowns show higher retention force values than 0 degree tapered crowns.
Turp I et al.	A more predictable and less excursive retention force can be obtained using a hard and rigid primary crown material like zirconia.	Zirconia (1,250 HV) is a harder material than the gold alloy (295 HV), the adaptation of the double crown takes place with the deformation of the secondary crown to fit the primary crown, without any wear on the primary crown. Therefore, the use of a hard and wear-resistant primary crown material against a less hard secondary crown material may be advantageous.
Pietruski J K et al.	It appears that the strength of this correlation is determined by the type of the material pair and also the coping fabrication technique.	Dispersion of retention values is similar in material combination casting alloy/electroforming as compared to casting alloy/casting alloy, but when cone angle was 2° or 4°, stability of retention force with the passage of time was higher in combinations with electroformed copings.

### Discussion:-

The cardinal aim of the review is to investigate how strong the value of retentive force of telescopic crowns in an implant-supported overdenture is in clinical practice.

In the field of the double crown technique, studies regarding PEEK on implants are scarce. Telescopic crowns on implants are effective in prosthesis stabilization with regard to horizontal forces in cases of advanced atrophy of the alveolar crest<sup>[4, 19]</sup>.

It was revealed that the variation in the results is not only material related, but also related to the manufacturing techniques<sup>[4]</sup>.

(PEEK) showed higher values of retention compared to (metal). In cases where the primary crown is made of metal and the secondary crown is made of PEEK and it was proven that the secondary crown is the determinant of the retentive forces<sup>[15]</sup>. Whereas the hardness of 1ry crown (metal) (455.88 HV) is more than that of the 2ry crown (PEEK) (110 HV), therefore, the use of a hard and wear-resistant primary crown material against a less hard secondary crown material is advantageous. Thus, the adaptation between primary and secondary crowns will be achieved by the changes in the fitting surface of the secondary crown<sup>[4, 5]</sup>.

Another potential explanation is that PEEK is a soft and ductile material that yields and adapts well. The adaption process resulted in a good marginal fit.

Persistence of retentive forces in conical crowns with the passage of time is higher in combinations of materials between the primary and secondary crowns<sup>[18]</sup>.

It was also claimed that the casting methods caused the formation of very minute microscopic casting beads on the internal and external surfaces of the primary and secondary crowns. Unfortunately, it is technically impossible to remove these casting beads from the surfaces of the cast crowns which apparently affect the retention by time<sup>[15]</sup>.

### Conclusion:-

Implant retained mandibular overdenture with telescopic attachments is a successful treatment option regarding the retention and improved overall function.

The retention force of a telescopic crown is influenced by factors of abutment preparation, such as taper angle, height, and marginal design, and also by factors associated with the fabrication process, such as milling speed, degree of cutter wear, polishing, casting technique, and setting method also the contact surface pressure, surface roughness in addition to the static frictional coefficient (SFC) have a great influence on the retention thus it could be controlled by changing the taper angle of the double crown and the thickness of the secondary crown.

The use of a harder and more wear-resistant primary crown material against a less hard secondary crown material is advantageous because the adaptation between primary and secondary crowns is increased by the changes in the fitting surface of the secondary crown. Unfortunately this conclusion is based on a limited number of articles, indicating the need for more clinically controlled randomized studies.

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### RESEARCH ARTICLE

#### VIOLETION OF THE SOVEREIGNTY OF INDONESIA AIRSPACE BY FOREIGN AIRCRAFT.

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#### Abstract

State sovereignty in the airspace is complete and exclusive guaranteed by international law. This research is a normative or library research that examines the legal and enforcement arrangements sovereignty in Indonesian airspace. The results of the study are Aircraft entered Indonesian airspace without permission is a violation of Indonesia national law and international law. And as a sovereign state can take measures to preserve the sovereignty of their airspace in accordance with Indonesian national law and international law.

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#### Introduction:

In article 5 of Law No. 1 of 2009 on Aviation that "the Republic of Indonesia full and exclusive sovereignty over the airspace of the Republic of Indonesia".As a sovereign state, the Republic of Indonesia has sovereignty fully and completely in the airspace of the Republic of Indonesia, in accordance with the provisions of the 1944 Chicago Convention on International Civil Aviation and the Convention on the Law of the Sea 1982 which has been ratified by Law No. 17 of 1985 concerning the Ratification of the United Nations Convention on the Law of the Sea.<sup>1</sup>

The provisions in this article only confirms the authority and responsibility of the Republic of Indonesia to regulate the use of airspace, which is part of the territory of Indonesia, while about the sovereignty of the Republic of Indonesia as a whole remain applicable provisions of the legislation in the field of national defense. In order to safeguard the sovereignty of the airspace of the Republic of Indonesia, to do the acquisition and development of technology so that the Unitary Republic of Indonesia can be as high as possible control of its airspace for the benefit of the widest possible for people, especially for the benefit of flight.<sup>2</sup>

Sovereignty is one element of the existence of a state. From the point of linguistic sovereignty can be interpreted as a highest authority of the Governmentstate, local, and so on. In the context of the science of statecraft, Parthiana said that sovereignty can be defined as the highest authority is absolute, complete, round and can not be divided and therefore can not be placed under the authority of another. However, in the process of further development, there has been a change in the meaning of state sovereignty.<sup>3</sup>

<sup>1</sup>Explanation of article 5 of Law No. 1 of 2009 on Aviation

<sup>2</sup>Explanation of article 5 of Law No. 1 of 2009 on Aviation

<sup>3</sup>Suryo Sakti Hadiwijoyo. 2011. *Perbatasan Negara Dalam Dimensi Hukum Internasional*, Yogyakarta: Graha Ilmu. p. 8

The sovereignty of a country is no longer an absolute or absolute, but in certain limits must respect the sovereignty of other countries, which is governed by international law. It is then known as Relative Sovereignty of State. In the context of international law, a sovereign state in essence must submit to and respect international law, as well as the sovereignty and territorial integrity of other countries.<sup>4</sup>

Management and defense issues in the border region are closely linked to the basic conception of the state as a sovereign entity, population and territory as well as the interpretation or perception of the threat. Thus, the management and defense of the border region can be considered as all efforts to realize the existence of a state that is characterized by protection of sovereignty, population and territory of the various types of threats. This conception is part of an understanding of the totality of the concept of 'national security' which in essence is "the ability of states to protect what is defined as core values, where achievement is a continual process, using all elements of power and resources that exist and embraces all aspects of life."<sup>5</sup>

Each state has a standard secure air space region closely. The national air space of a country entirely closed to foreign aircraft both civilian and military, and only with the permission of the state under the first place either through bilateral and multilateral agreements, the national air space can be entered or passed by foreign aircraft.

Violation of airspace is a condition, in which the aircraft of a country's civilian or military airspace entering another country without the prior permission of the state which he entered. Judging from several cases of cross-border violations in Indonesia are ordinary and not so threatening, but the Indonesian state must act decisively because the country's sovereignty is violated by another country. It is in fact on the ground a lot of violations of our air border areas by foreign nationals either of civilian aircraft and military aircraft.

Standard guarding the air space in Indonesia is still considered to be less due to several factors such as lack of technology owned by Indonesia, Weak radar system in Indonesia as well as the lack of the number of aircraft and defense equipment makes supervision Indonesian airspace to be not optimal.

Many foreign aircraft crossing the airspace of the Indonesian state without permission from the control tower located on land and most of the military aircraft belonging to another country in violation to fly all the way into Indonesian airspace.<sup>6</sup>

This issue becomes important warning about the security and sovereignty of the territory of Indonesia that could be threatened due to the many foreign planes passing Indonesian air territory without a permit to fly in advance of the government in this case the Air Force.

This research outlines as follows to explain: 1. Legal arrangements on airspace violations, 2. Enforcement sovereignty in the airspace of the Republic of Indonesia, 3. Barriers to enforcement Airspace Sovereignty in Indonesia.

### **Method of the Research:**

This type of research is a normative legal research. The study began with an inventory of legal regulations in both the international and national laws regarding the violation of sovereignty in the airspace. Furthermore, to determine sovereignty on the enforcement of foreign aircraft violating airspace Indonesian nation and obstacles to the enforcement of the country's sovereignty in the airspace of Indonesia conducted interviews with the parties in the Command Headquarters of the National Air Defense Sector II (Kosekhanudnas II) Makassar.

Data obtained both primary and secondary processed first and then analyzed using qualitative descriptive method, which the researchers explain, describe, and illustrate in accordance with the problems closely related to the study, and then draw a conclusion based on the analysis that has been done.

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<sup>4</sup>*Ibid.*

<sup>5</sup>Mufti Makarim. A. 2005. *Strategi Pengelolaan dan Pertahanan Wilayah Perbatasan Udara Republik Indonesia : Tantangan Aspek Politik*. Yuridis dan Operasional. p. 89

<sup>6</sup>Look <http://www.cnnindonesia.com/nasional/20151004173758-20-82703/ramai-penyusup-di-angkasa-garuda/>. Accessed on 08 Oktober 2015

## Results and Discussion:

### Legal Arrangements Against Foreign Aircraft Infringing the Sovereignty Airspace:

Very strategic area air space for defense and security under the state has been realized by forming the 1919 Paris Convention on the regulation of aerial navigation. Article 1 of the Paris Convention in 1919 boosted by The 1944 Chicago Convention on international civil aviation asserted that each country has full and exclusive sovereignty over the air space over its territory. As is the territory is its land and territorial waters associated with controlled for sovereignty, absolute power, protection or mandate of a country. The State has exclusive jurisdiction and authority full to control the air space above its territory. Words full and exclusiveshows how much of a nation's sovereignty over its air space.<sup>7</sup>

The extent to which the country's sovereignty in the air space can actually be viewed horizontally or vertically. Horizontally country has sovereignty over the air space above the land and waters to its territorial sea. The air space above the contiguous zone, EEZ is already not under the sovereignty of the country under. Likewise for the air space over the high seas belong to all mankind. The limits of sovereignty over the air space vertically up to now unclear. This is because the absence of an agreement to which the height of the air space and start what height space begins.<sup>8</sup>

With the full and exclusive sovereignty of its state reserves the right to make the adjustment to flights in the air space. This arrangement is necessary so as the flight takes place safely and efficiently and orderly. In addition to the Paris Convention in 1919, other important legal instruments are the 1944 Chicago Convention on civil aviation. As the name implies, this convention is intended for civil aircraft, not for State Aircraft.<sup>9</sup>

Article 1 of the 1944 Chicago Convention, recognize the sovereign rights in the territorial airspace of a State, which reads:

The contracting States Recognize that every State has complete and exclusive sovereignty over the airspace above its territory.

Article 3 as the implementation of article 1 Chicago Convention, explains:

(a) This Convention shall be applicable only to civil aircraft, and shall not be applicable to state aircraft. (b) Aircraft used in military, customs and police services shall be deemed to be state aircraft. (c) No state aircraft of a contracting State shall fly over the territory of another State or land thereon without authorization by special agreement or otherwise, and in accordance with the terms thereof. (d) The contracting States undertake when issuing regulations for Reviews their state aircraft, that they will have due regard for the safety of navigation of civil aircraft.

In Chicago Convention Article 3a only stated that the convention does not apply to state aircraft / military aircraft, but no detailed explanation about it, only in the form of a statement negative. According Boer Mauna distinction whether a plane including civilian plane flight or state depending on their function rather than quality owner.<sup>10</sup>

In Article 3b of this convention only mentions that "Aircraft used in military, customs and police services shall be deemed to be state aircraft". This is not a definition but only a rebuttable presumption (iuris presumptio). Many types of activities other countries that use the air which is also owned by the state such as coastguards, search and rescue, medical services, mapping or geological survey services, disaster relief, and Government VIP transport, and others. Thus, according to Michael Milda, what otherwise Article 3b is not something exclusive and comprehensive.<sup>11</sup>

However in practice some elements that are generally used to categorize an aircraft as military aircraft are as follows: 1. design of the aircraft and its technical characteristics; 2. registration marks; 3. ownership: the fact that the

<sup>7</sup>Sefriani. *Pelanggaran Ruang Udara Oleh Pesawat Udara Asing Menurut Hukum Internasional dan Hukum Nasional Indonesia*. Jurnal Hukum Ius Quia Iustum No. 4 Vol. 22 Oktober 2015. p. 544

<sup>8</sup>*Ibid.* p. 544

<sup>9</sup>*Ibid.* p. 545

<sup>10</sup>Sefriani. *Op.Cit.* p. 545

<sup>11</sup>*Ibid.* p. 546

plane is owned by units of the military in certain cases not automatically could be proof that the plane was "used in military services"; 4. Type of operation, consisting of: the nature of the flight, documents Carried on board, flight plan, communications procedures, composition of the crew (military or civilian), Secrecy or open nature of the flight, etc.

Countries entitled to organize all kinds of activities that are above their airspace including defining areas that can be taken by civil and military flights. Flight status determination is also a determinant of the law enforcement in case of infringement. Offenses committed by civilian aircraft shall not constitute a responsibility of the state, if the breach is not directly or indirectly ordered by the state but rather delegated to the organizer or the owner of the aircraft. While the violations committed by the state or military aircraft, the state aircraft owners are responsible for the violations committed. Law enforcement against violations of airspace in accordance with applicable law in the country. In the event of a violation under the state can perform or ambush interception and forcing the plane to come down or landing at a base in accordance with the command of the country under. Violations of airspace of a country is a violation of national law and international law and international dispute resolution conducted in accordance with international law.

Basically the Indonesian national laws in line with international law that can be seen of which Article 5 of Law No. 1 of 2009 which states that "the Republic of Indonesia full and exclusive sovereignty over the airspace of the Republic of Indonesia", which adopted directly from Article 1 of the 1944 Chicago Convention.

In respect of the country's sovereignty over the airspace of the Republic of Indonesia, the Government has implemented the authority and responsibility for regulating the air space for the benefit of airlines, the national economy, national defense and security, social, cultural, and environmental air.<sup>12</sup>

Indonesian airspace own settings set by the government to establish areas where the air is prohibited and restricted. The authority to establish areas of prohibited and restricted air is under the authority of every sovereign state to regulate the use of their airspace, in the framework of the public safety, aviation safety, the national economy, the environment, defense and security.<sup>13</sup>

For sanctions against violators of the rule of Indonesian airspace governed by Article 401, 402 and 414.

**In Article 401 Reads:**

"Each person operating an aircraft Indonesian or foreign aircraft entering the airspace prohibited as referred to in Article 7 paragraph (2) shall be punished with imprisonment of 8 (eight) years and a maximum fine of Rp 500,000,000.00 (five hundred million rupiah). "

**Article 402 Reads:**

Each person operating an aircraft Indonesian or foreign aircraft that entered restricted airspace as referred to in Article 7 paragraph (4) shall be punished with imprisonment of three (3) years or a maximum fine of Rp 500,000,000.00 (five hundred million rupiah ).

**Article 414 Reads:**

Each person operating foreign aircraft in the territory of the Republic of Indonesia without the permission of the Minister referred to in Article 63 paragraph (2) shall be punished by imprisonment of five (5) years or a fine of not more Rp2.000.000.000,00 (two billion rupiah).

Harmony and firmness in law enforcement to air violators sovereign territory of Indonesia, which can be a deterrent effect, it would be very necessary. Indonesian Aviation Law does not regulate differences in the treatment of types of foreign aircraft violating sovereign territory of Indonesia. For civilian aircraft is clear that this type of aircraft should be subject to Indonesian law when in the territory of Indonesia. The aircraft can be sanctioned under Indonesian law. State under the right to make an interception, forced down, even the legal process of civil aircraft with air crews who violate the sovereign territory of Indonesia.

<sup>12</sup>Article 6 of Law No. 1 of 2009 about Flights

<sup>13</sup>Explanation of article 7 paragraph 1 of Law No. 1 of 2009 about Flights

By contrast, if the offense is the best that the state aircraft, especially foreign military aircraft entered the sovereign territory of the State of Indonesia. In international law the state aircraft has diplomatic immunity. State aircraft should not be investigated and examined by the investigation authorities, however, state aircraft, can be driven out by state aircraft Indonesia in this case the Indonesia air forces to exit the sovereign territory of the Republic of Indonesia. Violations committed this type of aircraft bore the responsibility of state and settlement using the dispute settlement mechanism under international law. According to international law dispute resolution can be done through peaceful or violent means. Under state security authorities in the framework of self-defense is entitled dispel such a plane, interception or even shoot down aircraft that foreign. Shoot down aircraft that foreign country in violation of the territorial sovereignty of the country under a form of legitimate means of violence perpetrated by the state under a foreign country if the plane was suspected of conducting activities that endanger national security vault. A peaceful solution can be done either through legal or political. Admission of guilt and an apology from the country of origin aircraft violating the country is one of the best form of accountability countries of origin when they did. Other forms of accountability are compensated for losses suffered under the state.

#### **Enforcement of State Sovereignty In Indonesia Airspace:**

The competent institution as enforcing air sovereignty is the Air Force National Army of Indonesian. It is stated in Law No. 34 of 2004 of the Indonesian Armed Forces, in the article

To implement the task implementation and enforcement of rule of law in the national air space, it takes the role of the National Air Defense Command (Kohanudnas). Because Kohanudnas has the capability of detection, identification and prosecution of the entire air vehicle that violated the airspace of the Republic of Indonesia. Meanwhile, in carrying out this task, Kohanudnas implement the **Air Defense Operations, both active and passive**.<sup>14</sup>

Basically the implementation of the Air Defense Operations divided into two namely **Active Air Defense Operations**, which includes the following activities:<sup>15</sup>

1. Detection: is the process of surveillance of air targets electronically and visually.
2. Identification is the process of determining the classification of each comrade air targets, air targets are not known or enemy air targets.
3. Repression: a follow-up of activities carried out by the identification of fighters ambushed for shadowing, dispels, forced landing and destruction.

While the **Passive Air Defense Operations**, includes:<sup>16</sup>

1. Danger preaching Air, aims to safeguard personnel and facilities against air strikes and increased readiness of all units in the face of air attacks.
2. Reduction due to attacks by air, these efforts made to regional security measure air strikes, rescue people and prevent the emergence of new dangers as a result of air strikes.

The process action carried out by warplanes assault as follows:<sup>17</sup>

1. Shadowing.
2. Intervention.
3. Force down.
4. Destruction.

For foreign civil aircraft violating airspace, carried out actions in accordance with Law No. 1 Year 2009 on Aviation of article 8 is: be warned and told to leave the area by the air traffic control personnel. In the case of warnings and

<sup>14</sup>Interview with Inteligence Assistant The Command Headquarters of the National Air Defense Sector II (Kosekhanudnas II) Makassar

<sup>15</sup>Interview with Inteligence Assistant The Command Headquarters of the National Air Defense Sector II (Kosekhanudnas II) Makassar

<sup>16</sup>Interview with Inteligence Assistant The Command Headquarters of the National Air Defense Sector II (Kosekhanudnas II) Makassar

<sup>17</sup>Markas Besar TNI. 2003. *Buku tentang Pertahanan Negara Petunjuk Pelaksanaan OPSGAB TNI Tentang Operasi Hanud Nasional*. Jakarta. p. 19

orders are not obeyed, performed acts of coercion by the aircraft of the Republic of Indonesia. As well as inspected and investigated in accordance with the provisions of Indonesian law.

And for a military aircraft or a foreign country who violate the airspace of Indonesia, the Indonesian government in this case the Air Force can conduct air defense operations in the framework of self-defense which is entitled dispel such a plane, interception or even shoot down aircraft that foreign. Shoot down aircraft that foreign country in violation of the territorial sovereignty of the country under a form of legitimate means of violence perpetrated by the state under a foreign country if the plane was suspected of carrying out activities that threaten or endanger national security.

**Implementation Case Interception and Force Down aircraft Foreign air include:**<sup>18</sup>

- Interception in Bawean island between planes F-16, the Indonesian air force with F-18 US Air Force union.
- Force down in Manado, VH-RLS plane with pilot Paul Jacklin Greame and Mc Clean Richard Wayne, and imposed a penalty of 60 million rupiah.
- Force down in Pontianak, the plane containing three crews in order training (training) were identified as captain Tan Chin Kian (instructor, Singapore), Xiang Bohong (trainee, Chinese), and Zheng Chen (trainee, Chinese). And imposed a penalty of 60 million rupiah
- Force down in Kupang, private jet Saudi Arabian Airlines, captain pilot, Waleed Abdul Aziz and Abdullah Aziz Ibrahim; two co pilot, Mohammed Suliman and Mohammed Saud; two stewardess, Kaitouni Oulaya and Safa; as well as the passengers, namely Muhammed Dhafir, Sami Amadh, Muhammed Abdullah, Hussin Ali, Khalid Mushabbad, Atiah Ayed, and Domino Domingo. After inspection, the aircraft did not carry dangerous goods. Head of Information Lanud El Dance. And imposed a penalty of 60 million rupiah
- Force down in northern Borneo, the aircraft with callsign TS-3009 and TS-3011 with a pilot named James Petrick Murphy member US Navy Reserve. And imposed a penalty of 60 million rupiah.

Based on the cases of violation of the sovereignty of the airspace above it can be concluded that the Air Force can perform actions such as detection, identification and prosecution of the aircraft which breach the sovereignty of airspace Indonesia, for foreign civil aircraft which do not have the permission through Indonesian airspace then penalized in the form of administrative sanction, and pay a fine of Rp. 60,000,000 (sixty million rupiah). Whereas under Article 418 of Law 1 Year 2009 on Aviation mentioned, violation commercial flight unscheduled coming into Indonesia without permission fined a maximum of Rp.200,000,000.00. Fines were granted pursuant to the Decree of the Directorate General Air Transportation No. 195 of 2008 regarding Implementation Guidelines Approval Fly in Article 17. Fines Rp. Rp. 60,000,000.00 rated the Air Force is very small and is not comparable to the costs incurred for the country deploy fighter aircraft belonging to the Air Force (AU). According to TNI AU needed Rp.100,000,000.00 to 400,000,000.00 (one hundred million to four hundred million rupiah) for fighter aircraft Sukhoi be able to fly for an hour. As for the state aircraft or foreign military efforts are warning, interception and forced out of the territory and the sovereignty of the Indonesian government could send a Diplomatic Note to the country where their aircraft foul Indonesian airspace. However, if the warning and forced out the territory sovereignty of Indonesia not adhered even suggests actions that threaten or endanger national security and defense Indonesia, then to do the shooting and destruction of the aircraft.

**Barriers in enforcing sovereignty in the airspace of the country of Indonesia:**

In the monitoring of the airspace required vast Indonesian Defense System Main Equipment corresponding to an area of high and standard capacity. The Command Headquarters of the National Air Defense Sector II (Kosekhanudnas) in maintaining the sovereignty of airspace Indonesia operates 6 units of Radar, addition the National Air Defense Command (Kohanudnas) have Air Squadron 11 Wings 5 Lanud Hasanuddin consisting of a squadron of Sukhoi Su-30 MK2 and Su-27 SKM totaling 16 aircraft and escorting sky Indonesian air. But of all defense equipment owned by Kohanudnas especially Kosekhanudnas II Makassar, still far away with the minimum standards of military force should be owned by Indonesia. Then the next barrier is the human resources both in quantity and quality operate air defense equipment is still very limited due to the many personnel lack the advanced education technologies more renewable air defense.<sup>19</sup>

<sup>18</sup>Data The Command Headquarters of the National Air Defense Sector II (Kosekhanudnas II) Makassar

<sup>19</sup>Interview with Intelligence Assistant The Command Headquarters of the National Air Defense Sector II (Kosekhanudnas II) Makassar

**Conclusion:**

From the above results it can be concluded that the regulation of the air sovereignty violations committed by foreign aircraft as expressly provided in the 1944 Chicago Convention and Law No. 1 of 2009 on Aviation which states in its airspace sovereignty is recognized by international law. Every state entitled to organize all kinds of activities that are above their airspace including defining areas that can be taken by civil and military flights. Status of Flight is also a determinant of the law enforcement in case of violation. Enforcement sovereignty in the airspace of the responsibility of the Air Force by conducting air defense operations in the form of detection, identification, and prosecution. The limitations of the Main Tool defense capacity (Alutsista) owned by the Air Force who has not reached the minimum limit of the defense forces can be an obstacle to the enforcement of the rule of Indonesian airspace. As well as the quality and quantity of human resources who operate tools of defense also be a determining factor in any surveillance and defense operations Indonesian airspace.

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### RESEARCH ARTICLE

## EVALUATION OF COINCIDENCE OF FACIAL MIDLINE TO DENTAL MIDLINE AND MAXILLARY MIDLINE TO MANDIBULAR MIDLINE IN UNDERGRADUATE STUDENTS.

Soham Mavani, Ramesh TR, Nikunj Patel and Vilas Patel.

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Facial Midline, Dental Midline,  
 Maxillary and Mandibular midline,  
 Esthetics.

#### Abstract

**Aim:** To evaluate coincidence of Facial midline with Dental midline and Maxillary midline with Mandibular midline in undergraduate students of Narsinhbhai Patel Dental College and Hospital, Visnagar.

**Materials and Methods:** A total of 200 Undergraduate students with the age range from 18 to 24 were selected randomly for the study. The patient having 2<sup>nd</sup> molar to 2<sup>nd</sup> molar present were included in the study. However patients having midline diastema, congenital or acquired defect were excluded. The patients were examined by 2 examiners to check if facial midline was coincide with dental midline and maxillary midline was coincide with mandibular midline or not.

**Result:** The results of the present study showed that 180 Patient's (90%) maxillary midline coincide with the facial midline. Among 20 patients, 14 patient's (70%) had facial midline shift towards right side and 6 patients had facial midline shift towards left side. 129 Patient's (64.5%) maxillary midline coincide with mandibular midline.

**Conclusion:** Maxillary midline is coincide with the philtrum and can be used as a guide for establishing Maxillary dental midline while fabricating fixed prosthesis or removable prosthesis. Maxillary midline is partly coincide with the mandibular midline.

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#### Introduction:-

Smile is the first outline of your personality and it has been accepted that it is the best gift any one can give. The balance smile midline has great importance. The balance smile depends on the coincidence of facial and dental midlines respectively. The facial midline is defined by the landmarks such as nose, philtrum and chin aligned in a straight line. It should be in the center of face and should coincide with the dental midline. The dental midline is the mid sagittal line of maxillary and mandibular arches when teeth are in maximum intercuspation.<sup>1</sup>

Dental midline is the vital element in smile design and should be parallel to the long axis of the face. Furthermore it should be perpendicular to Incisal plane and perpendicular to papilla.<sup>2</sup> Establishing dental midline parallel to that of face is the initial step while fabricating fixed or removable prosthesis.<sup>3</sup> If it is in harmony with facial component it significantly contributes to the aesthetics of the face. This will give patient a feeling of symmetry and balance.

Complete dentures must be attractive and natural in appearance. An important consideration in arrangement of the anterior teeth is the matter of equilibrium. Dental midline is an imaginary line that will separate the two maxillary central incisors. During complete denture fabrication or fixed prosthesis, we consider the philtrum as a guide for midline of the maxillary incisors. The dental literature fails to disclose the data of any research considered to provide



information as to how nature position the natural anterior teeth in relation to the anatomic center line of the face.<sup>4</sup> So aim of the present study is to check the coincidence of facial midline to dental midline and also to check the coincidence of maxillary midline to the mandibular dental midline.

### Materials and Methods:-

A Total of 250 dentate patients were selected from Narsinhbhai Patel Dental College and Hospital, Visnagar, Gujarat. The standards for selection of participants include undergraduate students from first year to final year and interns with age range from 17 to 25 years. All of them had permanent dentition from 2<sup>nd</sup> molar to 2<sup>nd</sup> molar in maxillary arch. There was random selection for male and female participants, no fixed proportion was proposed. The patients with midline diastema and congenital or acquired maxillofacial deformity were excluded. The patients undergone any orthodontic treatment were also excluded in the study. A written informed consent was obtained from each selected participant.

All the participants were examined by 2 examiners separately. To avoid eye fatigue both the examiners examined 50 participants per day. The participants were observed to check if maxillary dental midline coincides with facial midline. The facial midline was inspected by marking points between mid-deepest part of the till middle of the anterior most part of chin including center of philtrum with the help of scale or dental floss.

As a part of the routine examination, a specially set form was filled out by the examiner. The form required that two questions to be answered:

1. Does the dental midline (between the maxillary central incisors) coincide with the facial median line (using the philtrum as the guide)?

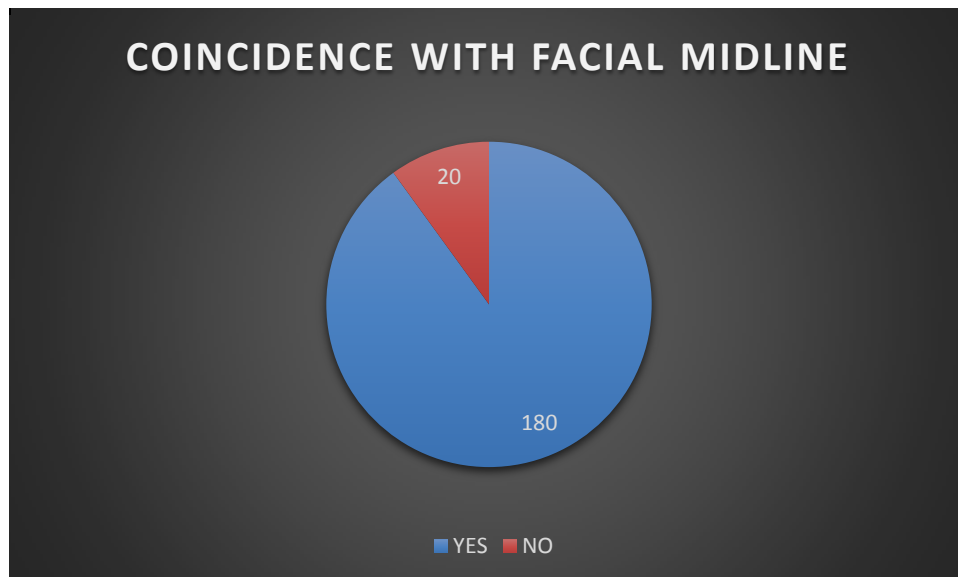
Yes                      No

2. Does the midline of the maxillary teeth coincide with the midline of the mandibular teeth?

Yes                      No

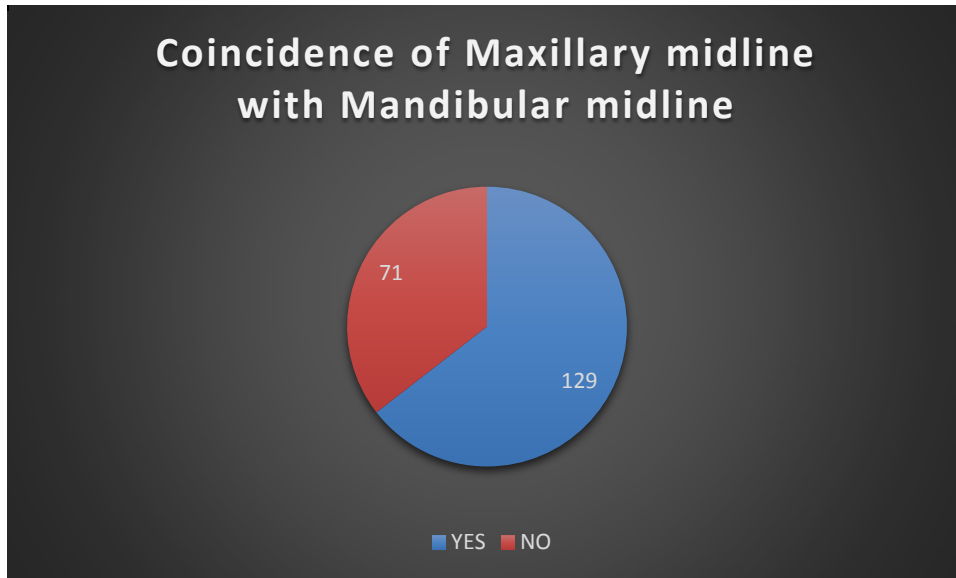
### Results:-

200 undergraduate students were evaluated for coincidence of facial midline with dental midline at Narsinhbhai Patel Dental College and Hospital, Visnagar, S Gujarat and results were obtained as follows. Philtrum was the guide to check the coincidence of the midline. Data was analyzed with descriptive statistical test.



**Graph 1:-**Coincidence of Facial Midline with Dental Midline

Graph 1 showed Coincidence of Facial midline and Dental midline in patients in which among 200 patients 180 patient's (90%) facial midline coincide with the dental midline (Figure 1) and 20 patient's (10%) midline did not coincide with the facial midline (Figure 2).



**Graph 2:-**Coincidence of Maxillary Midline with Mandibular Midline

Graph 2 showed that 129 patient’s (64.5%) maxillary midline coincide with mandibular midline (Figure 3) and 71 patient’s (35.5%) maxillary midline did not coincide with mandibular midline (Figure 4).

**Table 1:-**Facial and dental shift of midline towards right and left

	FACIAL SHIFT		DENTAL SHIFT	
	Right	Left	Right	Left
Frequency	14	6	39	32
Percentage %	70	30	54.93	45.07

Table 1 showed that Midline shift of patients towards right and left side. It showed that for facial midline to dental midline shift is more toward right side than the left side. For Dental midline shift, more patients had midline shift towards right side than the left side.

**Table 2:-**Facial Midline shift in distance

Distance	Towards Right	Percentage %	Towards left	Percentage %
1mm	8	4	2	1
2mm	4	2	3	1.5
3mm	2	1	1	0.5

Table 2 showed facial midline shift with distance towards right and left side. It showed that facial midline shift more towards right side than left side.

**Table 3:-**Dental midline shift in distance

Distance	Towards right	Percentage %	Towards left	Percentage %
1mm	6	3	11	5.5
2mm	23	11.5	16	8
3mm	7	3.5	4	2
4mm	3	7.7	1	0.5

Table 3 showed Dental midline shift with distance towards right and left side. It showed that dental midline shift more towards right side than left side.

**Discussion:-**

Graph 1 showed that among 200 patients 180 patient’s (90%) facial midline coincide with the dental midline and 20 patient’s (10%) midline did not coincide with the facial midline. It indicates that almost all patients midline is coincides with the philtrum of the patients.

Graph 2 showed that 129 patients' (64.5%) maxillary midline coincide with mandibular midline and 71 patients' (35.5%) maxillary midline did not coincide with mandibular midline. It indicates that not all patients maxillary midline coincide with the mandibular midline.

Table 1 showed that among 20 patients, 14 patients (70%) had facial midline shift towards right side and 6 patients (30%) had facial midline shift towards left side. It indicates that more midline shifts noted towards right side than left side. Among 71 patients, 39 patients (54.93%) had dental midline shift towards right side and 32 patients (45.07%) had dental midline shift towards left side. It indicates that dental midline shift found more on right side than left side.

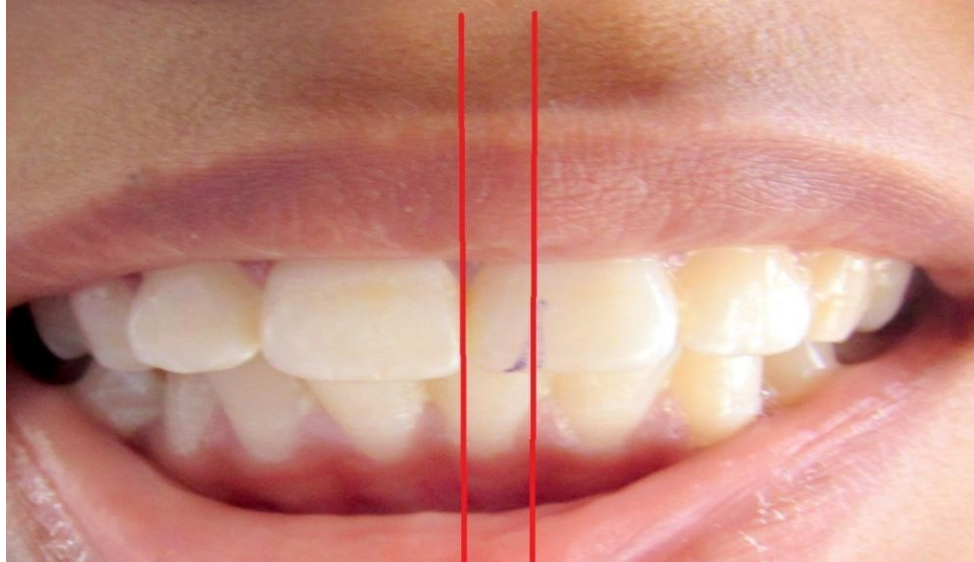
Table 2 showed facial midline shift with distance towards right and left side. It showed that towards right side among 14 patients, 8 patients' had midline shift of 1 mm, 4 patient had midline shift of 2 mm and 2 patients had midline shift of 3 mm. Towards left side among 6 patients 2 patients had midline shift of 1mm, 3 patients had midline shift of 2 mm and 1 patient had midline shift of 3 mm.

Table 3 showed Dental midline shift with distance towards right and left side. It showed that among 39 patients towards right side 6 patient showed midline shift of 1 mm, 23 patients showed midline shift of 2 mm, 7 patients showed midline shift of 3 mm and 3 patient showed midline shift of 4 mm. Towards left side among 32 patients, 11 patients showed midline shift of 1mm, 16 patients showed midline shift of 2 mm, 4 patients showed midline shift of 3 mm and 1 patient showed midline shift of 4 mm.

Facial symmetry is one of the facial aesthetic characteristic. Attractiveness of the face depends on alignment, symmetry and proportion of face. To achieve a balance smile while fabricating fixed or removable prosthesis is mandatory. The results of the present study are in agreement with the results obtained in the study conducted in city of Riyadh, Saudi Arabia.<sup>5</sup> They have found 88.10% subjects showing coinciding maxillary dental midline with facial midline. Similar results were obtained in another study done by Miller.<sup>6</sup>



**Figure 1:-**Facial midline coincide with Maxillary midline



**Figure 2:-**Facial midline not coincide with Maxillary midline



**Figure 3:-**Maxillary midline coincide with Mandibular midline



**Figure 4:-**Maxillary midline not coincide with Mandibular midline

**Conclusion:-**

With the limitation of this study it was concluded that

1. Maxillary midline is coincide with the philtrum and can be used as a guide for establishing maxillary dental midline while fabricating fixed prosthesis or removable prosthesis.
2. Maxillary midline is partly coincide with the mandibular midline.

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### RESEARCH ARTICLE

#### **PATHOLOGY BEYOND SLIDES-WHERE DO YOU THINK THE FUTURE LIES?**

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Oral and Maxillofacial Pathology,  
 Digital Pathology, Diagnosis, Histopathology,  
 Image Analysis, Nanosensors,  
 Pharmacogenomics.

#### **Abstract**

Oral and Maxillofacial Pathology today is viewed as a speciality of dental sciences, which addresses the diagnosis and treatment of the disease of the oral and peri-oral regions. As medical practice, it covers all aspects of diagnostic methods on solid or fluid tissues based on laboratory techniques. It also covers the methodologies to transmit diagnostic data in an interpretable way to other physicians directly involved with patient treatment. It also manages tissue banks for research or diagnostic purposes. Cellular therapies from tissue banks or blood banks are increasingly becoming part of Oral and Maxillofacial Pathology. The object of investigation in histopathology is the digital slide, which is accessible throughout the world with no time or geographical limits. It permits the digital modelling of routine histological and/or cytological slide and it also allows measurements by using image analysis or stereology software packages. The electronic slide can be viewed, examined and diagnosed on a computer connected to a microscope, a new interface in diagnostic histopathology. This article describes the possible uses of digital slides, future of Oral and Maxillofacial Pathology beyond slides which by improving communication could have a positive effect on the entire health care system that will redefine how pathology will be practiced and the role of the Oral and Maxillofacial Pathologist in India in the near future.

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#### **Introduction:-**

The four main aspects of applied medical information technology, which change the traditional systems of the entire health service are signal and data processing, digital modelling and interface optimisation. The information technology serving individual clinical specialties including Oral and Maxillofacial Pathology is changing at each of the four levels resulting in transformation of the communication paradigms.<sup>[1]</sup> Digital pathology systems offer Oral and Maxillofacial Pathologists an alternate, emerging mechanism to manage and interpret information. They offer increasingly fast and scalable hardware platforms for slide scanning and software that facilitates remote viewing, slide conferencing, archiving, and image analysis. Digital modelling of routine histological and/or cytological slide is increasingly being implemented for direct patient care.<sup>[2]</sup> Improvements in image quality, scan times, and image

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viewing browsers will hopefully allow Oral and Maxillofacial Pathologists to more seamlessly convert to digital pathology, much like our Oral Medicine and Radiology colleagues.<sup>[3]</sup> Digital imaging in pathology has undergone an exponential period of growth and expansion catalyzed by changes in imaging hardware and gains in computational processing. Today, digitization of entire glass slides at near the optical resolution limits of light can occur in 60 seconds.<sup>[4]</sup> Conventional histopathology is rapidly shifting towards digital integration. Will microscopes (and Oral and Maxillofacial Pathologists) soon be obsolete? Or are we dealing with just another image modality that leaves the core of tissue diagnosis intact? <sup>[5]</sup> This article provides an overview of current digital pathology beyond slides.

### **Future Of Oral and Maxillofacial Pathology Beyond Slides:-**

This article explores trends within society and medicine which could significantly change Oral and Maxillofacial Pathology practice in India in near future the most important ones being advances in medical knowledge and advances in human technology.

#### **1. Advances in Medical Knowledge:-**

Disease is being understood increasingly in terms of molecular and sub-cellular processes which will have at least three major implications. The first and most promising will be the improvement to patient care as we can expect earlier diagnosis, more accurate prognosis and improved therapies as we better understand the disorders.<sup>[1-3]</sup> The second implication will be increasing specialisation of medicine. A third consequence will be the drive towards personalised medicine which could result in shift from routine slide workload to a more potential shift.<sup>[4]</sup>

#### **2. Advances in Human Technology:-**

The next trend to consider is the rapid development of technology. Diagnostic tests are being refined which reveal the genomic and proteomic features of disease. Emergent new technologies impacting Oral and Maxillofacial Pathology are- *Molecular Diagnostics at the histology level, Digital Diagnostics, Bedside diagnostics, Nanosensors, Pharmacogenomics.*<sup>[5]</sup>

Of these **Digital Pathology** will be most closely related for getting the most from the static image in the future. The current paradigm includes- Simple staining of histopathology sections (typically hematoxylin- eosin), IHC is used to identify expressed proteins by specific antibodies (one antibody per section).<sup>[6]</sup> The problems arise when multiple markers/sections are needed, the amount of tissue available may not be enough for all markers. The future new paradigm may include application of multiple antibodies on the same section, using Quantum Dot photoemitters attached to each antibody species.<sup>[7]</sup>

**Virtual Microscopy-Going beyond the microscope** are current technologies under rapid development which aim to create a digitized computer file from complete scanning of a stained tissue section.<sup>[8]</sup> The digitized file will be amenable to examination at any spot on a computer screen at different magnifications. This may replace the microscope as the basis for morphologic analysis of tissues.<sup>[3]</sup>

**Histology based proteomics** will provide a complete proteomics analysis connected to the histology of the tissue. This may form the practical applications for pathology practice as when in the recent future all proteins are mapped on standard mass, this approach will allow complete molecular determination of all proteins present in a section.<sup>[9]</sup>

**Concurrent mapping** a marker for endothelial cells and marker for a tumor marked together in different pseudocolors can determine vascular invasion of many oral lesions. *Salivaomics* technologies may contribute significantly in the identification of alterations in gene expression, transcription, protein coding and small molecules concentration, in biologic systems and may represent a novel and holistic approach in oral disease management including diagnosis, prognosis and monitoring.<sup>[3-5]</sup> Elevated levels of *circulating immune complexes (CIC)* in the sera of oral cancer patients suggest that it contributes in evaluating the degree of malignancy, and provide an approach for a more precise test to predict prognosis of the disease which are far beyond slides only.<sup>[10]</sup>

### **Advantages And Disadvantages Of Pathology Beyond Slides<sup>[2]</sup>**

#### **Advantages-**

- Facilitates rapid diagnosis.
- Cost effective.
- Helps leverage existing resources.
- Provides coverage for remote sites.

- Useful for remote frozen sections.
- Useful for immediate fine- needle aspiration evaluation.
- Potential to improve patient care.
- Secondary consultation.
- Ability to retain original material at the host institution.
- Decreased turnaround time to retrieve, deliver, and file glass slides.
- Less effort required by support staff to handle consults.
- More rapid than courier services.
- No risk of slide loss or damage.
- Portability of the telepathologist.
- Real-time consultation.
- Possibility of simultaneous collaboration (teleconferencing).
- More timely response for patients and family awaiting a secondary review.
- Eliminates the need for multiple recuts; 1 slide may be scanned and viewed by an entire class.
- Avoids the risk of broken, damaged, lost, or unsatisfactory slides.
- Eliminates the need and cost for microscopes.
- Access to a wider variety of cases.
- Teleconferencing to multiple sites.
- Portability.

**Disadvantages-**

- May overextend existing resources (i.e consulting / covering pathologist).
- Difficult to handle multiple time sensitive requests arriving at the same time.
- Some cases may still require the pathologist to review the glass slide.
- May take longer than glass slide review.
- Potential for downtime.
- System maintenance required.
- Review of multiple slides including special stains for difficult cases may be difficult to review.
- Billing may be difficult, especially with missing information.
- Technical failures are possible.
- Poor image resolution compared with glass slides.
- Initial setup costs.
- Does not precisely simulate real-life evaluation of diagnostic material.
- Review of multiple slides or special stains may be difficult.
- Access to computers, higher network bandwidth, and/or monitors required in teaching environments.

**Conclusion:-**

To conclude we may state that Oral and Maxillofacial Pathology may not be limited to slides only in the near future as the amount of information that can be extracted from minute tissue and fluid samples using complex, automated and miniaturized devices will continue to increase. Sophisticated computer-based algorithms will provide assistance in integration of all information. Lab and tissue- based diagnostics will be increasing their capability to provide a safe guide to therapy. Enhanced imaging capabilities will allow groups of pathologists to share information on tissue based diagnostics. Pathology practitioners, blending knowledge of histopathology, disease related molecular processes and lab diagnostics, will be the integrators of information related to the molecular, biochemical and cellular processes underlying the patient's disease, complications and symptoms which may be far beyond slides. *Will anybody ever, be able to do without us?The answer to this will always remain NO.*



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### RESEARCH ARTICLE

#### BURN INJURIES AND ASSOCIATED CAUSES IN AL KHARJ PROVINCE OF SAUDI ARABIA: ARE THEY PREVENTABLE?

Dr. Anthony Morgan, Dr. Adel Mohammed Bin Sultan, Dr. Abdullah Mussad Al Harbi, Dr. Saad Mohammed Aljuhayyim, Dr. Omar Abdullah Al Hatlan and Mr. Yazeed Aldhfyan.

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##### Key words:-

Mechanism of burns, Burn causes,  
Traumatic burns, Saudi Arabian population.

#### Abstract

**Introduction:** Currently, studies investigated burn injuries and their causes in Saudi Arabia mainly focused on pediatric patients, while epidemiology of burns among the adult population required more exploration. Therefore, the purpose of this study was to investigate the pattern of burns and associated factors among both children and adults in one of the largest Saudi Arabian province.

**Methods:** This is a surgical audit type study included patients admitted with the burns to the surgical department of King Khaled Hospital in Al Kharj province of Saudi Arabia. The medical records of 60 patients with burn injuries, admitted from 2010 to 2015 inclusive, were reviewed for demographic factors, the pattern of burns, the severity of burn injuries and associated trauma injury severity score (ISS), the length of hospital stay, the types of burns, and the most common body locations. Descriptive statistics including frequencies, percentages, means, and standard deviations were demonstrated in tables and graphs. Inferential statistics were used to detect significant study associations. The P values less than 0.05 were considered significant.

**Results:** This study included 60 patients, where 57% were non-Saudis and the majority were adult males. The most affected body parts were the upper extremities followed by lower extremities and the head. The most common types of burns were hot liquid burns (43.3%), followed by flame burns (28.3%). The significant correlations were found between the mechanism of burn and patient's gender and age. The burns area was directly related to the length of hospital stay and correlated well to the age ( $p=0.037$ ).

**Conclusion:** The hot liquid burns are the most common types of burns followed by the flame burns. The hot liquid burns were commonly affecting Saudi nationality, children and female gender. The areas of burns are well correlated to the age of affected patients and the length of hospital stay.

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#### Introduction:-

Burn defined as a traumatic injury, which occurs when skin or other underlying tissues are damaged by the mechanism of direct thermal, chemical, electrical or frictional exposure.<sup>1</sup> The type of burn is dependent on the age factor, where the most common burns in children are the results of direct hot fluid and skin contact, while flame exposure, electrical and frictional burns are most common among adults.<sup>2</sup> According to the depth of the injury, burns

are classified into four degrees, although most of the times the burn injury include more than the first degree. The first degree is defined by superficial or epidermal burn, which may be equal by the clinical presentation to the sunburn. The second degree constituted of partial burning of skin thickness. The third degree burn involves the full thickness of skin, while the fourth degree involves the underlying tissues or organs.<sup>3</sup>

The (World Health Organization) WHO estimated the global incidence of burn injuries to be 110/100,000 per year.<sup>4</sup> Saudi Arabia, as well as many other developing countries, is undergoing a period of changes in regards to transformation from non-communicable problems to the pattern of chronic diseases and trauma, which is more common for industrial communities.<sup>5</sup> Burns representing a common type of domestic trauma, that have been increased due to urbanization and introduction of technologies and complex electrical, and mechanical equipments to the daily live.<sup>6</sup>

In Saudi Arabia, the incidence rate of burns among children was shown by Alharthy et al. to be 494/100,000 per year. They found that 16% of children, attended hospitals with burns, had more than 10% of total body surface area (TBSA) involved. The most common causes of burns among Saudi children were the hot liquids burns followed by flame injuries.<sup>7,8</sup> This was supported by study conducted among children in Makah city, which found that majority of burn injuries were related to the direct hit exposure by high temperature fluids.<sup>9</sup> Only one study, conducted by Jamal et al., in Jeddah city, investigated a wide range of age groups in relation to the patterns of burns.<sup>10</sup> Thus, current study aimed to investigate the pattern of burns and associated factors among both children and adults in one of the largest provinces of Saudi Arabia based on the local trauma registry.

### Methods:-

This retrospective audit study design included patients admitted with all types of burns injuries in one of the teaching university affiliated hospital in the Kharj province of Saudi Arabia. The medical records of patients collected over the period of the last five years, presented and admitted to the surgical department with burn injuries, were reviewed for the collection of demographic factors, pattern of burns, length of the hospital stay, mechanisms of burns and parts of body locations with TBSA involved. The confidentiality of the patients was ensured through the anonymous data entry from medical records. The data were analyzed using descriptive statistics such as frequencies, percentages, means and standard deviations. The chi-square test was used to identify significant differences between demographical variables and causes of burns. The independent t-test was used to identify significant differences in groups of numerical variables. Pearson's correlation was used to identify the relation between the age of the injured with burns and the length of hospitalization. The *p* values less than 0.05 were considered as statistically significant.

### Results:-

Medical records of 60 patients were included in this study, showing that 56.7% were non-Saudis. All patients were exposed to different mechanisms of burn with various body parts and the total area affected. The majority of the patients (70%) were males and 30% were females respectively. Mean of age of burn victims was 21±15.5 ranging from 1 year to 64 years old. 25% of the patients with burns were under 5 years old children and near 38% were under the age of 16 years old, while the rest were adults as shown in Table 1.

**Table 1:-**Distribution of demographic factors.

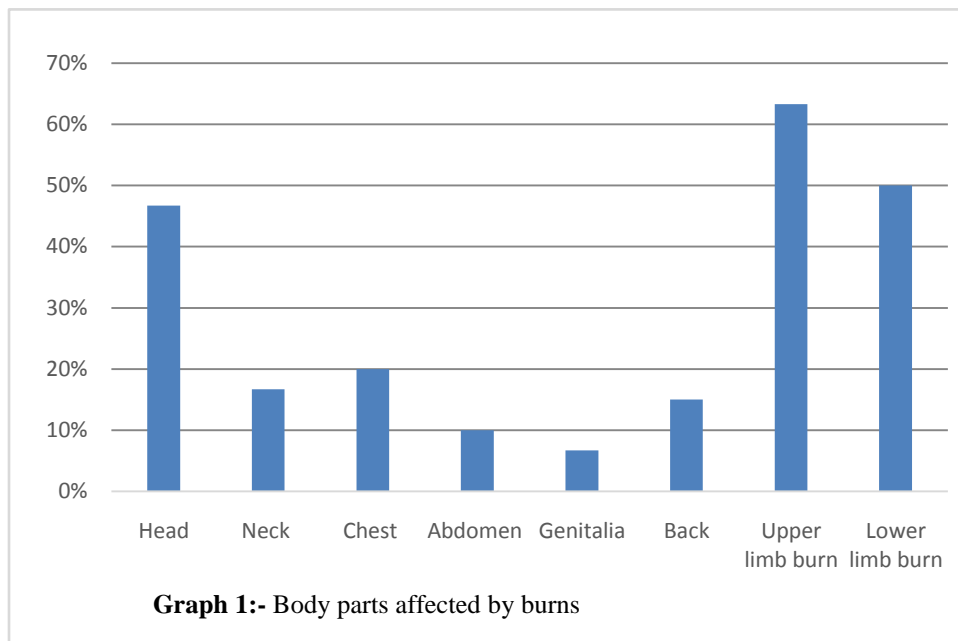
DEMOGRAPHIC FACTORS		Patients (n)	%
Gender	Male	42	70.0
	Female	18	30.0
Nationality	Saudi	26	43.3
	Non-Saudi	34	56.7
Age groups	<5 years old	15	25.0
	5-10 years old	5	8.3
	11-16 years old	3	5.0
	>16 years old	37	61.7

The distribution of burns in this study demonstrated, that the majority (70%) of them had the second-degree burns followed by the third and first-degree burns in 16.7% and 13.3% respectively. The most affected body locations were the upper limbs (63.3%) followed by the lower limbs and the head, which accounted for 50%, and 46.7% respectively. This reflecting that many burn areas have affected more than one site in the body. The chest, neck, and

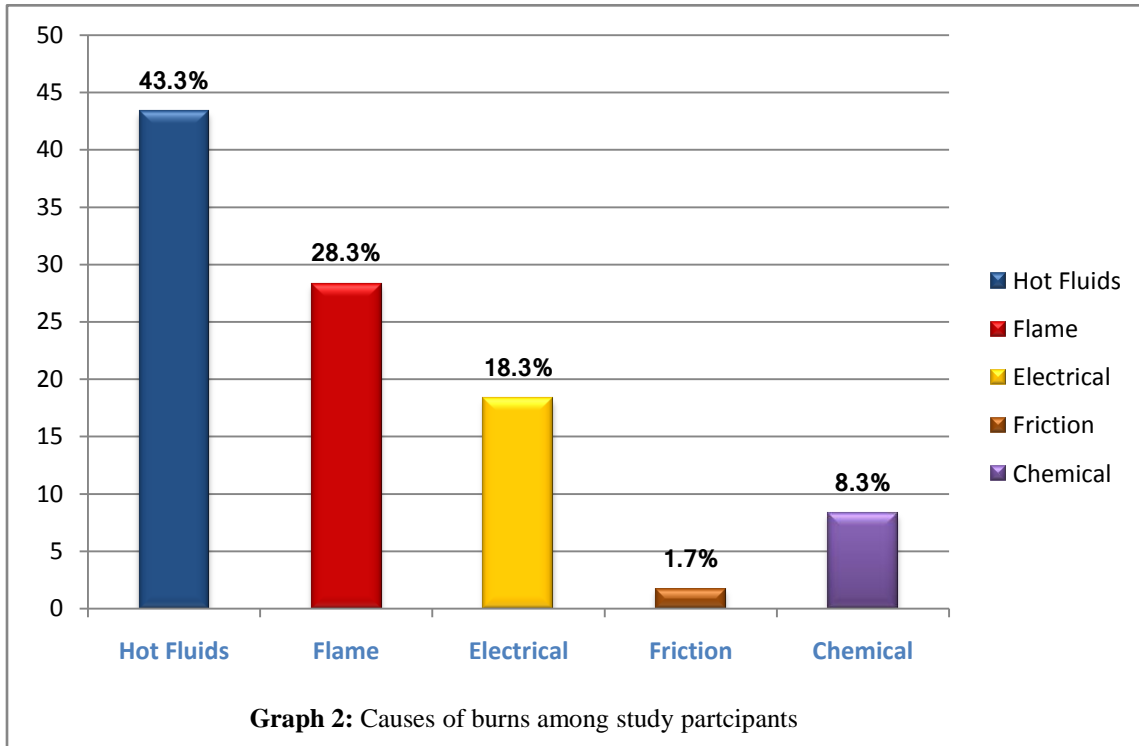
back areas were involved in 20%, 16.7%, and 15% of burns respectively, while the least affected sites were genitalia and abdominal areas. No burns were identified involving the pelvic area in this study. The majority of the patients had more than one location affected by burn injury and 68.3% had burn with >10% of TBSA was involved. There was no mortality reported. Table 2. (Graph 1)

**Table 2:-**Patterns and locations of burns among study subjects (n=60).

Classification, body parts and area of burns		Patients (n)	%
Degree of burn	I degree	8	13.3
	II degree	42	70.0
	III degree	10	16.7
Head		28	46.7
Neck		10	16.7
Chest		12	20.0
Abdomen		6	10.0
Genitalia		4	6.7
Back		9	15.0
Upper limb burn		38	63.3
Lower limb burn		30	50.0
TBSA%	≤10%	19	31.7
	>10%	41	68.3



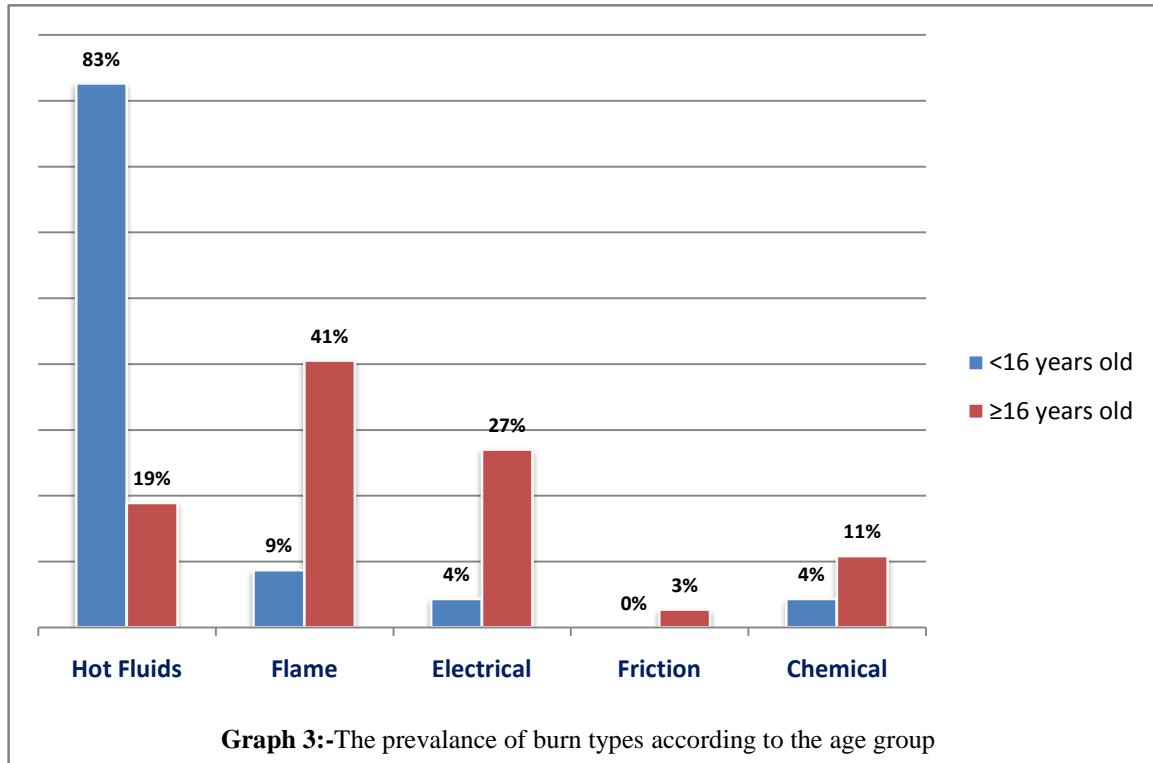
The most common cause of burns was from contact with hot fluids (43.3%), followed by the flame burns (28.3%), electrical (18.3%), chemical (8.3%) and frictional burns (1.7%) respectively, as reflected in Graph 2.



The significant correlations were identified between the patient’s nationality, gender and age to the causes of burns. 69.2% of the Saudis were affected by hot fluids burns in comparison to 23.5% of non-Saudi (p = 0.001). A significantly higher percentage of women (77.8%) had hot fluids burns compare to men, where only 28.6% had burns related to hot fluid exposure. Children under the age of 5 had a significantly higher prevalence (93.3%) of hot fluids burns. No women had electrical or frictional burns and only one had chemical burn. The children and adolescents (< 16 years old) had a significantly higher prevalence (82.6%) of hot fluid burns in comparison to adult patients (Table 3, Graph 3). The mean length of stay was 7±5 days and ranging from 1 day to 1 month, depending on the severity of burn and TBSA. The correlation between TBSA and the length of hospital stay was significantly increased when the patients had more than 10% TBSA affected by burns (p=0.037).

**Table 3:-**Correlation between demographic factors and causes of burn.

Demographic factors		Causes of burn				
		Hot fluid	Flame	Electrical	Friction	Chemical
Nationality	Saudi	18 (69.2%)	6 (23.1%)	0 (0.0%)	1 (3.8%)	1 (3.8%)
	Non-Saudi	8 (23.5%)	11 (32.4%)	11 (32.4%)	0 (0.0%)	4 (11.8%)
Gender	Male	12 (28.6%)	14 (33.3%)	11 (26.2%)	1 (2.4%)	4 (9.5%)
	Female	14 (77.8%)	3 (16.7%)	0 (0.0%)	0 (0.0%)	1 5.6%
Age group	<16 years old	19 (82.6%)	2 (8.7%)	1 (4.3%)	0 (0.0%)	1 (4.3%)
	>16 years old	7 (18.9%)	15 (40.5%)	10 (27.0%)	1 (2.7%)	4 (10.8%)



### Discussion:-

The burns result not only a physical damage to the body surface, but also affecting the psychological well being of the affected patients. In addition, it has an very high impact on the socio-economic status in the community and large burden to the Health System of the society by the required medical and surgical treatments and long hospital stay.<sup>11</sup>

In modern communities, regardless of cultural and ethnic differences, children of young age mostly affected by the exposure of hot fluids and flames. However, increase in urbanization and industrial development leads to the higher incidence of burns related to advance technologies and exposure to high voltage electricity and work with complex mechanical equipment.

This study highlighted, that the majority of the patients (70%) were males, where about 38 % were under 16 years old. A Saudi study conducted by Mahaluximivala et al. found different characteristics of admitted patients with burns in AlQassim region, where 51% of patients were males and 41% where adults.<sup>12</sup> Their results showed that the most affected sites of the burns were the upper limbs followed by lower limbs and the head. This was in agreement with Gangemi et al., where upper limbs were also found the most common site followed by the lower limbs, then the head and the neck.<sup>13</sup>

The findings of our study demonstrate, that the TBSA was significantly related to the length of the hospital stay, when the patients had more than 10% of TBSA. The findings reported by Iranian study where the mean admission time was related to the burn size till, the peak of 60% were agreed with the present study findings.<sup>14</sup> However, Lari AR et al, found that the length of hospital stay was declined when the burn area became more than 60%, due to the increased mortality. In our study, the mean length of hospitalization was  $7 \pm 5$  days, which is less than reported by other Saudi studies conducted in pediatric patients<sup>9,15</sup> This could be attributed to a positive correlation found between pediatric age and shorter hospital stay, as children have tendency to stay in hospital less than adults.

In the present study, the most common cause of burns where burns caused by exposure to hot fluids (43.3%), followed by flame, electrical, chemical and mechanical exposure. This is in agreement with findings showed by the Saudi study of Mahaluximivala et al., when hot fluids burns where the most common mechanism of injuries causing the burns in 40% of cases, followed by flame burns.<sup>12</sup> The main contributory factor for this high prevalence of burns

related to hot fluids is the traditional Arabic costume of preparation coffee and tea drinks in social events and the family gathers. This can be supported by the fact that, a significantly higher number of Saudi patients were affected by hot fluids burns in comparison to non-Saudis.

In the present study, hot fluid burns were significantly more common among women than men, which could be attributed to the traditional role of women in cooking and food preparation. No women had electrical or frictional burns and only one had chemical burn, due to traditionally no or little contacts with outdoor activities in the Saudi community in contrast with men, which made them more susceptible to flame, chemical and electrical burns.

In this study the high prevalence for children under the age of 5 to have hot fluid burn could be explained by the presence of the young children around the kitchen area close to their mother's, where the boiling water or hot food in preparation could be easily exposed to. Similar findings reported by other Saudi and Kuwaiti studies where similar culture traditions are practiced.<sup>9,17,18</sup> In addition, a Turkish study found similar results for the high prevalence of burns among children. Due to the fast development of Saudi Arabia in relation to the buildings of the complex industrial infrastructure, we can see more injuries related to the electrical and mechanical burns. Also the high impact of the modernization in Saudi industries increasing the exposure of the working male population to chemicals and petroleum related products, which increasing chances for the flame burns. This explaining a relatively high volume of other causes of burns identified in our study.

Some limitations of this study include the short period of data collection due to the relatively recent trauma registries available.

### **Conclusion:-**

The hot liquids burns were the most common type of burn injuries followed by the flame exposure. Larger study is required for a more detailed look in relation to the outcome and correlations to the TBSA by various mechanisms of burn injuries.

### **Conflict of interest:-**

No financial support was received for conduction of this study, and the investigators stated no conflict of interests.

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### RESEARCH ARTICLE

#### EWART'S SIGN A CLINICO-RADIOLOGICAL REVIEW.

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#### Abstract

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#### Introduction: -

Suspicion of the presence of pericardial effusion could be from the history, physical examination, electrocardiogram (ECG), and chest x-ray.

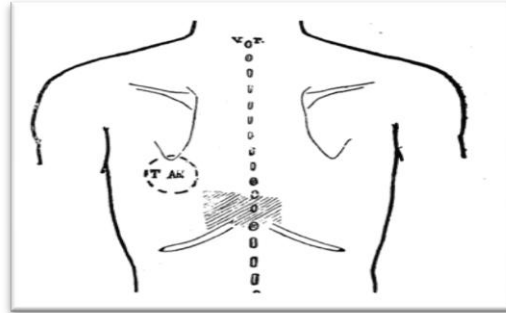
However, the clinical examination remains the first tool in the diagnosis of pericardial effusion.

In Dr. William Ewart's seminal paper "Practical Aids in the Diagnosis of Pericardial Effusion in connection with the questions as to the Surgical treatment" in 1896, he describes the clinical signs associated with pericardial effusion which includetriangular area at the tip of the left scapula which shows breath sounds and egophony associated with dullness.

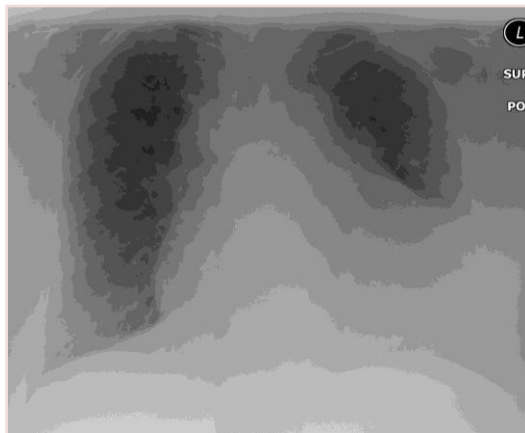
We report a case of pericardial effusion which present the clinical and radiological basis for Ewart's sign.

#### Case Presentation: -

We present an 86 years old female who is known to suffer from Type II diabetes mellitus on Insulin mixtard, she also takes Perindopril 5 mg for hypertension. She presented with one-month history of breathlessness and cough associated with night sweats. No past medical history of TB or contact with TB. When examined in the ER she was found tachypnic (RR22) with pulse rate 85, small volume and BP 130/80 (nonpulsusparadoxus) and saturation of 92% in room air. Her chest examination showed: dullness left base posteriorly below the left scapula with Bronchial breathing (Ewart's Sign).



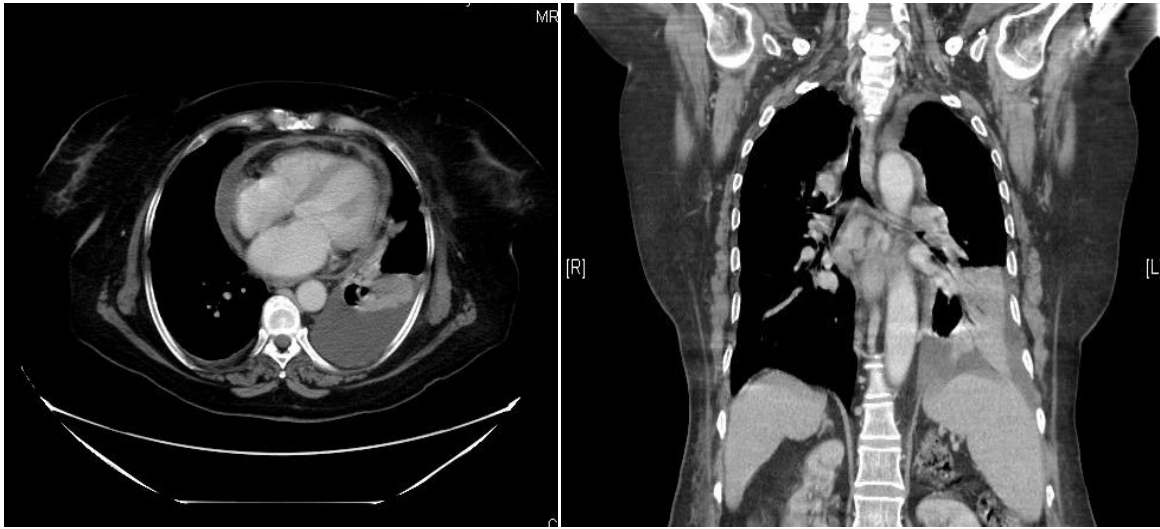
The Posterior Pericardial Patch of dullness and the posterior pericardial patch of tubular breathing and aegophony.



**Fig 1:-** CXR at presentation showing enlarged cardiac silhouette.



**Fig 2:-** CXR post Pericardiocentesis showing segmental atelectasis.



**Fig 3:-** CT chest with contrast showing the pericardial effusion , segmental atelectasis left lower lobe with effusion.Note the lymphadenopathy on CT.

**Cardiovascular System: -**

Muffled heart sound and JVP raised. No Lymph nodes were felt and her abdominal examination was unremarkable. TST: no reaction to 2TU PPD (Mantoux test). Bloods including TSH and autoimmune screen: TSH Normal, Urea 9.7 with Normal Creatinine and normal liver function test, CBC: WBC 8.1 Hb 12.7 and Platelets 215. ESR 61. Echocardiogram: massive pericardial effusion EF 50%RVSP 45 and thickened pericardium. Echo-free space 2.5 cm posterior and lateral .RV diastolic collapse. ECG showed small voltage QRS complexes with no acute ischemic changes. Chest x-ray (Fig 1&2) showed increased cardiac shadow. CT chest with contrast (Fig 3) showed pericardial effusion with mediastinal lymph nodes. Sputum analysis was negative for AFB.

Pericardiocentesis under echo guidance showed straw colored fluid. There were no malignant cells and it was lymphocyte rich fluid. The AFB stain, TB culture and TB PCR were negative. Pericardial window was done and the biopsy showed chronic inflammation. No granuloma

The patient was treated with oral prednisolone and Anti-TB medications for 6 months with improvement both radiological and clinical.

**Follow up study: -**

limited study with minimal effusion, follow up CXR shows resolution of the effusion.

Sign Number	Description of the Sign
First Sign	Increased Lateral Cardiac Dullness
Second Sign	Increase in the Absolute Dullness
Third Sign	Liver Depression
Fourth Sign	Dr Rotch's sign : dullness in the right 5 <sup>th</sup> Intercartilagenous space
Fifth sign	The lower angle of pericardial dullness points to the right
Sixth sign	The left lower angle of dullness. The relation of the apex beat to this angle
Seventh Sign	The first rib sign "feel with the finger the upper edge of the first rib as far as its sternal attachment".
Eighth Sign	<b>The Posterior Pericardial Patch of dullness.</b>
Ninth Sign	Tubular breathing below the right Mamma.
Tenth Sign	<b>The posterior pericardial patch of tubular breathing and agophony.</b>
Eleventh Sign	The secondary pleural effusions and the pulse in pericardial Effusion.
Twelfth Sign	The large and slapping pulse of pericardial effusion.

### Discussion and Conclusion: -

As rightly stated by Ewart and shown in our case there was at compression of the left lower lobe correlating with the clinical Ewart's sign. We found only three references in PubMed using "Ewart's sign" as a search word<sup>1-3</sup> beside Dr. Ewart paper<sup>4</sup>. The latest was in 2000 in relation to tuberculous pericardial effusion. It has been referred to as Bambergereger- Pins. Ewart's sign in the European Cardiology Society guidelines on pericardial diseases 2004. Despite the availability of echocardiography, clinical examination remains the first tool in the diagnosis of pericardial effusion.

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### RESEARCH ARTICLE

#### REMOTE HOME MONITORING SYSTEM USING IOT DEVICES.

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 Webcam

#### Abstract

IoT is expected to incorporate very large number of diverse devices ranging from simple networked sensors to large servers. For internetworking and communication among these devices, a seemingly large number of protocols have to be developed owing to the variety and difference in the hardware characteristics of each of these devices. Further, each IoT device should have a mechanism to identify and isolate the different kinds of messages in such a network. India faces a lot of security problems in the home or offices while we are not present. This paper aims to describe a IoT based motion detection mechanism system using low cost computing devices. Now a day's cost is most important factor so this project is reducing the cost for motion detection system. The objective of this work is to capture an image when any intruder motion is detected in prevented or secured area. Due to hardware limitations of Raspberry pi, motion detection is implemented by comparing the last two consecutive images saved locally. Any changes identified are notified to the user by uploading all the images from the point of identification, to a cloud server and via email.

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#### Introduction: -

The IoT means Internet of things. The internet of things interconnection between object or anything. The communication of IoT exchange the data over the network. Communication occurs without the machine to machine [1] interaction. In the new era, the all things are connected to internet of things. After the few years the internet of things interconnect with billions of devices. The IoT is used for many of the fields, Automobile, Agricultural, SecuritySurveillance, the internet of things is interconnecting to worldwide physical network. The main advantage of IoT is very low cost. The communication network has more complex and security issues are occurring.

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**Fig 1:-** Internet of Things

The main aim of this work is to the IoT concept using cloud server [2] to transfer the images. The motive behind the work is to develop a motion sensing (image processing) algorithm for IoT device considering the resource limitation and storage space limitations of such device, Further, the whole cost of the system is designed to be low. The figure 1 shows internet of things, it inter- connect with whole world. In 2020 the most of the world things are interconnect with IoT device.

#### **Motion Detection: -**

The existing systems use motion detection kits that use motion sensors and Ethernet modules to send or receive data captured by the sensors. This requires an external server to process the data. The external server processes the data live streamed by the sensors. There is no local storage of the data in such systems and if the cloud server is insecure, sensitive data can be leaked. Further, present secure systems use heavy data encryption algorithms to securely upload the data to the server. This approach is impractical in IoT in common IoT devices due to the hardware limitations.

Present systems also require large cloud storage to store such data and can use up the home internet bandwidth. The cost of such implementations are high. So, ordinary home users need an alternate method to reduce the cost of implementation using IoT based security hardware - without loss in efficiency and use ability. Further the requirement of existing systems to be always connected to the cloud server can handicap the functionality of the security of the intruder alert/notification function of the system since any problems in connectivity to the remote server or problems in the server can hinder communication between the sensors and the user.



**Fig 2: -** Burglar detection based on frame comparison

#### **Raspberry pi: -**

Raspberry pi is a small size computer. it uses for low power processing. In this work we can use for latest version of raspberry pi, it known as model 3 B. Raspberry pi model 3 B have the following features:

Operating system	Raspbian, Fedora, Ubuntu MATE, Kali Linux, Debian
CPU	1.2 GHz 64/32-bit quad –core ARM cortex-A53
Memory	1GB LPDDR2 RAM at 900MHz
Storage	MicroSDHC
Bluetooth	4.1
802.11.b/g/n Wireless LAN	



Fig 3: -Raspberry Pi 3 Model B

**Proposed Work: -**

This proposed method uses the motion detection using low cost computing devices. In this work we have used raspberry pi 3 model B to connect logic tech c270 webcam to capture the intruding activities. The figure 3 shows the motion detection flow chart. Due to hardware limitations of Raspberry pi, motion detection is implemented by comparing the last two consecutive images saved locally. Any changes identified are notified to the user and all the images from the point of identification are uploaded to a cloud server and sent via email.

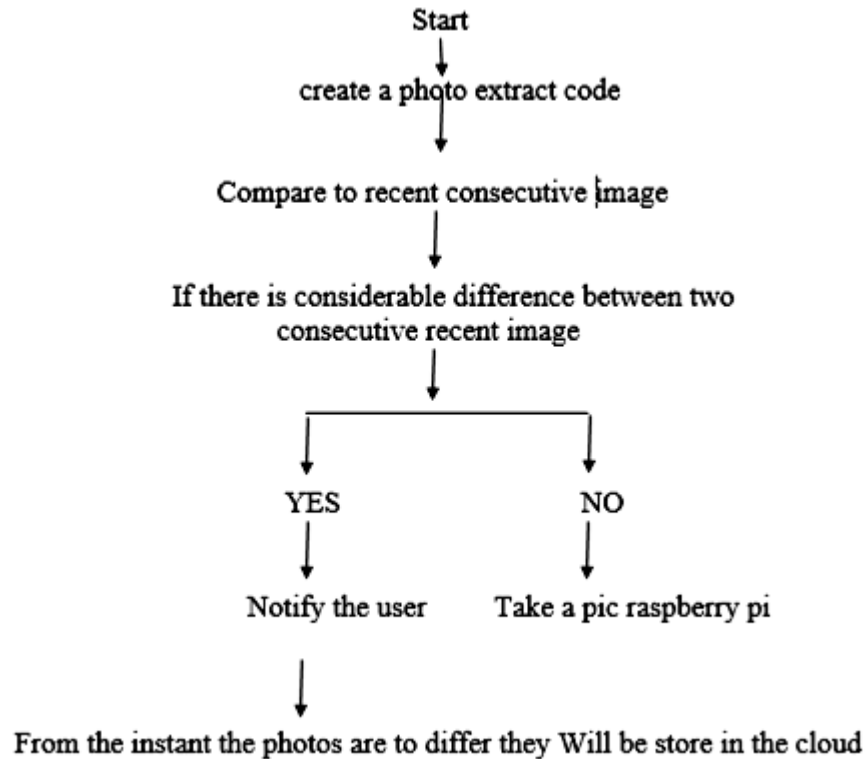


Fig 4: - Motion detection flow chart

In this work we can use the Gaussian Mixture Model algorithm [3][4]. This algorithm is generally used as a preprocessing stage in large image process project. The algorithm uses low resource. In addition to background subtraction, this also has ability to neglect small changes in the background such as changes in lighting condition etc which should not be perceived as motion. The segmentation approach also allows shadow [4] from the images to be removed.

**Implementation part is Divides in four-part: -**

- Representation of image as Gaussian Mixture Model.
- Background Subtraction.
- Image segmentation for motion detection.



- Image segmentation for motion detection Minimum area threshold.



**Fig 5:** - camera captured colour image to upload it to the user

#### **Representation of image as Gaussian Mixture Model: -**

The probability density function representation of every naturally occurring signal, including images, show clusters of data. This means that some regions of an image has more data than other regions A Gaussian Mixture Model is the mathematical model of the image as the weighted sum of Gaussian component densities. For example, this image can be mathematically modelled as the sum of 3 Gaussian distribution functions, the coefficients of each of the function being the weights.

#### **Background Subtraction: -**

For motion detection, the background needs to be separated from the foreground. Background subtraction or Foreground Detection is used to extract an images foreground for further processing and object localisation. The pixels which remain static between frames are considered as the background and the pixels which are displaced from frame to frame are considered as the foreground. The absolute value of the pixel intensity differences difference between frames is obtained by a simple subtraction.

#### **Image segmentation for motion detection: -**

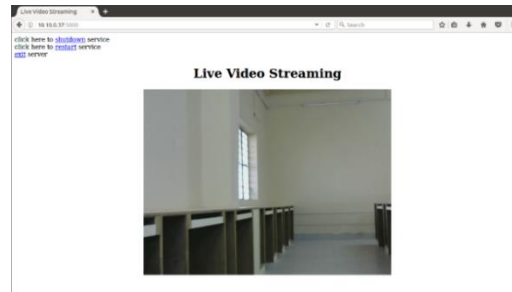
The goal of segmentation is to simplify and/or change the representation of an image. Our approach to image segmentation is to represent the background of the image as black (0) and the pixels where the motion is taking place in the image, called the foreground it represented in white (1). Finally, only regions where data is clustered are considered and unwanted data is removed.

#### **Image segmentation for motion detection Minimum area threshold: -**

If the contour area of the foreground segment is larger than our supplied minimum area called the threshold, motion can be considered to be detected. This method of comparing the foreground segment with that of the threshold area also helps to neglect any relatively small motion, like a paper moving in the breeze.

In this work, python script is used for motion detection. We can place camera in particular position and continuously monitor the area. If there is considerable difference between two consecutive [5] recent image the notification of motion detection is send to email and user phone as SMS. Through the website we can see the room from where ever we are and we can control raspberry pi





**Fig 6:** - Controlling raspberry pi remotely

### **Conclusion:** -

The motion detection less space to store the data. Data privacy and safe communication is also considered to be achieved in the new communication system. The motive behind the project is to develop a motion sensing (image processing) algorithm for IoT device considering the resource limitation and storage space limitations of such device, Further, the whole cost of the system is designed to be low. Using this project, we can identify intruder motion. Which help to secure the area.

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## RESEARCH ARTICLE

### A SURVEY ON PUBLIC AWARENESS ABOUT THE ROLE OF ANESTHESIOLOGISTS

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Anesthesiology, Anesthesiologists' roles,  
 Anesthesia

#### Abstract

**Background:** Anesthesiology is a medical discipline and the specialist of this science is the anesthesiologist. The roles of anesthesiologists are not obvious to most of public, although their roles are very important and critical. The roles of anesthesiologists exceed the limitation of operating room, they have many roles preoperatively and postoperatively. More awareness about their roles is necessary. Patients may become more relaxed when they know their anesthesiologist and identify his role in their safety and success of their surgery.

**Aim:** The objective of this study is to assess the public knowledge about the role of anesthesiologist and to educate the public.

**Methods:** This study included 202 patients to answer 10 questions about their knowledge regarding anesthesiologist and anesthesia using simple and short questionnaire.

**Results:** Most of patients in this study had good knowledge about anesthesiologist and most percentages of positive answers were high. No association between awareness of patients and gender was found.

**Conclusion:** Patients had good and acceptable knowledge about the role of anesthesiologist.

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#### Introduction:-

Anesthesia has developed after the first anesthesia was administered by TG Morton in 1846, it has a supportive role in performing advanced surgeries (Ribeiro et al, 2015). Anesthesiology is one of medical Science branches (Sable et al, 2016), it has been grown in the recent past years (Cooper et al, 1995), by development of monitoring system, new anesthetic agents and techniques (Khara et al, 2013), however it is behind the light, the knowledge about this specialty and the exact role of anesthesiologists is limited between public (Cooper et al, 1995). After the great advances in anesthesia field (Lee et al, 2014), now anesthesiologists play a very important role in peri-operative, the operating room, intensive care, trauma centers, pain management and on the code team (Lee et al, 2014; Prasad et al, 2014; Kadriet al, 2014), however they don't receive the deserved attention and their due regards between public (Prasad et al, 2014), this limited awareness of public about the anesthesiologist exceeds anesthesiologist's role in the operating room (Ribeiro et al, 2015), reaching to anesthesiologist's roles outside the operation room (Garry, 2001). This lack in public awareness about anesthesiologist's role is not new (Armitage, 1978). Many studies have reported a low public awareness about anesthesia and the role of anesthesiologists in both developing and developed countries (Swinhoe et al, 1994; Jathar et al, 2002). Patients think that the surgeon is responsible for tasks of anesthesia (Acosta-Martínez et al, 2016), 44.5% think so, while only 22% of them know that anesthesiologists were the providers of anesthesia

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(Sable et al, 2016)but inanother report 42% of patients knew that the anesthetist was responsible for providing anesthesia(Naod et al, 2016)this still low percent. Actually patients don't know if the anesthesiologist is even a physician(Erdenet al, 2012), but it was reported that 67% ofsurvey respondents in a survey conducted in the United Kingdom during knew that anesthesiologist is a doctor(Keep et al, 1978),while this percent raised in 1933 to reach 81% and then dropped again in 1994 to 65%(Swinhoe et al, 1994; Hennessy et al, 1993).These results seems quite good, but in developing countries this percent is low (Hariharan, 2009).In Pakistanonly 56% of the patients hadknown that anesthesiologist is a physician (Khan et al, 1999). Here in Saudi Arabia 50 % of the patients had the awareness about the previous fact (Baaaj et al, 2006).Beside that other patients did not know thatanesthesiologists are responsible for monitoring their vital signs throughout surgery, only27.33% of the patients knewthat role.Also a limited number of patients had the knowledge aboutanesthesiologist's role in intensive care unit (ICU), painless labor and relief of chronic pain with percentage 7.33%, 12.67%and 4.67% respectively (Naithani et al, 2007).The reason for the poor knowledge may be related to anesthetists being busy in operating room and they have limited time to interact with their patients' pre & post-operatively(Naod et al, 2016).Not only is the role of anesthetists neglected by patients, but also by others such as administrative staff in the hospitals who did not see the importance of this specialty (Hariharan, 2009). The Audit Commission in Englanddid not realize any role for anesthesiologists outside the operating room (Plevvry et al, 1982)and in some universities all over the world,they see that there is no requirement for anesthesiologyto be taught for medical students (Cheunget al, 1999).A widehealth care awareness especially in developed countries has been taken place(Khara et al, 2013).Public awareness programs were arranged in developed countries for increasing public knowledge about the anesthetists(Khara et al, 2013;Prasad et al, 2014; ,Pandyaet al, 2016; Ahsan- Ul-Haq et al, 2004). October 16th is celebrated as Anesthesia Day worldwide (Prasad et al, 2014; Pandyaet al, 2016), this explains why the developed countries have high care awareness among the patients (Bhandary et al, 2016).It is important especially in our countries to spread the awareness and knowledge about anesthesiologists, so in this study we assess the public knowledge about the roleofanesthesiologists.

## **Materials and Methods:-**

### **Subjects:-**

This cross sectional observational study was performed on 202 patients in the period from 20<sup>th</sup> January 2017 to 7<sup>th</sup> February2017 from Yamama Hospital in Riyadh, an approval from thehospital was obtained to perform this study. This study was performed after operation performing. Patients accepted to answer questions, theywere not exposed to any pressure andthey freely answered the questions, there was no exclusion for patients.

### **Questionnaire:-**

A questionnaire was established to record patients' answers. It was containing 10 questions written in both Arabic and English. The answers were recorded as Yes and No in the questionnaire to be easy for patients.

### **Statistical analysis:-**

Data were analyzed by using Statistical Package for Social Studies (SPSS 22; IBM Corp., New York, NY, USA). Continuous variables were expressed as mean  $\pm$  standard deviation and categorical variables were expressed as percentages. Chi square test was used for categorical variables. P-value  $<0.05$  was considered statistically significant.

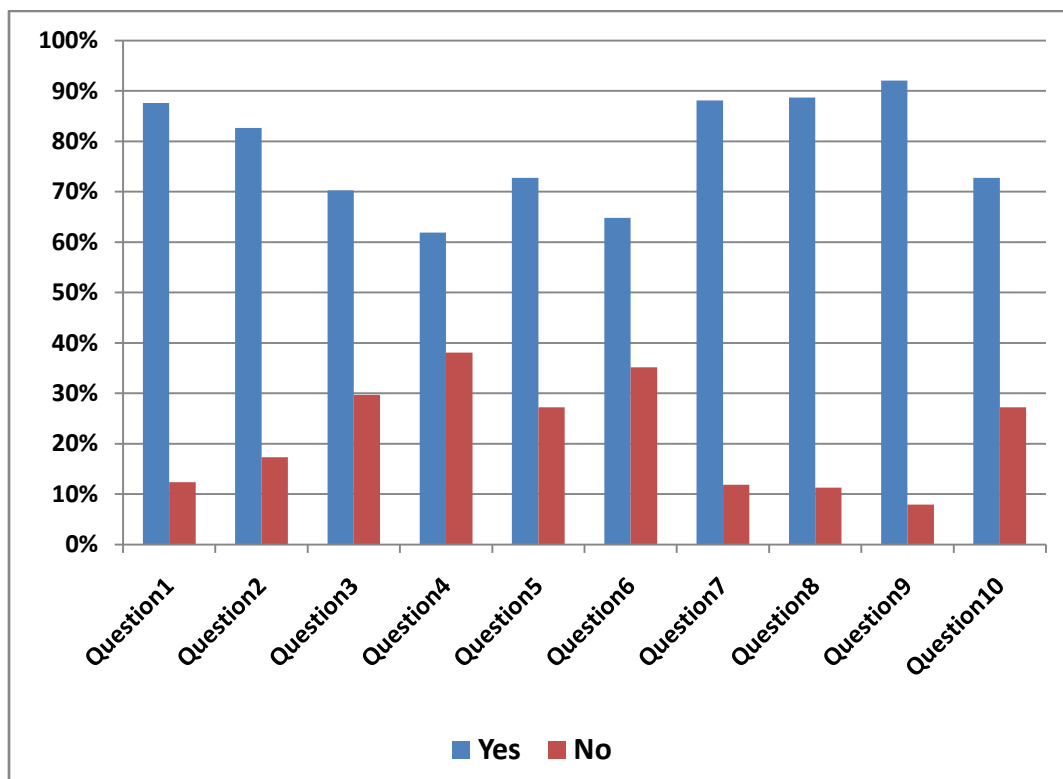
### **Results:-**

This study was conducted on 202 patients after performing operation. The number of males was 69 (34.16%) while females' number was 133 (65.84%), the female represents most of patients in this study. The mean age of participants was  $32.84 \pm 10.94$ . Most of the individuals were Saudi 184 (91.1%) and few of participants were non Saudi 18 (8.9%). The majority of patients were from urban areas 197 (97.5%) and only 5 (2.5%) came from rural area. The questions of questionnaire are summarized in table1.

**Table 1:-** Questions presented to patients

Item No	Questions
Q1	Do you know what anaesthetics are?
Q2	Do you know that anaesthesiologists are doctors?
Q3	Do you know that anaesthesia is safe?
Q4	Do you know that there are different types of anaesthesia for different surgeries?
Q5	Do you know that, unless you give informed consent, nothing is performed?
Q6	Do you know that all types of pain can be managed by anaesthesiologists?
Q7	Do you know that labour can be painless with labour analgesia?
Q8	Would you prefer painless delivery? (Female only)
Q9	Would you know that you should follow certain preoperative instructions?
Q10	Did you have any benefit by visiting anaesthesia stall in this mela?

The answers were recorded as yes and no and percent of each answer was estimated. Figure 1 shows a high percent of participants knew about anesthesia (87.62%), most of patients (82.67%) knew that anesthesiologist is a doctor. 70.30% of them realized that anesthesia is safe and 61.88% had knowledge about different types of anesthesia. 72.77% of patients knew about the consent, more than half of patients (64.85%) knew that anesthesiologist can manage all types of pains. Only 11.88% did not know about painless labor. Most of females in this study preferred painless delivery (88.72%) over a painful one. The majority of individuals (92.08%) knew that there are certain preoperative instructions that should be followed and 72.77% found benefit by visiting an anesthesia stall.



**Fig 1:-** Answers of patients to the questions

There was no significant difference in all answers regarding gender except for question number 2, where females had more knowledge than males about anesthesiologist as a doctor. Table 2.

**Table 2:-** Participants' answers to the questionnaire by gender.

Item No	Question	Male		Female		*P-value
		Yes (%)	No(%)	Yes(%)	No(%)	
Q1	Do you know what anaesthesia is ?	61 (88.41)	8 (11.59)	116 (87.22)	17(12.78)	0.808
Q2	Do you know that anaesthesiologists are doctors?	(75.36)52	17 (24.64)	115 (86.47)	18(13.53)	0.048
Q3	Do you know that anaesthesia is safe?	46 (66.67)	23 (33.33)	96 (72.18)	37(27.82)	0.416
Q4	Do you Know that there are different types of anaesthesia for different surgeries?	41 (59.42)	28 (40.58)	84 (63.16)	49(36.84)	0.604
Q5	Do you Know that, unless you give informed consent, nothing is performed?	48 (69.57)	21 (30.43)	99 (74.44)	34(25.56)	0.461
Q6	Do you Know that all types of pain can be managed by anaesthesiologists?	48 (69.57)	21 (30.43)	83 (62.41)	50(37.59)	0.312
Q7	Do you Know that labour can be painless with labour analgesia?	57 (82.61)	12 (17.39)	121 (90.98)	12(9.02)	0.081
Q8	Would you prefer painless delivery? (Female only)	– –	– –	118 (88.72)	15(11.28)	–
Q9	Would you know that you should follow certain preoperative instructions?	62 (89.86)	7 (10.14)	124 (93.23)	9(6.77)	0.399
Q10	Did you have any benefit by visiting anaesthesia stall in this mela?	50 (72.46)	19 (27.54)	97 (72.93)	36(27.07)	0.943

\*P-value<0.05 was statistically significant.

### Discussion:-

Complex surgery is now possible and easier due to developed techniques by anesthetists (Naod et al, 2016), indeed the role of anesthesiologist not only inside the operating room, but also in preoperative evaluation, pain management and intensive care(Erden et al, 2012). However public awareness about anesthesiologist is low. In the present study we investigated about the knowledge of patients about anesthesiologist and anesthesia, we found that most of participants 87.62 % knew about anesthesia, this is a high percent compared to many other studies (Prasad et al, 2014; Swinhoe et al, 1994; Ismaeil, 2011) where the percentage of people knew about anesthesia were 82%, 80% and 60.6%. In another study (Pandyat al, 2016) only 26% of participants knew about anesthesia. Most of our patients were from urban area this may explains the height in our patients' knowledge about anesthesia. In the present study high percent of participants 82.67% knew that anesthesiologist is a doctor, this in agreement with a study by Acosta-Martínez et al (2016)and Ahsan-ul-Haq et al (2004)where the percents in their studieswere 80% and 82% respectively, also in many studies by lee et al (2014),Prasad and Suresh(2014) and Bhandary et al (2016) the percentswere74.8%, 75 %and 60% respectively, however our results still higher. In other studies (Swinhoe et al, 1994; Khan et al, 1999),Pandyat al, 2016;Irwin et al, 1998), the percent was around 30-35%, whileitraised in Caribbean and Singapore studies toreach 59% and 65.8% respectively of patientsknew that anesthesiologist is a doctor [Hariharan et al, 2006; Chew et al, 1998), another study (Hariharan, 2009)recorded least percent, only 5.5 % of patients knew that anesthesiologist is a qualified doctor.This low percent reflects very poor knowledge about anesthesiologists who really are.This may return to many reasons such as; patients choose surgeons not anesthesiologist because some patients think that anesthesiologist is surgeon's assistant, another reason is the short duration often spent between patient and anesthesiologist (Hariharan, 2009).In replay to the question about safety of anesthesia, 70.30% of patients realized that anesthesia was safe; this result is close to one study(Garry, 2001)where 76 % of individuals felt anesthesia as safe, while in another study (Ahsan- Ul-Haq et al, 2004)only 40 thought anesthesia was safe. Although our result about safety of anesthesia seems to be good, much awareness still needed to patients, this will decrease their fears before surgery especially with the presence of developed anesthesia

techniques. There are different types of anesthesia for different surgeries, but only 61.88% of our patients knew that. This percent was lower compared to many other studies (Prasad et al, 2014; Ahmad et al, 2011), where percentage were higher 73% and 82.4%, however in other study (Kadri et al, 2014), it was found that 48.1% of patients were aware of the various types of anesthesia techniques, while in a study by Pandya et al (2016) 74% did not know about different anesthesia techniques. Informed consent is a document signed by the patient, it is a medicolegal binding between doctor and patient (Prasad et al, 2014). In the current study, 72.77% of participants knew that the consent is important and nothing will be performed unless patient signed it. In a study by Prasad and Suresh (2014), they found that 77% of patient knew about this consent, while lower percent 34.67% was reported by Naithani et al (2007), however in another study (Pandya et al, 2016) 57.69% of patients had awareness about this consent. Anesthesiologist can manage all types of pain, this fact was known by 64.85% of our patients and 88.12% knew about painless labor, our results were close to a study by Prasad and Suresh (2014) who showed that 69% knew the role of anesthesia doctor in managing pain and 72.5% knew about painless labor, while in a study by Ahsan-ul-Haq et al (2004) they found that only 34% knew about the role of anesthesiologist in managing pain. In Egypt (Swinhoe et al, 1994) only 4.3% knew about pain clinic, while 77.14% did not know about this role of anesthesiologist and 11.4% knew about the painless delivery. These results in Egypt are similar to that by Naithani et al (2007) who reported 12.67% of individuals knew about painless labor whereas only 19.4% said post-operative pain management by anesthesiologists in another study (Bhandary et al, 2016). In Finland study (Tohmo et al, 2003) 36% of patients did not know the role of anesthesiologists in pain clinics. These results show the weak awareness of patients about the role of anesthesiologists postoperatively. In the current study, a question especial to female was asked, it was about preferring painless delivery, 88.72% of them said yes, only 11.28% chose the painful delivery, whereas 73% preferred painless delivery in another study (Prasad et al, 2014). Although 11.28% is very low percent in preferring painful delivery, the fear of female from anesthesia may be the reason, it is recommended for pregnant to visit anesthesiologist before delivery, so she can know more about anesthesia and feel safe, as a result she may choose the painless way. By comparing our results to the results of Prasad and Suresh (2014) regarding preoperative instruction that patients should follow and benefit by visiting the anesthesia stall at the mela, we found that our patients were more aware of the preoperative instruction 92.08% than the other study 81%, whereas in the previous study more individuals get benefit by visiting anesthesia stall at the mela 92% than ours 72.77%. Regarding to gender as a factor affect awareness of individuals about anesthesiologist role, there was no significant difference in this study between male and female except for question number 2 about anesthesiologist as being a doctor ( $p$ -value=0.048), actually more female knew that anesthesiologist was a doctor, but in the other questions there were no significant differences between the two genders. Gender had significant association with knowledge of patients about anesthesia was a doctor. In contrast to our study, it was reported no significant differences between gender when asked if anesthesiologist was a doctor (Khara et al, 2013). However it was mentioned that gender had significant association with knowledge of patients about anesthesia (Naod et al, 2016).

### Conclusion:-

Awareness about the role of anesthesiologists and anesthesia of patients in this study was very good and promising, however good contact between patients and anesthesiologists preoperatively still required and period spent between them should be increased to raise patients' awareness and knowledge about anesthesia and anesthesiologists' roles. The good relationship between anesthesiologists and patients can remove any fear before operation, also increasing trust in anesthesiologist leads to good outcome of operation. Our patients had good awareness, but programmes of awareness and education still needed to cover all the area in society to reach the best results.

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### RESEARCH ARTICLE

## IMPORTANCE OF DIET (AAHAR) AND LIFE STYLE (VIHAR) IN ANORECTAL DISORDERS (GUDROGA)

Pranali Sureshrao Manthanwar.

### Manuscript Info

#### Manuscript History

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#### Key words:-

Life style, Diet, Constipation, Anorectal diseases, *Dincharya*, *Ritucharya*.

### Abstract

“Sarveroga Malayatanani” Etiology of all diseases is collection of toxic (Excretory) product in the body. Which happen due to faulty diet and change in life style? For healthy body we have to need balanced healthy diet, balanced physical activity and balanced sleep. These are explained in Ayurveda as three sub pillars of healthy body, which helps to maintain three pillars (Three Dosh) of living body. Here, we are discussing about most common and immerging diseases of Anorectal region. The commonest etiopathogenesis of these diseases is constipation, which is risk factor for metabolic diseases. If, we go on depth of Ayurveda, Main aim have to prevent constipation, Anorectal diseases and metabolic diseases by maintain proper digestive activity. Ayurveda deals both prevention and management of Anorectal diseases. Preventive aspect explained under headings of *Dincharya*, *Ritucharya*, *Dasaharavidha visheshayatana*, *Aaharopyogivarg*, *Sadavrita* and *Neendra*. Primary principal treatment of disease in Ayurveda is, to correct and ignited our Agni (Digestive Fire) along with detoxification of body. This will mentain our normal metabolic activity and makes us healthy.

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### Introduction:-

*Ayurveda* in Sanskrit means 'science of life'. This ancient science of medicine & positive health, first originated in India, is still relevant and beneficial to modern life. Along with system of preventive medicine, *Ayurveda* also emphasizes a healthful & enlightened lifestyle a concept that's gaining wide acceptance across the globe. *Ayurveda* has first emphasis on *Aahar-vihar* & *neendra* of healthy person, which are important for healthy body. *Acharya Charak* has also emphasizes on health, medicine, hygiene, prophylaxis, diet and life-style in *sutra sthan*. The best way to increase the general life force of the body is by good nutrition, sufficient deep sleep, a positive mental attitude and yoga. The cause of Anorectal disorders (*Gudroga*) is mainly originated from irregular bowel habit (constipation). Due to busy life schedule most of the persons suffering from constipation because of change in diet, life style & sleep pattern (Harry & Curry). Constipation is an awkward problem that a lot of men and women suffer from on a daily basis. Processed foods, baked goods, red meat, caffeine, oily food and dairy products, change in daily life styles are the main cause for indigestion & leading to constipation.

In Anorectal a disorders mainly external & internal hemorrhoid, fissure in ano, partial mucosal prolapse, and sentinel tag develops from most common primarily due to constipation. In these cases, if we avoided constipation by



improving healthy fibrous diet, changing in life style & proper sleep than all most all the patients have been improved and also prevent recurrence.

### Causes Of Constipation:-

The aggravation of *Vata* causes constipation. Improper eating habits including eating a lot of food, eating food, which is difficult to digest (such as meat) and not eating enough vegetables and salads also lead to constipation. Irregular sleep habits or emotional disturbances (stress, grief, fear or worry) are other causes for constipation, due to accumulation of toxins in the colon or excessive stimulation of the nervous system. Smoking, consuming too much tea and coffee, or intake of prescribed illicit drugs can also cause constipation.

### Diet- (Aahar) In Anorectal Disorders:-

Our diet is an essential factor for the formation of our body. *Charak* Says that consuming improper diet in improper way is the main cause of disease. This is explained under heading of *Astaaharvidha vishesayatana*. As per the Ancient *Ayurvedic* Proverb by *Lolimbaraja* "When diet is wrong medicine is of no use. When diet is correct medicine is of no need.

### Importance Of Timely Food Consumption:-

A person should take meal only when he feels hungry. Lunch should be taken early between 12 and 1P.M. this coincides with the peak *Pitta* period, *Pitta* is responsible for the digestion. *Ayurveda* recommends that the lunch should be the largest meal of the day. Dinner should be lesser and lighter than lunch.

### Quantity Of Food:-

Generally half of the capacity of stomach should be filled with solids, ¼ th with liquids and rest kept empty for the free movements of body humors. Capacity of stomach can be analyze by ingestion capacity of a person.

### Importance Of Rasa In Food Consumption:-

*Madhur* (sweet) rasafood like fruits are advisable to take in the beginning of meal, food with *Amla* and *Lavana*(sour and salty) *rasa* in the middle and *Katu, Tikta, Kashay* (bitter ,astringent and pungent) foods should be taken at the end of meal for healthy one. This serial of food intake will prevent over eating by inhabiting sanitary center.

### Method Of Consuming Food:-

First wash the face, hands and feet before meal. Selected an isolated neat and clean place in pleasant environment with the affectionate persons in sitting position.

Food should be taken after complete digestion of previous one.

Chew your food until it is an even consistency before swallowing.

Hard items should be consumed in the beginning followed by soft and liquids subsequently.

Heavy substances are contraindicated after meals and should be avoided Do not drink cold drinks just prior to or while eating, also don't drink large quantities of liquid during meals. This weakens digestion.

Avoid consumption of excessive hot food, which leads to weakness. Also avoid cold and dry food leads to delayed digestion.

### Incompatible Food (Viruddha Ahara):-

- Milk followed by fruits and vice versa. Soar substance along with milk.
- Milk with salt, horse gram, green gram & cow gram Wheat preparations in *Tila taila*
- Hot drinks after alcohol, curd or honey Cold and hot substances together Banana with curd and butter milk Chicken with curd Ghee kept in bronze vessel Radish with jiggery Fish with jaggery or sugar Use of incompatible food leads to skin disorders, Gastro intestinal disorders, constipation, anemia, leucoderma, hyperacidity, impotence etc. hence these should be avoided.

### General Instructions About Meal –What Don't Do?

- Do not eat while being engaged in some activity as like television, excessive conversation or reading.
- Don't eat fruits immediately – Immediately eating fruits after meals will cause stomach to be bloated with air. Therefore take fruit one to two hours after meal or one hour before meal.

- Avoid meals when thirsty and water while hungry. Avoid meals after exertion.
- Avoid meals when you are having no appetite.
- Don't suppress the appetite as it leads to body pain, anorexia, lassitude, vertigo and general debility.
- Don't suppress the thirst as it leads to general debility, giddiness and heart diseases.
- Avoid spicy food, fast food, junk food, cold drinks, chocolates etc. Because of these foods disturb the digestive system & lead to constipation.
- Fried foods, beans, gas forming vegetables like cabbage, cauliflower and broccoli, nuts and dried fruits should be avoided.
- Do not mix too many kinds of foods in one meal.

#### **What To Do?**

- The diet taken during constipation must be easily digestible, Plenty of fruits, vegetables, salads, freshly cooked food, and chew food thoroughly.
- Including probiotic foods like curd in your daily diet. Eating Vitamin C and magnesium rich foods.
- Eating fruits like apples, orange, cucumber, guava, plums, pears, berries, and dried fruits.
- Intake plenty of water, about 3-4 liter in cold weather & 5-6 liter in hot season.
- During eating keep yourself in present mind and pay full attention on food.

#### **Life Style- (Vihar) In Anorectal Disorders:-**

- Wake up from bed early morning.
- Drink one liter of warm water and walk around for a few minutes Starting of the day with light exercises or a jog.
- Using an Indian toilet, or squatting when you poop.
- Avoid straining on during defecation. Avoid long sitting time in toilet.
- Go for toilets when you feel pressure, without pressure don't take time in toilet.
- Drinking hot green tea or hot water (with psyllium husk) every morning, to get things rolling.
- Walk a while (100 steps) after meal to help digestion.
- No travelling, exercise or sexual intercourse within one hour after meal. Regular physical exercise is also important for maintaining proper bowel movements
- Drinking a glass of warm milk before going to bed helps in easy evacuation in the morning. In case of severe constipation, mix two teaspoons of castor oil in the milk.
- Sleeping hours should be regulated and efforts should be made to have a sound sleep.

#### **Conclusion:-**

This study emphasizes the importance of diet and physical activity in case of Anorectal disorders. Diet & life style is also a part of treatment of these diseases. Without the use of healthy fibrous diet & changing in life style, the treatment of these diseases is difficult. So that for prevention of these diseases healthy diet & life style is compulsory. In our busy schedule, we have to remember the important instructions for healthy life.

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### RESEARCH ARTICLE

#### CHARACTERISTICS OF UNDER-TRIAGED PATIENTS WHO GET ADMITTED.

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##### Key words:-

under-triage, emergency department,  
 CTAS, pain, cancer.

#### Abstract

**Background:** Triage is a key factor to successfully prioritize patients coming to emergency department to identify life-threatening conditions and allocate resources for patients who need immediate management. Under-triage, defined as inappropriate assignment of a low level of severity during triage, is associated with high levels of substantial mortality. The aim is to identify risk factors & common diagnoses of under-triaged patients.

**Methods:** retrospective case-control study based on Canadian Triage & Acuity Scale (CTAS),

both groups were initially trained CTAS 4 or 5. The case group includes patients who got admitted and the control group includes patients who were discharged.

Sample of 71 patients was collected over 6 months. demographic characteristics, baseline health status, co-morbid diseases, initial complaint, vital signs, pain score and admission & discharge diagnoses.

**Results:** Pain played an important role in the triage decision. Pain-free patients were more likely to be under-triaged (42% of under-triaged patients versus 0% of correctly triaged patients). Conversely, cancer patients were more likely to be under-triaged than non-cancer patients, and this was statistically significant (47% of under-triaged patients had cancer, versus 20% of correctly triaged patients, p 0.023).

no statistical difference in average age or gender of under-triaged versus correctly triaged patients.

Under-triaged patients were relatively healthier, with less comorbid diseases, although this difference was not statistically significant (44% of under-triaged patients were healthy, versus 26% of correctly triaged patients, p 0.137).

**Conclusion:** Factors that led to under-triage include being cancer patient and pain-free at presentation. We recommend paying attention to those patients during triage.

**Introduction:-**

Triage is the key factor for successful management and prioritization of emergency patients to identify life-threatening presentations and to allocate resources for patients who need immediate medical management. One of the biggest problems in the triage area is deciding who is truly sick.<sup>1</sup>Mis-triage (inappropriate triage) can have serious consequences for patients with urgent complaints.<sup>2</sup>Under-triage, defined as inappropriate assignment of a low level of severity during triage, delays the initiation of treatment and may lead to deterioration of severely ill or injured patients.<sup>3</sup>

Since under-triage is a major concern, A lot of studies have been conducted. Many of them stated that under-triage is associated with high levels of substantial mortality.<sup>4-6</sup>It is also associated with higher costs because of the use of more interventions and diagnostics. And it is correlated with considerable poor outcomes, longer hospitalization, complications, and morbidity.<sup>6,7</sup>

There are many factors that contribute to under-triaging. Some factors are related to nurses and medical staff, such as lack of knowledge, training, and awareness regarding pain perception and management, which represent the main causal factors of under-triage.<sup>8</sup>Another study found that absence of vital signs measurement, poor recognition of neurological symptoms, and atypical clinical presentations, were associated with under-triage.<sup>9</sup>For example, normalized vital signs as a reason to forego objective testing for symptomatic patients with a risk factor for PE should not be relied on.<sup>10</sup>On the other hand, some other factors were more related to patients themselves; such as gender, age, and clinical presentation. A study in Denmark stated that women had a higher risk of being under-triaged than men. Elderly patients were at a significantly higher risk of being under-triaged as well, especially those older than 65 years, and it can have serious clinical consequences.<sup>11,12</sup>

Other studies showed that the common diagnoses of under-triaged patients range from falls from low height<sup>11</sup> to severe traumatic injuries, like chest, abdomen, head, and pelvis.<sup>13,14</sup>In one of those studies, traumatic brain injury (TBI) was the most common diagnosis of the under-triaged patients.<sup>15</sup>A study conducted in the United States suggested that some critically ill patients especially those with sepsis were also under-triaged.<sup>16</sup>In another study, the under-triage group predominantly included elderly males with head and neck injuries, or hemato-oncology diseases.<sup>17</sup>

As the previous studies suggested, under-triaging is associated with serious clinical consequences and poor outcomes. Since it is a major concern, we conducted the study in order to identify patient-related risk factors & common diagnoses associated with under-triaged patients. We identified under-triage by including patients who were initially assigned a Canadian Triage & Acuity System (CTAS) triage level of either class 4 or 5, but then got admitted to the inpatient services.

**Methodology:-**

A retrospective case-control study at king Fahad specialist hospital (the only cancer center in eastern province). Charts of all admissions originating from the emergency department were screened and reviewed to find out the initial CTAS categories assigned in the period of 6 months. we had 2 categories:

1. Patients admitted from the emergency department but were initially given a low triage priority (CTAS 4 or 5).
2. Patients discharged from the emergency department and were initially given a low triage category (CTAS 4 or 5).

Data of 71 patients were analyzed and demographic characteristics, baseline health status, co-morbid diseases, initial complaints, vital signs, pain score, and final admission & discharge diagnoses

**Results:-**

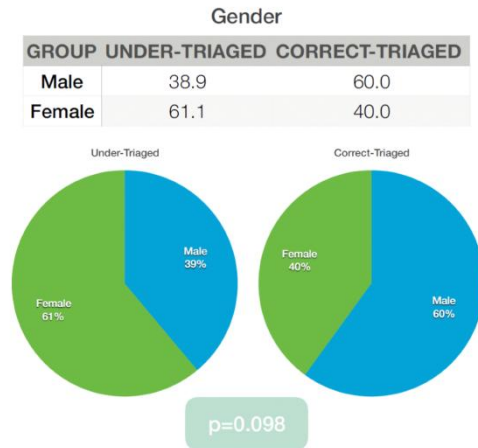
There was no statistical difference in the average age of under-triaged versus correctly triaged patients (31.6 vs 40.6 years, p 0.104). There was also no statistical difference in patients who were older than 65 years (11% under-triaged), versus those younger than 65 years (17% under-triaged, p 0.514). There was also no statistical difference

between males & females, although there was a trend indicating that more females were under-triaged (61% of under-triaged patients were female vs 40% of correctly triaged patients, p 0.098).fig. 1

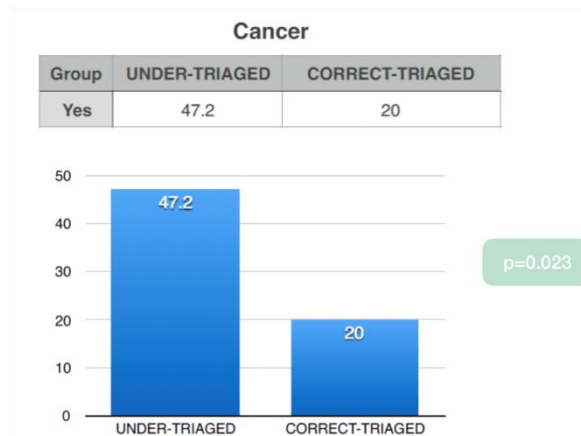
Under-triaged patients were relatively healthier, with less percentage of comorbid diseases, although this difference was not statistically significant (44% of under-triaged patients were healthy, vs 26% of correctly triaged patients, p 0.137).

Conversely, cancer patients were more likely to be under-triaged than non-cancer patients, and this was statistically significant (47% of under-triaged patients had cancer, vs 20% of correctly triaged patients, p 0.023).fig. 2

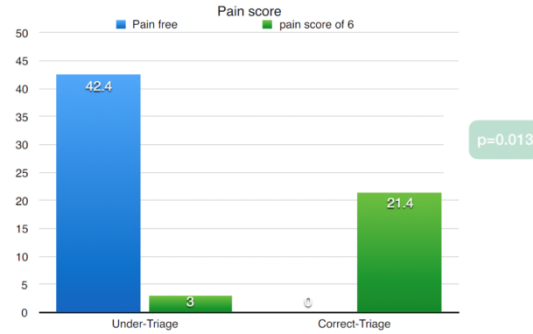
Pain played an important role in the triage decision. Pain-free patients were more likely to be under-triaged (42% of under-triaged patients versus 0% of correctly triaged patients), whereas patients with a pain score of 6 were more likely to be correctly triaged (3% of under-triaged patients versus 21% of correctly triaged patients) p 0.013. fig. 3



**Fig.1:-**Effect of gender on patient’s triage score.



**Fig 2:-** Comparison between cancer patients who were correctly triaged and those who were under-triaged.



**Fig. 3:-** the pain score as an influencing factor in the process of triaging.

### Discussion:-

Triage is the key factor for successful management and prioritization of emergency patients to identify life-threatening presentations and to allocate resources for patients who need immediate medical management.<sup>1</sup> Under-triage, defined as inappropriate assignment of a low level of severity during triage, delays the initiation of treatment and may lead to deterioration of severely ill or injured patients.<sup>3</sup>

Many factors were studied including the patient's demographics, general condition, co-morbidities and presenting complaint in order to identify factors that led to under-triage. Regarding demographics, the literature states that old age –especially more than 65 years-and female gender are risk factors for under-triaging patients<sup>11,12,18</sup>. In our study no statistical significance was found. However, it showed a trend of under-triaging female. (61% of under-triaged patients were female Vs 40% of correctly triaged patients, p 0.098).

When looking at co-morbidities, cancer patients were more likely to be under-triaged (47% of under-triaged patients had cancer, vs 20% of correctly triaged patients p 0.023). it might seem counter-intuitive but This might be attributed to that fact that the study took place in tertiary hospital which is the only cancer center in the Eastern Province. So ER doctors might be more inclined to under-triage those patients as chronic complaint.

Regarding the presenting complaint, Pain played an important role in the triage decision. Pain-free patients were more likely to be under-triaged (42% of under-triaged patients vs 0% of correctly triaged patients). this seems quite fitting and parallel to the international literature<sup>19-21</sup>.

We faced some limitations in the sense that the study had a convenience sample, which has resulted in missing statistical significance for some results.

Our definition of under-triage might not be the most optimum definition. We did not have any gold standard triage to compare with.

Study was done in a tertiary cancer & organ transplant center, and might not be generalized to general hospitals.

### Conclusion:-

We concluded that Factors contributed to under-triage in our study include being a cancer patient & being pain-free at presentation. We recommend paying more attention to those patients during triage.

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### RESEARCH ARTICLE

#### A DEMOGRAPHIC STUDY TO ASSESS THE ASSOCIATION BETWEEN SMOKING AND VITAMIN D DEFICIENCY IN ADULT MALE POPULATION OF ALKAHARJ.

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#### Abstract

**Background:** vitamin d deficiency has come up as a major public health issue in many parts of the world despite the fact that it can be synthesized in the body. Tobacco smoking is found to be associated with a low bone mass and an increased risk of osteoporotic fracture.

**Aim:** to find the association between smoking status and vitamin D levels in young adult Arab male population.

**Study design:** cross sectional study design

**Methods:** interview method was used to assess the smoking status. WHO STEPS questionnaire was used. Vitamin D levels were recorded from respective patient files.

**Results:** Vitamin D deficiency was found in 75% of study population. no statistically significant association was found between smoking status and vitamin d deficiency.

**Conclusion:** High prevalence of vitamin D deficiency warrants the need of more studies.

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#### Introduction:-

Vitamin D concentration is increased by exposure to sunlight. Urban residents spend most of their time in indoor spaces, resulting in vitamin D deficiency, the prevalence of which is high worldwide. Vitamin D insufficiency ( $\leq 20$  ng/mL) is 41.6% in US adults, based on data from the 2005-2006 National Health and Nutrition Examination Survey [1]. Vitamin D deficiency causes a mineralization defect in the adult's skeleton resulting in osteomalacia. The associated secondary hyperparathyroidism causes an increase in the mobilization of the matrix and mineral from the skeleton that can increase risk or precipitate osteoporosis [2]. Osteomalacia is not only associated with mineralization defect of the skeleton, but is also associated with isolated or global bone pain, muscle weakness, and muscle pain which are symptoms that often go undiagnosed or misdiagnosed as some type of collagen vascular disease, such as fibromyalgia [3,4]

The interest in vitamin D status has increased substantially over the past decade because of the many roles of vitamin D in physiological functions; the reported worldwide prevalence of vitamin D deficiency [5,6] including countries with sufficient sunshine and lack of enough evidence on the impact of inadequate and deficient status on public health. In eastern of Saudi Arabia revealed the prevalence of vitamin D deficiency between 28% to 37%

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Similarly, other are in Saudi Arabia on population at high risk reported the vitamin D deficiency to be 50% to 80%. [7]

In 2012, 21% of the global population aged 15 and above smoked tobacco. Men smoked at five times the rate of women; Smoking among men was highest in the WHO Western Pacific Region, with 48% of men smoking some form of tobacco. Smoking among women was highest in the WHO European Region at 19%. The rates at which adolescent girls aged 13–15 use tobacco average around 8% globally. This average does not include the WHO European Region or the WHO African Region due to unavailability of comparable data. [8] We tried to conduct this study to assess the association of vitamin d deficiency with smoking in young Saudi adults.

### **Objectives:-**

- To assess the association between smoking and vitamin D deficiency in adult male population of Al Kharj.

### **Methodology:-**

#### **Study Area:-**

The Study Was Conducted In Population Of Al Kharj Saudi Arabia.

#### **Study Population:-**

The Study Was Conducted In Males Of Al Kharj In The Age Group Of 20 Years And Above.

#### **Inclusion Criterion:-**

Respondents Satisfying The Following Inclusion Criteria Were Selected:

1. All males more than or equal to 20 years of age who have done vitamin D laboratory testing in the last 3 months
2. Those who have not taken vitamin D supplements in last 3 months

#### **Study Period:-**

The study was carried out over a period of two months i.e. From September 2015 to December 2015. During this period, finalization of study tool, field survey, data collection, data analysis and interpretation was done.

#### **Study Design:-**

A **hospital** based cross-sectional design was adopted for studying the association of vitamin d deficiency and smoking among individuals aged 20 years and above in the study area.

#### **Sample Size:-**

The sample size was calculated by using website: [www.surveysystem.com](http://www.surveysystem.com) taking into consideration

- A) The population of al Kharj city
- B) Confidence limit of 95%
- C) Margin of sampling error 10%

#### **Sampling Technique:-**

The population of al Kharj city is 234607 in 2013. [9] So the study sample size comes out to be 96. The study subjects were chosen from two hospitals: Prince Sattam Bin Abdulaziz University hospital Al Kharj and Military hospital Al Kharj. The former hospital serves as the teaching hospital for the students and latter collaborates with university in various trainings and courses. So these two hospitals were chosen due to convenience to have the desired sample size.

#### **Proforma To Assess The Smoking Behaviour:-**

To study the smoking behavior of respondents, World Health Organization's STEPS proforma was followed. STEPS is a sequential process starting with gathering of information on factors like smoking by use of questionnaire (**Step I**), moving to simple anthropometric measurements (**Step II**) and then the collection of blood samples for biochemical assessment (**Step III**).

**Step I:-**

The questionnaire recommended by WHO for this purpose was used with suitable modifications. The questionnaire contained identification and socio-economic data and data on tobacco. The definitions of various types of tobacco users used in this study are mentioned below:

**Current tobacco user/smoker:-**

Someone who at time of the survey, smoked/used tobacco in any form either daily or occasionally. People who smoked or used tobacco everyday with rare exceptions such as not on the days of religious fasting or during acute illness were still classified as a current smoker.

**Past Smoker/tobacco user:-**

people who were former daily or current smokers/tobacco users but currently do not smoke at all or use tobacco.

**Non-smokers /tobacco users:-**

Those who have never smoked / used tobacco at all.

**Step II:-****Blood Pressure:-**

Two BP readings were taken, one before the interview and second after the interview. The auscultatory method of BP monitoring with a properly calibrated and validated instrument was used. Participant was seated quietly for at least 5 minutes on the chair with feet on the floor and the arm supported at the heart level. An appropriate size cuff (cuff bladder encircling at least 80% of the arm) was used to ensure accuracy. SBP was the point at which the first Korotokoff's sound was heard (phase 1) and DBP was the point at which the Korotokoff's sound disappeared (phase 5).

**Weight:-**

A weighing machine was used for this purpose, which was standardized against known weight. The scale was kept on a hard and even surface and zero error was ensured. The participant was asked to remove the footwear and step on scale with one foot on each side of the scale. He/she was asked to stand still keeping his face forward and placing arms on the side. He was asked to wait until asked to step off. Weight was measured in kilograms up to nearest 100g.

**Strategy:-**

Males who fulfilled the eligibility were contacted once for data collection in the outpatient department of the two hospitals. The information about smoking behavior was taken by interview technique followed by general anthropometry. The results of vitamin d levels were obtained from the respective patient medical record file after completing all the codal formalities. Informed consent was taken from participants before taking interview and general anthropometry. Only those who were willing to participate were included in the study.

**Ethical Consideration:-**

The present study did not impose any financial burden to the patients and informed consent was taken from the participants before conducting the study. Prior permission was taken from the competent authority to have access to patient's record for vitamin d levels.

**Statistical Analysis:-**

Data has been presented as means + SD for continuous variables and as frequencies for categorical variables. Comparisons between the two groups (smokers and non- smokers) have been performed as Pearson chi- square test for categorical variables. All reported p values are two sided and a p value of less than 0.05 has been considered to indicate statistical significance. All statistical analyses have been performed with SPSS17.0 (SPSS Inc, Chicago, IL)

**Results:-**

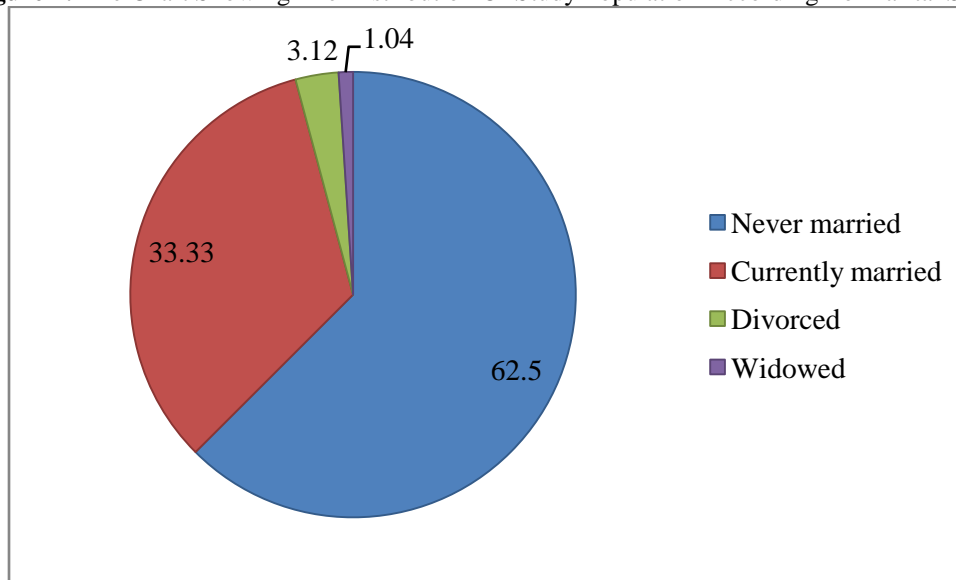
**Table 1:-** Distribution Of Participants In The Study Population.

AGE GROUPS (IN YEARS )	n (%)
20-34	74(77.08)
35-49	10(9.60)
50-64	12(12.50)
Total	96(100)
Mean + SD	25.58+ 5.77
EDUCATIONAL STATUS	n (%)
Illiterate	5(5.20)
Primary school	12(12.50)
Sr. Secondary school	24(25)
Graduate	55(57.29)

**TABLE 2 : DISTRIBUTION OF PARTICIPANTS ON THE BASIS OF OCCUPATION**

Occupation	n (%)
Government employee	18(18.75)
Business	2(2.08)
Student	65 (67.70)
Retired	6(6.25)
Unemployed	5(5.20)

**Figure 1:-** Pie Chart Showing The Distribution Of Study Population According To Marital Status



**Table 3:-**Association Of Vitamin D Levels With Smoking Status.

SMOKING STATUS	VITAMIN D STATUS		Total n (%)
	NORMAL n (%)	DEFICIENT n (%)	
Smoker	16	60	76
Never smoked	8	12	20
Total	(25%) 24	72(75%)	96

The chi-square statistic is 3.0316. The p-value is .081659. The result is not significant at  $p < .05$

**Acknowledgements:-**

I would like to thank the Department of Family and Community Medicine for giving me an opportunity to conduct hands on research at undergraduate level. This has given me confidence to undertake bigger and better research

activity in future. I would like to thank DrJamaan Al Zahrani,Head of Department of Family and Community Medicine for giving us the permission to do research in Military Hospital, Al Kharj. Last but not the least I would like to thank Dr Nasser (Director, University Hospital) and DrMagdy (Deputy Director, University Hospital) for their whole hearted support

### **Conclusion:-**

1. In this study a statistically significant association was not found between Vitamin D levels and smoking status.( $p < 0.08$ )
2. A very high(75%) prevalence of vitamin D deficiency was found in the study.
3. A very large number (79.16%) of adults smoke which can be a potential stimulus for increased respiratory pathologies in the future to come.
4. Also an additional finding was an increase in body weights and blood sugar levels

### **Recommendations:-**

- Although the statistically significant association was not found between vitamin d status and the smoking status, yet considering the magnitude of vitamin d deficiency and large number of smokers more studies need to be undertaken.
- Due to restraint of time and resources, the study was undertaken in a small population. So the results cannot be generalized to the whole Saudi population and more studies need to be done multiculturally.

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**RESEARCH ARTICLE**

**CERTAIN ECOLOGICAL CHARACTERISTICS OF FIRE-RESISTANT FOREST PROJECTS  
 (YARDOP) IN KEPSUT (BALIKESİR/TURKEY).**

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**Key words:-**

Ecology, Fire-resistant, Climate, Soil, Kepsut.

**Abstract**

Fire-resistant forest projects (YARDOP) have been undertaken in different geographical regions of Turkey in recent years in order to protect forests against fires. In this study, YARDOP area in the district of Kepsut were evaluated in terms of ecology. Soil structure and climate characteristics in this area were investigated in ecological studies. With respect to the soil structure, the area had a sandy-loamy texture, pH was neutral, the soil was non-calcareous or slightly calcareous, salt-free and weak in terms of organic matters. The climate type and water balance of the area were investigated using Thornthwaite's and Erinç's methods. The annual average temperature in the area was found to be 14.5°C, whereas the average temperature was 24.5°C in July and 24.3°C in August. The annual total rainfall was found to be 602.2 mm, whereas the average rainfall was 9.1 mm in July and 8.7 mm in August. According to Thornthwaite climate classification, the climate type of the study area was dry/sub-humid, mesothermal and close to marine conditions with moderate water surplus in winter, represented with C1 B'2 s2 b'3. According to Erinç's rainfall efficiency index, Kepsut was observed to have a sub-humid climate and the natural cover was dry forest resembling a park. Species for planting in the area should be selected according to these climate and soil characteristics.

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**Introduction:-**

Forest fires affect approximately 350 million hectares of land in the world each year causing financial loss as well as loss of life. Fires may lead to acceleration in climate change (Stocks et al., 1998), air pollution (Ferrare et al., 1990), increase in carbon emission into the atmosphere (Zhang et al., 2003) and losses in products and services made possible by forests (Anderson et al., 1976; Garcia-Ruiz et al., 2013).

Fire-resistant forest projects (YARDOP) which have gained pace in our country in recent years, involve zoning works to protect various plant species against fire, changing the fire behavior and mitigating fire severity (Coşkuner and Bilgili 2013). To this end, fire-resistant areas have been created in the district of Kepsut, a rich area in terms of forests, and measures have been taken to mitigate the severity of forest fires (Yılmaz and Satıl, 2016).

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It is necessary to analyze ecological characteristics of the area prior to plant selection. Climatic data and soil structure, which are important in plant development, must be investigated in detail before determining appropriate plants.

Knowing the climate type of a region is necessary for planning of several activities from selection of plants to be cultivated and industrial facilities to be built (Şensoy and Ulupınar, 2008).

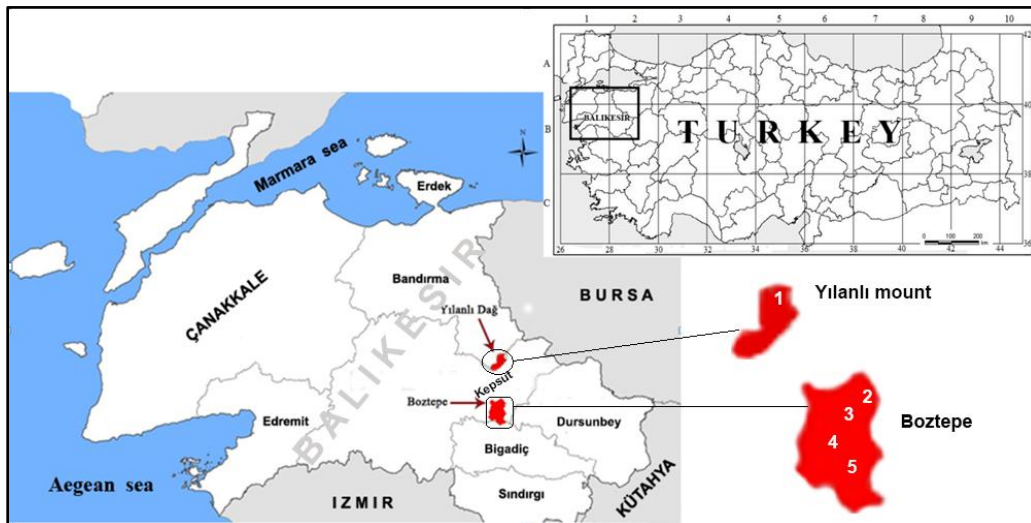
To the best of our knowledge, there is no study on the climatic data of the district of Kepsut. However, the climatic data of the Balıkesir Plain and its surroundings, 29 km from the district of Kepsut, have been investigated by Tağlı (2003).

The soil structure is as important as the climate for planting (Benek, 2006; Peker Say et al. 2012; Paksoy et al. 2016).

In this study, the climate and soil characteristics in Yılanlı Mountain and Boztepe localities in the district of Kepsut were investigated to create fire-resistant forests (YARDOP). Plant types suitable for this ecological environment were determined based on the results of the study.

### Materials AndMethods:-

The climate type and water balance of the area were determined using Thornthwaite's (1948) and Erinç's (Şensoy and Ulupınar 2008; Demir et al. 2015) methods. The meteorological climatic data of the area between 1990-2015 were examined in the study. The climatic data used in the study were obtained from the records of the General Directorate of Meteorology (Anonymous, 2015). The general view of the study area and soil samples obtained from 5 different points can be seen in Figure 1.



**Figure 1:-** The general view of the study area and soil samples obtained from trial areas.

**Soil Analysis:-**

Soil profiles were opened at five different trial areas and soil samples were obtained from these profiles at depths of 0 - 30 cm, 30 - 60 cm and 60 - 90 cm. Soil samples of about 1 kg each were brought to the Forest Sub-district Directorate in paper bags and kept until dry. The samples were then analyzed by the Ege Forestry Research Institute Directorate. Physical (texture, pH, calcitic lime (CaCO<sub>3</sub>), total salt) and chemical (N, P, K, organic matter) analyses of the soil samples were performed according to standard methods (Bayraklı, 1984) and the samples were examined according to Kaçar (1972).

**Discussion:-**

The climatic data and observation data related to climatic factors such as rainfall, temperature and evaporation shown in Table 1 were received from the General Directorate of Meteorology (Anonymous, 2015) and assessed according to Thornthwaite and Erinc methods. The annual average temperature in the area was found to be 14.5°C, whereas the average temperature was 24.5°C in July and 24.3°C in August. The annual total rainfall was found to be 602.2 mm, whereas the average rainfall was 9.1 mm in July and 8.7 mm in August. The annual average relative was found to be 69% and the annual average wind velocity was 2.8 m/sec. The highest wind velocity was 29.6 m/sec and the wind direction was Northwest. Table 1 shows the climatic values in the study area between 1990-2015. The climate type and water balance of the area were determined using Thornthwaite's (1948) and Erinc's (Şensoy and Ulupınar 2008; Demir et al. 2015) methods.

As shown in Table 1, the potential evaporation was found to reach high values between May-September, when the temperature rises and solar energy increases. The annual average potential evaporation in Kepsut was found to be 861.2 mm. The evaporation was found to start increasing in May and reach its highest value (147.6 mm) in July, start decreasing in September and reach its lowest value (20.8 mm) in December.

**Table 1:-** The climatic values in the study area between 1990-2015.

Meteorological observations	Months												Annual
	1	2	3	4	5	6	7	8	9	10	11	12	
Meantemp. (°C)	4,8	6,0	7,0	12,8	17,8	22,2	24,5	24,3	20,4	15,6	11	6,8	14,5
Maximum temp. (°C)	23,3	23,4	30,2	35,2	38,5	39,8	41,7	43,3	39,4	36,1	28,7	25,7	33,76
Means of max.temp. (°C)	8,6	10,6	13,2	18,9	24,5	28,8	30,9	31,0	27,2	21,8	16,2	10,8	20,2
Means of min.temp. (°C)	1,5	2,3	3,4	6,9	11,1	14,8	17,3	17,6	14,0	10,2	6,9	3,4	9,1
Min.temp. (°C)	-21,8	-13,1	-7,8	-2,8	0,6	4,0	9,1	6,0	4,5	-2,3	-2,6	-12,9	-21,8
Average humidity (%)	82	78	74	68	65	58	55	56	63	69	78	82	69
Average of days more than 10 mm of rainfalls	2,9	2,5	2,1	1,9	1,3	0,8	0,2	0,2	0,7	1,4	2,4	3,3	1,6
Total precipitation average (mm)	93,7	75,1	60,9	50,0	42,6	25,1	9,1	8,7	21,0	42,8	74,8	98,4	50,2
Max. precipitation (mm)	77,9	56,4	63,9	41,1	53,9	41,8	50,1	40,1	39,6	68,3	118	9,2	61,2
Average of rainy days	5,8	5,4	5,8	0,6	0,1	0,0	0,0	0,0	0,0	0,4	5,0	5,0	2,1
Average wind speed (m_sec)	2,7	2,8	3,1	2,5	2,1	2,7	3,7	3,7	3,1	2,4	2,0	2,4	2,8
Max. wind speed (m_sec)	SW	W	NESW	SW	SSW	N	NHE	N	NNE	NE	NW	SSSW	NESSW
Max. wind speed (m_sec)	27,2	28,1	29,6	26,8	24,7	23,2	25,3	26,9	28,2	26,1	28,2	27,8	29,6
Average evaporation (mm)*	21,0	25,7	40,8	67,2	91,7	138	147	137	95,7	49,9	25,3	20,8	861,2
Average temperature (mb)	6,3	6,4	7,1	9,0	11,8	14,0	15,7	15,8	12,9	10,9	8,6	7,2	10,5

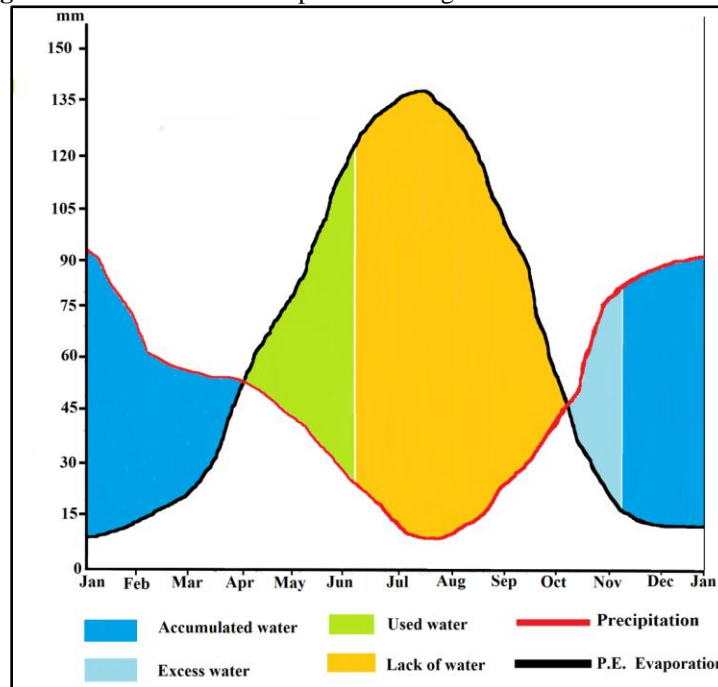
**Table 2:-** The water balance of the district of Kepsut (according to Thornthwaite)

Meteorological observations	Months												Annual
	1	2	3	4	5	6	7	8	9	10	11	12	
Temperature	4,8	5,6	7,6	12,2	17,8	21,9	23,6	22,9	19,6	14,6	9,2	6,2	13,8
Temperature index	0,94	1,19	1,89	3,86	6,84	9,36	10,48	10,01	7,91	5,07	2,52	1,39	61,46
Unamended PE	9	12	18	46	62	97	108	102	84	55	28	16	-
Amended PE	7,6	10	18,5	51,1	76,9	121,3	137,2	120,4	87,4	52,8	23,2	13,0	719,4
Precipitation	92,3	64,8	55,7	55,4	42	19,2	7,9	8	27,2	39,8	76,8	84,5	573,6
Change monthly of ditchwater	0	0	0	0	34,9	65,1	0	0	0	0	53,6	46,4	-
Ditchwater	100	100	100	100	65,1	34,9	0	0	0	0	53,6	100	-
Real PE	7,6	10	18,5	51,1	76,9	84,3	7,9	8	27,2	39,8	23,2	13	367,5
Water scarcity	0	0	0	0	0	37	129,3	112,4	60,2	13	0	0	351,9
Surpluswater	84,7	54,8	37,2	4,3	0	0	0	0	0	0	0	25,1	206,1
Flow	54,8	69,7	46	20,8	2,2	0	0	0	0	0	0	12,6	206,1

The water balance data of the trial areas were formed in order to determine the climate type of Kepsut based on the Thornthwaite method. The data can be seen in Table 2.

According to the results obtained using the Thornthwaite method, Kepsut had a dry/sub-humid and mesothermal climate type close to marine conditions with moderate water surplus in winter (C1 B'2 s2 b'3) (Table 2, Figure 2). The rainfall in November exceeds PE in Kepsut and the water surplus begins in this month. In December, the soil becomes saturated. The water surplus continues until the end of April. The situation changes in May and PE begins to exceed rainfall. However, there is not a lack of water in May since the soil is saturated in May. The low rainfall between May-June is compensated from the water accumulated in the soil. These months are when the accumulated water is consumed. There is no more accumulated water in the soil beginning from July. This situation continues until November, when the rainfall starts to exceed PE and these months are the time when lack of water is experienced (Table 2, Figure 2).

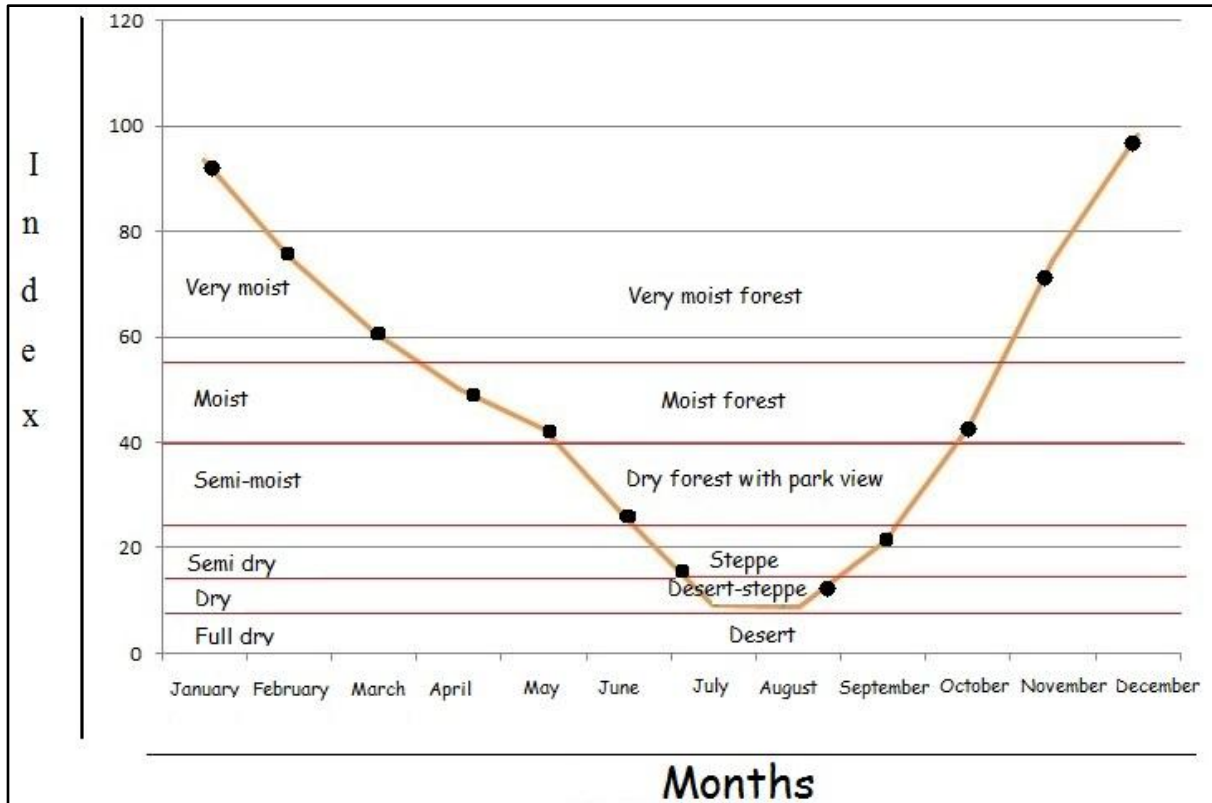
**Figure 2.** Water balance of Kepsut according to the Thornthwaite method.





According to Erinç rainfall activity index formula (Annual total rainfall / Annual average max. temperature), the area has an index value of 29.8 (Figure3). According to this value, Kepsut has a sub-humid climate and the natural cover is dry forest resembling a park (Şensoy and Ulupınar 2008). It was found that the climate is very humid in November, December, January, February and March; sub-humid in October, April and May; sub-arid in June and September; and arid in July and August (Figure 3).

**Figure 3:-** Diagram composed according to Erinç precipitation index formula.



It was determined as a result of the study that the climate of Kepsut is arid or sub-humid in general according to both classifications (Table 1). Climate demonstrates the characteristics and the state of a region in terms of weather events and also is accepted as a basic indicator of how the plant cover in the region is distributed (Usta et al., 2014). As shown in Table 1, plants selection should be made considering the lack of water and maximum evaporation level in June, July and August, high duty irrigation systems should be installed and an appropriate agricultural mechanization is required considering topographical conditions.

Analysis results are shown in Table 3-7. The texture of soils obtained from five different trial points was observed to be sandy-clayey and sandy-loamy in general and loamy in some places. The texture was observed to be sandy-loamy for soil samples obtained from a depth of 0-30 cm, sandy-clayey loam for soil samples obtained from a depth of 30-60 cm and sandy-loamy for soil samples obtained from a depth of 60-90 cm. The pH character of the soil samples obtained from trial areas were found to vary from slight acid to moderate alkali in general. The pH character was neutral in the trial area no. 1 and slight acid in the trial areas 2, 3 and 5 and moderate alkali in the trial area 4. Figure 1 shows the soil samples obtained from trial areas.

**Table 3:-** Results soil analysis of trial area no. 1

Depth (cm)	Texture				pH	Total CaCO <sub>3</sub>	Salt mS/cm	Organic matter	Total N (%)	Beneficial P (mg/kg)	Beneficial K (mg/kg)
	Sand	Clay	Silt	Kind							
0-30	55.5	26.05	18.45	Sandy – clayloam	6.95	0.07	0.203	0.76	0.062	0.83	14.8
30-60	57.38	28.04	14.58	Sandy – clayloam	6.97	0.05	0.017	0.73	0.056	0.54	0.6
60-90	75.42	11.17	13.41	Sandyloam	6.88	0.04	0.012	0.14	0.035	0.65	4.2
					Neutral	Lime-free	Saltless	Slightly	Poor	Slightly	Slightly

**Table 4.** Results soil analysis of trial area no. 2

Depth (cm)	Texture				pH	Total CaCO <sub>3</sub>	Salt mS/cm	Organic matter	Total N(%)	Beneficial P (mg/kg)	Beneficial K (mg/kg)
	Sand	Clay	Silt	Kind							
0-30	60.51	17.38	22.11	Sandy-loam	5.78	0.08	0.036	2.76	0.157	1.28	20.5
30-60	59.4	20.11	20.49	Sandy – clayloam	6.33	0.001	0.029	2.34	0.088	1.26	18.7
60-90	60.39	21.79	17.82	Sandy-clayloam	5.91	0.001	0.03	2.42	0.089	1.30	17.4
					Mild acid	Lime-free	Saltless	Medium	Poor	Slightly	Slightly

**Table 5:-** Results soil analysis of trial area no. 3

Depth (cm)	Texture				pH	Total CaCO <sub>3</sub>	Salt mS/cm	Organic matter	Total N(%)	Beneficial P(mg/kg)	Beneficial K (mg/kg)
	Sand	Clay	Silt	Kind							
0-30	63.23	14.98	21.79	Sandy-loam	6.43	0.01	0.031	1.60	0.081	1.43	2.9
30-60	46.68	16.54	36.78	Loam	6.56	0.01	0.026	0.05	0.015	0.28	2.5
60-90	77.91	6.51	15.58	Loam-Sandy	6.63	0.02	0.024	0.01	0.010	0.24	8.8
					Mild acid	Lime-free	Saltless	Poor	Poor	Slightly	Slightly

**Table 6:-** Results soil analysis of trial area no. 4

Depth (cm)	Texture				pH	Total CaCO <sub>3</sub>	Salt mS/cm	Organic matter	Total N (%)	Beneficial P (mg/kg)	Beneficial K (mg/kg)
	Sand	Clay	Silt	Kind							
0-30	61.41	15.28	23.31	Sandy-loam	8.35	5.68	0.092	2.23	0.113	1.53	19.5
30-60	78.60	2.10	19.30	Loam-Sandy	8.95	31.29	0.069	0.18	0.028	0.27	4.0
60-90	83.77	1.13	15.10	Loam-Sandy	9.01	36.68	0.068	0.29	0.025	0.34	4.1
					Alkali	Excess limy	Saltless	Poor	Poor	Slightly	Slightly

**Table 7.** Results soil analysis of trial area no. 5

Depth (cm)	Texture				pH	Total CaCO <sub>3</sub>	Salt mS/cm	Organic matter	Total N(%)	Beneficial P (mg/kg)	Beneficial K (mg/kg)
	Sand	Clay	Mil	Kind							
0-30	69.84	10.40	19.76	Sandy-loam	5.76	0.01	0.156	3.20	0.132	4.71	30.6
30-60	70.29	10.25	19.47	Sandy-loam	6.72	0.06	0.03	0.37	0.060	0.46	15.0
60-90	70.01	10.34	19.65	Sandy-loam	5.99	0.01	0.043	0.063	0.063	0.51	15.2
					Mild acid	Lime-free	Saltless	Slightly	Poor	Slightly	Slightly

Considering the lime (CaCO<sub>3</sub>) structure of the trial areas, it was observed that the trial areas were generally non-calcareous, whereas the soil structure of the trial area no. 4 was found to contain moderate to high lime. The soil samples obtained from five different areas were found to have a salt-free character. All of the trial areas were found to have organic matter, albeit in low amounts. The organic matter content was moderate in the samples obtained from a depth of 0-30 cm in the trial areas no. 2, 4 and 5, whereas the organic matter content was low in the remaining trial areas. The organic matter content was moderate in the samples obtained from a depth of 30-60 cm in the trial area no. 2, the organic matter content was very low in all of the remaining trial areas. The organic matter content was moderate in the samples obtained from a depth of 60-90 cm in the trial area no. 2, the organic matter content was very low in all of the remaining trial areas. The N element was found in low levels in all of the trial areas. The rate of N was found to be similar in samples obtained from different depths (0-30 cm; 30-60 cm; 60-90 cm) and soils from all depths had a low rate of nitrogen. Whilst the rate of P was observed to be low in the soil samples obtained from a depth of 0-30 cm in the trial area no. 5, the rate of P was very low at all depths in all trial areas. Whilst the rate of P was observed to be moderate in the soil samples obtained from a depth of 60-90 cm in the trial area no. 5, the rate of P was very low at all depths in all trial areas.

### Conclusion:-

In conclusion, the fire-resistant plant species to be selected for fire-resistant forest areas should be able to adapt to the arid or sub-humid climate type and regions close to marine conditions. These plant species should be suitable for salt-free, slightly acidic or neutral soils with poor organic matter content in order to create long-lasting YARDOP areas.

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### RESEARCH ARTICLE

#### ROLE OF GROWTH REGULATORS IN MICROPROPAGATION OF WOODY PLANTS-A REVIEW

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#### Abstract

The success of micropropagation technique depends upon the use of growth regulators in the culture medium. Growth regulators regulate the growth and developmental processes. These are the key factors in initiating the process of regeneration in tissue culture. In most of *in vitro* studies, explants do not respond well on culture media without growth regulators. An interactive balance of auxins and cytokinins controlled the *in vitro* growth and differentiation response in plant tissues. This review highlights on the role of growth regulators in micropropagation of woody plants.

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#### Abbreviations

**BAP:** 6 benzylaminopurine  
**Kn:** Kinetin  
**TDZ:** Thidiazuron  
**2iP:** 2-isopentenyl adenine  
**GA<sub>3</sub>:** Gibberellic acid

**IAA:** Indole-3-acetic acid  
**IBA:** Indole-3-butyric acid  
**NAA:**  $\alpha$ -Naphthalene acetic acid  
**2,4-D:** 2,4-Dichloro phenoxy acetic acid  
**ABA:** Abscisic acid

#### Introduction

The world has a very rich biodiversity of plant species. Many of which are herbaceous and many others are woody in nature. In the view of propagation, woody plants are difficult to propagate than herbaceous species. The difficulty in propagation is due to their poor seed germination capacity, as seeds are not viable in most of the time. In this case the favorable season is a very important criterion for the successful germination. Moreover, the slow growth is also a barrier, because apical and axillary buds become dormant during specific time periods. Therefore, woody plants require favorable season for the germination of seeds and buds. Further, some more conventional methods of propagation such as cuttings and graftings are also used for woody plants. But these are not much effective methods for their large scale production. As, for a wide population, woody plants are important source of timber, medicines, fruits, dyes etc. Therefore, there is a need to propagate them wisely as well as in large amount to fulfill the requirements of the population. The possible approach to overcome the problem is micropropagation.

Micropropagation is the technique of growing the plants from seeds or small pieces of tissues under sterile condition in a laboratory on a specially selected medium. It allows mass multiplication of a species from a small piece of tissue. One of the important aspects of this technique is that it is not dependent on the season for the propagation. Through micropropagation, a number of woody plant species have been propagated successfully during past years. But, the success of micropropagation technique depends upon the use of plant growth regulators in the culture medium. Growth regulators regulate the growth and developmental processes, which are present in various concentrations in different plant parts. These are the key factors in initiating the process of regeneration in tissue

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culture. Miller and Skoog (1953) reported that *in vitro* root and shoot differentiation is regulated by exogenous hormonal interaction. In most of *in vitro* studies, explants do not respond well on culture media without growth regulators (Kumar, 1992; Kumari *et al.*, 1998; Kumar *et al.*, 2003; Walia *et al.*, 2003; Gururaj *et al.*, 2007; Sharma and Vashistha, 2010b; 2015c). Growth regulators applied externally might disturb the internal polarity and change the genetically programmed physiology of explants resulting in organogenesis from the explants.

Basically, plant growth regulators come under two broad categories- auxins and cytokinins. Commonly used auxins are- IAA, NAA, IBA and 2,4-D and cytokinins are- BAP, Kn, TDZ, Zeatin and 2-iP. An interactive balance of auxins and cytokinins controlled the *in vitro* growth and differentiation response in plant tissues. During indirect organogenesis, the formation of callus or somatic embryo from explants is stimulated by altering the levels of exogenously applied auxins or combinations of auxins and cytokinins. Similarly, direct organogenesis from apical or axillary buds is stimulated by the cytokinins or combinations of cytokinins and auxins in the culture medium. A variety of plant growth regulators have been used individually as well as in combinations to achieve the micropropagation of a number of woody plant species (Table 1). During past years, some reviews have been published on micropropagation of trees and woody plants (Sharma and Vashistha, 2015a; Sharma, 2016). In these reviews, problems of propagation of woody plants and their possible solution through micropropagation technique have been taken in to consideration. But, this review highlights on the role of growth regulators in micropropagation of woody plants, which categories under following headings:

#### ***In vitro* seed germination and shoot elongation**

Many woody plants are propagated through seeds under *in vitro* condition. GA<sub>3</sub> is a growth regulator effective for seed germination as well shoot elongation. A number of workers used GA<sub>3</sub> in their culture media and found useful results (Isogai *et al.*, 2008; Balaraju *et al.*, 2011; Joseph *et al.*, 2011 and Al-Safadi and Elias, 2011). Ghimire *et al.* (2016) reported that among different growth regulators tried in *Melastoma malabatricum*, GA<sub>3</sub> was the most effective for shoot elongation. But in *Pyrus boissieriana*, GA<sub>3</sub> negatively affected number and length of shoots (Zakavi *et al.*, 2016).

#### ***In vitro* shoot regeneration**

In case of most of woody plants, basal nutrient medium without growth regulator is not much effective in inducing shoot buds. Similarly no shoot buds developed in *Crataeva nurvala* (Walia *et al.*, 2003) and *Cinnamomum camphora* (Sharma and Vashistha, 2010c) on basal medium. Growth regulators applied exogenously have variable effects which varied with the type of growth regulator, its concentration and nature of explants. In woody species, *in vitro* shoot regeneration is achieved by two methods: direct and indirect organogenesis.

#### **Direct organogenesis**

Direct method involves the proliferation of apical and axillary buds. This method is most popular in woody plants for shoot multiplication because the apical (shoot tips) and axillary buds (nodes) have the potential to develop in to a shoot. In contrast to basal medium, it is observed that when the medium is supplemented with cytokinins individually or in combination with auxins shoot tips and nodal explants produced multiple shoots. The number and frequency of shoot induction is mainly dependent on the concentration of cytokinin used in the culture medium. The past studies showed that among the cytokinins (BAP, Kn, TDZ and Zeatin) tested in different woody species, BAP and Kn were most common. Further, in many woody species, BAP is more effective than Kn for shoot induction and multiplication (George, 1993; Sharma and Vashistha, 2010b; Sharma *et al.*, 2015). Bunn (2005) and Asthana *et al.* (2011) reported that BAP resulted in the highest shoot multiplication rates when compared to Kn and Zeatin. The superiority of BAP over other cytokinins has also been reported in *Capparis decidua* (Tyagi and Kothari, 2001) and *Pterocarpus marsupium* (Chand and Singh, 2004). In contrast, Shahzad and Siddiqui (2001) in *Melia azedarach* reported that Kn proved more effective than BAP for direct shoot regeneration. Similar observation is reported in *Gmelina arborea* (Kumar *et al.*, 2010). Further, it is reported that higher concentration of BAP and Kn are inhibitory in some woody plants (Anuradha and Pullaiah, 1999; Tornero *et al.*, 2000; Nair and Seeni, 2001; Balaraju *et al.*, 2011 and Sharma *et al.*, 2015). Besides these growth regulators, many workers used TDZ in their culture medium and found positive effects on shoot induction and multiplication as in *Pterocarpus marsupium* (Husain *et al.*, 2007), *Fraxinus pennsylvanica* (Du and Pijut, 2008), *Medusagyne oppositifolia* (Marriott and Sarasan, 2010) *Pterocarpus santalinus* (Balaraju *et al.*, 2011). In spite of these findings, a combination of cytokinin and auxin also used for shoot proliferation in *Salvadora persica* (Mathur *et al.*, 2002) and *Ficus religiosa* (Siwach and Gill, 2011).

### Indirect organogenesis

Indirect method involves the shoot regeneration through callus induction and somatic embryogenesis. For callus induction, different explants are cultured on nutrient medium supplemented with different concentrations of auxins individually or in combinations with cytokinins. Callus so obtained is further separated and transferred in to fresh medium supplemented with different concentrations of cytokinins individually for shoot generation. The somatic embryos initiate either directly from the explants or *via* callus formation and can grow in to seedling on suitable medium.

### Callus induction and plantlet regeneration

It is reported in most of woody species that basal medium without growth regulator failed to induce callus (Sharma and Vashistha, 2010a; 2011b). This is probably due to the insufficient level of endogenous growth regulators in explants to induce callus and therefore it requires an exogenous supply. In woody plants, commonly used auxins are IAA, NAA, IBA and 2,4-D. In some investigations, 2,4-D has been essential for callus formation, as in *Thevetia peruviana* (Kumar, 1992) and *Terminalia arjuna* (Kumari *et al.*, 1998). In addition to this, 2,4-D is effective in inducing callus in *Moringa oleifera* (Kumar *et al.*, 2009), *Citrus jambhiri* (Savita *et al.*, 2011) and *Simmondsia chinensis* (Bala *et al.*, 2015). According to Murashige (1974) 2,4-D is a most potent auxin and it stimulates callus formation and strongly antagonizes organized development. In contrast, NAA played an important role in callus formation in *Cinnamomum camphora* (Sharma and Vashistha, 2010a), *Pseudarthria viscid* (Cheruvathur and Thomas, 2011) and *Tinospora cordifolia* (Sharma and Vashistha, 2011a; 2014). Similarly, IAA has been used in some *in vitro* culture studies to initiate callus (Isah and Mujib, 2015; Sharma and Vashistha, 2015b).

**Table 1: Role of growth regulators in micropropagation of some woody plant species**

Woody plant species	Explants used	Growth regulators	Role of growth regulators	References
<i>Abies cephalonica</i>	Embryo	ABA	Somatic embryogenesis	Krajnakova <i>et al.</i> (2009)
<i>Aegle marmelos</i>	Cotyledonary node and Nodal explants	BAP, Kn, IAA and IBA	Direct shoot regeneration	Kumar and Seeni (1998), Nayak <i>et al.</i> (2007)
<i>Ailanthus altissima</i>	Stem segments	BAP & IBA	Direct shoot regeneration	Gatti (2008)
<i>Azadirachta indica</i>	Zygotic embryos	BAP; 2,4-D and ABA	Somatic embryogenesis	Rout (2005)
<i>Bixa orellana</i>	Nodal segments	GA <sub>3</sub> , BAP and IBA	Direct shoot regeneration	Joseph <i>et al.</i> (2011)
<i>Boehmeria nivea</i>	Cotyledon, hypocotyl, leaf, petiole and stem explants	TDZ + NAA	Direct and indirect (callus) shoot regeneration	Wang <i>et al.</i> (2008)
<i>Capparis spinosa</i>	Seeds, immature fruits and stem cuttings	GA <sub>3</sub> , BAP, IAA and NAA	Callus induction and plantlet regeneration	Al-Safadi and Elias (2011)
<i>Cinnamomum camphora</i>	Shoot tip, nodal and internodal explants	BAP, Kn, IBA, NAA and 2,4-D	Direct and indirect (callus) shoot regeneration	Sharma and Vashistha (2010a, 2010b and 2010c)
<i>Citrus jambhiri</i>	Cotyledon explants	2,4-D; BAP and NAA	Callus induction and plantlet regeneration	Savita <i>et al.</i> (2011)
<i>Couroupita guianensis</i>	Seeds and nodal explants	BAP, Kn, NAA and IBA	Direct shoot regeneration	Shekhawat and Manokari (2016)
<i>Crataeva nurvala</i>	Shoot tips	2,4-D	Somatic embryogenesis	Inamdar <i>et al.</i> (1990)
<i>Elaeocarpus sphaericus</i>	Nodal explants	BAP+Kn, NAA	Direct shoot regeneration	Saklani <i>et al.</i> (2015)
<i>Emblica officinalis</i>	Juvenile roots and Epicotyl explants	BAP, IAA, NAA and IBA	Direct and Indirect (callus) shoot regeneration	Gour and Kant (2009), Nayak <i>et al.</i> (2010)
<i>Eucalyptus camaldulensis</i>	Nodal explants	Bap, NAA and IBA	Direct organogenesis and Somatic embryogenesis	Girijashankar (2012)
<i>Ficus religiosa</i>	Nodal explants	BAP, TDZ, 2iP,	Direct shoot	Siwach and Gill (2011)

		IAA and NAA	regeneration	
<i>Fraxinus americana</i>	Hypocotyls & cotyledons	BAP, TDZ, IAA and IBA	Direct shoot regeneration	Palla and Pijut (2011)
<i>Gmelina arborea</i>	Shoot tip, node and internode explants	Kn, BAP, NAA and 2,4-D	Direct and indirect (callus) shoot regeneration	Kumar <i>et al.</i> (2010)
<i>Juglans nigra</i>	Shoot tips and nodal segments	Zeatin, TDZ, BAP and IBA	Direct shoot regeneration	Bosela & Michler (2008)
<i>Lawsonia inermis</i>	Nodal explants	BAP, Kn, IAA and IBA	Direct shoot regeneration	Ram and Shekhawat (2011)
<i>Moringa oleifera</i>	Cotyledons	NAA; 2,4-D and BAP	Callus induction and plantlet regeneration	Kumar <i>et al.</i> (2009)
<i>Morus alba</i>	Leaf explants	2,4-D; IAA, NAA, BAP and Kn	Callus induction and plantlets regeneration	Lee <i>et al.</i> (2011)
<i>Pongamia pinnata</i>	Nodal explants	BAP, Kn, Zeatin and TDZ	Direct shoot regeneration	Sujatha and Hazra (2007)
<i>Populus tremula</i>	Axillary buds	BAP, IAA, NAA and IBA	Callus induction and plantlet regeneration	Peternel <i>et al.</i> (2009)
<i>Prosopis laevigata</i>	Cotyledonary node and Zygotic embryos	2,4-D + BAP and NAA	Direct and indirect (callus) shoot regeneration, Somatic embryogenesis	Buendia-Gonzalez <i>et al.</i> (2007), Buendia-Gonzalez <i>et al.</i> (2012)
<i>Prunus domestica</i>	Hypocotyl explants	TDZ, IBA and NAA	Direct shoot regeneration	Tian <i>et al.</i> (2007)
<i>Pseudarthria viscida</i>	Cotyledonary node and leaf pieces	2,4-D; NAA, BAP, IAA & IBA	Callus induction and plantlet regeneration	Cheruvathur and Thomas (2011)
<i>Psidium guajava</i>	Zygotic embryos	2,4-D	Somatic embryogenesis	Rai <i>et al.</i> (2007)
<i>Pterocarpus marsupium</i>	Cotyledonary node	TDZ, BAP and IBA	Direct shoot regeneration	Husain <i>et al.</i> (2007)
<i>Pterocarpus santalinus</i>	Shoot tip explants	GA <sub>3</sub> , BAP, TDZ and IBA	Direct shoot regeneration	Balaraju <i>et al.</i> (2011)
<i>Salvadora persica</i>	Cotyledonary node explants	BAP & IAA	Direct shoot regeneration	Mathur <i>et al.</i> (2002)
<i>Sapindus trifoliatus</i>	Nodal explants	BAP & IBA	Direct shoot regeneration	Asthana <i>et al.</i> (2011)
<i>Simmondsia chinensis</i>	Leaf explants	2,4-D; IBA and BAP	Callus induction and plantlets regeneration	Bala <i>et al.</i> (2015)
<i>Tabebuia donnell-smithii</i>	Stem segments	Zeatin & IBA	Direct shoot regeneration	Gonzalez-Rodriguez (2010)
<i>Tinospora cordifolia</i>	Shoot tip, Node, Internode, leaf and petioles	BAP, Kn, 2iP, IAA, NAA, IBA and 2,4-D	Direct and indirect (callus) shoot regeneration	Gururaj <i>et al.</i> (2007), Sharma and Vashistha (2011b; 2015b; 2015c) Sharma <i>et al.</i> (2015)
<i>Vitex agnus-castus</i>	Apical & nodal explants	GA <sub>3</sub> , BAP, Kn, NAA and IBA	Direct shoot regeneration	Balaraju <i>et al.</i> (2008)
<i>Ziziphus jujuba</i>	Leaf explant	TDZ & NAA	Direct shoot regeneration	Feng <i>et al.</i> (2010)
<i>Zygodhryllum xanthoxylon</i>	Cotyledons, hypocotyl and radicles	BAP, NAA and IAA	Callus induction and plantlet regeneration	Sun <i>et al.</i> (2008)

### Somatic embryogenesis

Somatic embryogenesis and plant regeneration studies has been reported in many woody plant species such as *Crataeva nurvala* (Inamdar *et al.*,1990), *Thevetia peruviana* (Kumar, 1992), *Emblia officinalis* (Tyagi and Govil, 1999), *Pinus roxburghii* (Arya *et al.*, 2000 and Mathur *et al.*, 2000), *Acacia farnesiana* and *A. schaffneri* (Ortiz *et al.*, 2000), *Eucalyptus globulus* (Nugent *et al.*, 2001 and Pinto *et al.*, 2002), *Areca catechu* (Karun *et al.*, 2004),



*Acacia arabica* (Rout and Nanda, 2005) and *Psidium guajava* (Rai *et al.*, 2007). In *Azadirachta indica* (Rout, 2005) used a combination of BAP and 2,4-D for plantlets generation from zygotic embryo and ABA for maturation and germination of embryo.

### **In vitro rooting**

In few cases, *in vitro* formed shoots develop roots when transfer in basal nutrient medium (without growth regulators). Otherwise, in most of studies auxins are known to induce rooting. In some species IAA induced rooting (Anuradha and Pullaiah, 1999; Arockiasamy *et al.*, 2000; Raghu *et al.*, 2006). In other species NAA was effective in inducing roots under *in vitro* condition (Kumar and Kumar, 1995; Savita *et al.*, 2011). However, in many investigations, maximum roots were formed when medium was supplemented with IBA (Ndoye *et al.*, 2003; Babu *et al.*, 2003; Chand and Singh, 2004; Sharma and Vashistha, 2010b; 2015c). Babu *et al.*, 2003 in *Cinnamomum camphora* reported that although roots were developed on basal medium without any growth regulator yet maximum *in vitro* rooting observed on 0.5 mg/l IBA in the medium.

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### RESEARCH ARTICLE

#### OPTIMIZATION OF FORMULATION PARAMETERS AND CHARACTERIZATION OF SIMVASTATIN LOADED CHITOSAN NANOPARTICLES.

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#### Abstract

This study aimed to optimize and characterize formulation factors in the preparation of drug-loaded polymeric nanoparticulate drug delivery system by employing response surface methodology (design of expert-DOE). Nanoparticles were prepared by three different methods namely solvent evaporation, solvent diffusion, and cross-linking method. Effect of important factors like method of preparation, surfactant type, stabilizer type on particle size, and percentage entrapment efficiency were studied using DOE. The prepared formulations show particle size and % entrapment efficiency in the range of  $602.11 \pm 12.5$  to  $1005.55 \pm 98.6$  nm and  $77.01 \pm 0.003$  to  $97.01 \pm 0.21\%$  respectively. Based on the result formulation prepared with nonionic surfactant (Tween 80), synthetic polymeric stabilizer (poly vinyl alcohol- PVA) and solvent evaporation method were found to be effective. After selection of optimized formulation, twelve formulations were prepared by altering key processing parameters like stabilizer and surfactant concentration and effective formulation was selected on the basis of in vitro release. Among various concentrations, formulation with combination of 0.50% w/v of PVA and 0.02% w/v of Tween 80 had sustain release property, stability and biocompatibility.

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#### Introduction:-

Over the past decade, there has been a rise in particle manipulation and nanosizing of solute drug (simvastatin). The intrinsic shortcomings of conventional drug delivery and the potential of nanoparticles as drug delivery systems have offered incredible scope for researchers in the field of pharmaceuticals (Khan et al., 2013). Nanoparticles may be used for oral administration of gut-labile drugs or those with low aqueous solubility like simvastatin (Wong et al., 2010). These colloidal carriers have the ability to cross mucosal barrier as such. Besides, they have the potential for enhancing drug bioavailability via particle uptake mechanisms (Chen et al., 2011). It was therefore decided to prepare nanoparticles of simvastatin so as to optimize its delivery and overcome its inherent negative aspects like low solubility, low bioavailability, short half-life, dose-dependent adverse effect, etc. (PrakashKatakam et al., 2014). The success of formulation not only relies on the selection of technology but also based on the appropriate selection of polymer, surfactant, stabilizer, formulation parameters like stirring speed, temperature, etc. Nanoparticles are considerably easy to prepare but the stability and the selection of stabilizer(s) are the most challenging and critical step as they can affect drug bioavailability (Peltonen et al., 2010). Both polymers and

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surface active agents have been utilized as stabilizer for pharmaceutical nanoformulation. Polymers like PVP, PVA, HPMC, PEG, CMC (Mahesh et al., 2014, Danhier et al., 2014) and surface active agents like pluronic F68, F127, Tween 80, Tween 20, SLS, lecithin were used often in preparation. Stabilizer can be non-ionic or ionic in nature and the overall stability is based on electrostatic force. Single stabilizer may be sufficient but combinations of stabilizers are utilized for narrow distribution in particle size (Valo et al., 2013, George et al., 2013). In general, stabilizers are thought to be pharmaceutically inactive excipients and the selection of the stabilizers is performed keeping in mind only the physical stability (prevents particle aggregation). However, these stabilizers are not inactive. Many polymers and surfactants utilized as stabilizers for drug nanocrystals are affecting the cells and cell layers leading to modified bioavailability of active drug.

To optimize the formulation variables, RSM is used (collection of mathematical and analysis of problems) in which a response of interest is influenced by variables and the objective is to optimize this response (Sabir et al., 2000, Singh et al., 2005). Moreover RSM is helpful in rapid development of optimum formulation with minimum number of experiments for the investigation of influence of the independent variables on results (Roy et al., 2009, Jain et al., 2013). The objective of this research work was to formulate simvastatin nanoformulation using chitosan by three different methods (solvent evaporation, solvent diffusion, and cross-linking technique) and optimization of nanoformulation by response surface methodology (Mennini et al., 2008). Initially, preliminary trials were done with 1:1, 1:2, and 1:3 drug:polymer ratios for obtaining lag phase during drug release. With 1:2 drug:polymer ratio, lag phase was obtained. Hence, this ratio was selected for the factorial design. During optimization, the effect of three independent variables, i.e., method of formulation (X1), stabilizer (X2), and surfactant (X3), on responses such as particle size (Y1) and % entrapment efficiency (Y2) were studied. This study encompasses the development of further 12 formulations, which were analyzed by *in vitro* release characterization. Optimized formulation finally subjected to stability and biocompatibility studies.

## **Experimental:-**

### **Materials:-**

Simvastatin was obtained as gift sample from Biocon Pharmaceuticals. All chemicals and polymers used in this study were purchased from Sigma Aldrich and were of analytical grade.

### **Preparation of nanoformulation:-**

Nanoparticles were prepared by solvent evaporation, solvent diffusion, and cross-linking technique (Krishna Sailaja et al., 2011).

### **Solvent evaporation method:-**

The organic phase consisting of simvastatin (SS) solution (dissolved in methanol) was added drop wise to the aqueous solution containing polymer, surfactant and stabilizer under stirring condition at 400 rpm for 3 hrs. Then it was homogenized at 10,000 rpm using Remi overhead stirrer. The formed nanoparticles were separated by centrifugation (REMI cooling centrifuge) at 20,000 rpm for 30 min followed by freeze-drying (Mao et al., 2008).

### **Solvent diffusion method:-**

The organic phase consisting of simvastatin (SS) solution (dispersed in dimethyl sulfoxide) was added dropwise to the aqueous solution containing polymer, surfactant, and stabilizer and kept in magnetic stirrer at 400 rpm for 3 hrs. Then it was homogenized at 10,000 rpm using Remi overhead stirrer. The formed nanoparticles were separated by centrifugation (REMI cooling centrifuge) at 20,000 rpm for 30 min followed by freeze-drying (Quintanar-Guerrero et al., 1996).

### **Cross-linking method:-**

Methanol was added to simvastatin (10mg/5ml), which was then incorporated to chitosan solution (20 mg dissolved in 5 ml of 2% acetic acid). This organic phase was added to the aqueous solution containing polymer, surfactant and stabilizer under stirring at 400 rpm for 3 h period. 150  $\mu$ l of 25% glutaraldehyde was added for cross-linking. Ethanolamine was finally added to block unreacted aldehyde group of cross linking agent (Murtaza et al., 2011). Then it was homogenized at 10,000 rpm using Remi overhead stirrer. The formed nanoparticles were separated by centrifugation (REMI cooling centrifuge) at 20,000 rpm for 30 min followed by freeze-drying.

After optimization by factorial design, appropriate method of formulation, stabilizer, surfactant and concentration of additives were chosen by preparing various formulations from F25 to F36 as given in Table 2 and characterized for its *in vitro* release.

#### **Experimental design:-**

A central composite design having a unit value of  $\alpha$  was applied according to reference protocols (Roy et al., 2009, Jain et al., 2013) to assess the influence of three independent variables (i.e., method of formulation, stabilizer and surfactant) on two dependent variables (i.e., particle size and encapsulation efficiency). All other formulations and process parameters were kept constant during the study. Stat-Ease design Expert®, version 7.0.3, was employed to generate and evaluate the statistical experimental design and construction of a design matrix with 24 experimental trials. This experimental trials of factorial design (table 1) consists of various combinations of three different methods, three types of polymeric stabilizers and surfactants coded as F1 to F24 as per Table 2. All the batches were prepared in triplicate ( $n = 3$ ). The experiments were performed in random order. The response variables were evaluated by the following second-order polynomial model, as in Eq.1

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_1X_2 + \beta_4X_1^2 + \beta_5X_2^2 \dots (1)$$

Where  $\beta_0$ – $\beta_5$  represents regression coefficients,  $X_1$ – $X_2$  the studied variables, and  $Y$  the measured response with each factor level combination. Different combinations were selected on the basis of the experimental design.

#### **Characterization:-**

##### **Particle size analysis:-**

Mean particle size and size distribution of simvastatin-loaded polymeric nanoparticles were determined by dynamic laser light scattering (SEM-633, SemaTech, France) at 25 °C. The samples were diluted to an appropriate concentration using deionized water. Water was previously filtered through a 0.22- $\mu$ m membrane filter (Millipore, USA) to avoid the presence of any interfering particles. All measurements were carried out in triplicate; hence, each value is the mean of three independent readings within a batch and error represents the standard deviation of the mean particle size as an index of particle size and polydispersity.

##### **Transmission electron microscope:-**

About 5  $\mu$ L of nanoparticle suspension was deposited on a carbon film coated on a TEM copper grid and negatively stained with 2 % uranyl acetate. The grid was tapped with a filter paper to remove extra water and then air-dried. The observation was done at an accelerating voltage of 100 kV in a transmission electron microscope (Zeiss LEO-906, Germany).

##### **Entrapment Efficiency of Nanoformulation:-**

Entrapment efficiency of nanoformulation was calculated by using the following equation

$$\% \text{ Entrapment efficiency} = \frac{\text{Total amount of drug added initially} - \text{free drug in supernatant}}{\text{Total amount of drug added initially}} \times 100 \text{-----Eq.2}$$

A suspension of a representative nanoformulation was centrifuged at 12,000 rpm for 5 min until separation of all precipitate. The supernatant was collected for determination of drug content. It was then analyzed spectrophotometrically in triplicate at the wavelength of 238nm (UV-visible spectrophotometer, Shimadzu UV-1601, Japan). Calculation of simvastatin content was performed by using calibration curve method.

##### **In vitro drug release study:-**

*In vitro* release studies on formulation were carried out in PBS7.4 using dialysis bag technique. Then nanoformulation (10 mg) was placed in 500 ml dissolution medium and study was carried out for 24 h. The temperature was maintained at  $37.0 \pm 0.5$  °C and the stirring speed at 100 rpm. Samples (4 ml) were withdrawn and replaced with an equal volume of fresh dissolution medium at regular time interval and analyzed spectrophotometrically (model 1601, Shimadzu, Japan) at 238 nm. The concentration of simvastatin in the samples was determined from a standard calibration curve. The release studies were carried out in triplicate.

##### **Forced degradation studies:-**

The ICH guideline entitled stability testing of new drug substances and products requires that stress testing be carried out to elucidate the inherent stability characteristics of the active substance. Stability studies of both simvastatin and formulation were carried out under extreme stress conditions like acidic, alkaline, hydrolytic, thermolytic, oxidation, photolytic (UV exposure) as per stability indicating assay methods (SIAM).

**Acid degradation:-**

0.1 N HCl was taken in a 10 ml volumetric flask and then accurately weighed 10 mg sample was dissolved in it. To solubilize the drug, few drops of methanol was added and then the volume is made by 0.1 N HCl. Then, this solution was refluxed for 3 days at room temperature in water bath. The specific amount of solution was withdrawn at end of each day. After this, the absorbance was measured by scanning the prepared solution of required concentration in a UV spectrophotometer (model 1601, Shimadzu, Japan).

**Alkali degradation:-**

0.1 N NaOH solution was prepared. Accurately weighed 10 mg sample was taken in a 10 ml volumetric flask. Then, the volume was made with 0.1 N NaOH. Then this solution was refluxed for 3 days at room temperature in a water bath. The absorbance was measured every day by withdrawing the required amount of the sample. Then, scanning was performed with a UV spectrophotometer.

**Degradation in pH solution:-**

Accurately weighed 10 mg of drug was taken in a 10 ml volumetric flask. Then, little amount of methanol was added to dissolve the drug. The volume was adjusted up to the mark with different pH solutions (2,4,6,8,10). Then, that solution was refluxed for 3 days at room temperature in a water bath. The absorbance was measured at specific interval by withdrawing the required amount of sample solution. Then, scanning was performed with a UV-spectrophotometer.

**Thermal degradation:-**

A specific amount of sample was taken in a clean petridish and dried, then the petridish along with drug was placed into the oven at 100 °C for 3 days, 5 mg of bulk drug was taken from the Petridish each day and 1000 ppm solution with methanol was prepared. After this, the required concentration was made and the absorbance was measured in UV spectrophotometer. Percentage of degradation was calculated.

**Photolytic degradation:-**

Accurately weigh 10 mg of sample in a 10 ml volumetric flask and the volume was adjusted up to the mark with methanol. The prepared solution was placed in the photo stability chamber for 3 days. The absorbance was measured at end of each day by withdrawing the required amount of sample solution by using UV-spectrophotometer.

**Oxidation with H<sub>2</sub>O<sub>2</sub>:-**

10mg of sample was weighed accurately, 2–3 drops of methanol was added to solubilise the drug. Then the volume was made with 3% H<sub>2</sub>O<sub>2</sub> and placed it in a cupboard for 3 days. Specified amount of sample was taken and the required concentration was prepared each day. It was scanned in a UV spectrophotometer

**Hemolysis assay for biocompatibility:-**

Blood was collected from healthy adult volunteers and loaded into test tubes containing EDTA (anti coagulant) and diluted with PBS buffer. 0.2 mL of diluted blood was added into fresh test tubes containing test samples (drug, polymer, two concentrations of formulation, positive and negative control) and incubated for 60 min at room temperature. 0.2 mL of diluted blood in 10 mL SLS and PBS buffer served as positive and negative controls respectively (HA et al., 2014).

**Results:-****Appearance of nanoformulation:-**

The nanoparticles were in size range of  $602.11 \pm 12.5$  to  $1005.55 \pm 98.6$  nm (table 2) was confirmed by fig 3. The TEM images in fig.4 have shown the morphological properties and surface appearance of nanoparticles. The nanoparticles have nearly spherical shape and smooth surface. It also shows the homogenous molecular distribution of the drug in the polymer-based nanoparticles and drug distribution in the particulate form. There was no diffraction of transmission of electrons through the particles and that is why uniform dark particles were seen without any spot. Spotted particles support the presence of drug in particulate form rather than its distribution in molecular form.

The resultant equation for response-particle size Y1 is shown in Eq 3 and Figure 1.

$$Y1 = 75.7281 + 3.3580 X1 - 1.9108 X2 - 0.2312 X1X2 - 0.0198 X1^2 - 0.2109 X2^2 \dots (3)$$



**Drug entrapment efficiency:-**

Entrapment efficiency was in the range  $77.01 \pm 0.003$  to  $97.01 \pm 0.21\%$  (table 2) and was dependent on the encapsulating polymer, stabilizer, and surfactant. RSM results for response Y2 (entrapment efficiency) is given in Figure 2. The resultant equation for response Y2 is given in Eq 4.

$$Y2 = 27.047 + 1.087 X1 + 10.2130 X2 + 0.0475 X1X2 - 0.0930 X1^2 - 0.8078 X2^2 \dots\dots(4)$$

**In vitro drug release study:-**

Drug release from the nanoformulation depends mainly on the type and concentration of the polymers used in the formulation. All the formulations displayed fastest to sustained release pattern with 67–90 % (table 3) released in PBS at 24 h. The highest drug release is obtained for F33, F34, F35, and F36 in which both Tween 80 and PVA concentrations were higher. For formulation F25, F26, F27, and F28 (all contain 0.01% Tween 80), there is no such difference, which indicates concentration of Tween 80 play a role in drug release profile. Among F29, F30, F31, and F32, the F29 containing the 0.5% concentration of PVA/0.02% of Tween 80 showed the sustained drug release which is preferable for further drug development.

**Forced degradation study:-**

In this research, the nanosized chitosan-drug conjugates offers more stability as shown in Fig.5. Formulation minimally decomposed at acidic pH 2: however, the stability of this complex compared to simvastatin alone, for the same time interval, is much higher. At buffer above pH 6, simvastatin is totally degraded. But the dissociation of formulation complexes decrease in higher (basic) pH 10.0 (less than 5% of complex degrade) indicating the extensive stability of simvastatin at alkaline pH. The complexation event also protects simvastatin from the exposure to UV radiation ( $\lambda = 240$  nm) besides the damage by alkali. After a long exposure at short wavelength ~ 40 % of simvastatin molecules remains undamaged. At this condition, the uncomplexed or rather free simvastatin deteriorates ~100 %. So the chitosan/stabilizer can reduce the degradation of active moiety due to protection of drug by H-bonding only to certain extent (as long as it holds) when compared to raw drug, but extensive protection is not possible. No oxidative degradation was noticed throughout the experiment which might be due to anti oxidant properties of both drug and polymer present in nanoformulation. When formulation was exposed to thermal stress, the results indicated that the formulation is less degraded and more stable compared to raw simvastatin. The thermal protection given by chitosan is reason for this stability.

**Hemolysis assay for biocompatibility:-**

Our results disclosed that all the tested concentrations of formulation neither showed hemolytic activity nor thrombus formation making it biocompatible for circulation in the blood. SLS which was used as a positive control showed 100% hemolysis marked by complete lysis of the Red Blood Cells (RBC's) as shown in Fig. 6. While PBS which was used as the negative control, drug and nanoformulation did not show any hemolysis or toxicity to the RBC's making it a clinically suitable formulation.

**Discussion:-**

The main objective in this optimization study was to determine the experimental conditions which yield the best response including mean particle size around 500 nm, % entrapment efficiency of about 95%, uniform morphology and shape of the particles. Simvastatin was encapsulated by chitosan using an o/w emulsion solvent evaporation method. We studied the effect of three stabilizers on the characteristics of prepared nanoparticles, i.e., natural (xanthan gum), semisynthetic (carboxy methyl ethyl cellulose) and synthetic (PVA) and three surfactants, i.e., anionic (sodium lauryl sulfate), cationic (cetrimonium chloride), and nonionic (Tween 80), while other parameters such as drug concentration, polymer concentrations, stirring rate, temperature and the volume ratio of o/w phases were kept constant.

From the result of DOE, it was concluded that the formulation prepared by solvent evaporation method with nonionic surfactant (Tween 80) used at a concentration of 0.02 % w/v and synthetic polymer PVA (0.5%) was sufficient to facilitate the production of satisfactory nanoformulation. Attempts made in preliminary studies to use other surfactant types (except nonionic surfactant) failed to yield nanoparticles, but rather an aggregated mass was formed. Except synthetic polymer, other types of stabilizer resulted in decrease in the entrapment efficiency. Drug release from the formulation depends mainly on the type and concentration of additive used in the formulation. Formulation batches F25 and F29 which had a concentration 0.5% of PVA relative to that of chitosan showed sustained release of drug over the 24 h period of the release study. Being biocompatible, PVA is widely employed in the fabrication of drug delivery systems. Due to its polar groups, it is an efficient proton acceptor; therefore, it can

easily undergo hydrogen bonding with suitable compounds, especially polymers (chitosan) that behave as proton donors. The application of PVA as polymer matrix has been confirmed to possess significant outcomes, including enhancement of drug stability (Murtaza et al., 2011). Thus, simvastatin release was sustained from formulation F29 which contained a relatively accepted level of PVA. The nanoformulation with the highest concentration PVA showed fastest drug release in pH 7.4 buffer.

#### **Effect of constant formulation parameters on nanoparticles formation:-**

The drug:polymer ratio, stirring rate and temperature were kept constant which also influence nanoparticles formation. Chitosan (encapsulating polymer) is a natural polymer (Riva et al., 2011, Patil et al., 2014) does not adversely affect the mucosal lining instead adhere to membrane and helps to rid gastrointestinal problems, and is commonly used for the development of oral drug delivery systems (Agnihotri et al., 2004, Ludwig et al., 2005). Its degradation is pH dependent, being sparingly soluble in acidic medium due to the presence of acidic group (Huanbutta et al., 2013, Dudhani et al., 2010), but soluble in solution medium of pH > 6.0. It exhibits excellent swelling as a result of which it can retard drug release and is therefore used to achieve prolonged drug release (Dodane et al., 1998). This probably accounts for the very slow release of simvastatin from formulation F29 which contained a relatively optimum concentration of PVA and Tween 80. At this optimum concentration, polyelectrolyte complex formed between chitosan and PVA makes drug delivery effective in sustained release and higher entrapment efficiency with nanosize. Stirring rate also influenced the particle size and entrapment efficiency. The stirring speed of 400 rpm at 37° C produced the nanoformulation of optimum size. By increasing stirring speed above 400 rpm, there was no nanoparticle yield (data not shown). This low yield could be due to the formation of smaller nanoparticle which was lost during washing process. Decreasing the stirring speed promotes aggregation of the nanoparticles and causes materials to adhere to the walls of beaker, thus resulting in low yield.

#### **Effect of method of preparation on encapsulation efficiency and particle size of the nanoformulation:-**

Among the three methods of preparation, the solvent evaporation method used for the preparation of the nanoformulation successfully entrapped simvastatin. The encapsulation efficiency for all nanoformulations prepared by o/w emulsion-solvent evaporation technique was found higher. Simvastatin is practically insoluble in water; therefore, this substance was preferred partitioning into the dispersed organic phase of the emulsion. The amount of the drug passing into the aqueous phase was very low; thus, high encapsulation efficiencies were obtained (Reis CP et al., 2006).

#### **Effect of PVA on encapsulation efficiency and particle size of the nanoformulation:-**

During the solvent evaporation process, there is a gradual reduction in volume, resulting high viscous dispersed droplets. These affect the droplet size equilibrium, causing the coalescence and the agglomeration of the droplets during the early stages of the solvent removal (Abdel-Mottaleb et al., 2009). This problem can be managed by adding a steric stabilizer, e.g., PVA, into the continuous phase, thereby providing a thin protective layer around the droplets and hence reducing their coalescence (Juntanon et al., 2008). Using an insufficient quantity of stabilizer would result in large particles, but too much quantity would cause aggregation of the particles.

Three different concentrations of PVA with Tween in the outer aqueous phase were used in this study to find the best grade for production of nanoparticles. Effect of PVA concentration on the mean particle size of the produced nanoparticles shows that the concentration of PVA used plays an important role in determining the particle size of the obtained nanoparticles.

PVA with lower (data not shown) and higher concentrations yielded larger particles ( $d=1005.55$  nm) in comparison to medium concentration (538 nm). PVA concentration in the external water phase is well known to influence the particle size of nanoparticle. Since the presence of PVA in the external phase stabilizes emulsion droplets against coalescence, increasing the PVA concentration usually leads to a decrease in the size of nanoformulation. However, we did not find any linear relationship between the PVA concentration and particle size. This might be due to the fact that higher concentration of hydrophilic polymer (PVA) makes particle to bombard leading to aggregation and larger particle size.

Particle sizes and morphology of the nanoparticles are given in fig 3 and 4. The particle size of formulations depends on viscosity of the dispersed phase which in turn directly related to the molecular weight of the polymer. As the energy level required to disperse even medium viscous solutions is too high, larger droplets formed during the emulsification process; as a result, greater nanoparticles were obtained when PVA concentration was increased. In

spite of the iterative workup procedure applied to the nanoparticles including several washings with water, PVA of 0.5% w/v concentration covered the nanoparticle surfaces relatively more than the other three concentrations. The binding of PVA on the particle surface is likely to happen when the organic solvent is removed from the interface, in which interpenetration of PVA and chitosan molecules takes place. The hydrophobic vinyl acetate part of a partially hydrolyzed PVA serves as an anchoring site at the oil interface for binding to the surface of encapsulating polymer during the particle formation (Pillay et al., 2005). According to the results, it could be concluded that the greater the PVA concentration, the higher amount of residual emulsifier despite the several washing cycles. In addition, it induces local gelatinization of PVA and subsequent agglomeration of the nanoparticles, which might be responsible for the polydispersity of the nanoparticles. Hence, this may be the reason for the larger particle size obtained for PVA with higher concentration. Use of PVA with a low concentration prevented the local gelatinization of PVA at the surfaces of emulsion droplets and restricted the aggregation of nanoparticles considerably. In light of these results, 0.5% PVA was good steric stabilizer agent in the outer aqueous phase.

#### **Effect of Tween 80 on encapsulation efficiency and particle size of the nanoformulation:-**

Some studies have indicated that particles with superior topographical characteristics were obtained when Tween 80 was used as an emulsifier, instead of Tween 20 or Tween 40, independent of their concentrations. This might be due to better emulsification capability of Tween 80 as compared with that of Tween 20 or Tween 40 (Hoeller et al., 2009). In addition, the Tween 80 molecules acting as amphiphilic molecules deposited at the particle surface resulting in increment of particle size; moreover, they could shield surface charge of the nanoformulation led to decrease in zeta potential. Three different percentages (0.01%, 0.02%, and 0.03% w/v) of Tween 80 in the external aqueous phase were selected according to the literature studies (Mitra et al., 2003, Prieto et al., 2013). It is known that the concentration of Tween in the external aqueous phase is an important key factor for the nanoparticles size. The effect of Tween 80 concentration on particle size and zeta potential of nanoformulation was investigated. According to the results, the mean particle size of the prepared nanoparticles was increased by increasing the Tween 80 concentration. Since nanoparticles were formed from the emulsion droplets after solvent evaporation, their size is intensely dependent upon the size and the stability of the emulsion droplets. Although an increase in size was observed when Tween concentration increased from 0.1 to 0.3 % (w/v), it was not significant above 0.4% (data not shown). The increased particle size nanoparticles at higher Tween 80 concentration is due to the further head group hydration resulting in greater emulsion droplets. These emulsion droplets are gradually solidified to form nanoparticles during the solvent evaporation process. Another reason for increased nanoparticle size may be due to higher emulsifier concentration which frequently results in increased viscosity of the outer phase, leading to highly aggregated droplets. This high viscosity leads to resistance toward shear forces in emulsion and less efficient stirring with a negative impact on the size of nanoparticles. According to the results, 0.2 % (w/v) of Tween 80 concentration is the optimal value to obtain nanoparticles with appropriate particle size around 500 nm.

It was found that the nanoparticles obtained from formulations containing 0.02% w/v Tween 80 could be suspended in solvent for 48 h before settling at the bottom of the test tube. This is due to deposition of Tween 80 on nanoformulation surface providing steric repulsion effect preventing agglomeration of the nanoparticles. Formulation with lower surfactant possessed more zeta potential, due to insufficient electrostatic repulsion to stabilize nanosuspensions. However, formulation with 0.03% Tween 80 possessed larger particle size but less zeta potential. It showed agglomeration and sedimentation of nanoparticles within 24 h as well. This implied that steric repulsion effect from Tween 80 could stabilize this system. Therefore, Tween 80 at the concentration of 0.02% w/v could be considered as a suitable concentration for stabilization of nanoparticles.

#### **Effect of PVA and Tween 80 concentration on drug release:-**

Among F29, F30, F31, and F32, the F29 containing the 0.5% concentration of PVA/0.025% of Tween 80 showed the sustained drug release, which is preferable for further drug development.

Two possible mechanisms could explain the drug release from F29 formulation. These are swelling/pore formation from the spherical matrices and the matrix erosion resulting from degradation of nanoformulation (Fu et al., 2010). In actual circumference, since both PVA and chitosan is hydrophilic, the drug release in 24 h should be faster. In contrary to this, at particular combination, formulation shows sustained release. At this concentration of stabilizer and surfactant polyelectrolyte complex which offer intra hydrogelation properties, formed making slower drug release (Ravi Sankar et al., 2013, Garud et al., 2012).

**Mechanism of stability produced by nanoformulation:-**

The oxidative degradation of drug substance involves an electron transfer mechanism to form reactive anions and cations. Amines, sulfides and phenols are susceptible to electron transfer oxidation to give N-oxides, hydroxylamine, sulfones and sulfoxide. The functional group with labile hydrogen like benzylic carbon, allylic carbon, and tertiary carbon or  $\alpha$ -positions with respect to hetero atom is susceptible to oxidation to form hydroperoxides, hydroxide or ketone (Ngwa et al., 2010, Boccardi et al., 2005). In this study no degradation above the limit was reported. The reason attributed is the anti oxidant properties of simvastatin and chitosan evidenced by many literature. In addition the electrostatic bond formed between amino group of chitosan and hydroxyl group of simvastatin resist the oxidative stress producing more stable compound.

In general hydrolysis is a chemical process that includes decomposition of a chemical compound by reaction with water. Hydrolytic study under acidic, basic and different pH condition involves catalysis of ionizable functional groups present in the molecule which is in bonded state in the formulation resisting decomposition. Less degradation compared to pure drug might be due to breakage of bond at particular pH which is also essential for sustain release of drug to produce its pharmacological actions.

Light stress conditions can induce photo oxidation by free radical mechanism. Functional groups like carbonyls, nitro aromatic, N-oxide, alkenes, aryl chlorides, weak -C-H and -O-H bonds, are likely to introduce drug photosensitivity (Alsante et al., 2003). Limited protection from chitosan is offered to formulation due to strong -N-H bonds. But the polymer couldn't withstand more light stress condition, so protection from light must be ensured.

**Effect of PVA and tween 80 in stability of nanoformulation:-**

Development of nanosized particles builds high energy surfaces, which can turn to aggregation and Ostwald ripening, if stabilization is not at an efficient level. Smaller the particle size, the more efficient the stabilization. Stabilization is required for the formation of nanoparticles as well as for the long-term stability during storage. Nanoformulation are formed from a solid core surrounded by a stabilizer layer and distinctive stabilizers are surfactants or polymers.

Since the drug candidate-simvastatin used here for nanoformulation are poorly soluble and hydrophobic, the stabilizers PVA and tween 80 tend to enhance the wetting and dissolution properties of the active drug. Stabilizers can either be non-ionic (tween 80) or polymeric (PVA) in nature, but the stability is based on the classical DLVO-theory reached either via steric hindrance or electrostatic forces.

Stabilization with Tween 80- non-ionic surfactants and PVA-polymer is based on the steric stabilization effect. Steric stabilization created in F29 formulation is based on the formation of a mechanical barrier, a steric layer, between the particles and it requires polymeric chains on the particle surfaces that are long enough which offered by PVA. Temperature and pH changes, during the drying, can affect molecular mobility and hence the efficiency of steric stabilization, which is maintained in our study (Kim et al., 2010). Electrostatic stabilization formed by combination of chitosan, PVA, drug and tween 80 is based on formation of repulsive Coulomb forces between the charged colloidal particles. The three fundamental requirements for an efficient stabilizer are firm attachment to the solid surface, high percentage of stabilizer coverage on the nanoparticle surfaces and hydrophilic/lipophilic balance of the stabilizer (here the balance between tween 80 and PVA chain lengths, is essential to anchor onto the nanoparticle surfaces) which are satisfactorily given by the appropriate concentration of stabilizers used in this formulation (Liu et al., 2015).

**Conclusion:-**

This study using DOE showed the response of independent factors on dependent factors with the help of response surface plots and polynomial equation. Optimized formulation of simvastatin-loaded polymeric nanoparticles achieved higher encapsulation efficiency with smaller particle size which was prepared by solvent evaporation method, synthetic polymer and with nonionic surfactant. The investigation for effective concentration of stabilizer and surfactant showed that the F29 containing the 0.5% concentration of PVA/0.02% of Tween 80 showed the sustained drug release, higher stability and biocompatibility.

**Table 1:-** Factorial design for optimization of simvastatin loaded polymeric nanoparticles.

Factors (independent variables)	Levels		
	-1	0	1
X1 Method of preparation	SE	SD	CL
X2 Type of polymeric stabilizer	NL	SS	SY
X3 Type of surfactant	AN	CA	NA
<b>Response (dependent variables)</b>	<b>Constraints</b>		
Y1:PS (nm)	Minimize		
Y2:EE (%)	Maximize		

**Abbreviations:** SE-Solvent evaporation, SD-Solvent diffusion, CL-Cross linking, NL- Natural, SS-Semi synthetic, SY-Synthetic, AN-Anionic, CA-Cationic, NA-non ionic, PS-Particle size, nm- Nanometer, EE-encapsulation efficiency.

**Table 2:-** Particle size and % entrapment efficiency of nano formulations.

Formulation code	Particle size (nm)*	Encapsulation efficiency (%)*
F1	602.11±12.5	94.2±0.03
F2	800±19.5	85.4±0.01
F3	749.7±41.7	91.70±0.34
F4	823.34±23.89	84.20±0.09
F5	950±15.8	77.0±0.01
F6	1005.55±98.6	73.10±0.001
F7	595.89±34.8	95.00±0.002
F8	987.86±12.8	79.23±0.03
F9	826.78±56.9	85.21±0.78
F10	925±10.7	80.00±0.07
F11	976.9±50.0	82.00±0.21
F12	850.31±34.90	81.00±0.008
F13	756.33±21.0	85.52±0.07
F14	778.47±15.91	84.11±0.11
F15	1000.0±10.10	79.00±0.09
F16	524.32±34.67	97.01±0.21
F17	700.0±18.7	90.07±0.32
F18	751.45±10.0	92.10±0.01
F19	795.0±20.9	90.08±0.021
F20	695±3.4	89.02±0.091
F21	598±30.9	87.34±0.11
F22	700±54.7	91.91±0.005
F23	604±14.89	77.01±0.003
F24	645±10.1	84.78±0.03

Notes: \*All values are mean+ SD (n=3).

**Table 3:-** Cumulative percentage drug release of formulations with respect to surfactant and stabilizer concentrations at 24 h.

Formulation code	Stabilizer (%w/v)	Surfactant (%w/v)	% drug release*
F25	0.5	0.01	70.90±1.30
F26	1.0	0.01	72.00±2.10
F27	1.5	0.01	71.00±1.10
F28	2.0	0.01	72.11±3.20
F29	0.5	0.02	67.43±1.00
F30	1.0	0.02	72.21±2.50
F31	1.5	0.02	81.03±4.30
F32	2.0	0.02	87.06±2.20
F33	0.5	0.03	74.11±0.34
F34	1.0	0.03	83.23±0.91
F35	1.5	0.03	87.21±0.34
F36	2.0	0.03	90.01±1.30

Notes: \*All values are mean+ SD (n=3).

Design-Expert® Software

Factor Coding: Actual

PARTICLE SIZE

◆ Design points above predicted value

◇ Design points below predicted value

X1 = A: METHOD

X2 = B: STABILIZER

Actual Factor

C: SURFACTANT = AS

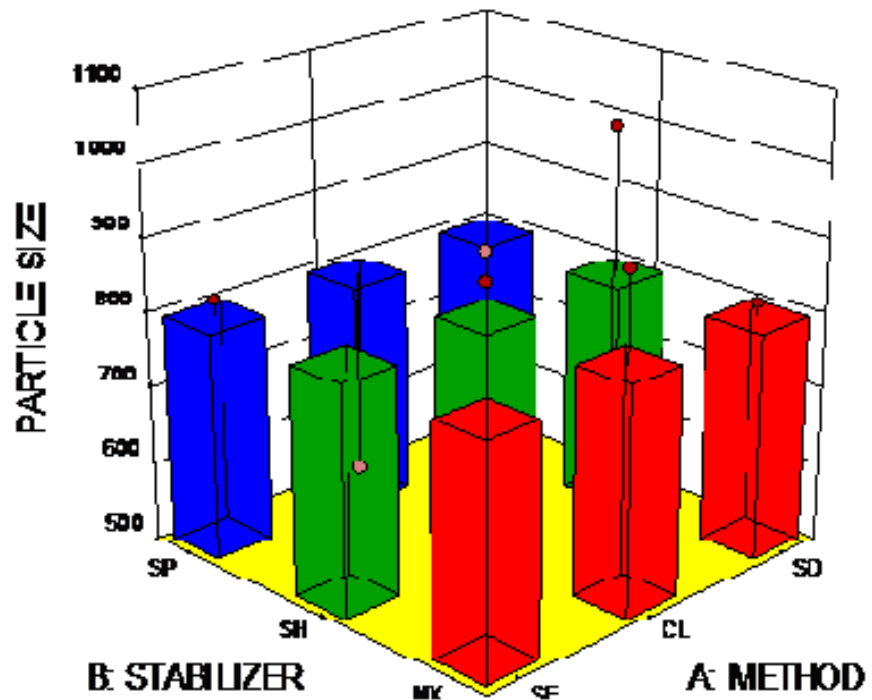


Fig. 1 Response surface plot illustrating influence of method of preparations, polymeric stabilizers and surfactants on particle size

Design-Expert® Software  
 Factor Coding: Actual  
 % EE (%)  
 ◆ Design points above predicted value  
 ◇ Design points below predicted value  
 X1 = A: METHOD  
 X2 = B: STABILIZER  
 Actual Factor  
 Q: SURFACTANT = AS

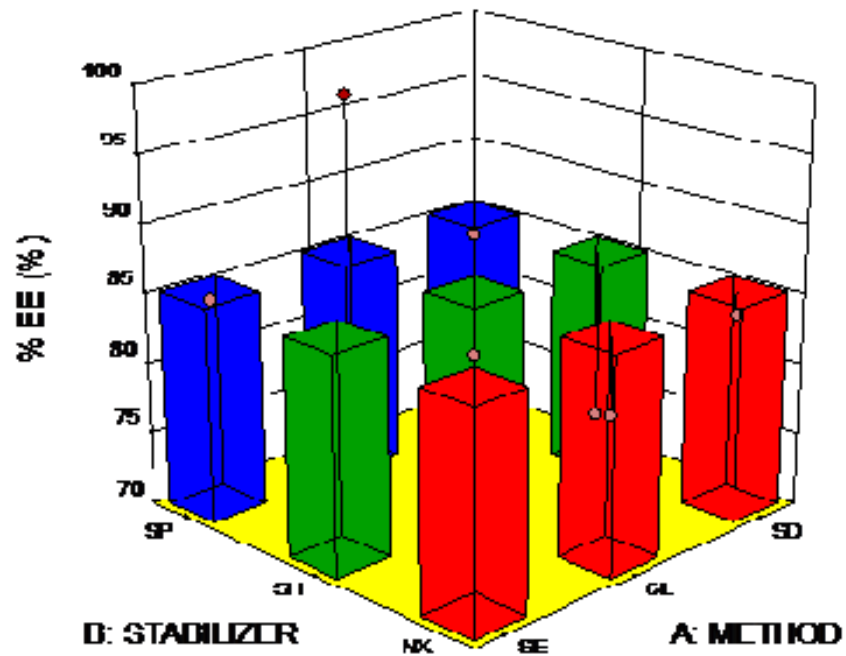


Fig.2 Response surface plot illustrating influence of method of preparations, polymeric stabilizers and surfactant on % encapsulation efficiency.

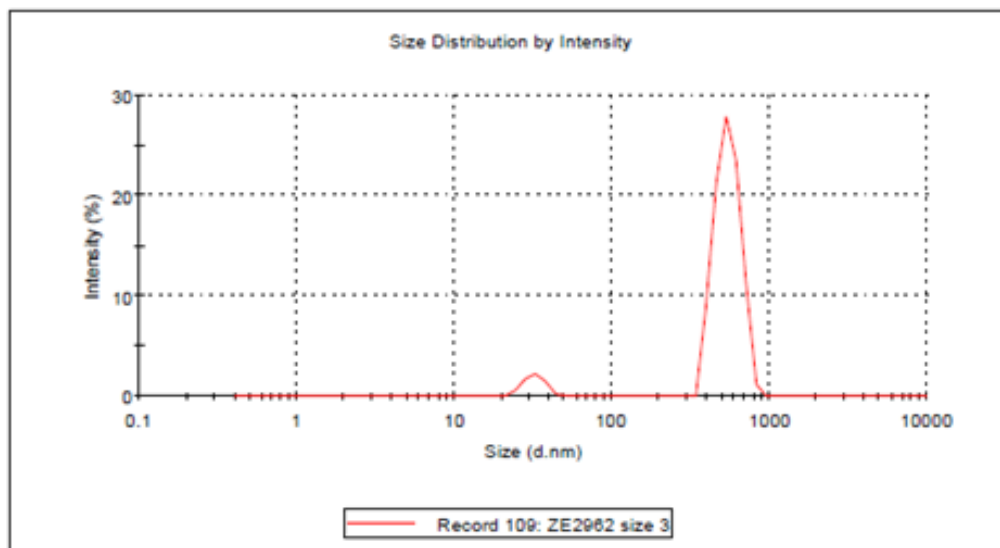


Fig.3 Particle size distribution curve of formulation showing nanosize range.

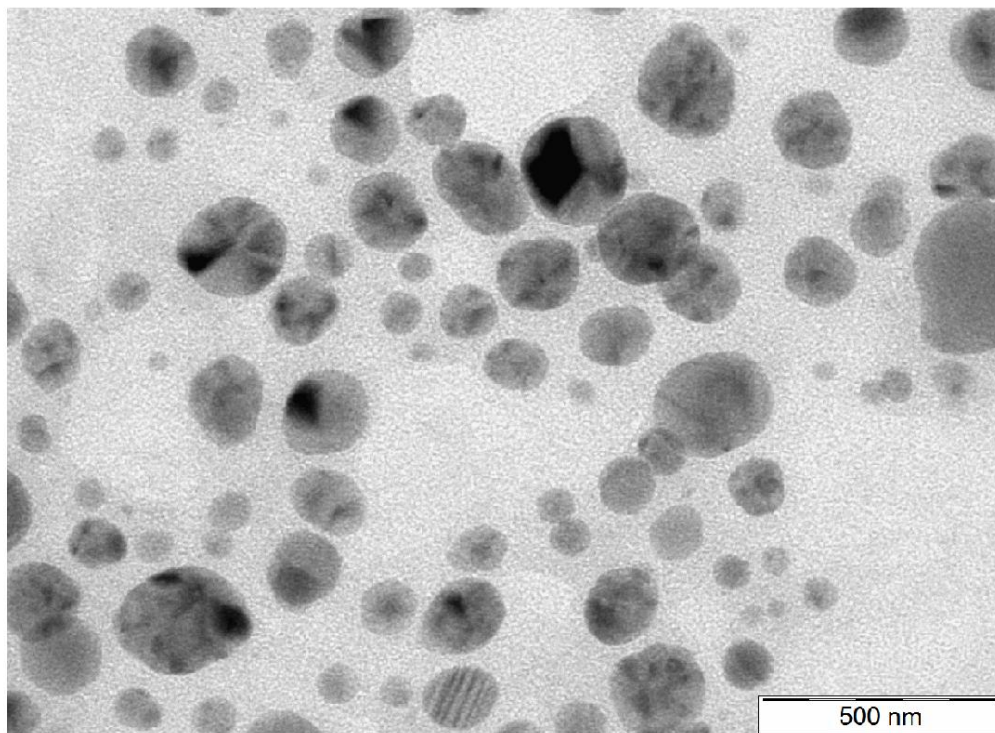


Fig.4 Transmission electron microscopy of formulation representing smooth, spherical, homogenous nanosized particles.

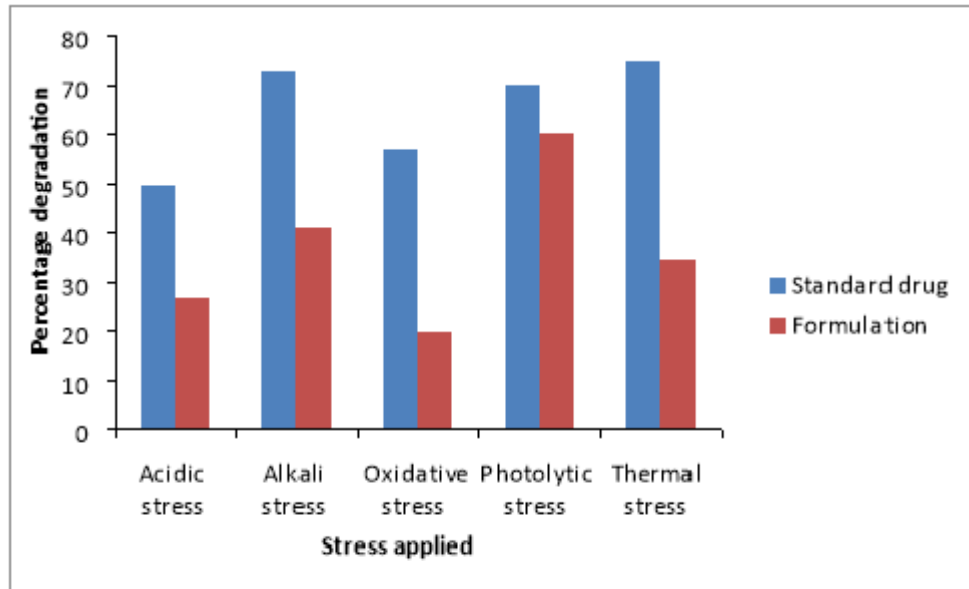


Fig. 5 Forced degradation study. Percentage degradation of drug and formulation when subjected to various stress conditions.



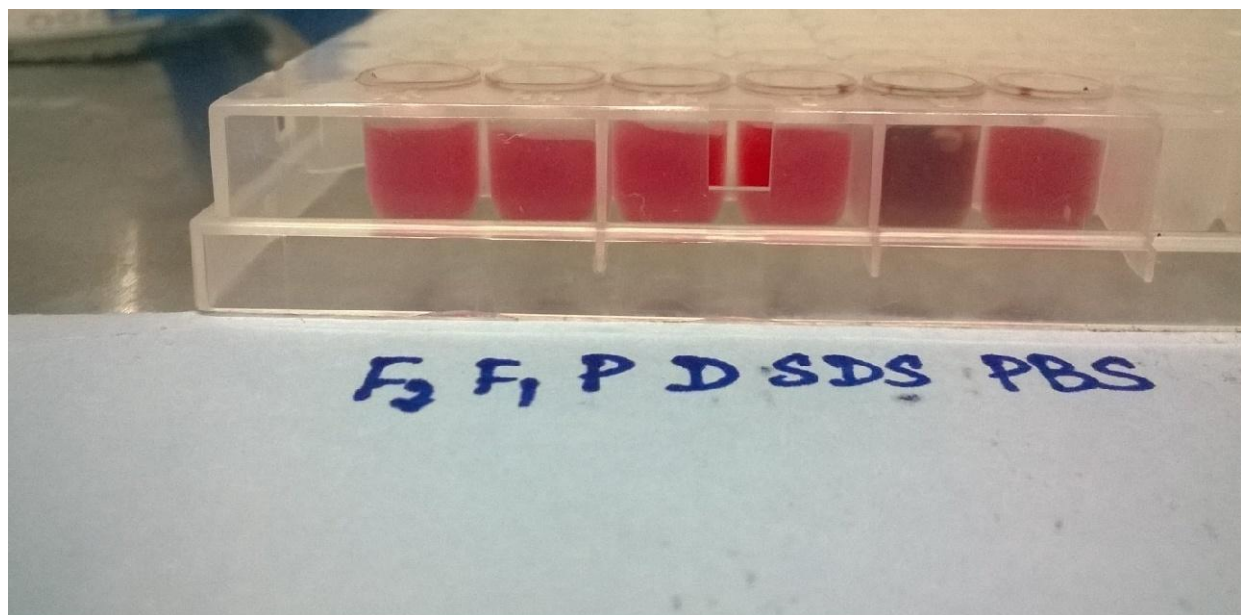


Fig. 6 Hemolysis assay

The biocompatibility of simvastatin loaded chitosan nanoparticles is shown with tubes from right to left as PBS-Phosphate saline buffer, SDS- sodium docecyl sulphate, D-Drug, P-Polymer, F1- Formulation with lowest concentration, F2-Formulation with highest concentration. All are showing biocompatibility when compared to positive control –SDS.

#### Declaration of interest:-

The authors state no conflict of interest and have received no payment in preparation of this manuscript.

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**RESEARCH ARTICLE**

**EXTRAOCULAR INJURIES CAUSED BY PELLET GUNS. DOES IT SEAL THE LESS LETHAL  
 DEBATE?  
 THE KASHMIR EXPERIENCE.**

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**Abstract**

The search for a non-lethal method of crowd control goes on. A lot of literature in recent years has pointed to the fact that projectile based munitions should be reclassified as lethal weapons while quoting supporting facts and figures of mortality and morbidity caused by these weapons. In recent times, a new method of crowd control in the form of a pellet gun has been used by the authorities in Kashmir. The wide range and severity of injuries to extra ocular tissues caused by the pellets from this gun further buttresses the argument that projectile based munitions in all forms inflict severe injuries to all tissues. It is also important in the present day for all surgeons to be well versed with the challenges concerning the management of these injuries. The surgical skills need to be sharpened while continuing to send out a call for milder methods of crowd control.

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**Introduction:-**

The Lone Ranger never killed a bad man. In 22 years of fighting for justice (on radio and television), he always aimed at the outlaw's gun. In doing so, he not only defeated his enemies, but he won over the hearts and loyalties of millions of kids [1].

The management of public dissent is a challenge for governments the world over. This dissent is especially difficult when it is shown by large crowds. Several methods of crowd control have been developed by agencies the world over. The intent of these weapons is to subdue or incapacitate violent or dangerous suspects without causing serious harm or death. Commonly used less lethal weapons include chemical irritant agents, explosive distraction devices, kinetic impact munitions, and electrical incapacitation devices [2]

Kinetic impact munitions are basically projectile based weapons which are fired to cause superficial injuries to the protestor as there is transfer of kinetic energy to the body. However, the amount of kinetic energy transferred to the human body by these munitions is variable depending upon the size of the munitions as well as the distance from which it is fired.

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Kashmir has provided a rather large arena for the use of the pump action projectile pellet gun this year. While as most of the reportage has focused on eye injuries, a number of extra ocular injuries flooded the hospitals during the first month of the protests.

This report outlines the range of extra ocular injuries witnessed by our hospital, the management problems and the residual issues faced by these patients. It perhaps also provides significant ballast to the argument that the pellet gun should be classified as a lethal weapon.

### **Material and Methods:-**

The valley of Kashmir witnessed large scale protests and protesting crowds from July 8<sup>th</sup> 2016. The authorities used the pump action pellet gun on a very large scale to control the crowds with over 3 thousand shots fired. This caused injuries to many people. Our hospital also received a large number of patients injured by these projectiles. While as an unprecedented number of patients were hit in the eyes, we focused on the extra ocular injuries that we treated in the first month of the unrest. We report on 30 patients with extra ocular injuries who needed admission for management during the first month. Patients who could be treated on an outdoor basis were excluded from the study.

### **Results Observations:-**

Most of the superficial wounds were cleaned with antiseptics only. This was followed by regular dressings. In cases with larger wounds and multiple pellets lodged enmasse, the skin was debrided to the area where it started bleeding. Tendon injuries were debrided and reconstructed, but significant stiffness ensued due to underlying comminuted phalangeal fractures in two patients.

Three cases presented late with primary wound management done at a local level. Infection of the wound was the cause for referral as the patients had tried to remove the pellets themselves fearing police arrest or reprisals in the hospitals. All cases were treated with debridement of the wound followed by washes.

In two cases some pellets were present within the joints. Both bullets were retrieved and repeated joint washes were given.

A significant number of wounds were small but a large number sustained by being shot at close range caused significant damage at the entry site. This can be imagined due to 600 pellets striking simultaneously. Such wounds were surrounded by skin splits which were debrided.

Most of the larger wounds were managed in the operating theatre by longitudinal incisions in the fascia and skin to relieve the hematoma and remove the debris and the pellets within a zone of safety.

The muscle was debrided along the time-honored concept of color, consistency, contractility and circulation. The area was allowed to drain in cases with extensive damage. The primary wound tract, otherwise known as the permanent cavity was cleaned and washed. The contusion zone of muscle adjacent to the track created by the pellet mass was washed. The concussion zone formed by the shock waves produced during cavitation which causes damage distant from the immediate track area was not explored according to the principles of debridement.

We also received many patients who had sustained pellet injuries to chest and abdomen. Most of these patients had superficial injuries. Many of the pellets were superficial and were removed by the patients themselves and some pellets got spontaneously extruded from the skin. In these patients local cleaning with antiseptic solution was done. Some of the pellets were very superficial and were removed at the time of examination only. Some of our patients had got serious injuries to chest and abdomen. Nine patients had sustained pellet injuries to chest. Out of nine patients, intercostal tube drainage (ICTD) was put in 5 patients (two right ICTD and 3 left ICTD). Rest of the patients were managed conservatively.

**Table 1:-**

S.no	Age(years)	Sex	Type of injury	Radiology	Procedure
1	25	male	Pellet Right side chest	normal	Debridement with primary closure
2	23	male	Pellet injury to anterior right lower chest with small exit wound on posterior aspect	Contusion right lower lobe of lung.	Right ICT drainage with debridement and primary closure of wound.
3	17	male	Pellet injury left side of the chest	Left hemothorax	Left ICTD
4	17	MALE	Pellet injury left side of chest	Left pneumothorax	Left ICTD
5	20	MALE	Pellet injury right side of chest	Right side hemothorax	Right ICTD
6	18	male	Pellet all over chest	normal	Local cleaning with antiseptic solution
7	24	male	Pellet injury chest all over	normal	Local cleaning with antiseptic solution
8	18	male	Pellet injury left side of chest	normal	Local cleaning with antiseptic solution
9	24	male	Pellet injury left side chest	Left pneumothorax	Left ICTD

We also received patients who had sustained pellet injuries to abdomen. Some of the injuries were superficial which were managed by local cleaning with antiseptic solution and superficial pellet removal while as some patients had received serious intra-abdominal injuries requiring exploration. In three patients exploratory laparotomy with resection/primary repair of the perforation and covering stoma was done. Rests of the patients were managed conservatively.

**(Table 2:-**

S No	Age(Years)	Sex	Type of Injury	Radiology	Procedure
1	25	male	Pellet injury abdomen	Multiple perforation over right half of transverse colon with grade I liver laceration	Exploratory Laparotomy with transverse colectomy with end to end anastomosis with covering ileostomy
2	23	Male	Pellet injury abdomen	Grade I Laceration upper pole of right kidney, multiple foci of air in retro peritoneum. 11th rib fracture with no obvious gut injury.	Managed conservatively for abdominal injuries.
3	30	Male	Pellet injury abdomen	Hemoperitoneum	Exploratory laparotomy with primary repair sigmoid colon perforation with transverse loop colostomy.
4	17	Male	Pellet injury abdomen	normal	Conservative management
5	20	Male	Pellet injury abdomen	Hemoperitonium	Exploratory laparotomy with primary closure of gut perforation.
6	24	Male	Pellet injury abdomen	normal	Conservative management

We used second generation cephalosporins and aminoglycosides in all cases at the outset before obtaining culture sensitivity reports.

S.No	Age(yrs)	Sex	Injury	Exam	Procedure
01	25	Male	Pellet injury with fracture BB Right Leg (open type iii B)	Right Leg lacerated wound with loss of skin approximately 6x12 cm on anterior aspect of distal leg plus another lacerated wound with loss of skin approximately 4x8 cm on anterior aspect of leg. Tendon junction ok, DNVS ok	CR done and external fixate applied using two connecting rods (12 clamps)
02	24	Male	Pellet injury left thigh with fracture neck of femur with CCS in-situ fresh fracture subtrochantric left femur		Conservative management to be done for two weeks
03	28	Male	Pellet injury right gluteal region upper and lower back	Lacerated wound 3x2 cm right gluteal region multiple pellet injuries on upper and lower back	Debridement of wound under LA managed conservatively
04	16	Male	Injury fracture shaft of femur right side.		CRIF with ILIMN 10x40 mm
05	35	Male	Bilateral sub condylar fracture		ORIF with DFL palate for fracture femur rt. And fracture tibia rt.
06	19	Male	Pellet injury right Thigh (open type iii B with fracture shut of femur		OR with EF
07	24	Male	Pellet with fracture neck of femur left		CCS fixation left plus VAC
08	25	Male	Fracture both bones right Leg with Achilles tendon injury (compound type iii)		External fixation for fracture tibia with HLA tender repair
09	20	Male	Fracture shaft of femur right compound type iii		External fixation of fracture shaft of femur
10	21	Male	Injury right shoulder with fracture distal humerus right with fracture both bones proximal Forearm right floating elbow compound type iii B		External fixation for right shoulder
11	40	Female	Pellet injury both lower limbs with committed fracture proxy. Tibia left. (open type iii fracture medial tibia right Open type ii)		E.F and debridement left leg
12	16	Male	Pellet injury right leg with fracture medial femoral condyle with EF in situ with RVSG+STSG		

Out of 12 patients 11 were male 1 was female. 11 patients had lower limb involvement while as 1 patient had upper limb involvement. 6 patients were managed by external fixation, three patients had internal fixation, 3 patients were managed without fixations.

We continue to observe follow up patients. Several cases report discomfort due to the subcutaneous location of the pellets which has made some postures painful. A large number of patients are also reporting back with draining sinuses from several pellet sites. As the follow up is short, it is difficult to guess how many pellets may need to be removed over a prolonged period before these patients return to normal.

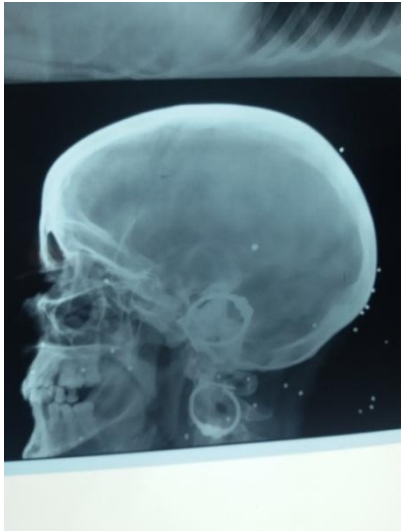


Fig: X ray skull showing multiple pellets

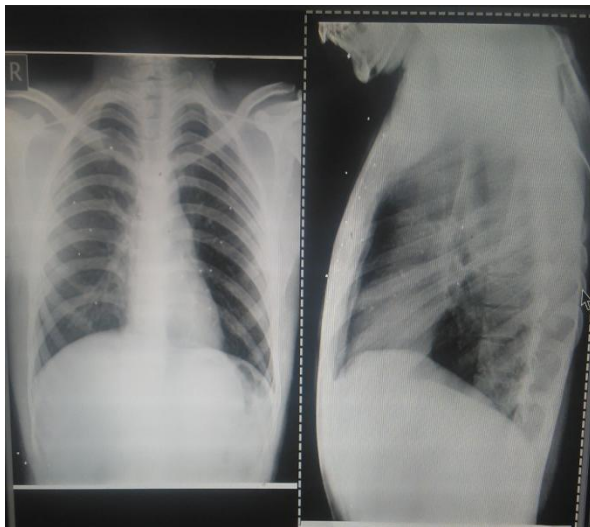


Fig:CXR PA view and lateral view with pellets every where



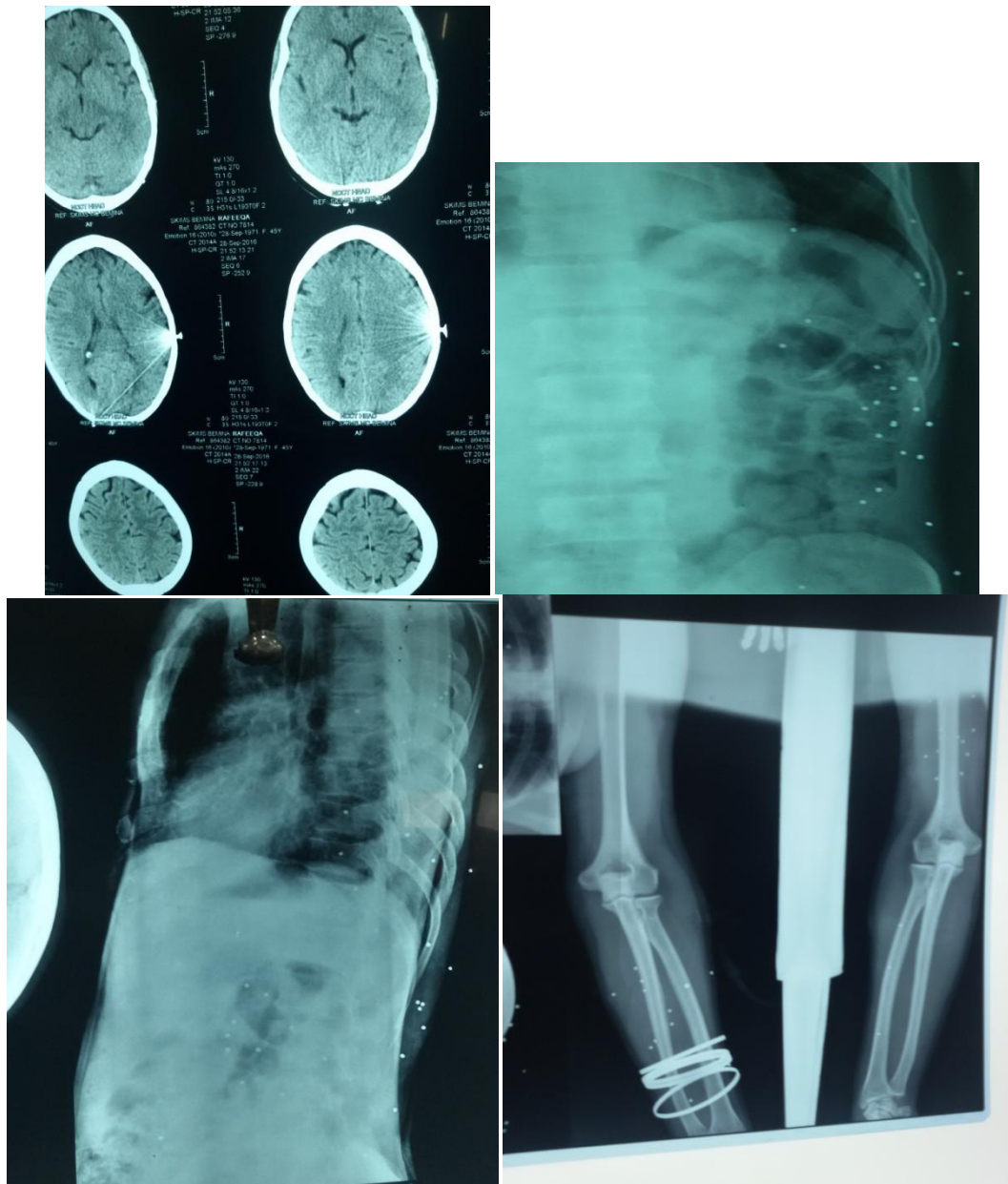


Fig: NCCT head and radiographs showing how deep pellets can reach and how much injury they can inflict



**Fig:-** intra operative picture of gut perforation ( pellet injury to sigmoid colon)

### **Discussion:-**

Many law enforcement and military agencies are adopting so-called “less-lethal weapons” that are also called “nonlethal weapons,” “sub lethal weapons,” or “less-than-lethal weapons.” [2].

In simple terms Non-Lethal/Less lethal incapacitation means ‘to render a suspect incapable of action by means of force which is highly unlikely to cause death or serious injury when properly applied’[3]

While less lethal weapons are significantly safer than traditional firearms, no weapon can be entirely non-lethal and no weapon can be made entirely safe. Medical providers may treat subjects exposed to less lethal weapons and should presume injury until proven otherwise. They should be familiar with less lethal weapons' actions, effects, and typical injury profiles [4]

Projectiles deform upon impact to provide maximal surface area and a reduced likelihood of penetrating injury. However, skin penetration does occasionally occur [5].

However, intra abdominal, intra thoracic, ocular, intracranial, and extremity penetrations of intact projectiles have all been reported. In addition, bean bag type projectiles have been reported to rupture upon impact, releasing their numerous small metallic pellets which then produce penetrating injuries [4].

Less-lethal weapons "were originally intended as a de-escalation tool, as a substitute for deadly force. But in many cases it became an add-on, substituting for a less serious form of physical force." [6] The manufacturer of pellet guns, used against protesters by armed forces in Kashmir, said they are generally used for hunting. No tests have been

conducted regarding their effect on the human body [7]. technically called 12 Bore Pump Action guns, can contain shots of various sizes ranging from 'BB' to 9, with BB being the largest and 9 number the lowest. The state police only make use of number 9 pellets to deal with the protestors [7].

The pellet gun injury raises several challenges for the treating doctor. These challenges are enumerated below

1. Lack of any literature as a guide for the management of these injuries.
2. Presence of hundreds of small projectiles spread over a rather large area involving bone, nerve, vessel, and muscle simultaneously in a large percentage of cases.
3. High incidence of missed injuries due to a large number and spread of the projectiles.
4. Difference between the types of injury caused by the projectiles fired point blank versus shots fired from a distance.
5. To avoid being arrested, several protestors had removed the superficial pellets at home with knives and razors creating additional wounds. These cases presented late and with infected wounds.

In all cases local wound care consists of superficial irrigation and careful cleansing followed by dressing. The tracks of the individual pellets are allowed to heal and only dressed regularly. In cases with large entry wounds caused by point blank shots, the wound track should be cleaned and pellets removed along with the detritus. In spite of significant debridement, some peripheral pellets remain. The margins of the entrance wounds should be excised and the missile tract thoroughly irrigated. A wide debridement of devitalized tissue is to be performed and foreign bodies removed. The patients with larger wounds should be returned to the operating room every 48-72 h for serial debridement. All contaminated subcutaneous fat and devitalized muscle must be removed. Bone without soft tissue attachments should be excised. Elimination of dead space is vital. Wound closure is to be avoided due to a significant chance of infection. The associated fractures should be stabilized by external or internal fixation. Secondary wound closure can usually be performed within 1-2 weeks after injury. We used

X- Ray and CT scanning liberally, however MRI would have been the most desirable. It was not possible to use it due to obvious reasons.

Two aspects of crowd control were found to have an effect on the management of these wounds. The gun per se does not have a significant research back up [7]. Without the research back up, the standard operating protocol about the use of these guns is difficult to guess. We, however observed that shots fired from a distance did not cause deep extraocular damage. According to the patients who had been shot at point blank range or from very short distances, the damage was significant. The severity of the injury in inverse proportion to the distance from which the gun was fired probably suggests that lethality is proportional to the intent of the shooter. It is pertinent to mention here that the Indian police and paramilitaries are signatory to the Geneva Convention, but the 'heat of the moment' may introduce dangerous uncertainties in the use of this gun. The amnesty international has reported that "In dozens of countries around the world, we've documented how police have misused and abused tear gas, rubber bullets and electric shock equipment, amongst many other dangerous devices, to quell protests [8]. In several situations, the goal of incapacitating an individual is not achieved whilst producing internal organ damage [2]

There is a lot of literature which supports the renaming of kinetic energy based munitions as lethal weapons. Recent research even focuses of non-projectile weapons stating that each type of non-projectile less lethal weapon also has a number of physiologic effects and specific medical issues that must be considered when the weapon is used. [9, 10, 11, 12, 13, 14] There is no clear evidence, yet that the non-projectile devices are inherently lethal, nor is there good evidence to suggest a causal link between sudden in-custody death and the use of irritant sprays or conducted energy devices [15, 16]

Users of less lethal kinetic impact munitions are trained to target the torso and proximal extremities of a suspect while avoiding the head, neck, precordium and groin areas. However, the relatively poor aerodynamics of these large surface area projectiles makes these weapons fairly inaccurate [3].

### **Conclusion:-**

Real efforts must now be made to identify or develop acceptable non-lethal (or less than-lethal) weapons. Better training of the police and the paramilitaries is also necessary so that acceptable damage is caused while crowds are being restrained. It is also important for surgeons to be fully trained in the management of ballistic wounds. In extension, there should be dissemination of literature concerning newer projectile munitions so that doctors are able to at work along some basic guidelines to improve patient care.

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### RESEARCH ARTICLE

#### INFLUENCES OF *NIGELLA SATIVA* ON ANTIOXIDANT ACTIVITY IN BROILERS TOXIFIED WITH SYNTHETIZED ORGANOPHOSPHORUS COMPOUNDS.

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#### Abstract

*Nigella* has historical and religious uses for preventing and treating many different kinds of diseases. Influences of *Nigella* on bird performance, biochemical, antioxidant and immunological status in birds toxified with synthesized diazinon were studied. 150 broiler chick were received and divided into three groups; G1 and G2 were supplemented with *Nigella* (1.4 gm / 100 gm; 2.8 gm / 100 gm ration; respectively) and G3 is control. G1 and G2 were toxified with synthesized diazinon (100 ppm / 1 L drinking water). A total of 180 samples (60 serum, 60 plasma and 60 intestinal swab) were collected during the study period. The results revealed the ability of *Nigella* to maintain biochemical parameters as TP; Alb; Glob; ALT; AST; Urea and Creatinine after prolonged deviation. Glutathione peroxidase was sharply decreased, Glutathione Reductase was sharply increased indicating the stimulation action. Superoxide Dimutase was significantly increased until the 4<sup>th</sup> week of age followed by significant decrease. Immunoglobines (IgG, IgM) were increased at the 2<sup>nd</sup> week of age followed by significant decrease by the protective effects of *Nigella*. On the other hand, IgE was increased and maintained at high levels. A sharp decline in both Total Bacterial Count and Total Enterobacteriaceae Count until the 4<sup>th</sup> week of age followed by sharp increase in both types in all treated groups suggesting the failure of the protective action. A follow up with the supplementation in higher doses may protect from the further changes in biochemical, antioxidant, immunological and bacteriological aspects.

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#### Introduction:-

*Nigella sativa* was known in traditional and religious medicine for almost centuries in India, China, Far East and Middle East as a natural treatment for many diseases and as a flavoring agent that claimed a medicinal usage traced back to the ancient Egyptians, Greeks, and Romans; **Elkhayat et al., (2016)**. *Nigella* seeds have many medicinal actions such as bronchodilator, hypotensive, antibacterial, antifungal, anti-diabetic, anticancer; **Periasamy et al. (2016)**, analgesic, anti-inflammatory, antidepressant; **Sahak et al., (2016)** and immune-potentiating actions.

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*Nigella* was able chemically to reduce the levels of triglycerides and glucose once they were elevated in the body, as well as can stabilize cholesterol metabolism. Despite of its large benefits in the medicinal field, *Nigella* seeds were neglected and left behind although, *Nigella sativa* may possibly induce P-glycoprotein activity, **Hammad Shafiq et al., (2014)**.

Diazinon is one of the most commonly used organophosphorus compounds; and have many applications in the veterinary and agricultural fields; **Ghoneim et al., (2001)**. Diazinon is an organic phosphate and cholinesterase enzyme inhibitor that commonly used for the control of common chicken lice and other variety of insect in poultry farms. Diazinon was not recommended to be used in the presence of a live bird as chickens will consume the diazinon crystals, results in lacrimation, diarrhea, dyspnea, and death. Postmortem finding from toxicity may include lung edema, fatty livers, severe enteritis and the inclusion of diazinon crystals in the crop and gizzard contents.

The present study aimed for evaluating the influences of supplementary different concentration of *Nigella sativa* on antioxidant activity [superoxide dismutase (SOD), glutathione peroxidase (GSH-Px) and glutathione reductase], blood chemistry, bacterial load and immunological status before and after toxifying birds with synthesized diazinon.

## Material and methods:-

### Experimental birds and study design:-

150 broilers (one day old chicks) were purchased and placed under the same environmental conditions for acclimatization. The birds were divided into 3 groups (G1, G2, and control G3) according to the supplemented concentration of *Nigella sativa*. G1 supplemented with 1.4% *Nigella sativa* (1.4 gm / 100 gm ration); G2 supplemented with 2.8% *Nigella sativa* (2.8 gm / 100 gm ration) and G3 was kept as control. G1 and G2 were toxified with synthesized diazinon (100 ppm / 1 L drinking water; LD50= 6.31 mg / kg) after it have been compared to the commercial form for its chemical and physical properties as well as the compound stability.

### Diazinon:-

Diazinon was synthesized in the laboratory and the reaction mixture was then washed first with 400 mL of 0.1 N hydrochloric acid and then with 400 mL of 0.1 N sodium hydroxide solution. After Separating off the washing liquids, the xylene was distilled off in vacuum for the complete removal of the volatile constituents, the diazinon was finally distilled in a high vacuum (approximately 1 mbar) at 60 °C. The yield of 0,0 diethyl -0- (2- isopropyl -4-methyl -6 – pyrimidinyl) the ionophosphate was 280 g = 92.1% of the theoretical yield, **Budavari, (1996); Hansch et al., (1995); Geller et al., (2003)**.

### Sampling and samples preparation:-

**Blood samples:** A total of 180 samples were collected during the study period, these samples were collected on a weekly basis starting from 14<sup>th</sup> day old (zero sample), and three post challenge sample collections (P1, P2, and P3). **Serum blood samples** (60 samples) were left in a cool place for 2-3 hrs, then centrifuged at 3000 rpm / 5 min. The serum samples were separated in Eppendorf tube of 3 mL capacity and kept frozen until examination for Blood biochemical parameters as Total Protein (TP); Albumin (ALB); Globulin (Glob); liver enzymes as alanine aminotransferase (ALT); aspartate aminotransferase (AST); Cholesterol (CHOL); Triglycerides (TG); Urea (Ure); Creatinine and Glucose (Gluc), the parameters were measured calorimetrically using UV1100 spectrophotometer; **Young, (1995-2001)**, immunological assay was also performed on serum samples (IgG, IgM, IgE) using DIFFU plate method; **Berne, (1974), Heremans and Masson, (1973)**. **The whole blood samples** (60 samples) were centrifuged at 4000 rpm / 10 min; then aspirate off the plasma and stored at -80 °C. The erythrocytes were washed 3-4 times with 5 mL sodium chloride 0.9% solution and centrifuged after each wash at 4000 rpm / 10 min. Finally the washed erythrocytes were re-suspended in cold distilled water and mixed; the lysate were stored at -80 °C for antioxidant assay as superoxide dismutase; SOD (**Nishikimi et al., 1972**), glutathione peroxidase; GSH-Px (**Paglia and Valentine, 1967**).and glutathione reductase (**Goldberg and Spooner, 1983**).

**Intestinal swab** (60 samples); from the original dilution of all swab sample, 1 mL was transferred aseptically to a test tube containing 9 mL sterile 0.1% buffered peptone water (w/v) to prepare a dilution of 10<sup>-2</sup>, then from which tenfold decimal serial dilution up to 10<sup>-6</sup> were prepared to cover a wide range of samples contamination which could be easily counted. The dilutions were subjected to two types of bacterial counts; Total Bacterial Count (TBC) and Total Enterobacteriaceae Count (TEC).



**Bacterial Counts:-**

**Total Bacterial Count (TBC);** The number of Aerobic spore forming micro-organisms in samples was carried out using drop Plate Method by **Zelver et al., (1999)** and **Herigstad et al., (2001)** using standard plat count agar. The inoculated and un-inoculated control plates were incubated at 37 °C for 24-48 hours. **Total Enterobacteriaceae Count (TEC);** was performed using drop Plate Method; **Zelver et al., (1999)** and **Herigstad et al., (2001)** with Eosine Methylene Blue Agar (EMB). Plates were inverted and incubated at 37 °C for 24-48 hours. Counting the colonies on the plates showed 30-300 colonies per plates; **Cruickshank et al., (1975, 1980)**. Five typical colonies were selected and cultured onto MacConkey agar plates, and incubated at 37 °C for 24 hr, the pure colonies on MacConkey agar plates were inoculated onto nutrient slant and incubated at 37 °C for 24 hr and kept for further identification.

**Statistical analysis:-**

Statistical analysis was run through SPSS (version, 16) for windows Levesque, (2007). The obtained data were analyzed statistically using factorial experiments of Analysis of Variance (ANOVA) with general linear model procedures (GLM) for all tested groups, times and their interactions.

**Results:-**

Proteinogram in Table 1 revealed that total protein, Albumin and Globulin revealed non-significant ( $P \leq 0.05$ ) differences between G1, G2 and control at different sampling times. As well as, ALT, AST (Table 2) showed non-significant differences ( $P \leq 0.05$ ) in all groups at all sampling times. Urea (Table 2) revealed a non-significant increase ( $P < 0.05$ ) in G1 and G2 compare to control at P1, P2 and a non-significant decrease ( $P < 0.05$ ) in G1 and G2 compare to control at P3. Creatinine revealed significant decline ( $P \leq 0.05$ ) in G2 and control compared to G1 at zero time and a highly significant decrease ( $P < 0.01$ ) in control compared to G1 and G2 at P1 sampling time. Meanwhile, at P2 and P3 there was a non-significant difference ( $P > 0.05$ ) between groups.

Triglycerides and cholesterol (Table 3) showed a highly significant decrease ( $P < 0.01$ ) in G1 and G2 compared to control at zero sampling time and a non-significant difference ( $P > 0.05$ ) between groups at P1, P2 and P3 sampling times. Glucose showed a highly significant decrease ( $P < 0.01$ ) in G1 and G2 compared to control group at P1 and significant decrease ( $P \leq 0.05$ ) in G1 and control groups compared to G1 at P2 sampling time.

Glutathione peroxidase (Table 4) showed a highly significant ( $P < 0.01$ ) decrease in G2 and control groups compared to G1 at zero and P1 sampling times, and a non-significant difference ( $P > 0.05$ ) between all groups at P2 and P3 sampling times. Glutathione reductase and Superoxide dimutase revealed significant difference ( $P \leq 0.05$ ) between groups at zero and P2 sampling times.

Immunoglobines (IgG) revealed a highly significant difference ( $P < 0.01$ ) in Table (5) between groups during all sampling times and non-significant ( $P > 0.05$ ) decrease between G2 and control compared to G1 at P1 sampling time. IgM profile showed a highly significant difference ( $P < 0.01$ ) between groups at all sampling times; a non-significant decrease ( $P > 0.05$ ) between G2 and control compared to G1 at zero sampling time; a non-significant decrease ( $P > 0.05$ ) between G1 and G2 compared to control at P2 sampling time and a non-significant difference ( $P > 0.05$ ) between G1 and control at P3 sampling time; Table (5). IgE revealed a highly significant difference ( $P < 0.01$ ) between groups at zero and P1 sampling times, and a non-significant decrease ( $P > 0.05$ ) in G1 and G2 compared to control at the same sampling time. A significant difference ( $P \leq 0.05$ ) at P2 and non-significant difference ( $P > 0.05$ ) at P3 sampling time, Table (5).

TBC revealed in Table 5 a highly significant ( $P < 0.01$ ) difference between all groups at all sampling times, and a non-significant decrease ( $P > 0.05$ ) between G2 and control compared to G1 at P2 sampling time. Meanwhile, TEC showed a highly significant difference ( $P > 0.01$ ) between all groups at all sampling times and non-significant ( $P > 0.05$ ) difference between G1 and control; G1 and G2; G2 and control and G2 and control at zero, P1, P2, and P3 sampling times; respectively.

IgM and IgE (Table 6) showed a highly significant strong positive correlation ( $r = 0.646$ ;  $P < 0.01$ ) with TBC. Table (7) revealed a significant weak negative correlation ( $r = -0.394$ ;  $P \leq 0.05$ ) between TBC and Superoxide Dimutase. TEC in Table (7) showed a significant weak negative correlation with SOD ( $r = -0.336$ ;  $P \leq 0.05$ ).

### Discussion:-

A variety of medicinal plants as well as their extracted and purified constituents have shown many therapeutic effects. On a wide spectrum, medicinal plants was able to serve as therapeutic, medicinal alternatives, safer choices and effective treatment. Animals, broilers and human-being in a variety of cultures can be treated or prophylactic with medicinal plants. *Nigella sativa* from family *Ranunculaceae*, have been used for centuries as food preservative and medicinal plant. The oil constituents; thymoquinine (TQ), have shown a potential medicinal properties, as it possess anti-oxidant effects by enhancing the oxidant scavenger system, which as a consequence causes antitoxic effects induced by several problems; **Salem, (2005)**. The present study showed that Glutathione peroxidase possess a highly significant decrease in G2 and control groups compared to G1 at zero and P1 sampling times, and a non-significant difference between all groups at P2 and P3 sampling times. Glutathione reductase and Superoxide dimutase revealed significant difference between groups at zero and P2 sampling times.

Several diseases serve to contribute oxidative damage to many biological structures during their pathophysiological course especially in cardiovascular diseases and cancer. The oxidative damage was caused by imbalance between the pro-oxidant (free radicals) and the anti-oxidant (scavenging) mediators, as pro-oxidant predominated either by the increased generation of the free radicals contributed by excessive oxidative stress conditions, or by the poor scavenging capability in the body. Free oxygen radicals; O<sub>2</sub>, OH<sup>-</sup>, and NO<sup>-</sup> that are developed during a stress condition; are electrically charged and attack cells causing tearing of the cellular membranes and created a havoc with the nucleic acids, proteins, and enzymes existed in animal or human body, causing the cell to lose its structure and function completely. ROS are produced mainly by certain cells of immune system as macro-phages and neutrophils;

**Maxwell, (1999); Schulz et al., (2000); Hogg, (1998).**

The present study showed a sharp increase in the lipid profile and glucose, and this was attributed to diazinon intoxication. The elevated levels was declined latter as the bird proceed in age and this was attributed to the ability *Nigella sativa* to decrease the lipid peroxidation, increase the anti-oxidant mechanism and prevent the lipid-peroxidation-induced liver damage. *N. sativa* also was able to decrease the elevated glucose and MDA concentrations, increased the lowered GSH and ceruloplasmin concentrations. These results were supported with the finding from experimentally infected rabbits in **Meral et al., (2001); Mariod et al., (2009), and Umar et al., (2012).**

*Nigella sativa* showed beneficial immunomodulatory properties, as it was able to stimulate T cell- and natural killer cell-mediated immune responses. The oil and its active ingredients proved an excellent anti-microbial and anti-tumor properties. Gathering these beneficial and medicinal influences, *N. sativa* seed is a promising source for active ingredients that would be with potential therapeutic modalities in different clinical settings; **Salem, (2005)**. Immunoglobines (IgG, IgM) in the present study revealed a highly significant difference between groups during all sampling times with potential increase followed by decrease from the 3<sup>rd</sup> week of age proving the presence of immune barrier, that did not last for a period of time.

**Table 1.** Biochemical changes in proteinogram by groups supplemented with different *Nigella sativa* concentrations against Diazinon (OPC) toxicity.

Time	Group	Total Protein g/dl	Albumin g/dl	Globulin g/dl
Zero	G1	7.373±2.445 <sup>a</sup>	1.828±0.242 <sup>a</sup>	5.546±2.653 <sup>a</sup>
	G2	9.181±5.032 <sup>a</sup>	1.054±0.385 <sup>a</sup>	8.127±4.650 <sup>a</sup>
	G3	18.048±4.347 <sup>a</sup>	0.887±0.489 <sup>a</sup>	17.161±3.927 <sup>a</sup>
P1	G1	39.181±10.161 <sup>a</sup>	2.161±0.088 <sup>a</sup>	37.020±10.077 <sup>a</sup>
	G2	35.108±10.282 <sup>a</sup>	2.164±0.702 <sup>a</sup>	32.945 ±9.585 <sup>a</sup>
	G3	25.687±11.704 <sup>a</sup>	0.754±0.154 <sup>a</sup>	24.933±11.858 <sup>a</sup>
P2	G1	32.048 ±9.338 <sup>a</sup>	1.805±0.199 <sup>a</sup>	30.243±9.537 <sup>a</sup>
	G2	29.157±1.193 <sup>a</sup>	1.867±0.500 <sup>a</sup>	27.289±0.997 <sup>a</sup>
	G3	32.024±3.842 <sup>a</sup>	1.573±0.225 <sup>a</sup>	30.451±3.681 <sup>a</sup>
P3	G1	26.675±8.058 <sup>a</sup>	1.763±0.225 <sup>a</sup>	24.912±8.216 <sup>a</sup>
	G2	24.988±3.463 <sup>a</sup>	1.218±0.057 <sup>a</sup>	23.770±3.517 <sup>a</sup>
	G3	26.434±6.637 <sup>a</sup>	1.418±0.270 <sup>a</sup>	25.016 ±6.368 <sup>a</sup>



G1 Broilers supplemented with 1.4% *Nigella sativa*  
 G2 Broilers supplemented with 2.8% *Nigella sativa*  
 G3 control  
 Means carrying different superscripts in the same column are significantly different at ( $P \leq 0.05$ ) or highly significantly different at ( $P < 0.01$ ).  
 Means carrying the same superscripts in the same column are non-significantly different at ( $P > 0.05$ ).

**Table 2.** Biochemical changes in liver & kidney function by groups supplemented with different *Nigella sativa* concentrations against Diazinon (OPC) toxicity.

Time	Group	ALT U / L	AST U / L	Urea mg / dl	Creatinine mg / dl
Zero	G1	3.200±1.124 <sup>a</sup>	3.733±0.309 <sup>a</sup>	18.052±0.567 <sup>a</sup>	2.057±0.313 <sup>a</sup>
	G2	1.653±0.107 <sup>a</sup>	1.750±0.926 <sup>a</sup>	23.095±0.677 <sup>a</sup>	0.766±0.154 <sup>b</sup>
	G3	1.493±0.232 <sup>a</sup>	1.867±0.617 <sup>a</sup>	25.982±5.404 <sup>a</sup>	1.117±0.360 <sup>ab</sup>
P1	G1	0.853±0.053 <sup>a</sup>	9.450±4.554 <sup>a</sup>	23.364±0.828 <sup>a</sup>	0.951±0.037 <sup>a</sup>
	G2	0.800±0.562 <sup>a</sup>	5.133±3.739 <sup>a</sup>	19.361±1.544 <sup>a</sup>	0.412±0.102 <sup>b</sup>
	G3	0.800±0.640 <sup>a</sup>	3.967±3.106 <sup>a</sup>	8.545±5.079 <sup>b</sup>	0.341±0.156 <sup>b</sup>
P2	G1	1.547±0.282 <sup>a</sup>	9.217±2.510 <sup>a</sup>	19.900±0.491 <sup>a</sup>	0.484±0.039 <sup>a</sup>
	G2	5.013±2.399 <sup>a</sup>	5.017±3.365 <sup>a</sup>	12.933±5.543 <sup>a</sup>	0.362 ±0.237 <sup>a</sup>
	G3	4.587±2.356 <sup>a</sup>	5.367±3.285 <sup>a</sup>	13.818±6.034 <sup>a</sup>	0.823±0.365 <sup>a</sup>
P3	G1	1.600±0.277 <sup>a</sup>	5.950±2.865 <sup>a</sup>	18.938±1.447 <sup>a</sup>	0.973±0.504 <sup>a</sup>
	G2	1.547±0.533 <sup>a</sup>	4.200±3.676 <sup>a</sup>	20.131±1.485 <sup>a</sup>	1.048 ±0.435 <sup>a</sup>
	G3	2.507±1.102 <sup>a</sup>	2.683±1.184 <sup>a</sup>	28.907±5.530 <sup>a</sup>	0.908 ±0.417 <sup>a</sup>

G1 Broilers supplemented with 1.4% *Nigella sativa*  
 G2 Broilers supplemented with 2.8% *Nigella sativa*  
 G3 control  
 Means carrying different superscripts in the same column are significantly different at ( $P \leq 0.05$ ) or highly significantly different at ( $P < 0.01$ ).  
 Means carrying the same superscripts in the same column are non-significantly different at ( $P > 0.05$ ).

**Table 3.** Biochemical changes in lipid profile & glucose function by groups supplemented with different *Nigella sativa* concentrations against Diazinon (OPC) toxicity.

Time	Group	Triglycerides mg / dl	Cholesterol mg / dl	Glucose mg / dl
Zero	G1	87.255±22.162 <sup>b</sup>	26.667±1.633 <sup>b</sup>	882.143±43.055 <sup>a</sup>
	G2	146.078±21.502 <sup>b</sup>	81.569±37.650 <sup>b</sup>	990.476±55.380 <sup>a</sup>
	G3	378.431±43.965 <sup>a</sup>	236.340±18.573 <sup>a</sup>	915.476±124.750 <sup>a</sup>
P1	G1	533.333±163.866 <sup>a</sup>	184.052±55.219 <sup>a</sup>	1060.714±49.616 <sup>b</sup>
	G2	209.804± 4.273 <sup>a</sup>	130.980±32.236 <sup>a</sup>	1141.667±111.161 <sup>b</sup>
	G3	187.255± 47.191 <sup>a</sup>	191.373±59.268 <sup>a</sup>	1505.952 ±45.612 <sup>a</sup>
P2	G1	730.392±535.101 <sup>a</sup>	327.843±17.544 <sup>a</sup>	182.143±98.263 <sup>b</sup>
	G2	296.078±45.953 <sup>a</sup>	260.131±66.850 <sup>a</sup>	1192.857±154.812 <sup>a</sup>
	G3	408.824±109.313 <sup>a</sup>	212.549±104.265 <sup>a</sup>	783.333±281.172 <sup>ab</sup>
P3	G1	767.647±518.602 <sup>a</sup>	321.830±11.680 <sup>a</sup>	291.667±101.526 <sup>a</sup>
	G2	343.137±57.242 <sup>a</sup>	149.804±62.796 <sup>a</sup>	780.952±275.535 <sup>a</sup>
	G3	381.373±118.688 <sup>a</sup>	303.007±82.010 <sup>a</sup>	1016.667±503.872 <sup>a</sup>

G1 Broilers supplemented with 1.4% *Nigella sativa*  
 G2 Broilers supplemented with 2.8% *Nigella sativa*  
 G3 control  
 Means carrying different superscripts in the same column are significantly different at ( $P \leq 0.05$ ) or highly significantly different at ( $P < 0.01$ ).  
 Means carrying the same superscripts in the same column are non-significantly different at ( $P > 0.05$ ).

**Table 4.** Antioxidant enzymatic changes by groups supplemented with different *Nigella sativa* concentrations against Diazinon (OPC) toxicity.

Time	Group	GSH-Px mU / mL	GSH-Rx U / L	SOD U / mL
Zero	G1	7943.462±1685.959 <sup>a</sup>	475.582±415.297 <sup>b</sup>	2817.118±1154.865 <sup>b</sup>
	G2	2042.604±38.907 <sup>b</sup>	1714.773±328.218 <sup>ab</sup>	6357.759±563.306 <sup>a</sup>
	G3	1465.488±85.043 <sup>b</sup>	3215.200±541.572 <sup>a</sup>	4418.103±731.341 <sup>ab</sup>
P1	G1	5362.647±590.086 <sup>a</sup>	2411.400±1004.750 <sup>a</sup>	7635.468±2017.330 <sup>a</sup>
	G2	3423.794±291.801 <sup>b</sup>	1976.008±1935.818 <sup>a</sup>	4602.833±173.482 <sup>a</sup>
	G3	1990.729±244.611 <sup>c</sup>	864.085±90.613 <sup>a</sup>	6834.975±3214.343 <sup>a</sup>
P2	G1	635.477±103.751 <sup>a</sup>	569.358±448.788 <sup>b</sup>	6434.729±1534.552 <sup>ab</sup>
	G2	1841.586±745.713 <sup>a</sup>	7890.637±113.872 <sup>a</sup>	8097.290±203.645 <sup>a</sup>
	G3	1660.021±1195.042 <sup>a</sup>	3436.245±2346.301 <sup>ab</sup>	2478.449±1522.926 <sup>b</sup>
P3	G1	1614.630±622.508 <sup>a</sup>	3262.088±529.168 <sup>a</sup>	1631.773±226.769 <sup>a</sup>
	G2	1018.060±640.322 <sup>a</sup>	4903.180±535.825 <sup>a</sup>	1862.685±333.381 <sup>a</sup>
	G3	486.334±198.704 <sup>a</sup>	3262.088±487.462 <sup>a</sup>	2924.877±512.417 <sup>a</sup>

G1 Broilers supplemented with 1.4% *Nigella sativa*  
G2 Broilers supplemented with 2.8% *Nigella sativa*  
G3 control  
Means carrying different superscripts in the same column are significantly different at ( $P \leq 0.05$ ) or highly significantly different at ( $P < 0.01$ ).  
Means carrying the same superscripts in the same column are non-significantly different at ( $P > 0.05$ ).

**Table 5.** Immunological and bacteriological changes by groups supplemented with different *Nigella sativa* concentrations against Diazinon (OPC) toxicity.

Time	Group	IgG mg / dl	IgM mg / dl	IgE IU / mL	TBC CFU / mL	TEC CFU / mL
Zero	G1	8.433±0.384 <sup>a</sup>	9.900±0.058 <sup>a</sup>	6.667±0.219 <sup>b</sup>	13.8×10 <sup>3</sup> ±600.925 <sup>b</sup>	1.4×10 <sup>1</sup> ±2.404 <sup>b</sup>
	G2	6.100±0.058 <sup>b</sup>	4.067±0.067 <sup>b</sup>	6.467±0.176	16.2×10 <sup>3</sup> ±635.959 <sup>a</sup>	1.1×10 <sup>2</sup> ±7.638 <sup>a</sup>
	G3	3.867±0.949 <sup>c</sup>	4.500±0.500 <sup>b</sup>	10.667±0.667 <sup>a</sup>	4.5×10 <sup>3</sup> ±404.145 <sup>c</sup>	1.4×10 <sup>1</sup> ±2.333 <sup>b</sup>
P1	G1	21.100±2.098 <sup>a</sup>	12.133±0.353 <sup>b</sup>	8.800±0.208 <sup>b</sup>	3.4×10 <sup>3</sup> ±338.296 <sup>a</sup>	5.8×10 <sup>1</sup> ±6.009 <sup>a</sup>
	G2	8.567±0.384 <sup>b</sup>	5.800±0.404 <sup>c</sup>	7.467±0.06 <sup>b</sup>	3.1×10 <sup>2</sup> ±12.019 <sup>c</sup>	4×10 <sup>1</sup> ±8.083 <sup>a</sup>
	G3	4.833±0.833 <sup>b</sup>	19.667±1.856 <sup>a</sup>	28.400±6.032 <sup>a</sup>	1.3×10 <sup>3</sup> ±28.868 <sup>b</sup>	0.0±0.000 <sup>b</sup>
P2	G1	5.367±0.470 <sup>b</sup>	3.233±0.186 <sup>b</sup>	13.600±2.346 <sup>ab</sup>	2.4×10 <sup>2</sup> ±38.442 <sup>a</sup>	7.5×10 <sup>2</sup> ±31.798 <sup>a</sup>
	G2	4.033±0.033 <sup>c</sup>	2.233±0.186 <sup>b</sup>	8.033±0.786 <sup>b</sup>	3.5×10 <sup>1</sup> ±3.180 <sup>b</sup>	0.0±0.000 <sup>b</sup>
	G3	8.933±0.470 <sup>a</sup>	24.667±1.453 <sup>a</sup>	17.700±1.762 <sup>a</sup>	4.3×10 <sup>3</sup> ±1.856 <sup>b</sup>	0.0±0.000 <sup>b</sup>
P3	G1	8.767±0.384 <sup>a</sup>	5.467±0.418 <sup>a</sup>	9.400±0.643 <sup>a</sup>	22×10 <sup>3</sup> ±1527.525 <sup>b</sup>	12.3×10 <sup>3</sup> ±1452.966 <sup>a</sup>
	G2	7.233±0.722 <sup>a</sup>	3.733±0.504 <sup>b</sup>	10.833±1.837 <sup>a</sup>	41×10 <sup>3</sup> ±577.350 <sup>a</sup>	1.7×10 <sup>3</sup> ±378.594 <sup>b</sup>
	G3	4.900±0.802 <sup>b</sup>	6.167±0.088 <sup>a</sup>	13.567±1.065 <sup>a</sup>	9.3×10 <sup>2</sup> ±8.819 <sup>c</sup>	1.7×10 <sup>3</sup> ±44.096 <sup>b</sup>

G1 Broilers supplemented with 1.4% *Nigella sativa*  
G2 Broilers supplemented with 2.8% *Nigella sativa*  
G3 control  
Means carrying different superscripts in the same column are significantly different at ( $P \leq 0.05$ ) or highly significantly different at ( $P < 0.01$ ).  
Means carrying the same superscripts in the same column are non-significantly different at ( $P > 0.05$ ).

**Table 6.** Correlation co-efficient of immunoglobines with Total Bacterial Count (TBC) Above Diagonal and Total Enterobacteraceae Count (TEC) Below Diagonal.

r	TBC	IgG	IgM	IgE
TEC	1	0.24	-0.304	-0.248
IgG	0.043	1	0.278	-0.158
IgM	-0.185	0.278	1	0.646
IgE	-0.096	-0.158	0.646	1

\*\* Correlation is highly significant ( $P < 0.01$ ). \* Correlation is significant ( $P < 0.05$ ).  
NS. Correlation is non-significant ( $P > 0.05$ ).

**Table 7.** Correlation co-efficient of antioxidants with Total Bacterial Count (TBC) Above Diagonal and Total Enterobacteraceae Count (TEC) Below Diagonal.

r	TBC	GSH-Px	GSH-Rx	SOD
TEC	1	-0.015	0.114	-0.394
GSH-Px	-0.191	1	-0.327	0.136
GSH-Rx	0.074	-0.327	1	0.021
SOD	-0.366	0.136	0.021	1

\*\* . Correlation is highly significant (P < 0.01). \* . Correlation is significant (P < 0.05).  
<sup>NS</sup> . Correlation is non-significant (P > 0.05).

**Conclusion:-**

*Nigella sativa* supplementations (1.4%, 2.8%) were able to protect the birds from intoxication at once up to the 4<sup>th</sup> week of age. Although it maintained the biochemical parameters in a normal levels after little deviation resulted from intoxication. Antioxidants were severely stimulated by the *Nigella sativa* supplementations (1.4%, 2.8%) to initiate its protective effect. A follow up with the supplementation in higher doses may protect from the further changes in biochemical, antioxidant, immunological and bacteriological aspects.

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### RESEARCH ARTICLE

#### SOLAR PV SYSTEM USING MICROCONTROLLER.

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Hybrid system, power system, wind electric and solar electric technologies, Photovoltaic (PV).

#### Abstract

The purpose of this project was to design a portable and low cost power system that combines both wind electric and solar electric technologies. This system will be designed in efforts to develop a power solution for remote locations such as rural and research areas as well as improve the general well-being of individuals in developing countries affected by natural disasters. For this reason, it is imperative to design a hybrid system that will deliver a minimum of 80-250 watts of continuous power which is enough to power a wide range of appliances and medical equipment.

Looking from the consumer perspective the cost of a hybrid system is still the biggest problem which can cost anywhere between 25,000 to 30,000 Rupee. Considering that a portable hybrid system is designed to deliver a limited amount of power, less than 1.5 kW-hr, this is a high price for such system. In order for this system to become more attractive to the public, we need to design and develop a product which will benefit their pockets.

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#### Introduction:-

Buildings today consume more energy (41%) than either of society's other broad sectors of energy consumption industry (30%) and transportation (29%) [1]. India is fast growing country in the world. In recent years the electricity demand in India is increasing rapidly because of fast growing industry. 1.4 billion Still have no access to electricity (87% of whom live in the rural areas) and 1 billion that only has access to unreliable electricity networks.

Nowadays many issues appear due to the fact of using fossil fuel as a primary resource in generating electricity. The solution to such issues can be eliminated or reduced by means of using a renewable energy such as a solar power system. The first issue that is related to use of fossil fuels is the global warming, where the increase of using fossil fuels such as oil and natural gas in generating electricity resulted several health and environmental problems. Natural gas gives off 50% of the carbon dioxide, the principal greenhouse gas, released by coal and 25% less carbon dioxide than oil, for the same amount of energy produced. Coal contains about 80% more carbon per unit of energy than gas does, and oil contains about 40% more [2]. Global warming has many effects such as earth increase in temperature, sea level. Second issue is the air pollution. A lot of pollutants are produced by fossil fuel combustion that is used to produce electricity such that Sulphur oxides, and hydrocarbons. In addition, total suspended particulates contribute to air pollution can combine in the atmosphere to form tropospheric ozone, the major constituent of smog. Third issue, is the cost of the fossil fuel, the electricity that produced by the fossil fuel process is more expensive than the electricity produced by the renewable energy such that solar power.

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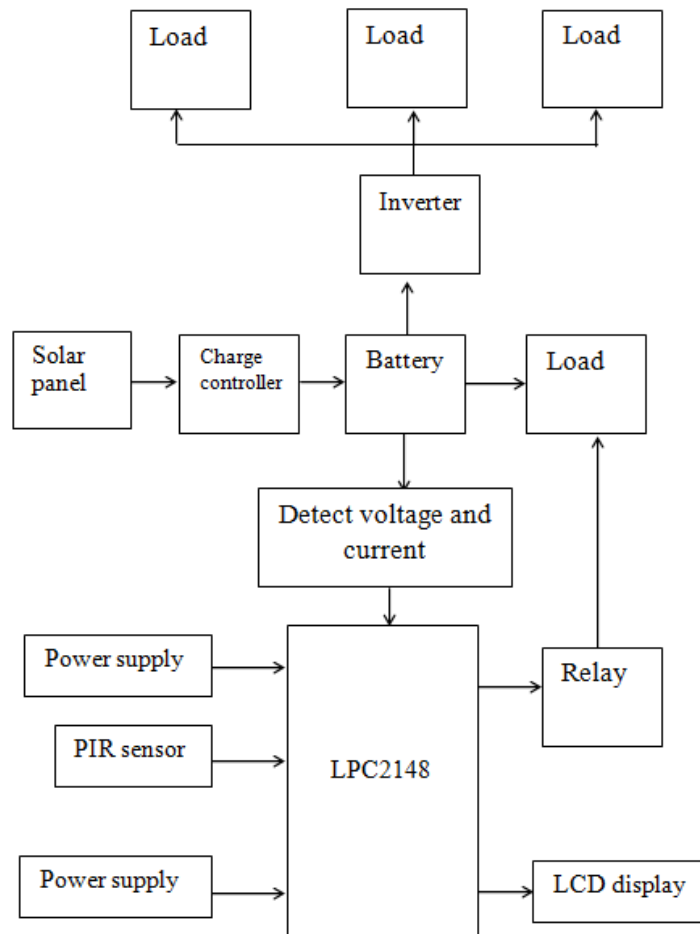
Address:-Electronic and Telecommunication department, Indira college of Engineering and Management, Pune, Maharashtra, India.

We need smart and practical approaches because energy, as a driver of development, plays a central role in both fighting poverty and addressing climate change. The government of India's make in India campaign will introduce more industry in India then there will be acute demand for more and more reliable power supplies. The energy sources in India is mainly Coal (56.65%), hydro (19.13%), Gas(9.2%), Nuclear(2.32%), Oil(0.58%) and other renewable sources(12.9%). From all above the renewable energy sources are free and can be easily utilize to have more energy.

The existing system has several disadvantages like solar energy and wind energy that are being in the system as an energy source can supply the load only for a particular period of time. A major drawback of the existing system is the charging of energy from the solar and wind is not always available.

The solar Photovoltaic (PV) cell is an electronic device that essentially converts the solar energy of sunlight into electric energy or electricity. Photovoltaic system consists of many cells, panels and array. The large scale PV plants are used for electricity generation that is fed into the grid and load. Such system, typically consist of one or more PV panels a DC/AC power Converter/Inverter. Additionally such system could also include maximum power point (MPP) and storage devices. The electricity generated is either stored, used directly for self-consumption or is fed into large electricity grids. Interconnections of panel or array, predict the output voltage or current or power and it is a variable that depends upon the sunlight. The converters may be used to regulate voltage and current at the load to control the power flow. There are many advantages of using solar Photovoltaic as a source for generating power, such as clean energy, no pollution and maximum power at peak hours. The modelling of solar PV system is to obtain maximum power for load requirements. Therefore energy storage system is very important for balancing the system or energy management of the system [3].

**Block Diagram:-**



**Specification:-****Hardware:-**

- Solar panel
- Rechargeable Battery(12 ,7A/h)
- Microcontroller
- PIR Sensor
- Max 232
- Light Sensor
- Charge controller
- Lcd display 16x2
- Inverter

**Software:-**

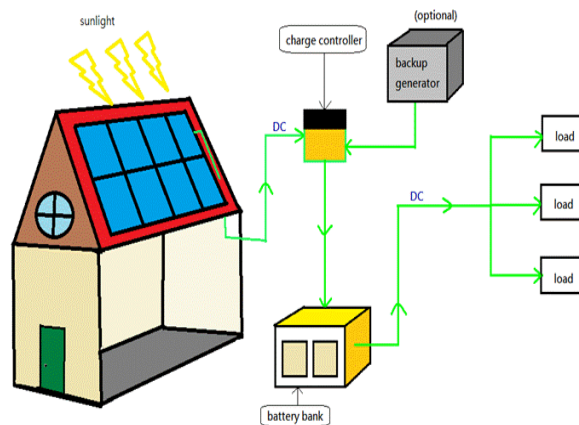
- Protel 99 SE 2.8
- Proteus 7.8
- Keil uVision 4.3

**Type of PV system:-**

There are generally two types of PV systems [5] off-grid and grid-tied depending on their connection to the utility grid.

**Off-grid DC/AC PV system: (DC without inverter, AC with inverter):-**

□ Off-Grid DC system (without inverter) - The DC output is immediately directed to DC loads. Excess power is stored in the battery banks controlled by the charge controller. Common applications of this system are found in RVs, boats, cabins, farm appliances, or rural telecommunication services. A backup generator may be included as shown in Fig. 1.



**Fig 1:-** Off-grid DC system (without inverter)

□ Off-grid AC system (with inverter) - An inverter is added to this system. The generated energy is directed to the inverter that converts DC to AC electricity for conventional electric appliances. Excess energy is stored in batteries and an optional backup generator can be added/included as shown in Fig. 2.

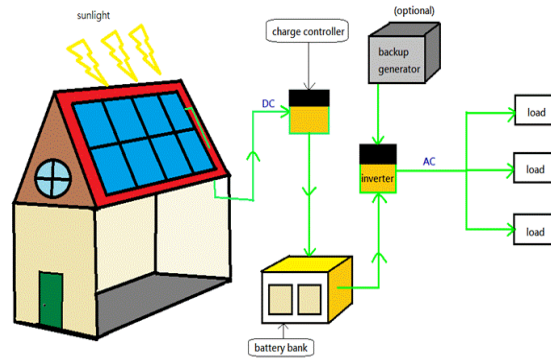


Fig 2:- Off-grid AC system (with inverter)

□ Hybrid system- In this system, another renewable energy generator is added to generate more power. For example, the wind turbine can be added to generate electricity from wind. This system is useful in places where the weather is sunny and windless during summer but cloudy and windy during winter. This system is typically off-grid and the excess energy is stored in batteries included as shown in Fig. 3. If neither the PV panel nor the wind turbine generates enough electricity, backup power such as a diesel generator can be added to generate the more energy.

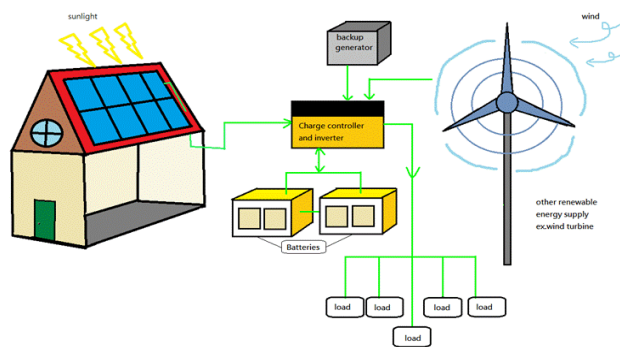


Fig 3:- Hybrid system

**Grid-tied system: with battery backup or no battery backup:-**

□ Grid-tied system (without battery backup) - In this system, the generated DC is converted to AC and used on-site. The solar power production is monitored by the solar production meter. If there is an excess energy, the energy can be fed into the electricity grid. If the PV system does not generate enough power because of higher demand, needed energy can be drawn from the grid included as shown in Fig. 4. This process of drawing or feeding electricity to the grid is monitored by the export/import meter.

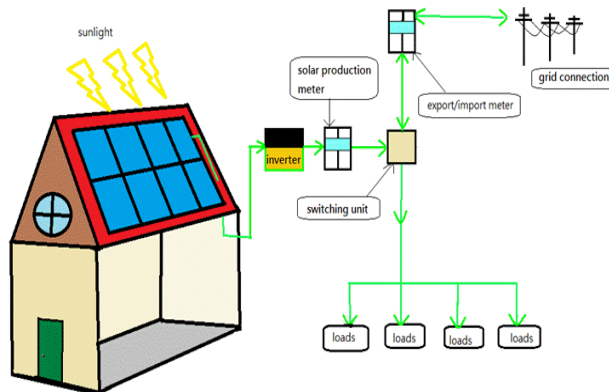


Fig.4:-Grid-tied system (without battery backup)



□ Grid-tied system (with battery backup) - In this system, the converted AC is used on-site or stored in batteries. The charge controller monitors the battery capacity and excess energy is stored in the batteries for backup. If the batteries reach their full capacity, the excess energy can be fed into the electricity grid. On the other hand, if the PV system does not generate enough power, needed energy can be drawn from the grid included as shown in Fig. 5. This process is done automatically through a net metering program.

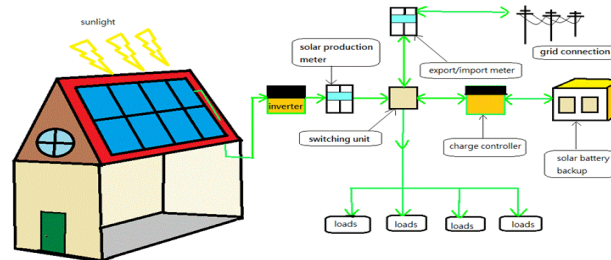


Fig.5:- Grid-tied system (with battery backup)

### Advantages and Disadvantages:-

#### Advantages:-

1. Electricity produced by solar cells is clean and silent. Because they do not use fuel other than sunshine, PV systems do not release any harmful air or water pollution into the environment, deplete natural resources, or endanger animal or human health.
2. Photovoltaic systems are quiet and visually unobtrusive.
3. Small-scale solar plants can take advantage of unused space on rooftops of existing buildings.
4. PV cells were originally developed for use in space, where repair is extremely expensive, if not impossible. PV still powers nearly every satellite circling the earth because it operates reliably for long periods of time with virtually no maintenance.
5. Solar energy is a locally available renewable resource. It does not need to be imported from other regions of the country or across the world. This reduces environmental impacts associated with transportation and also reduces our dependence on imported oil. And, unlike fuels that are mined and harvested, when we use solar energy to produce electricity we do not deplete or alter the resource.
6. A PV system can be constructed to any size based on energy requirements. Furthermore, the owner of a PV system can enlarge or move it if his or her energy needs change. For instance, homeowners can add modules every few years as their energy usage and financial resources grow. Ranchers can use mobile trailer-mounted pumping systems to water cattle as the cattle are rotated to different fields.

#### Disadvantages:-

1. Some toxic chemicals, like cadmium and arsenic, are used in the PV production process. These environmental impacts are minor and can be easily controlled through recycling and proper disposal.
2. Solar energy is somewhat more expensive to produce than conventional sources of energy due in part to the cost of manufacturing PV devices and in part to the conversion efficiencies of the equipment. As the conversion efficiencies continue to increase and the manufacturing costs continue to come down, PV will become increasingly cost competitive with conventional fuels.
3. Solar power is a variable energy source, with energy production dependent on the sun. Solar facilities may produce no power at all some of the time, which could lead to an energy shortage if too much of a region's power come from solar power.

**Application:-**

1. Agriculture-Water-pumping installations (very important in developing Countries): systems of automatic irrigation.
2. Industry, Telecommunications & Public Services-Cathode protection of gas, oil pipelines and other types of piping; provision of power in general, in particular for limited electric charges (in the order of a few kW) always in areas far from the grid or where power is unreliable (discontinuous electrical supply).
3. Radio/television relay stations: telephone devices; stations for data surveying and transmission (meteorological, seismic, for levels of watercourses, indicating the presence of fires), often very useful for civil protection services.
4. Lighting of streets, gardens and public transportation stops, street signaling.
5. Health- Especially for refrigeration, very useful particularly in developing countries for the conservation of vaccines and blood.
6. Residential-Power provision (especially lighting) for houses and mountain refuges. Very significant applications of this type in developing countries: photovoltaic systems do not require special maintenance and are easy to install.
7. Free Time- For charging boat and camper batteries.

**Conclusion:-**

The objective of his project was to design a portable power system that combines both, a wind turbine and a solar panel in one single unit. The main idea of combining the two types of systems together was to try to archive a constant power production, which would be available most of the time.

**Future Scope:-**

As a team with many innovative ideas we believe that the implementation of the following ideas will make the designed Solar and Wind Hybrid Power System a better product:-

1. Design and manufacture a cover for the permanent magnet wind turbine generator- In order to better protect the product and reduce customer complaints in the future, it is always a good idea to take protect the systems key component. By developing a cover for the generator, quality will increase tremendously as it will be protected from rain, snow, and dirt. Throughout time, these types of particles can have a tremendous burden on the system.
2. Design and adapt a lightweight base that is permanently fixed to the tower of the power system.- Many portable power systems in the market have been developing their products with built in bases. They are lightweight and are easy to assemble. By implementing a built in base to the design, customers will not have to worry about how they will be setting up.

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**RESEARCH ARTICLE**

**HISTOPATHOLOGICAL SPECTRUM OF SALIVARY GLAND TUMOURS:  
 A HOSPITAL BASED STUDY.**

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Salivary gland tumors, Pleomorphic adenoma, Adenoid cystic carcinoma.

**Abstract**

**Background:** Salivary gland tumors are common neoplasms of head and neck region. These tumors are complex and some of them exhibit great deal of morphologic overlap. The majority of these neoplasms are benign. These tumours can occur in both major and minor salivary glands. 80% of major salivary gland tumours occur in the parotid glands, while most minor salivary tumours are located in the palate. As a general rule in clinical practice, the smaller the salivary gland is, the more likely the tumour is malignant.

**Objective:** This study was carried out to study the histopathological spectrum of salivary gland tumors and to know their pattern of distribution.

**Material and Methods:-** This is a two year retrospective study which was conducted in the Post graduate department of pathology Government Medical College Srinagar from January 2015 to December 2016. Post surgical specimens were studied in detail to know the histological patterns. In each patient, age, sex, site and histopathological diagnosis was seen from record section of the department. The histological diagnosis of each individual tumor was based on the 2005 WHO classification of salivary gland tumors.

**Results:-** During two year (from January 2015 to December 2016), 100 cases of salivary gland tumors were diagnosed with peak incidence in third to fourth decade (48%). Among these, 63(63%) cases were benign and 31(31%) cases were malignant. The commonest site was parotid gland (68%) followed by submandibular glands (19%) and minor salivary gland tumors were 13%.

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Among benign tumours of salivary glands pleomorphic adenoma (42%) was most common followed by Warthin tumour (12%), basal cell adenoma (7%) and Myoepithelioma (2%) and among malignant tumours, Mucoepidermoid carcinoma

(46%) was most common followed by Adenoid cystic carcinoma (32.5%), Carcinoma ex pleomorphic adenoma (10.8%), Acinic cell carcinoma and Polymorphous low grade adenocarcinoma each comprising of (5.4%).

**Conclusion:** Histopathological study of salivary gland lesions is the most important method in establishing the final diagnosis and accordingly guides in the specific management.

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## Introduction:-

Salivary gland neoplasms are rare lesions and represent less than 1% of all tumors and 3-5.5% of all head and neck tumors<sup>1,2</sup>. These comprise a wide variety of benign and malignant neoplasms, which exhibit difference not only in biological behavior but in prognosis as well. Tumours of salivary glands have the most varied spectrum. Approximately 80% of the salivary gland tumors are found in the Parotid gland and 10 to 15% in the submandibular gland. Majority of Salivary gland tumours are of benign histology (80-85%), with pleomorphic adenoma being the most common,<sup>3</sup> constituting 70% of benign tumours.

The mean age of patients with salivary gland tumours is 50 years with a peak in 6th and 7th decades of life<sup>4,5</sup>. Benign Salivary gland tumours occur more frequently in females whereas malignant tumors occur mostly in males<sup>6,7</sup>. Parotid gland is the most common site comprising about 70% of all salivary gland tumors<sup>8</sup>. Benign tumours mostly occur in the parotid gland comprising of about 80% most common being pleomorphic adenoma followed by Warthin tumor<sup>6</sup>. The most common malignant salivary gland tumour is the Mucoepidermoid carcinoma which involves mostly the parotid gland followed by the minor and submandibular gland<sup>9</sup>. Adenoid cystic carcinoma (originally known as cylindroma) is a generally slow growing but highly malignant neoplasm with a remarkable capacity for recurrence. In the parotid gland it is less common than the mucoepidermoid carcinoma and acinic cell carcinoma, but in the minor salivary glands it is the most common malignant tumour<sup>10</sup>. Acinic cell carcinoma comprises of 1-3 % of all salivary gland tumour. There is a male predominance and a peak incidence in the third decade of life.<sup>11</sup>

## Aims and Objectives:-

- To study histopathological spectrum of Salivary gland tumours.
- To classify benign and malignant lesions according to WHO Classification.
- To study the age, sex and site distribution of various salivary gland lesions.

## Materials and Methods:-

This is two year retrospective study which was conducted in the post graduate department of pathology in Govt. medical college Srinagar from January 2015 to December 2016, which included 100 cases of salivary gland tumours which were received in our department. These specimens were subjected to the routine processing and paraffin embedding. The sections were stained with routine Hematoxylin and Eosin (H &E) and examined. The relevant patient data such as age, sex, location of the tumor and histopathological diagnosis were taken from the record section of our department. The neoplastic lesions were classified according to the World Health Organization's histological typing of salivary gland tumors (2005).

## Results and Observations:-

In our study we received 100 cases of salivary gland tumours during two year period from January 2015 to December 2016, in which 63 cases (63%) were benign and 37 (37%) were malignant. Males predominate and were 69 cases (69%) where as females comprising of 31 cases (31%). Male to Female ratio was 2.2 : 1. The age range was from 17 to 77 years.

Among the all salivary gland lesions, the commonest lesion was pleomorphic adenoma which comprised of 42% of all lesions. Among benign salivary gland tumours pleomorphic adenoma was most common (42%) followed by warthin tumour (12%), basal cell adenoma (7%) and Myoepithelioma (2%). Similarly among malignant salivary gland tumours, Mucoepidermoid carcinoma was most common(17%) followed by Adenoid cystic carcinoma (12%), Carcinoma ex pleomorphic adenoma (4%), Acinic cell carcinoma and Polymorphous low grade adeno carcinoma

each comprising of 2% of cases. Among benign salivary gland tumours pleomorphic adenoma (47.6%), Warthin tumour (17.4%) and basal cell adenoma (8%) was most common in parotid gland.

From age wise distribution, it is observed that benign tumours of salivary glands were common in the second to fourth decade of life and malignant tumours were common from 5th decade onwards. Mucoepidermoid carcinoma was more common in males than in females with a male to female ratio of 3.2:1. Parotid was the most common site of occurrence for mucoepidermoid carcinoma (70.58%) followed by minor salivary glands (17.64%) and submandibular gland (11.76%). Of all 17 cases of mucoepidermoid carcinomas 9 cases (53%) were high grade, 5 cases (29.5%) were intermediate grade and 3 cases (17.6%) were low grade.

Adenoid cystic carcinoma was the second most common malignant salivary gland tumor (12%). Minor salivary glands (41.6%) were the most common site followed by submandibular gland (33.3%) and parotid gland (25%). Mucoepidermoid carcinoma (32.4%) and Carcinoma ex-pleomorphic adenoma (10.8%) were most most in parotid gland where as adenoid cystic carcinoma (13.5%) was most common in minor salivary gland.

In our study, male preponderance was seen in overall salivary gland lesions, but in benign tumours female predominance was seen 24 cases (38%). In malignant salivary gland tumours, there was an overall male predominance 30 cases (81%).

**Table 1:- Age distribution of salivary gland tumours.**

Age group(years)	Total no.of patients	Benign tumours	Malignant tumours
<20	7	7	0
21-30	21	18	3
31-40	26	20	6
41-50	22	13	9
51-60	14	4	10
>60	10	1	9

**Table 2:- Site wise distribution of salivary gland tumours.**

Parotid gland	Submandibular gland	Minor salivary glands	Total
68	19	13	100

**Table 3:- Distribution of benign salivary gland tumours.**

Tumour type	Parotid gland	Submandibular gland	Minor salivary glands	Total (out of 100)
Pleomorphic adenoma	30 (47.6%)	9 (14.2%)	3 (4.7%)	42 (42%)
Warthin tumour	11 (17.4%)	1 (1.5%)	0	12 (12%)
Basal cell adenoma	5 (8%)	2 (3%)	0	7 (7%)
Myoepithelioma	1 (1.5%)	1 (1.5%)	0	2 (2%)

**Table 4:- Distribution of malignant salivary gland tumours**

Tumour type	Parotid gland	Submandibular gland	Minor salivary glands	Total (out of 100)
Mucoepidermoid carcinoma	12 (32.4%)	2 (5.4%)	3(8%)	17 (17%)
Adenoid cystic carcinoma	3 (8%)	4 (10.8)	5 (13.5%)	12 (12%)
Acinic cell carcinoma	2 (5.4%)	0	0	2 (2%)
Polymorphous low grade adenocarcinoma	0	0	2 (5.4%)	2 (2%)
Carcinoma ex pleomorphic adenoma	4 (10.8%)	0	0	4 (4%)

**Table 5:- Distribution of Salivary gland tumors according to sex and site.**

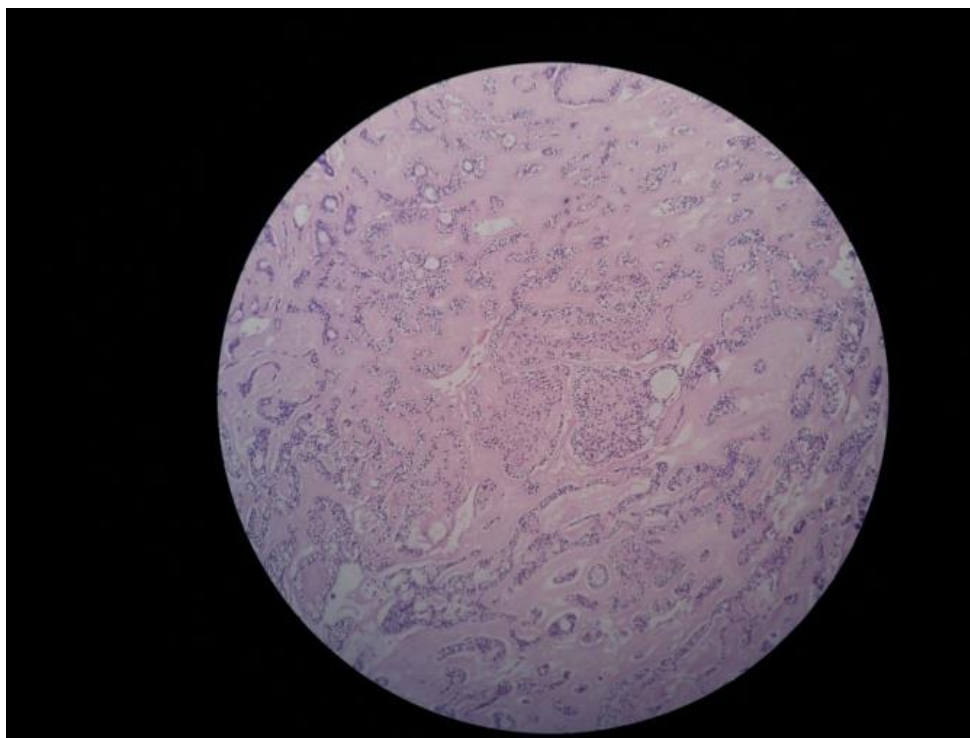
		Parotid Gland		Submandibular Gland		Minor salivary Gland	
Sex	Total	Benign	Malignant	Benign	Malignant	Benign	Malignant
<b>Males</b>	69 (69%)	29 (46%)	18 (48.6%)	8 (12.6%)	5 (13.5%)	2 (3%)	7 (19%)
<b>Females</b>	31 (31%)	18 (28.5)	3 (8%)	5 (8%)	1 (2.7%)	1 (1.5%)	3 (8%)

**Table 6:- Age wise distribution of Salivary gland tumors.**

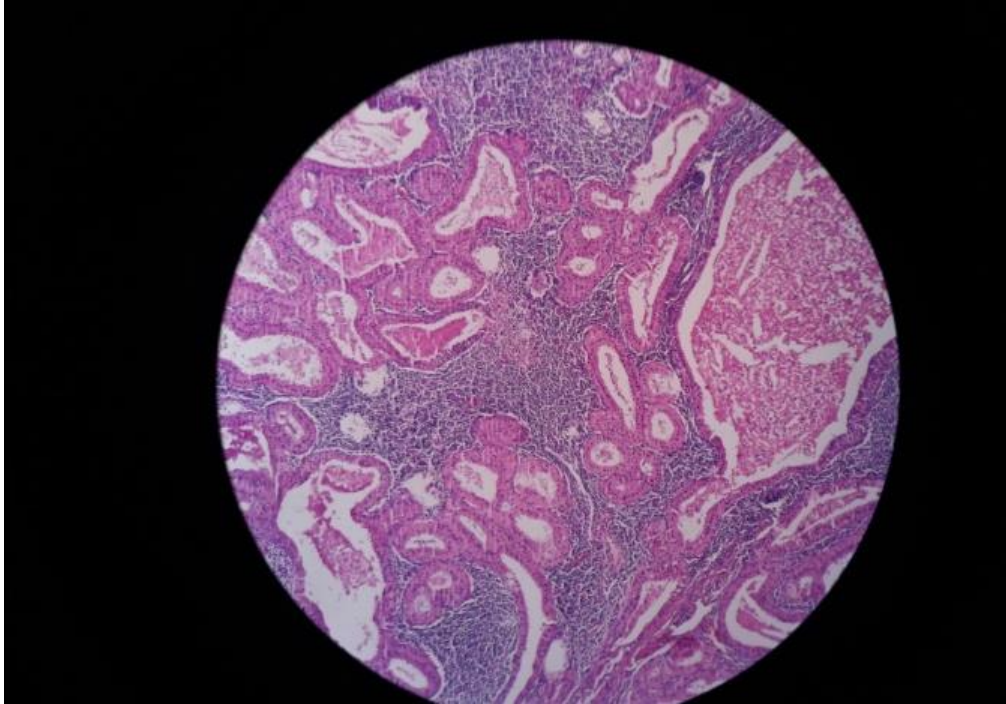
Salivary gland tumours	<20 years	21-30 years	31-40 years	41-50 years	51-60 years	>60 years	Total
Pleomorphic adenoma	5	10	14	10	2	1	42
Warthin tumour	2	5	2	1	2	0	12
Basal cell adenoma	0	2	4	1	0	0	7
Myoepithelioma	0	1	0	1	0	0	2
Mucoepidermoid carcinoma	0	1	3	4	5	4	17
Adenoid cystic carcinoma	0	2	2	3	2	3	12
Acinic cell carcinoma	0	0	1	0	0	1	2
Polymorphous low grade adenocarcinoma	0	0	0	2	0	0	2
Carcinoma ex pleomorphic adenoma	0	0	0	0	3	1	4

**Table 7:- Gender wise distribution of salivary gland tumours**

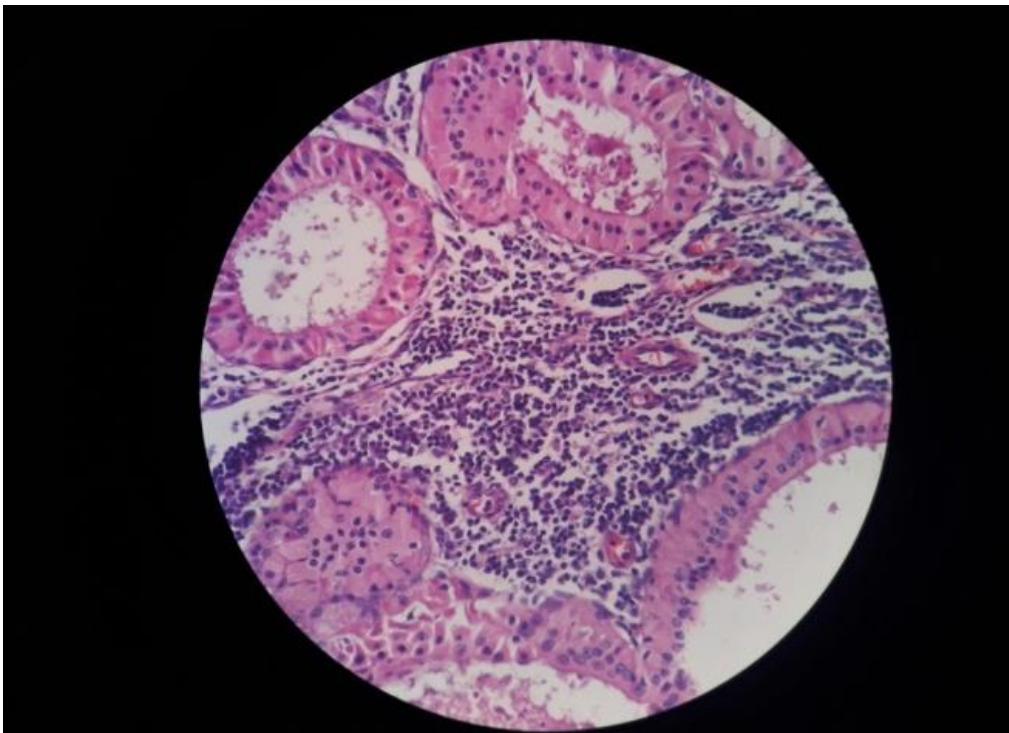
Salivary gland tumours	Male	Female	M:F
Pleomorphic adenoma	27	15	1.8:1
Warthin tumour	6	6	1:1
Basal cell adenoma	4	3	1.3:1
Myoepithelioma	2	0	2:0
Mucoepidermoid carcinoma	13	4	3.2:1
Adenoid cystic carcinoma	10	2	5:1
Acinic cell carcinoma	1	1	1:1
Polymorphous low grade adenocarcinoma	2	0	2:0
Carcinoma ex pleomorphic adenoma	4	0	4:0
Total	69	31	2.2:1

**PHOTO MICROGRAPHS:-****Photo Micrograph 1:-** Microscopic appearance of Pleomorphic adenoma showing both epithelial and mesenchymal components. H&E stain (10X).



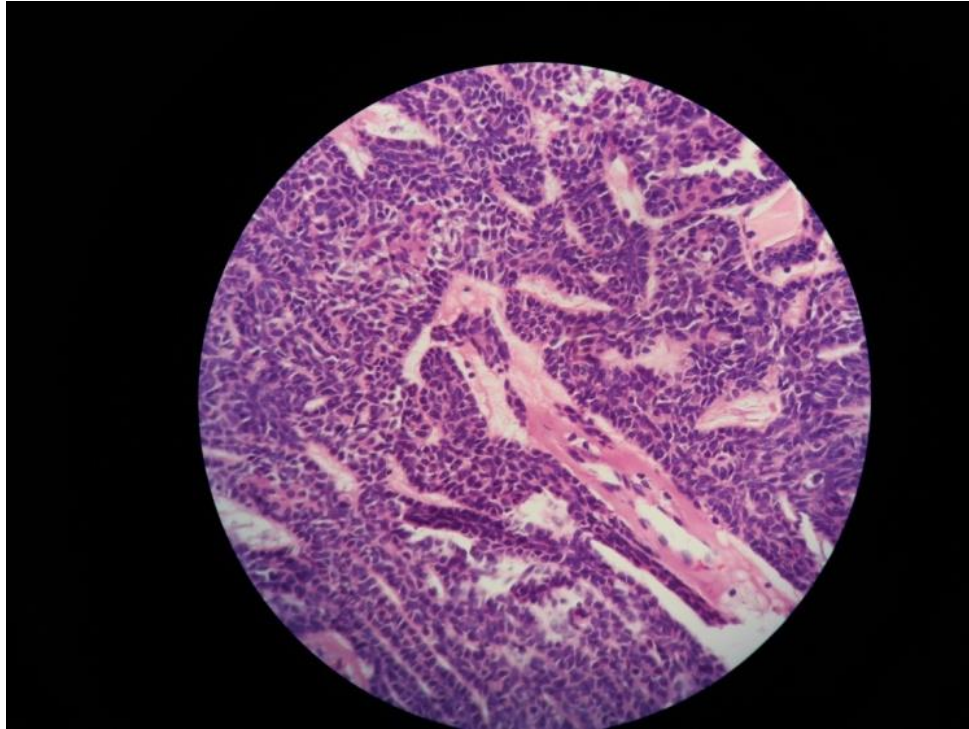


**Photo Micrograph 2:-** Microscopic appearance of Warthin tumour showing oncocytic lined epithelium and lymphoid stroma. H&E stain (10X).

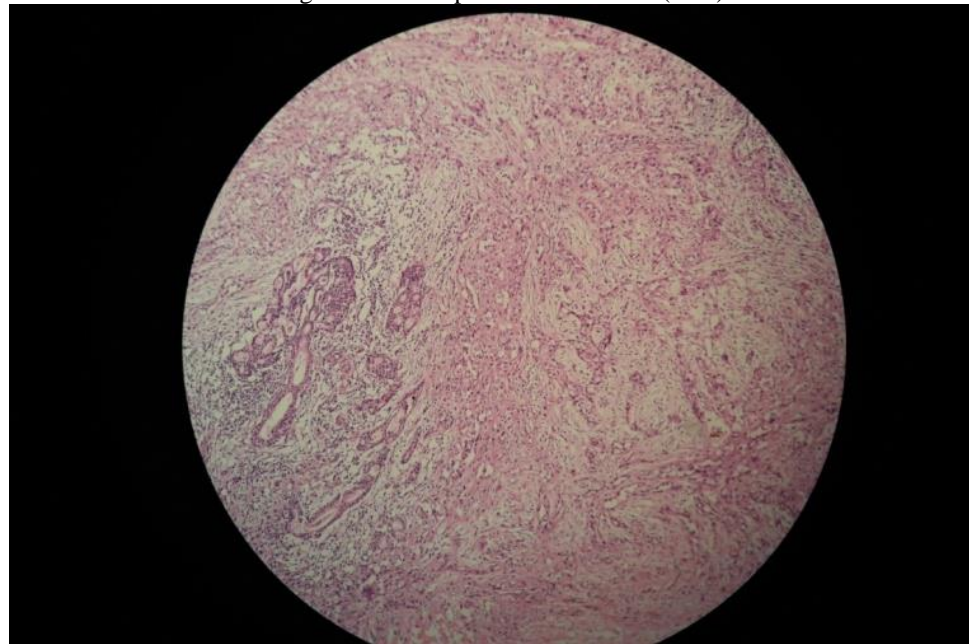


**Photo Micrograph 3:-** Microscopic appearance of Warthin tumour showing oncocytic lined epithelium and lymphoid stroma. H&E stain (40X).

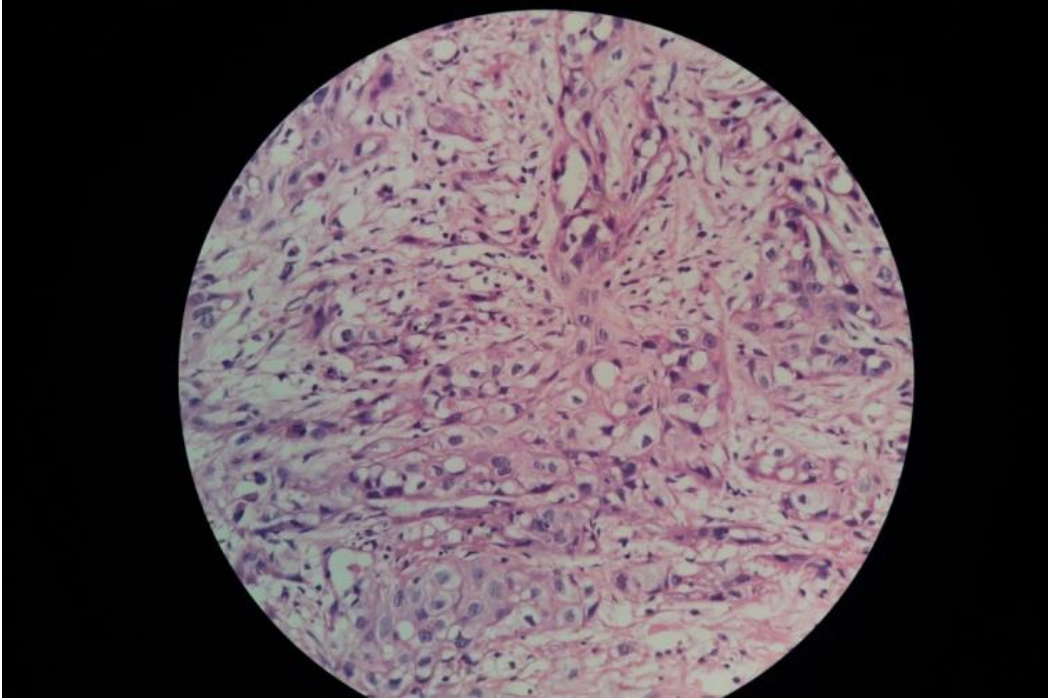




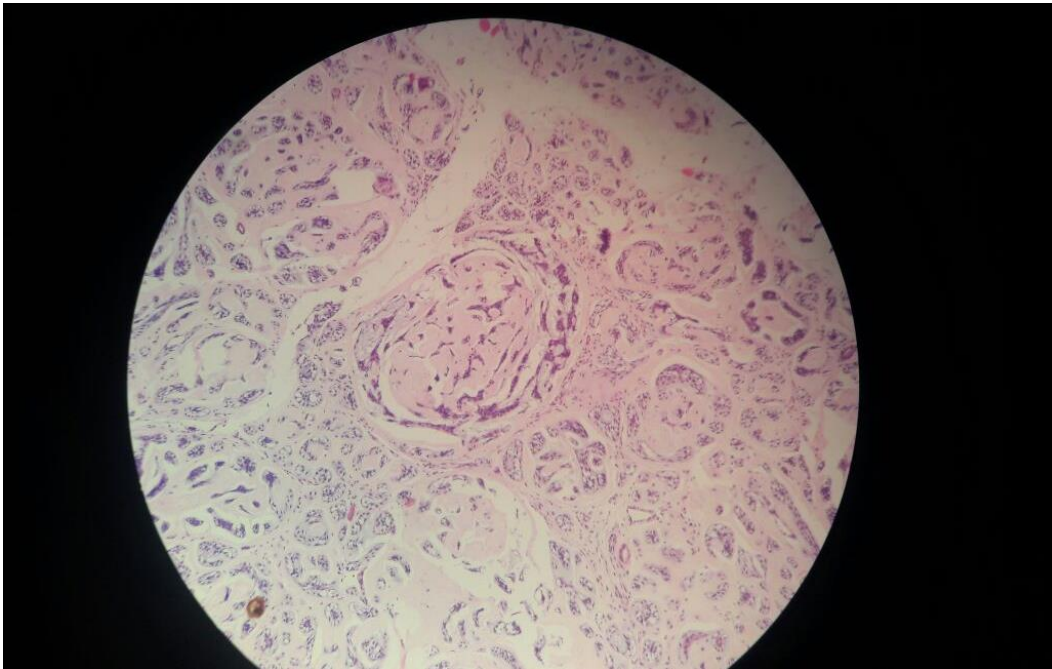
**Photo Micrograph 4:-** Microscopic appearance of Basal cell adenoma showing basaloid cells arranged in tubular pattern. H&E stain (40X).



**Photo Micrograph 5:-** Microscopic appearance of Mucoepidermoid Carcinoma showing epidermoid cells and mucous cells. H&E stain (10X).

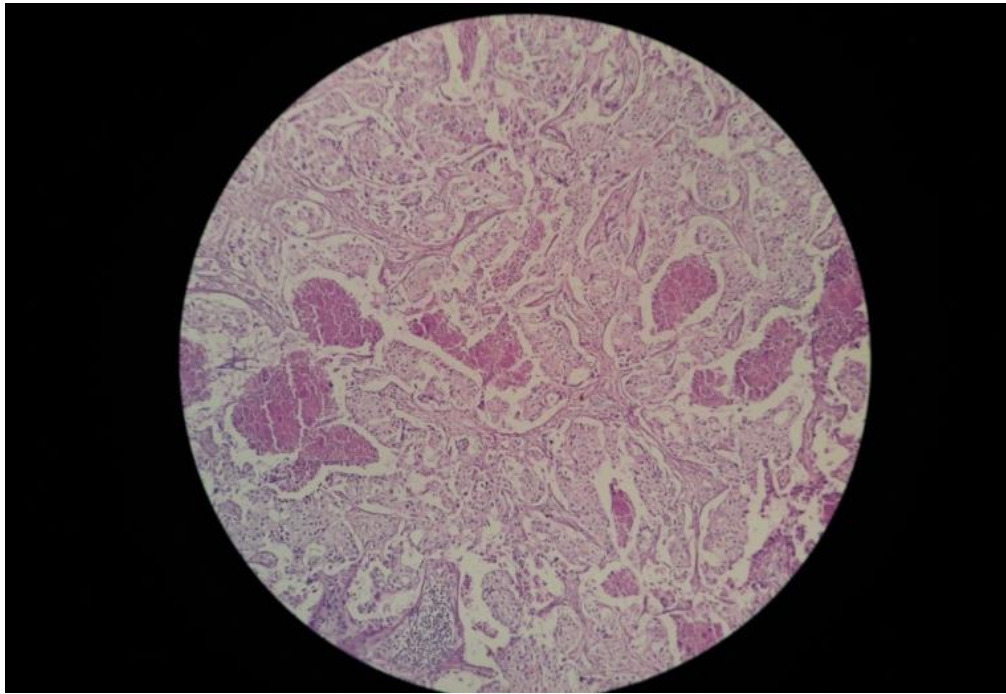


**Photo Micrograph 6:-** Microscopic appearance of Mucoepidermoid Carcinoma showing epidermoid cells and mucous cells. H&E stain (10X)

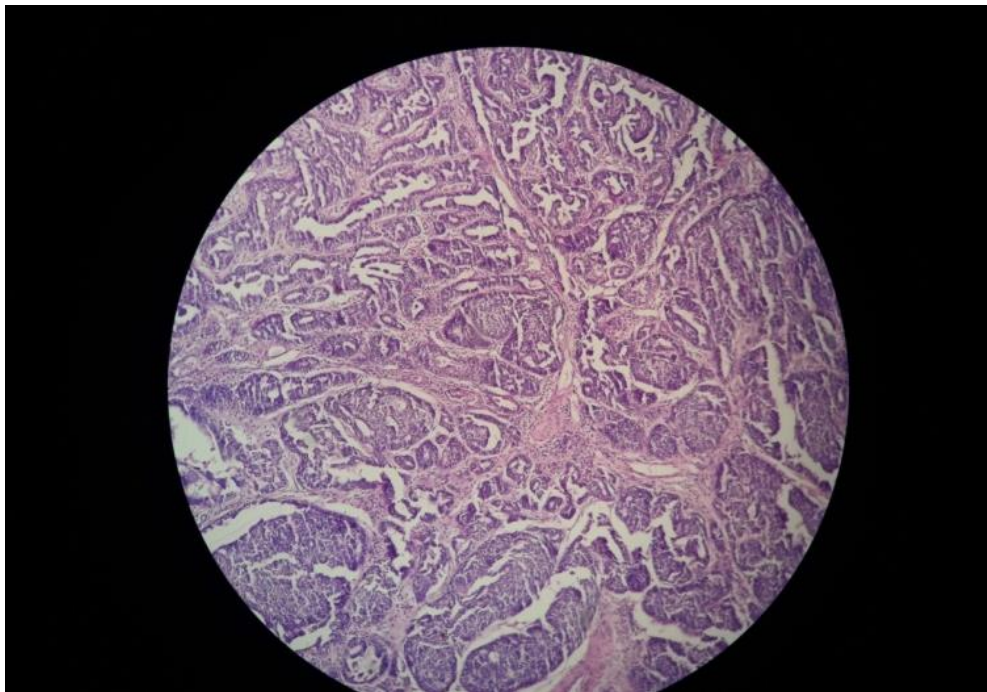


**Photo Micrograph 7:-** Microscopic appearance of Adenoid cystic carcinoma showing small cells arranged around gland like spaces. H&E stain (10X).





**Photo Micrograph 8:-** Microscopic appearance of Carcinoma ex Pleomorphic adenoma showing malignant epithelial component and areas of necrosis. H&E stain (10X).



**Photo Micrograph -9:-** Microscopic appearance of Polymorphous low grade adenocarcinoma showing malignant epithelial glands. H&E stain (10X)

**Discussion:-**

In the present study out of 100 cases of salivary gland tumors, 63(63 %) were benign and 37 (37 %) were malignant. This observation was comparable to the studies including case series by Nepal A et al.<sup>12</sup>, Ali NS et al.<sup>13</sup>, and Moghadam SA et al.<sup>14</sup> where they noted a predominance of benign tumors over the malignant ones. The peak incidence of benign tumours in our study was between second to fourth decade which is similar to the other studies in the Asian subcontinent <sup>15, 16</sup>. The peak incidence of malignant tumors in our study was seen in the fifth decade onwards which is similar to the other studies in the literature<sup>17,18</sup>.

In the present study M: F ratio of malignant salivary gland tumours was 4.2:1 which is higher than the studies conducted by Ahmed et al <sup>19</sup>(M:F ratio 1.1:1), Mohd Ayub et al<sup>20</sup> (M:F ratio 2.25:1) and Iqbal MS et al <sup>21</sup>(M:F ratio 2:1).

In our study parotid gland was the commonest site of tumours (68%) followed by submandibular gland (19%) and Minor salivary glands (13%) which is almost same as studied by Ahmed et al<sup>19</sup>, Pablo et al<sup>22</sup>, Rewusuwan et al<sup>23</sup> and Bashir S et al<sup>24</sup>.

Out of total 42 pleomorphic adenomas in our study, majority occurred in the parotid gland 30cases (71.42%) followed by submandibular gland 9 cases (21.42%) and minor salivary glands 3 cases (7.14%). Potdar and Paymaster <sup>25</sup> reported 183 cases of pleomorphic adenomas, out of which 101 were involving parotid gland (55%).

Benign salivary gland tumours (63%) predominate over the malignant salivary gland tumours (37%). The study conducted by Deepak Soni et al<sup>26</sup> shows it to be 69.33% and 30.66% respectively. Pleomorphic adenoma was the most common salivary gland tumour accounting for 42% of all tumours and 66.6% of all benign tumours. Almost similar results were obtained by the study conducted by Bhavani K et al<sup>27</sup>. The male female ratio of pleomorphic adenoma was 1.8:1. The result was comparable with the result obtained by Vergas et al<sup>28</sup> which showed male female ratio of 2:1.

Warthin tumour comprising of 12% of all salivary gland tumours and 19% of all benign tumours. The study conducted by Pablo et al <sup>22</sup> shows it to be 10.48% and 13% respectively.

91.6% of Warthin tumour were found in the parotid gland which were almost similar to the results obtained by Mohd Ayoub et al<sup>20</sup> and Bashir et al<sup>24</sup>.

Mucoepidermoid carcinoma was the most common malignant tumour comprising of 27% of total malignant salivary gland tumours. The results obtained by the studies conducted by Deepak Soni et al<sup>26</sup> showed it 34.78%, Thomas et al<sup>29</sup> showed it 34.73% and Iqbal MS et al<sup>21</sup> showed it 40%. The peak incidence of Mucoepidermoid carcinoma was seen in 40-60 years with male predominance and male female ratio of 3.2:1 which correlates with the study conducted by Deepak Soni et al<sup>26</sup>.

In our study Parotid gland was the most common site (70%) for mucoepidermoid carcinoma followed by minor salivary glands (17.6%) and submandibular gland (11.7%). Richardson et al<sup>30</sup> reported 52 cases of mucoepidermoid carcinoma in the parotid gland out of 61 cases (85%).

In our study Adenoid cystic carcinoma comprising of 19% Of all malignant salivary gland tumours which correlates with the study done by Deepak Soni et al<sup>26</sup> (21.73%)

Minor salivary glands were the most common site of adenoid cystic carcinoma (41%) followed by submandibular gland (33.3%) and parotid gland (25%). Rewusuwan et al<sup>23</sup> found submandibular gland to be the most common site of adenoid cystic carcinoma in their study.

Carcinoma ex pleomorphic adenoma comprises of 10.8% of all malignant salivary gland tumours which correlates to the study conducted by Deepak Soni et al <sup>26</sup>

**Conclusion:-**

Salivary gland tumours exhibit broad histopathological spectrum. Benign tumours are more common than malignant tumours with Parotid gland being the most common site and Pleomorphic adenoma the most common tumour type. The hurdle in their management lies in the difficulty in distinguishing between benign and malignant tumours.

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### RESEARCH ARTICLE

## PHYSIOLOGICAL, IMMUNOLOGICAL AND HISTOPATHOLOGICAL COMPARISON OF ECHINOCOCCUS GRANULOSUS (G6) CAMEL STRAIN BY DIFFERENT VIABILITY STATUS USING SECONDARY CYST DEVELOPMENT IN RAT

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#### Abstract

The current study aimed to demonstrate the differences in hydatid cysts of *Echinococcus granulosus* (G6) camel strain by different viability status using secondary cyst development in the rat and to study physiological, immunological and histopathological changes associated with. A comparative study was conducted along time of exposure in different groups of rats which intraperitoneally injected with three different status of the viability of hydatid cyst fluid of camel origin (G6). The groups were: low viability protoscolices (1), high viability protoscolices fluid (2), not viable and not completely transformed to the calcareous status of protoscolices fluid (3), and one negative control group. The immunobiology of host-*E. granulosus* interactions were evaluated by measuring IL-10 a cytokine associated with immunoregulation of effector responses. Histopathological changes were conducted in liver, lung, and kidney because these organs are the target of infection and play an important role in the immune status of the host. Results showed that secondary infection by hydatid cyst fluid in the experimental model caused severe pathological changes which increased in rats of groups 2 and 3 along with the time of infection, in addition to considerable changes that revealed by hematological and biochemical tests. The median IL-10 level in rats of group 1 was 6.77 pg/ml compared to 5.74 pg/ml in control group, while the third group recorded the highest level equal 10.45 (above 10.0 pg/ml). The rats of the second group reached to 9.11 pg/ml, but no more survival of rats above 10.0 pg/ml. Elevated IL-10 levels were correlated with poor survival. We concluded that the most effective stage of hydatid cyst development was the stage before transformation to calcareous phase and the most effective changes in serological, biochemical, immunological and pathological changes occur during this stage.

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## Introduction:-

Cystic echinococcosis is a chronic endemic helminthic disease caused by infection with metacestodes (larval stage) of the tapeworm *Echinococcus granulosus*. It is one of the most widespread parasitic zoonosis in animals and humans and one of the hygienic complications in both developing and developed countries (Budkeet *et al.*, 2006; Carmena *et al.*, 2008; Craig *et al.*, 2007; Menezes da Silva *et al.*, 2010). Hydatid cyst parasitizes many mammals including horses, camels, sheep, cattle, and man, in many organs (Rueda *et al.*, 1995) causes severe problems in different animal species especially in animals come in close contact with the final host (Namjoo and Arzanipour, 2014). In man, these cysts cause several complaints as pains or heaviness in abdomen and liver, cough, fatigue or anemia, and are often accompanied by hepatomegaly. It can also result in many acute complications such as anaphylactic responses depending on the number and location of the cysts (Rueda *et al.*, 1995). Ten strains of *E. granulosus* (G1–10) have been described with molecular biology techniques using mitochondrial DNA sequences (McManus and Thompson, 2003). The sheep strain (G1) and camel strain (G6) have a worldwide geographical distribution, specifically in North Africa, the Middle East and in some European countries (Dakkak, 2010; Khalifa *et al.*, 2014; Varcasia *et al.*, 2011). Comparative studies on the development of various isolates of the parasite have proved particularly useful, not only for speciation and taxonomy but also in the epidemiology and control of hydatidosis (Smyth & Davies, 1974; Thompson, 1977; Thompson, 1982).

On hydatid disease two alternative tools have been developed, one is in vitro culture and the other is laboratory animal models (Nakaya *et al.* 2006; Zak and Sande, 1999). Various species of animals (sheep, baboons, monkey, rabbits, mice, gerbils) and various ways of infection (intra-gastric administration of eggs, intraperitoneal, intravenous or subcutaneous injection of activated oncospheres and intraperitoneal inoculation of protoscolices or cysts) have been described (Zak and Sande, 1999). In this study, an attempt was made to develop hydatid cysts (G6 genotyping) in rats following intraperitoneal injection of protoscolices (different viability status) and following different changes occurred in rats of different groups along time of the experiment.

## Materials and Methods:-

### Collection of protoscolices:-

Naturally infected organs (lungs and livers) with hydatid cysts (G6) from camels were collected from El-Bassatein and El-Moneib abattoirs. Cyst fluids were aspirated using sterile disposable syringes and examined for fertility and viability. Cysts which contained no protoscolices (PS), as well as heavily suppurate or calcified, were considered infertile. Fertile cysts were subjected to viability test by centrifugation at 5,000 rpm for 30 min, a drop of the sediment containing the protoscolices was placed on the microscope glass slide and covered with the coverslip and observed for amoeboid-like peristaltic movements (flame-cell activity) with  $\times 40$  objective (Salih *et al.*, 2011). When it became doubtful or confusing to observe such movements, a drop of 0.1% Gentian violet dye solution was added to equal volume of protoscolices in hydatid fluid on a microscopic slide with the principle that viable protoscolices should completely or partially exclude the dye while the dead ones take it up (Macpherson 1985; Smyth and Barrett 1980). Protoscolices were isolated from the fertile cysts washed three times with phosphate buffer saline (PBS pH=7.2) and preserved in labeled sterile tubes contain the same volume of warm Hanks' Balarced Salt Solution (HBSS) for the experiment.

### Animals:-

Seventy-two male albino rats of *Sprague Dawley* strain, with average weight 160- 200 g were obtained from National Research Center, Dokki, Giza, Egypt. Animals were examined to be free from parasitic infection to avoid production of the antibodies before the experiments and kept in Animal house, Faculty of Science, Al-Azhar University, Cairo, Egypt under standard laboratory care of 21°C, 16% moisture, with water available *ad-libitum* and diet contains 20% protein, 3% fat, and 22% fiber. Rats were acclimatized for 7 days before the start of the experiment. Animal experiments were carried out according to Institutional Animal Care and Use Committee, National Research Centre Animal Care Unit.

### Experiment design:-

Animals were randomly divided into four groups (18 rats/ each) as follows: the first group intraperitoneally (IP) injected with low viable protoscolices (380 PS in 0.5 ml HBSS/rat), the second group IP injected with high viable protoscolices (1000 PS in 0.5 ml HBSS/rat), the third group injected with 0.5 ml/ rat of semi-calcareous fluid, before completely calcification, and has no protoscolices, whereas the fourth negative control group administrated with only HBSS. After injection, rats daily examined to monitor external and morphological changes for 3 weeks before



scarifying. Three animals per group were sacrificed at the end of each week from the 3<sup>rd</sup> to the 8<sup>th</sup> weeks (6 weeks) post infection for post-mortem examinations. Before scarifying, rats of the second and third groups died earlier at the 7<sup>th</sup> and 6<sup>th</sup> weeks respectively.

#### **Blood collection and preparation:-**

Rats were anesthetized using cotton wool soaked in chloroform and the abdominal cavity was opened until the sternum using medical scissors. The blood samples were directly drawn from the heart using 5ml sterile syringe into clean, dry centrifuge tubes that allowed to stand for 10 minutes at room temperature, then centrifuged at 3000rpm for 15 minutes using laboratory centrifuge (SM 800B, Surgifriend Medicals, England). Sera were carefully removed and stored frozen at -80° C until used for biochemical and immunological analyzes. Blood used for hematological analysis was collected into heparinized sample tubes containing EDTA to prevent the blood from clotting and taken for analyzes within 24 hours of collection.

#### **Hematological studies:-**

Hematological parameters including red blood cells (RBCs), white blood cells (WBCs) and platelets count in addition to hemoglobin level, hematocrit, mean cell hemoglobin (MCH), mean cell hemoglobin concentration (MCHC), mean cell volume (MCV) were accomplished. The samples were analyzed using the automated hematologic analyzer SYSMEX, KX-21 (Japan) as described by Dacie and Lewis, (1991).

#### **Biochemical analysis:-**

Serum samples were analyzed for total protein (Biuret method) (Smith, 1985), albumin (BromoCresol green (BCG) (Doumaset *et al.*, 1971), cholesterol (Cholesterol Oxidase/ Peroxidase method) (Allainet *et al.*, 1974), Bilirubin (Ballisteri and Shaw, 1987) and glucose (Caraway and Watts, 1987). The activity of liver enzymes Alanine aminotransferase (ALAT), Aspartate aminotransferase (ASAT) was measured by (Gella *et al.*, 1985) method, acid phosphatase (AcP) (Hilman and Klin, 1971), alkaline phosphatase (ALP) (Rosalkiet *et al.*, 1993) and Gamma-glutamyl-transpeptidase (GGT) by SZASZ method (Orlowski and Meister, 1963). All biochemical parameters were determined using a Technicon RA-2000 random access, automated analyzer.

#### **Measurement of cytokines in serum:-**

Rat IL-10 ELISA kit is an in vitro enzyme-linked immuno-sorbent assay for the quantitative measurement of rat IL-10 in serum, plasma, and cell culture supernatants. This assay employs an antibody specific for rat IL-10 coated on a 96-well plate. Standards and samples are pipetted into the wells and IL-10 present in a sample is bound to the wells by the immobilized antibody. The wells are washed and the biotinylated anti-rat IL-10 antibody is added. After washing away unbound biotinylated antibody, HRP- conjugated streptavidin is pipetted to the wells. The wells are again washed, a TMB substrate solution (12 ml of 3, 3,5,5'- tetra-methyl-benzidine in buffer solution) is added to the wells and color develops in proportion to the amount of IL-10 bound. The stop solution (8 ml of 0.2 M Sulfuric acid) changes the color from blue to yellow, and the intensity of the color is measured at 450nm. The data was calculated by measuring the mean absorbance for each set of duplicate standards, controls, and samples, and subtract the average zero standard optical density. The standard curve was plotted on log-log graph paper or using Sigma plot software, with a standard concentration on the x-axis and absorbance on the y-axis. (RayBio® ELISA Kits).

#### **Histopathological preparation:-**

At the end of each week, as shown earlier, portions of liver, kidney, and lung were washed in saline solution and fixed in 10% formalin for 24-48 hours at room temperature, embedded in paraffin and sectioned at 4-6 micrometers. Sections stained with haematoxylin-eosin stain using standard histological technique according to Bancroft (1975) for histopathological examination by Olympus BX51 light microscope.

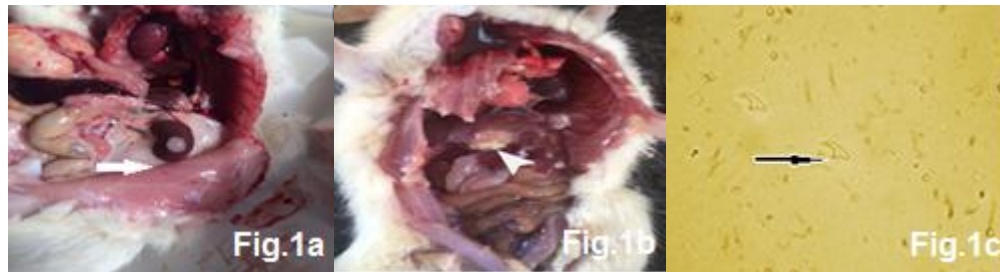
#### **Statistical analysis:-**

The results were expressed as Mean  $\pm$  standard deviation (SD) of the mean. The significance difference between means was evaluated by one-way analysis of variance (ANOVA) followed by post hoc test for the comparison of significance using the Statistical Package program (SPSS version 23). Values of  $P < 0.05$  were considered as statistically significant.

## Results:-

### Parasitology Results:-

The current study revealed several external changes that represented in weight loss, loss of body hair and blindness in the infected groups at the end of the experiment, however, the visual inspection after the autopsy showed different changes as internal bleeding and splenomegaly. Autopsy results detected the appearance of laminated layer stage in livers and kidneys of groups 1, 2 and 3 that started at weeks 7, 6 and 3 after injection respectively (Fig. 1a, 1b) while, protoscolices formation appeared in the last rat of the first group at the end of the experiment. Cysts formation showed in all the infected groups as it appeared at week 7 and 8 in the livers and kidneys of rats in group 1. On the other hand, the second group showed cysts formation in rats' liver at the 7<sup>th</sup> week of infection, while all rats of group 3 showed a formation of cysts in both kidneys and livers starting from the third week of infection until the death of animals earlier at the 5<sup>th</sup> week of infection. No cysts formation were observed in other organs along the experiment. Nucleated layer (N. L.), brood capsule (B. C.), and protoscolices formation (P.) stages were reported in kidneys of group 1 at 8<sup>th</sup> week of the experiment. Also, a smear provoked from hydatid cyst showed hooks (Fig. 1c).



**Fig 1:-**Showing the four stages in the development of secondary hydatid cysts

### Hematological and biochemical results:-

In the current study, the effect of *E. granulosus* infection with different viability status on the hematological and serum biochemical parameters was studied for 6 weeks except for groups 3 and 2 where all animals died earlier at the 6<sup>th</sup> and 7<sup>th</sup> week of administration was summarized in tables (1) and (2) respectively.

Hematological parameters in the control and *E. granulosus* infected groups were recorded after 3 weeks of infection at the end of every week revealed that there was a gradual increase in the white blood cells (WBC) along with time in all studied groups as compared to control. On the other hand, the red blood cells (RBC), hemoglobin (HB) and packed cell volume (PCV) were gradually and significantly decreased all over the infected groups in a dose and time-dependent manner as compared to the control. The lowest values were estimated after 8 weeks of infection in the 1<sup>st</sup> group as all animals in both of group 2 and 3 died at the beginning of the 7<sup>th</sup> week of infection. Likewise, platelets showed a significant decline all over the infected groups in a time-dependent manner with some fluctuations as compared to the control. Mean corpuscular volume (MCV) recorded increased values in groups 1 and 3 except for group 2 that showed unchanged values until the 6<sup>th</sup> week of infection where it recorded a significant decrease as compared to the control values. Meanwhile, mean corpuscular hemoglobin concentration (MCHC) exhibited a significant decline in all treated groups at the beginning of the study that restored to be very close to normal at the 4<sup>th</sup> week except for group 3. Unfortunately, the values could not be followed for both group 2 and 3 as all animals died, but group 1 values showed a continuous decline in MCHC throughout the remaining time of the experiment. However, no significant difference in the mean corpuscular hemoglobin (MCH) between the values of treated groups and those of control was detected (Table 1).

Total protein values showed a significant increase after infection by *E. granulosus* throughout the experiment as compared to the control (Table 2). Meanwhile, albumin exhibited an insignificant decline in the different infected groups with some fluctuations especially in group 2. Moreover, the average globulin levels recorded a significant elevation that becomes clearly noticed from the 4<sup>th</sup> week of the experiment with the highest level in the third group as compared to the normal control. Infected rats showed a gradual significant increase in the glucose levels analog with time after exposure to *E. granulosus* in the different treated groups as compared to control. However, cholesterol levels showed great fluctuations that end in elevation in some groups. Peritoneal administration of *E. granulosus* showed an overall increase in the ASAT and ALAT activities in all groups in a time-dependent manner where the highest levels were obtained after 6 weeks in group 2 as compared to the control. However, *E. granulosus* infection did not show any significant change in the GGT activities in groups 1 and 2, its activity recorded gradual

significant increased values in group 3. In addition, group 1 showed a slight increase in GGT values in the last two weeks of the experiment. Furthermore, *E.granulosus* (G6), camel strain, infected rats showed a marked increase in the levels of serum ALP in comparison with that of control rats as shown in Table (2). No significant difference was detected in AcP levels in group 2, however, its level in group 1 and group 3 showed a gradual significant change that was inversely related to time in group 1 as compared to control. On the other side, the effect of *E.granulosus* showed an increased trend in bilirubin levels that was more pronounced in group 1 as compared to control.

**Table 1:-**Hematological parameters of the infected rats with different doses of *Echinococcus granulosus* as compared to control group.

Week/ Group	RBCs	WBCs	Platelets	HB	MCV	MCH	MCHC	PCV	
3	C	8.12 ± 1	13.8 ± 1	783 ± 1	14.8 ± 0.2	59.2 ± 0.2	18.2 ± 1	30.8 ± 2	48.1 ± 1
	G1	7.42 ± 1	12.4 ± 0.2*	408 ± 2*	12.9 ± 0.1*	64.4 ± 0.1*	17.4 ± 0.5	26.9 ± 0.1*	47.9 ± 0.1
	G2	7.11 ± 2	17.3 ± 0.3*	490 ± 3*	12.3 ± 0.2*	58.4 ± 1	17.3 ± 1	29.6 ± 0.5*	41.5 ± 0.5*
	G3	5.97 ± 0.3	16.9 ± 0.5*	632 ± 1*	10.1 ± 1*	61 ± 0.5*	16.9 ± 0.1	27.7 ± 0.3*	10.1 ± 1*
4	C	8.12 ± 2	13.8 ± 0.2	783 ± 2	14.8 ± 1	59.2 ± 1	18.2 ± 2	30.8 ± 2	48.1 ± 1
	G1	5.3 ± 0.2*	19.8 ± 0.3*	407 ± 2*	10.9 ± 0.1*	69.1 ± 0.8*	20.4 ± 2	29.7 ± 0.3	36.2 ± 0.2*
	G2	6.65 ± 1	17.3 ± 0.3*	485 ± 5*	11.3 ± 0.5*	58.3 ± 0.2	16.9 ± 0.6	31.8 ± 0.2	35.5 ± 0.5*
	G3	4.3 ± 0.3*	21.2 ± 2*	309 ± 2*	9.2 ± 1*	74.5 ± 0.5*	21.2 ± 2	28.4 ± 0.4*	9.2 ± 2*
5	C	8.1 ± 0.5	13.8 ± 1.5	783 ± 3	14.8 ± 0.1	59.2 ± 0.1	18.2 ± 0.2	30.8 ± 0.5	48.1 ± 0.5
	G1	5.1 ± 0.5*	21.9 ± 0.1*	408 ± 2*	10.4 ± 0.5*	68.9 ± 2*	20.3 ± 0.2*	29.4 ± 1	35.3 ± 0.3*
	G2	5.98 ± 1*	18.3 ± 2*	465 ± 4*	11 ± 0.7*	58.3 ± 0.2	18.3 ± 0.5	31.5 ± 0.5	34.9 ± 0.1*
	G3	4.2 ± 0.1*	22.3 ± 0.2*	300 ± 6*	8.5 ± 0.9*	74.2 ± 1.2*	20.1 ± 1*	29.6 ± 0.3*	8.4 ± 0.5*
6	C	8.1 ± 1.5	13.8 ± 0.5	783 ± 2	14.8 ± 0.5	59.2 ± 3	18.2 ± 1.5	30.8 ± 1	48.1 ± 0.8
	G1	5.1 ± 0.1*	22.7 ± 2*	487 ± 1*	10 ± 0.9*	68.6 ± 0.3*	19.6 ± 0.4	28.6 ± 1	35 ± 1*
	G2	5.6 ± 0.5*	22 ± 0.6*	407 ± 3*	10.8 ± 0.2*	51.2 ± 0.3*	16.26 ± 2	31.8 ± 0.5	34 ± 0.6*
7	C	8.12 ± 1	13.8 ± 2	783 ± 4	14.8 ± 2	59.2 ± 0.5	18.2 ± 0.3	30.8 ± 0.9	48.1 ± 2
	G1	5 ± 1*	27 ± 0.5*	491 ± 1*	9.3 ± 0.5*	69.2 ± 0.5*	18.6 ± 1	27.1 ± 0.1*	34.3 ± 2*
8	C	8.1 ± 0.6	13.8 ± 0.8	783 ± 3	14.8 ± 1.5	59.2 ± 2	18.2 ± 0.8	30.8 ± 3	48.1 ± 1.5
	G1	4.9 ± 0.5*	28 ± 1*	465 ± 2*	8 ± 2*	69.8 ± 0.2*	16.4 ± 0.2*	23.5 ± 0.5*	34 ± 0.5*

The values are expressed as mean ± SD. \* P < 0.05 level compare with control group. C: control group.

#### Immunological results:-

The first signs of immune reaction can be observed with the naked eye in the liver, as the small accumulation of cells and appearance of hydatid cyst, as early as 3 weeks after infection. In the early phase of echinococcosis infection (21 days post infection), the concentrations of IL-10 in the sera of the infected rats of group 1 was the same as that of healthy control rats. However, comparing IL-10 concentration for the other two groups recorded increased levels that reached maximum level in rats of group 3. By progression, in the time of the experiment, we noticed a gradual increase in IL-10 levels (Table 3). We also observed when measured IL-10 levels in serum of infected rats; Group (1) still in low levels by comparison with other groups until the end of the experiment (56 days). Group (2) showed gradually increasing until 42 days after the rest of rats died. Group (3) started by an approximately high level of IL-10 and increased until reached to peak (10.45) in 35 days in the last rat of group 3.

**Table 2: -** Biochemical parameters of the infected rats with different doses of *Echinococcus granulosus* as compared to control group.

Week/ Group	Total protein	Albumin	Globulin	Glucose	Cholesterol	
3	C	7.6 ± 1	4.1 ± 1	3.5 ± 0	120 ± 1	63 ± 2
	G1	7.47 ± 0.8	4.5 ± 0.5	2.97 ± 0.4	137 ± 1.1*	62 ± 1
	G2	8.47 ± 1.7	3.33 ± 0.3	5.13 ± 1.4*	118 ± 0.4	49.2 ± 1.5*
	G3	8.37 ± 0.85	4.6 ± 0.5	3.77 ± 0.4	163 ± 1.5*	35.5 ± 0.5*
4	C	7.6 ± 0.5	4.1 ± 0.5	3.5 ± 0	120 ± 0.5	63 ± 1
	G1	9 ± 1*	4.4 ± 1	4.6 ± 0	142 ± 0.9*	72 ± 0.2*
	G2	9.3 ± 0.6*	3 ± 2	6.3 ± 1.4*	118 ± 2	53.2 ± 0.1*
	G3	9.1 ± 0.6*	3.84 ± 0.9	5.3 ± 0.3*	195 ± 2*	54 ± 0.5*
5	C	7.6 ± 2	4.1 ± 2	3.5 ± 0	120 ± 2	63 ± 0.5
	G1	9.6 ± 0.5	4 ± 0.5	5.6 ± 0*	168 ± 1*	72.7 ± 0.2*

	<b>G2</b>	10.5± 1.5*	2.57± 0.3	7.9± 1.2*	127± 2.3*	59.16± 1.8*
	<b>G3</b>	9.2± 0.2	3.6± 0.1	5.6± 0.1*	331± 1*	59.33± 1.3*
<b>6</b>	<b>C</b>	7.6± 0.1	4.1± 3	3.5± 2.9	120± 0.1	63± 0.1
	<b>G1</b>	10.53± 1.18*	3.9± 2	6.63± 1.09*	190± 1.1*	72.9± 0.28*
	<b>G2</b>	11.2± 0.5 *	2.52± 0.5	8.68± 0.03*	148± 0.5*	67.9± 0.9*
<b>7</b>	<b>C</b>	7.6± 3	4.1± 2	3.5± 1	120± 3	63± 3
	<b>G1</b>	11.3± 0.2 *	2.22± 0.2	8.98± 0.03*	210± 0.8*	72.9± 0.28*
<b>8</b>	<b>C</b>	7.6± 1.5	4.1± 2	3.5± 0	120± 1.5	63± 0.6
	<b>G1</b>	11.3± 0.2*	2.22± 0.2	8.98 ± 0.03*	241± 1.2*	72.9 ± 0.28*

Weeks/ Group	ALP	AcP	ALAT	ASAT	GGT	Bilirubin	
<b>3</b>	<b>C</b>	18.03± 0.15	0.03± 0.01	18± 0.5	72.3± 1.1	8 ± 2	0.24± 0.01
	<b>G1</b>	32± 1*	0.9± 0.03*	32± 1*	170± 2.2 *	6.6± 0.2	0.45± 0.02*
	<b>G2</b>	20± 1.5*	0.02± 0.01	58± 0.8*	212± 3.4*	10± 1	0.29± 0.02*
	<b>G3</b>	27± 0.9*	0.06 ± 0.02	25± 5*	140.67± 1.5*	17± 0.6*	0.31± 0.03*
<b>4</b>	<b>C</b>	18.03 ± 0.5	0.03 ± 0.0	18 ± 2	72.3 ± 1.1	8 ± 0.5	0.24 ± 0.01
	<b>G1</b>	34± 2*	0.7± 0.04*	33.8± 0.1*	184± 0.1*	6± 3	0.67± 0.02*
	<b>G2</b>	22.9± 3*	0.02± 0.01	58± 0.7*	380± 2*	9.3± 0.3	0.3± 0.1
	<b>G3</b>	27± 0.7*	0.2± 0.05*	48± 2*	255± 0.5*	25± 0.8*	0.35± 0.01*
<b>5</b>	<b>C</b>	18.03± 0.1	0.03± 0.01	18± 1	72.3± 1.1*	7.97± 0.65	0.24± 0.01
	<b>G1</b>	26± 0.2*	0.5± 0.1*	34± 0.4*	304± 0.6*	7.0± 0.9	0.32± 0.01*
	<b>G2</b>	24± 0.3*	0.04± 0.43	70± 0.1*	480± 5*	9± 3	0.3± 0.01*
	<b>G3</b>	29± 0.7*	0.18± 0.01*	85± 5*	469.3± 1.5*	26± 0.1*	0.4± 0.04*
<b>6</b>	<b>C</b>	18.1± 0.3	0.03± 0.01	18± 5	72.3± 1.1	8± 0.01	0.24± 0.01
	<b>G1</b>	26± 0.2*	0.5± 0.05*	36.9± 0.1*	412± 2.5*	8.6± 0.2	0.54± 0.04*
	<b>G2</b>	24.3± 0.15*	0.01± 0	90± 0.4*	527± 3*	8± 1	0.42 ± 0.03*
<b>7</b>	<b>C</b>	18.1 ± 0.2	0.03± 0.01	18± 0.4	72.3± 1.1	8± 1	0.24± 0.03
	<b>G1</b>	27± 0.4*	0.3± 0.03*	37.8± 0.2*	409± 5*	10.2± 0.5*	0.43± 0.01*
<b>8</b>	<b>C</b>	18.1 ± 0.3	0.03± 0.01	17.7± 1.2	72.3± 1.1	8± 0.4	0.24± 0.2
	<b>G1</b>	27 ± 1*	0.3 ± 0.01*	38 ± 2.5*	432 ± 3.3*	11.0000*	0.28 ± 0.2

The values are expressed as mean ± SD. \* P< 0.05 level compare with control group. C: control group.

### Histopathological results:-

The present study showed the histopathological changes produced mainly in kidneys, liver and to a lesser extent in lungs of rats which appeared as morphological changes, and also autopsy results showed the presence of hydatid cysts especially in both liver and kidney organs:

**Table 3:-** The change in Interleukin-10 (pg. /ml) levels in infected rats with different doses of *Echinococcus granulosus* as compared to control group.

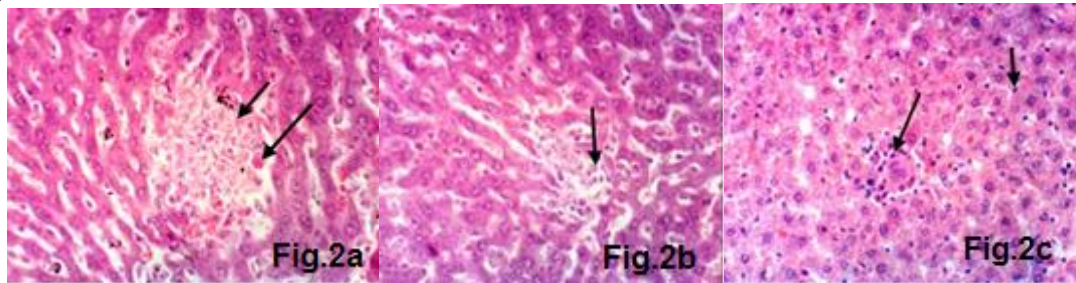
Groups	Control	G1	G2	G3
Week 3	5.74± 0.02	5.74± 0.04	6.93 ± 0.03*	7.64± 0.03*
Week 4	5.74± 0.03	5.89 ± 0.01*	7.57 ± 0.05*	8.99 ± 0.04*
Week 5	5.74 ± 0.04	6.05 ± 0.05*	8.08 ± 0.08*	10.45 ± 0.04*
Week 6	5.74 ± 0.05	6.12 ± 0.06*	9.11 ± 0.06*	-----
Week 7	5.74 ± 0.04	6.45 ± 0.04*	-----	-----
Week 8	5.74 ± 0.04	6.77 ± 0.03*	-----	-----

The values are expressed as mean ± SD. \* P< 0.05 level compare with control group

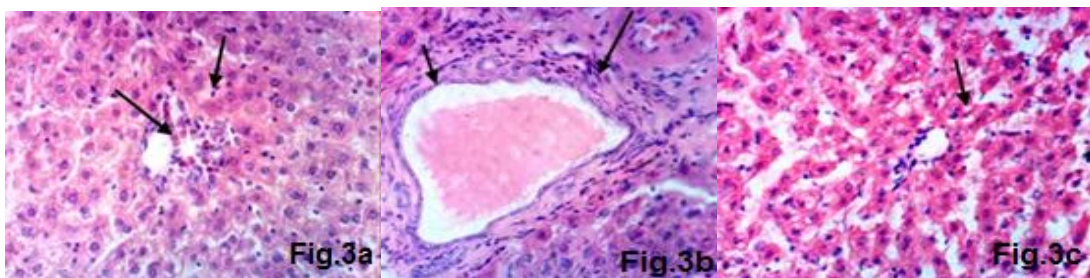
### Liver:-

The histological sections in the liver of rat group3 (21days post-infection) showed focal hepatic necrosis associated with inflammatory cells infiltration as well as apoptosis of hepatocytes in addition to sinusoidal leukocytosis (Fig.2a, b,c). Also the histological sections in the same group but in 28 days post infection showed severe pathological changes which increased with post-infection (Fig.3a). These changes were Kupffer cells activation and small focal hepatic necrosis associated with inflammatory cells in addition to portal infiltration with eosinophils and cystic dilatation of bile duct and fibroplasia in the portal triad around the bile duct (Fig.3b), and at end of experiment the

liver of the last rat in group 1 showed dissociation of hepatic cords and cytoplasmic vacuolation of hepatocytes (Fig.3c).



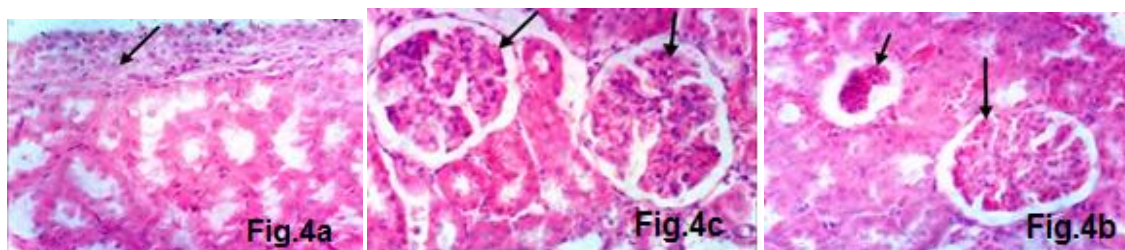
**Fig 2:-**Sections of rat livers of group 3 after 3 weeks of infection showing focal hepatic necrosis associated with inflammatory cells infiltration as well as apoptosis of hepatocytes (a), sinusoidal leukocytosis (b), and Kupffer cells activation and small focal hepatic necrosis associated with inflammatory cells infiltration (c) (H & E X 400).



**Fig 3:-**Sections of rat livers of group 3 after 4 weeks post infection showing Kupffer cells activation and portal infiltration with eosinophil (a), and dilatation of bile duct and fibroplasia in the portal triad around the bile duct (b). Whereas, liver of rat from group 1 in 56 day post infection showing dissociation of hepatic cords and cytoplasmic vacuolation of hepatocytes (c) (H & E X 400).

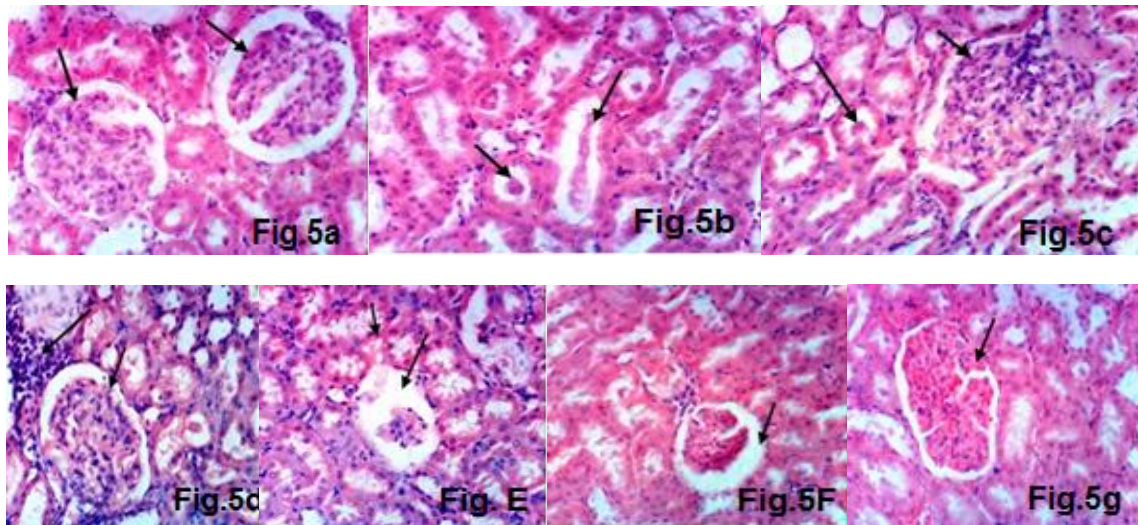
#### **Kidney:-**

The histological sections in the kidney of infected rat groups are demonstrated in Figures 4a-c and 5a-g. Kidney of rats in group 1 revealed inflammatory cells infiltration in the renal capsule, atrophy of some glomerular tuft, congestion, and hypertrophy of another glomerular tuft, also results showed hyper-cellularity of glomerular tuft. Histopathological changes which occurred in 5 weeks post infection in the rats of groups (2 & 3) which increased by increasing the time represented in the eosinophilic proteinaceous material in the lumen of renal tubules. Hyper-cellularity of the glomerular tuft and the eosinophilic proteinaceous material in the lumen of renal tubules. Thickening of the glomerular basement membrane and focal inflammatory cells infiltration. Vacuolation of tubular epithelium, atrophy of glomerular tuft and distension of Bowman's space. Slight distension of Bowman's space, and thickening of glomerular basement membrane with congestion of glomerular tuft.



**Fig 4:-**Sections of rat kidneys of groups 2 & 3 after 5 weeks post infection showing inflammatory cells infiltration in the renal capsule (a), atrophy of some glomerular tuft, congestion and hypertrophy of other glomerular tuft (b), and congestion and hypertrophy and hyper-cellularity of glomerular tuft (c) (H & E X 400).

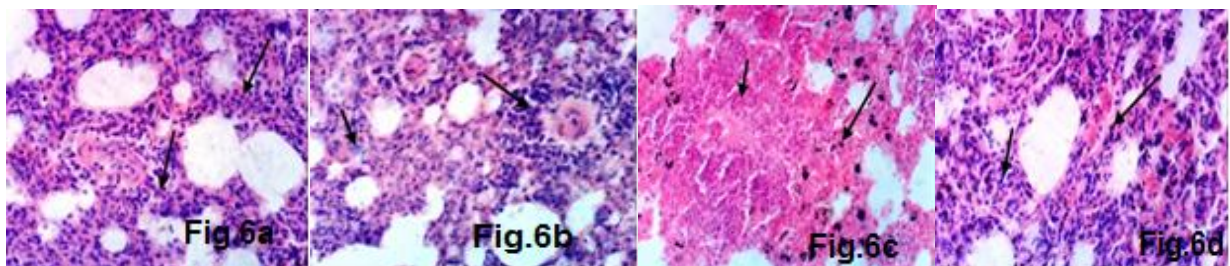




**Fig. 5:-**Sections of rat kidneys of group 1 after 6 weeks post infection showing hyper-cellularity of glomerular tuft (a), eosinophilic proteinaceous material in the lumen of renal tubules (b, c), thickening of the glomerular basement membrane and focal inflammatory cells infiltration (d), Vacuolation of tubular epithelium, atrophy of glomerular tuft and distension of Bowman's space (e), slight distension of Bowman's space, and thickening of glomerular basement membrane with congestion of glomerular tuft (f).

#### Lung:-

Pathological examination of alveolar tissues in the present study revealed that chronic interstitial pneumonia, interstitial pneumonia, and haemosidrosis, in the rat of group 1 in 8 weeks, while the last rat of group 3 at 5 weeks showed the same results in addition to perivasculitis (Fig. 6a-c).



**Fig. 6:-** Sections of rat lungs of group 3 after 6 weeks post infection showing chronic interstitial pneumonia (a), perivasculitis (b), haemosidrosis (c). Lung of rat from group 1 in 56 day post infection showing chronic interstitial pneumonia and haemosidrosis (d) (H &E X400).

#### Discussion:-

Although the last decade has clarified many aspects of host-parasite relationship in human cystic echinococcosis, establishing the full mechanisms that cause the disease in other intermediate hosts requires more studies (Siracusano *et al.*, 2012). It is generally accepted that *Echinococcus* is unaffected by the immune response during the developing stage. However, natural infections in sheep indicate that some cysts can be killed during the latter stages of development (Zhang and Zhao, 1992), with the relatively frequent occurrence of dead, calcified metacestodes or necrotic cysts. In our experimental study, Hydatid cysts of *E. granulosus* developed in internal organs (mainly the liver and kidney) of the three group rats as unilocular fluid-filled bladders that consist of two parasite-derived layers, an inner nucleated germinal layer and an outer a cellular laminated layer surrounded by a host-produced fibrous capsule. Brood capsules and protoscolices (PSC) bud off from the germinal membrane. Some cysts indicate enlargement in size, but in some portions active small-cysts takes place. These enlarged cysts have a close relation to brood capsule and scolex formation. In addition, no calcification could be detected in those lesions growing rapidly along this short cycle in early infection until the end of the experiment. A previous study by Holcman and Heath (1997) showed that secretions from the penetration glands of hatched and activated oncospheres of *E. granulosus* because lysis of host tissues may protect the parasite against the host immune response while the

laminated layer develops. Another study by Rogan (1988) explained that as the primary cyst having degenerated, leaving the cavity full of host leukocytes and protoscolex-derived daughter cysts. In our opinion, the infection is in progress not in the abortive form of the disease. Moreover, the progression of cyst degeneration does take place in group 3, then 2 and after that group 1 in ascending order may signify increased immunological stimulation with cyst progression. This in contrast to the reports by Wang *et al.* (2011) that they considered the mild calcification was easy to be detected in those lesions growing rapidly in short cycle.

In the present study, the increasing trend of WBCs may be considered as a defense mechanism against the inflammatory processes which may be produced in the body (especially in the liver) and lead to an increase of WBCs production of the stimulated bone marrow. Likewise, Younuset al., (2016) have been related these changes to the lytic effect of the newly developing *E. granulosus* hydatid cysts. These results are in agreement with the findings of Al –Nasiri, 2006; Moraitakiet al., 2010; Khalaf, 2013. Previous studies in experimentally induced secondary infections in mice, intraperitoneally injected PSC are surrounded by a considerable cellular infiltration within 3 days, initially involving activated macrophages and subsequently including neutrophils, eosinophils, and lymphocytes (Richards *et al.*, 1983; Riley *et al.*, 1986; Riley *et al.*, 1985). As far as, red blood cells, platelets, hemoglobin and packed cell volume are usually kept in normal levels through a balance between the new formation and the destruction of old cells in the control group. Our investigation recorded a significant decrease in these parameters which come in a dose and time-dependent manner that may be attributed to increased hemolysis or disturbance in the hemopoietin system which slows of its production (Guyton, 1993). Moreover, Frayha and Haddad, 1980 and Akhtar *et al.*, 1998 related these changes to HCF enzymes that cause an increase in the blood cells destruction. Similar results were obtained from previous studies by Tanveeret al., 1997 and Akhtar *et al.*, 1998 whereas Khalaf, 2013 reported no changes in these parameter concentrations in rats with *E. granulosus*. Increased MCV and decreased MCHC that observed in the inoculated groups of this study may indicate a macrocytic hypochromic anemia that cope with the increasing demand of oxygen requirement. The erythrocyte enlargement may be related to an accumulation of fluids after disturbance of cell membrane permeability. Similar findings have also been previously reported (Akhtar *et al.*, 1998; Xhemollari *et al.*, 2016).

Determination of plasma proteins reported having significant prognostic and diagnostic values, especially in liver diseases. Results of the present study revealed a marked increase in serum total protein that may be imputed to increased release of tissue specific enzymes and other intracellular proteins secondary to parasite-induced cell membrane disruption (Orhue and Nwanze, 2004). Similar findings have been reported by Tanveeret al. (1997) and Radfar and Iranyar (2004) but they attributed this increase in protein to incoming CHCF that already contained different kinds of proteins. Rueda *et al.*, 1995 and Anwar and Tanveer, 2000 interpreted this elevation in protein concentration with time by the formation of antibodies against antigens present in hydatid cyst fluid (HCF). In agreement with this, our findings revealed a statistically significant elevation in globulins. As far as serum globulins were concerned, several reports determined its alterations with various parasites and revealed its increase specifically in the endoparasites infection Ayazet al., 2007; Dede *et al.*, 2014). On the other hand, our results disagree with those reported by Smyth (1979) and Meduri *et al.* (1990) that reported a decline in protein level and related this to its use by the parasite, since the protoscolices of *E. granulosus* can digest host proteins. A drop in albumin levels was determined in our results in spite of there were no statistical difference as compared to control that may be attributed to the long half-life of albumin, therefore, a decrease in serum albumin is usually not apparent early in the course of liver diseases (Halsted and Halsted, 1981; Cheesbrough, 1998). This hypoalbuminemia may imply a combination of impaired synthesis and loss via the gut, kidney or both as revealed by several studies in various parasite diseases (Yeruhamet al., 1998, Turgut, 2000; Zygnere *et al.*, 2007).

Our biochemical results revealed a marked increase in glucose in the experimentally infected animals that may be due to the effect of the infection on the liver which play an important role in the glucose metabolism (Khalaf, 2013) or occurrence of glycolysis and gluconeogenesis cycles which related to energy production within parasite cyst (El-Bayati *et al.*, 2010). This in accordance with Shaafie *et al.*, 1999 and Muhsin *et al.*, 2015 who recorded high levels of glucose in the primary intermediate host. As far as the activity of enzymes is concerned, ALP, ALAT and ASAT activities were also measured showed an increase among the treated groups compared to the negative control group. Several studies have also previously reported significant increases in ALP, ALAT, and ASAT activities in *E. granulosus* infected animals (Abdulla, 2007; Shindala *et al.*, 2007). These studies explained that the liver infection with Cestodes tapeworms led to hepatocyte destruction and enzyme release or even indicates a cellular response. On the other hand, AcP values were closely related to the control values at the beginning of the experiment then trend to decrease with time. Rahman *et al.* (1992) suggested that the decrease in the activities of AcP might be due to the

increased permeability of plasma membrane or cellular necrosis that showing the stress condition of the treated animals. Taken together, the serum total bilirubin concentrations were dramatically increased in *E. granulosus* infected groups that may be related to additional enzymes produced by the protoscolices and/ or brood capsule (Anwar and Tanveer, 2000). Increased quantity of total bilirubin also may indicate the increased breakdown of hemoglobin that interprets the decreasing levels in hemoglobin and RBCs levels of our investigation.

During cystic echinococcosis (CE) the host-parasite relationship is interactive and the outcome of infection depends on the balance achieved by the combination of the different variables involved with the host immunity and the *E. granulosus* avoidance strategies (Siracusano *et al.*, 2008). There is no direct evidence that the viability, death or calcified of such cysts is due to an immunological phenomenon, but it is a likely possibility. In addition, there are no detailed studies of immunological events associated with the degeneration of different types of the cyst, and it is, therefore, unknown which mechanisms may be involved. Our experimental study in rat supported the possible local immunosuppression mediated by IL-10 as a possible mechanism that helps the parasite in escaping the host cell-mediated response in agree with Mondragón-De-La-Peña *et al.* (2002).

The co-expression of IL-10 and IFN- $\gamma$  at high levels in human hydatidosis suggests that the immune response to *E. granulosus* infection may be due to the very complex mixture of antigens in hydatid cyst fluid (McManus and Bryant, 1995) which probably contain distinct epitopes for each T-cell subset. Like other helminthic infections (Finkelman *et al.*, 1991; Lange, *et al.*, 1994; Pearce *et al.*, 1991), echinococcosis induces two very distinct Th1 and Th2 cytokine secretion patterns. It is not understood why hydatid infection can induce high levels of both Th1 (produce IL-2, IFN- $\gamma$ , and lymphotoxin), and Th2 cytokines (express IL-4, IL-5, IL-6, IL-10) since they usually down-regulate each other (Pearce *et al.*; 1991). In our results, elevated levels of IL-10 that produced in vivo experimental infection were correlated with poor survival in rats and accompanied with severe pathological changes which increased in rats of high and calcareous groups and period post-infection. This is in agreement with Haralabidis *et al.* (1995) who reported that primary and secondary infections elicit similar responses, which include elevated levels of IL-10. And the increased production of IL-10 in hydatid disease patients corresponds to high levels of IgE (Babba *et al.*, 1994).

### **Conclusion:-**

The effective stage of hydatid cyst development was the stage before transformation to calcareous stage. The most effective changes in serological, biochemical, immunological and pathological changes occur during this stage. Secondary infections by hydatid cyst fluid in experimental rats caused an alteration in liver functions in addition to changes in blood and body chemistry which showed by hematological and biochemical tests. Elevated IL-10 levels were correlated with poor survival in rats. Microscopically examination of livers and lungs of animals of different groups showed severe pathological changes which increased in rats of low and calcareous groups and period post-infection. The change of physiological parameters could be considered as a good diagnostic and reliable indicator to monitor the progress and severity of *E. granulosus* infection.

### **Ethical approval:-**

All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

### **Conflict of Interests:-**

The authors declare that they have no conflict of interests regarding the publication of this paper

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## RESEARCH ARTICLE

### ADVANCE TRAFFIC CONTROL AND PLANNING.

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#### Abstract

Traffic control can be regarded as a multi agent application in which car-agents and traffic-light-agents need to coordinate with each other to optimize the traffic flow and to avoid congestions. It is important to know the road traffic density real time especially in mega cities for signal control and effective traffic management. Traffic lights play an important role in the traffic management. The existing traffic lights follow the predetermined sequence. So these lights are called static traffic lights. These traffic lights are not capable to count the number of vehicles and the priority of the vehicles on intersection point. As a result some vehicles have to wait even there is no traffic on the other side. The vehicles like Ambulance and Fire Brigade are also stuck in traffic and waste their valuable time. In this paper, we propose an adaptive traffic light control algorithm that adjusts both the sequence and length of traffic lights in accordance with the real time traffic detected. Our algorithm considers a number of traffic factors such as traffic volume, waiting time, vehicle density, etc. and system also provides quality of service to Emergency vehicles.

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#### Introduction:-

This paper presents an automatic road traffic management systems that manage road traffic with the goal of improving traffic safety, optimizing the speed of the flow of traffic, and minimizing the energy consumption of vehicles running on the roads. Most existing work use a fixed sequence for traffic lights control, and take minimum average waiting time and number of vehicle stops as objectives. Most of them use the sensor to calculate current volume of traffic but this approach has the limitation that these techniques based on counting of the vehicles and treats a emergency vehicles as the ordinary vehicles means no priority to ambulance, fire brigade or V.I.P vehicles. With this system, we can consider the priority of different type of vehicles and also consider the density of traffic on the roads by installing RF reader on the road intersections. Radio frequency identification is a technique that uses the radio waves to identify the object uniquely. Section {I} represents the method a model problem and some notation and traffic control algorithm to detect the traffic condition, and then determine green light sequence and the green light length , section {II} represents the performance of our algorithm through simulation and implementation and section {III} represents provides approach to information regarding the priority of the vehicle and type of the vehicle with the help of VIN based on RFID Technique. Radio frequency identification is a technique that uses the radio waves to identify the object uniquely. RFID is a technique that is widely used in the various application areas like medical science, commerce, security, Electronic toll collection system, access control etc. There are three main components of RFID: RFID tag, RF Reader and Database. Various types of tags are available but we can mainly

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divide them into two categories: passive tags and active tags. The passive tags don't contain any internal power source. There are three parts of the tag: antenna, semiconductor chip and some form of encapsulation. The life of the passive tag is very long. The reader sends electromagnetic waves that produce current in the tag's antenna. In response antenna reflects the information stored in it. The active tags contain a battery as an internal power source used to operate microchip's circuitry and to broadcast the information to the reader. The range and cost of these tags is more as compare to passive tags . We have three kinds of tags which work on the three different frequency ranges: low – frequency, high-frequency and ultra high frequency. The Low frequency tags works on frequency lies between 30 ~ 300 KHZ and High Frequency and Ultra High Frequency Tag works on the frequency range lie 3 ~ 30 MHZ and 300 ~ 3 GHZ respectively

**Problem Modeling and Notations:-**

How to respond to a dynamically changing traffic environment adaptively to improve controlling efficiency. the efficiency includes maximum intersection throughput (the number of vehicles passing through the intersection), and minimum vehicle's average waiting time. the efficiency includes maximum intersection throughput (the number of vehicles passing through the intersection), and minimum vehicle's average waiting time. has two sensor nodes, one is installed at the intersection and the other is with a given distance, called *Sensor Distance*, from the intersection.

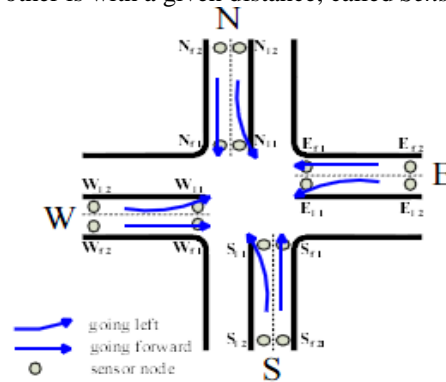


Fig. 1. Isolated Intersection

Subject to traffic safety rules, there exists a maximum of twelve different possible cases of green lights, in Fig. 2. Therefore, in face of dynamically changing traffic environment, the problem is transformed to decide which case should obtain green light next and how long it should last for.

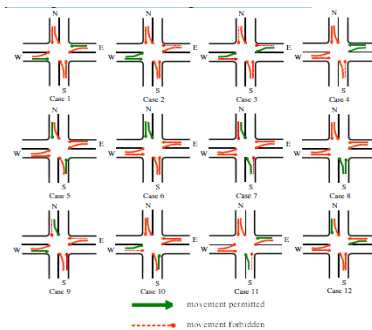


Fig. 2:- Twelve possible configurations of green lights

To formulate the problem, we use the following notations, and assume that all vehicles run at a constant speed *speed* and all the vehicles are in the same type:

$I = \{\text{north, south, east, west}\}.$

$J = \{\text{forward, left}\}.$

$R = \{1,2,3,\dots,8\}.$

$C = \{1,2,3,\dots,12\}.$

$TP$ : total throughput.

$AVGWT$ : average waiting time.

$T$ : total time period.

$DP(k, t)$ : number of vehicles passing through the intersection at case  $k$  at time  $t, k \in C$ .

$WT(k, t)$ : sum of vehicles' waiting time at case  $k$  at time  $t, k \in C$ .

$RM(k, t)$ : number of vehicles at case  $k$  at time  $t, k \in C$ .

$Xy1$ : sensors installed at the intersection in lane  $y$  at direction  $X, X \in I, y \in J$ .

$Xy2$ : sensors installed with distance *Sensor Distance* from intersection in lane  $y$  at direction  $X, X \in I, y \in J$ .  
Efficiency:

$$Max\ TP = Max \frac{\sum_{t=1}^T \sum_{k \in C} DP(k,t)}{T}$$

$$Min\ AVGWT = Min \frac{\sum_{t=1}^T \sum_{k \in C} WT(k,t)}{\sum_{t=1}^T \sum_{k \in C} RM(k,t)}$$

Equation 1 calculates the maximum number of vehicles passing through the intersection within a unit of time ( $TP$ ), Equation 2 calculates the minimum vehicle's average waiting time ( $AVGWT$ ) during time period  $T$ .

**Proposed Algorithm:-**

Traffic light control algorithm based on the above established model. The algorithm contains three steps: vehicle detection, green light sequence determination and light length determination. Vehicle detection detects and calculates traffic information in real-time. Green light sequence determination uses the traffic information to determine the next green light to the case in the most need. Light length determination determines how long the green light will last for. At the beginning, we set a control cycle  $T_{control}$  first, which is defined as an upper bound of light length. This value of  $T_{control}$  is based on expert knowledge.

**Vehicle Detection:-**

The first step is to detect arrival and departure rate of vehicles in each lane, and then collect relevant data, with sensor nodes installed in each lane of the intersection, as illustrated in Fig. 1. Sensor nodes detect the number of vehicles in each lane and each vehicle's ID and type.  $Xy1$  is responsible to detect vehicles at the intersection,  $Xy2$  is responsible to detect vehicles from the intersection with distance *Sensor Distance* mentioned. *Sensor Distance* is equal to  $T_{control} \times speed$  so that  $Xy1$  will get the information of the vehicles which will reach the intersection after  $T_{control}$  time in advance through the communication between  $Xy1$  and  $Xy2$ . Using these detected data, the arrival rate and departure rate in each lane real-time can be determined. In a lane having green light, both arrival and departure rates are calculated in real-time. In a lane having red light has the departure rate of zero and the arrival rate reflects how many vehicles are waiting in the lane. Because each vehicle has a length  $L_{vehicle}$ , we divide lane length  $L_{lane}$  into  $m$  intervals with the same length  $L_{interval}$  equal to  $L_{lane} / m$ , shown as  $D1, D2, \dots, Dm$ .  $Di$  is demonstrated as interval  $[di-1, di]$ ;  $di$  is defined as the distance to the intersection, which equal to  $i \times L_{interval}$ .  $RM(Di, t), AR(Di, t), DP(Di, t)$  are defined as number of vehicles in, arriving in and departing from  $Di$  at time  $t$ , respectively. The arrival rate in  $Di$  at time  $t$  is equal to the departure rate in  $Di+1$  at time  $t - 1$ , and then  $RM(Di, t)$  can be calculated (in equation 3 and equation 4). After that,  $G(Di)$  can be determined (in equation 5), which is defined as the density of traffic flow in interval  $Di$ , and then the density of traffic flow in the lane  $VDDF(D1, D2, \dots, Dm)$  can be demonstrated in equation 6.

$$AR(D_i,t) = DP(D_{i+1},t-1) \tag{3}$$

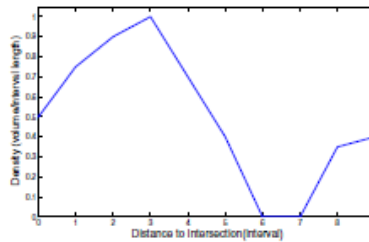
$$RM(D_i,t) = \max\{RM(D_i,t-1) + AR(D_i,t) - DP(D_i,t), 0\} \tag{4}$$

$$G(D_i) = \frac{RM(D_i,t)}{L_{interval}} \tag{5}$$

$$VDDF(D_1, D_2, \dots, D_m) = f(G(D_1), G(D_2), \dots, G(D_m)) \tag{6}$$

This is a nonlinear function, a random function example is shown in Fig. 3. Different interval has different traffic flow density, that is different number of vehicles. At some intervals, there exists a sub-interval without any vehicle in, and its length is larger than  $L_{vehicle}$ . Here, we define this sub-interval as a *blank*. In order to check blank

accurately,  $L_{interval}$  should be equal to  $2.5 \times L_{vehicle}$ . Then, if there exists a  $G(Di)$ , whose value is lower than 0.4 and higher than 0.2, we can decide that there is a blank in  $Di$  and the blank length  $L(blank)$  is equal to  $L_{vehicle}$ . If there exists a  $G(i)$ , whose value is lower than 0.2, we can decide that there is a blank in  $G(Di)$  and  $L(blank)$  is equal to  $2 \times L_{vehicle}$ .



**Green Light Sequence Determination:-**

The second step is to make a decision to determine green light sequence, using the traffic data real-time. In order to make this decision, we define  $GLD(k, t)$  to indicate the case  $k$ 's green light demand at time  $t$ , so that the case which has the most urgent demand should get the green light following. Since our objectives are to maximize the throughput and minimize the average waiting time, number of vehicles in each lane detected, their corresponding waiting time, the blank circumstance are influential factors. To guarantee that each case would not wait too long, hunger level as well affect the green light sequence determination decision-making.

Furthermore, special circumstance and effect from the adjacent intersections can play a role, too. Equation 7 demonstrates all the factors of  $GLD(k, t)$ .

$$GLD(k,t)=a_1 \times TV(k,t)+a_2 \times WT(k,t)+a_3 \times HL(k,t) + a_4 \times BC(k,t)+a_5 \times SC(k,t)+a_6 \times Neibor(k,t) \tag{7}$$

Here,  $TV(k, t)$ ,  $WT(k, t)$ ,  $HL(k, t)$ ,  $BC(k, t)$ ,  $SC(k, t)$ ,  $Neibor(k, t)$  are defined as the weight of traffic volume, average waiting time, hunger level, blank circumstance, special circumstance and influence from neighboring intersections of case  $k$  at time  $t$ , respectively,  $a_i$  are defined as the coefficient of these parameters to demonstrate their priorities,  $i = 1, 2, 3, 4, 5, 6$ . In our problem, since the distance between two intersections is longer than  $SensorDistance$ ,  $Neibor(k, t)$  can be ignored in this problem. Therefore, we discuss the 4 main factors as follows.

**Factor 1) Traffic Volume:-**

After  $VDDF(d, RM(t))$  calculation, we can calculate the weight of traffic volume of each case. To calculate  $TV(k, t)$ , we need to obtain  $TraVol(i, t)$  first, which is defined as the total number of vehicles in the lane  $i$ , from time  $t$  to following  $Tcontrol$  time.  $FV(i, t)$  is defined as number of vehicles which would reach the intersection at time  $t$  in the lane  $i$ ,  $i \in R$ . Equation 8 shows  $TraVol(i, t)$  in lane  $i$  with the green light at time  $t$ , and equation 9 shows  $TraVol(i, t)$  in lane  $i$  with the red light at time  $t$ . So, traffic

volume in case  $k$  can be obtained (in equation 10),  $u, v$  are two lanes of case  $k$ . Then, the traffic volume weight can be calculated (in equation 11). Higher  $TV$  brings more influence in decision-making.

$$TraVol(i,t)=RM(i,t)+ \sum_{j=1}^{Tcontrol} (FV(i,t+j)-DP(i,t+j))+\Sigma L(blank) \tag{8}$$

$$TraVol(i,t)=RM(i,t)+ \sum_{j=1}^{Tcontrol} FV(i,t+j) \tag{9}$$

$$TraVol(k,t)=TraVol(u,t)+TraVol(v,t) \tag{10}$$

$$TV(k,t)= \frac{TraVol(k,t)}{\sum_{k \in C} TraVol(k,t)} \tag{11}$$

**Factor 2) Waiting time:-**

To calculate  $WT(k, t)$ , we need to obtain  $AVGTwait(i, t)$  first, which is defined as average waiting time in lane  $i$ , from time  $t$  to following  $Tcontrol$  time. Equation 12 shows  $AVGTwait(i, t)$  in lane  $i$  with the green light at time  $t$ , and equation 13 shows  $AVGTwait(i, t)$  in lane  $i$  with the red light at time  $t$ . So, average waiting time in case  $k$  can be obtained (in equation 14),  $u, v$  are two lanes which of case  $k$ . Then, average waiting time weight can be calculated (in equation 15). Higher  $WT$  brings more influence in decision-making



$$AVGT_{wait}(i,t)=0 \tag{12}$$

$$AVGT_{wait}(i,t)=\frac{RM(i,t) \times T_{control} + \sum_{j=1}^{T_{control}} FV(i,t+j) \times (T_{control}-j)}{TraVol(i,t)} \tag{13}$$

$$AVGT_{wait}(k,t)=\frac{(AVGT_{wait}(u,t)+AVGT_{wait}(v,t))}{2} \tag{14}$$

$$WT(k,t)=\frac{AVGT_{wait}(k,t)}{\sum_{k \in C} AVGT_{wait}(k,t)} \tag{15}$$

**Factor 3) Hunger Level:-**

The hunger level  $HL(k, t)$  is defined to guarantee the fairness, it can be determined by times of green light of case  $k$ , which is represented by  $N(k, t)$ ,  $k \in C$ , in equation 16. The more times the case got green lights before, the lower hunger level it gets currently; the fewer times the case got green lights before, the higher hunger level it gets currently.

$$HL(k,t)=1-\frac{N(k,t)}{\sum_{k \in C} N(k,t)} \tag{16}$$

**Factor 4) Blank Circumstance:-**

Blank plays a rather important role to calculate  $GLD(k, t)$ . We try to minimize frequency of the circumstance in which there is a blank at the intersection with the green light for the certain lane. In order to maximize the throughput and minimize average waiting time, we calculate how many blanks

there are in each lane, and the length of each blank.

Within a  $T(blank)$  time, if a sensor node cannot detect a vehicle passing through, we decide there is a blank of length  $L(blank)$ .

$$L(blank) = T(blank) \times speed$$

Blank detection indicates three possible circumstances: every case has blank, or some cases have blank, or none of them has a blank. Different circumstances have different solutions. When every case has at least one blank, we would like to give green light with high priority to the case in which the first detected blank has the farthest distance to the intersection. In this way, green light would be provided to let more vehicles leave. When some cases have blank, we would decide to give red light for these cases next directly. When none of them have blank, we treats them as the same priority.

**Vehicle Priority Algorithm:-**

The total vehicles are divided into 4 categories: First system category includes Ambulance, Fire Brigade vehicles and V.I.P vehicles. These vehicles have the highest priority. The second category includes the buses and school & college buses. These buses need to reach their destination on time so these vehicles also need a fast service. Third category includes the car, motor cycles and scooters and fourth category include the Heavy vehicles. Day time priority of 3rd category is high as compare to 4th category but during night hours the priority of the heavy vehicles high. Each intersection on the road has 4 traffic lights as shown in the figure 1. Each lane has its own RFID reader that stores the vehicles passing through it with time stamp. On the basis of the time stamp, we find the violators. For this purpose we store the duration of the green light. So the vehicles coming on the corresponding light are allowed to move in any direction. During this time reader corresponding to red light stores the vehicles passing through the lane.



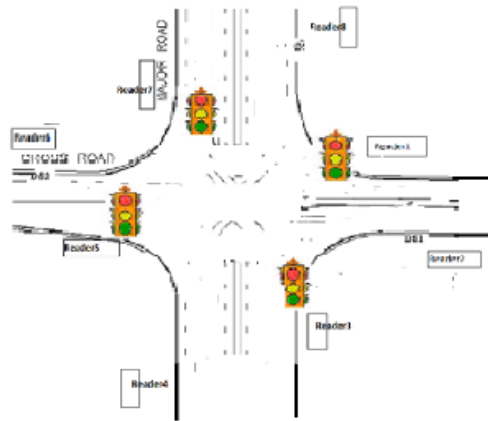


Fig. 4:- Structure of the Intersection & placement of the reader

Intelligent Traffic Light Controller: Each city has multiple intersections as shown in the figure 2. Two lights are called linked Lights that are placed on opposite sides of the road that join two intersections. The RFID reader stores the records of all the vehicles that passed through the road. The Traffic light controller follows the same round robin sequence of the lights. But if an Emergency vehicle is detected at any traffic light then controller leave the round robin schedule and generate the green signal for the ambulance. The other task of the controller is to calculate the time of green signal that is based on the number of vehicle. To solve the problem of Starvation a time limit is defined. If this limit exceeds then that light gets its turn.

The flow chart given below represents the flow of the algorithm. In which after receiving the message from linked lights controller consider the factors like traffic density of the road, priority of the vehicles and queue length and starvation factor to decide the term of the light to display green signal. The flow chart given below not only works according to the number of vehicles near the traffic light but also solve the problem of starvation that can be arisen. Here the basic purpose of the algorithm is to calculate the green time duration and also provide the quality of the service to the Emergency vehicles like ambulance, Fire brigade and VIP vehicles so that they can reach at their destination as early as possible and reduce the time wasted at the Red Light.

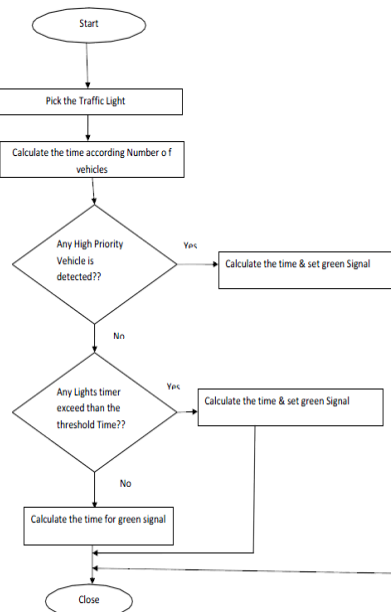


Fig. 5:- Flow Chart Model For Vehicle Priority approach

**Conclusion:-**

Using the proposed adaptive traffic light control algorithm, comparing it with fixed-time traffic control (FTC) and actuated traffic control (ATC), which are based on the same random arrival rate of each lane,  $T_{control}$ ,  $speed$ ,  $L_{vehicle}$  and  $L_{lane}$ . We set The objective of ATC refereed is to minimize the average waiting time, which is popular in existing ATC algorithm. We define *volume to-capacity* to indicate the busy degree of each lane. Here, *capacity* is defined as how many vehicles can be in the lane at the same time, equals to  $\frac{L_{lane}}{L_{vehicle}}$

Therefore, *volume-to capacity* is equal to  $\frac{TraVol}{capacity}$

The comparison items include throughput-to-volume and average waiting time. The intersection throughput values were calculated using the total number of vehicles departing the intersection per unit of time, and expressed as vehicles per second. Throughput-to-volume is defined as the percentage of passing vehicles in total traffic volume. The comparison items include throughput-to-volume and average waiting time. The intersection throughput values were calculated using the total number of vehicles departing the intersection per unit of time, and expressed as vehicles per second. Throughput-to-volume is defined as the percentage of passing vehicles in total traffic volume.

The work also considers not only the priority of the vehicles but also the density of the vehicles on the road and controls the traffic light sequence efficiently and more accurately and the accuracy of the RFID is more than Camera's so it also improves the performance of traffic light Violation Detection System.

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### RESEARCH ARTICLE

#### EFFECT OF BOILING TEMPERATURE LEVELS AND DURATIONS ON DRY MATTER, TOTAL ASH, CRUDE PROTEIN AND CRUDE FIBER CONTENTS OF DIFFERENT RHIZOME SET TYPES OF TURMERIC (*CURCUMA LONGA* L.).

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 Rhizome; Temperature; Boiling

#### Abstract

Turmeric products such as curcumin, oleoresin and essential oils have coloring and medicinal functions. Boiling and drying are mandatory and quality determining steps in turmeric processing. But most farmers in Ethiopia boil mother and finger rhizome together, and give less concern to boiling temperature levels and durations that probably leads to loss of biochemical and physical qualities of turmeric. Hence this study was initiated with objective of optimizing the boiling temperature level (s) and duration (s) of rhizome set types of turmeric for its quality improvement. Accordingly, the result of this study revealed that almost all of the parameters considered were significantly affected by the treatments or their interaction effects. Temperature levels, durations and rhizome set types independently brought about a significant variation on dry matter, crude protein and crude fiber. Rhizome set types demonstrated significant effect on the color of whole rhizome and powder. Curing percent significant differed according to boiling durations.

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#### Introduction:-

Turmeric mostly grows in South Asia, South Pacific Islands, East and West Africa, Malagasy, Caribbean islands, and the Central America (Sasikumar, 2001). 80% of world turmeric is from India (Chempakam and Parthasarathy, 2008; NMCE, 2007).

Currently high production in Ethiopia is found in Yeki woreda (Tepi area) and according to Zenebe and Bereke-Tsehay (1987) cited in Girma *et al.* (2008), turmeric was introduced in 1971/1972 to Ethiopia by Jimma Research Center and from adaptation results, it did well in areas such as Jimma, Mettu, Tepi, Bebeke, Wonago, Awasa, Mugi, and Bako.

From 2006 to 2009, the average land coverage by spices was 122,700 ha and produced 244,000tons/annum. Low land spices are dominantly produced in regions with potential order in SNNPRS, Oromia, Gambella and Amahara

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National Regional states. In general, the over-all potential for low land spices in Ethiopia is assessed to be 200,000 ha (MOARD,2009).

Turmeric is a tropical perennial herb native to Southern Asia, and perhaps originated on the slopes of the tropical forests of the west coast of South India (Yu, 2006). Turmeric is geographically dispersed about Cambodia, China, India, Indonesia, Lao People's Democratic Republic, Madagascar, Malaysia, the Philippines, and Vietnam. It is extensively cultivated in China, India, Indonesia, Thailand and throughout the tropics, including tropical regions of Africa, America and Australia (Peter *et al.*, 2007). Burkill (1966) cited in Peter (2007) stated his believe that the crop spread to West Africa in the thirteenth and to East Africa in the seventeenth centuries, respectively.

The excellence of spices is assessed by its intrinsic and extrinsic characteristics. The former consists of the preservation of chemical principles like volatile oil, alkaloids and oleoresins while the latter stresses physical quality (Purseglove *et al.*, 1981). In addition, certain health requirements are also implemented as export quality standard *viz.* pesticide residue aflatoxin, heavy metals, Sulphur dioxide, solvent residues and microbiological quality. However, physico-chemical quality remains the ultimate attribute, while considering export requirement of spices as these properties delineate its grade in the market. The physico-chemical characteristics vary widely depending on the variety, agro-climatic conditions existing in the area of production, harvest and post-harvest operations (Jose and Joy, 2004).

Similar to other spices, primary processing is still being done with traditional means leading to many post harvest quality losses. Most of farmers in Ethiopia boil mother and finger rhizome sets together; similar activity reported by Velappan *et al.* (1993) where farmers in some provinces of India rarely boil bulbs and fingers separately to facilitate uniform boiling and to quicken drying. The other factor with little consideration and care is the way the harvested rhizomes is boiled. The optimum temperature at which rhizomes are boiled, the duration of boiling and types of boiling pots used are not standardized by research in Ethiopia. For illustration, the stage at which boiling is stopped largely, effects the colour and aroma; over boiling spoils the colour while under-boiling renders the dried product brittle (Kandiannan *et al.*, 2009). Additionally, Kemble and Soni (2009) stated that as more the boiling duration the more loss of curcumin and oleoresins will be. Also, little has been done on the extent of value parameters such as volatile oil and oleoresin contents of the high yielding farmer's varieties.

The information that is available is limited on the information that is obtainable on the degree of annihilation of bioactive values of spices throughout food processing. Subsequently the healthy, beneficial physiological properties of spices are attributable to their energetic principles, there is a requirement to assess the availability of the spice active ideologies in their original arrangement when spices are heat treated as in domestic boiling. (Srinivasan, 2005). In Ethiopia farming of spices for centuries has mostly remained old by small farmers (MOARD, 2009). Efforts to produce improved technologies were limited to agronomic practices with little effort to improve product quality, which is highly influenced through its value chain from pre-harvest to postharvest management practices including processing of final products. Moreover, little effort has been made to assess farmer's pre and post-harvest management practices that could be used as a benchmark for improvement works targeting product quality and sustainable supply (Endrias and Asfaw, 2011).

Therefore, studies were necessary to investigate the role of different boiling temperature levels and boiling durations on the quality of turmeric rhizome sets. Hence the following objective: To determine the effect of boiling temperature levels and durations on dry matter content, total ash content, crude protein content and crude fiber content of different rhizome set types of Turmeric (*Curcuma longa* L.) duration of different rhizome set types of turmeric (*Curcuma longa* L.) for its quality improvement.

## Materials And Methods:-

### Description of the Study Area:-

The experiment was conducted at the Southern Nations and Nationalities' Peoples Regional State, Sheka zone, Yeki Woreda at the Tepi Soil Analysis Laboratory and on the drying structures at Tepi National Spices Research Center in 2010/11 both of which are located in the Tepi town that is about 611 Km from Addis Ababa. It is located at approximate geographic coordinates of 7°30'N, and 35°00'E and altitude of 1200 meters above sea level. The experimental site receives a long term mean annual rainfall of 1688mm and has a mean maximum and minimum

temperature of 29.5 °C and 15.3 °C, respectively (Edossa, 1998). The relative humidity of the site reaches 80 to 90%, and the soil is classified as Dystric Nitisol and it is dominated by a loam texture (Girma and Kindie, 2008).

#### **Experimental Materials:-**

For this experiment matured (9 months old) rhizomes of turmeric variety Dame was taken from Tepi National Spices Research Center seed multiplication plot. Nine month old rhizomes were preferred because harvesting after nine or ten months after planting the biochemical and dried yield recovery contents were reported higher (Girma *et al.*, 2008). Totally 400 kilogram of fresh turmeric was dedicated for the experiment.

#### **Methods:-**

##### **Experimental Design and Arrangement:-**

The treatments were arranged in three factors factorial combination of three boiling temperature levels (80°C, 90°C and 100°C) X four boiling durations (30, 45, 60 and 75 min) X three rhizome set types (Mother, finger and mother-finger) in completely randomized design with three replications. The above treatment levels were set based on the fact that most of turmeric producing farmers in Ethiopia boil mother and finger mixture rhizomes together and give little care to boiling duration though 45-60 minutes were believed to be in practice .

##### **Preparations and boiling method of the rhizomes:-**

Mature rhizomes of turmeric variety (Dame) were harvested from the seed multiplication site of Tepi National Spices Research Center in February, washed thoroughly, and mother rhizomes separated from finger rhizomes. Rhizomes were left heaped for 24 hours for sweating for better development of aroma and flavor.

Next, three and half kilograms from each rhizome types (mother, finger and mother-finger mix) was taken separately for each treatment. Then, rhizomes were boiled using electrically operated boiling heater. Boiling was performed in laboratory using stainless steel of 10 liter capacity dishes on three hot plates having capacity of 230V and 2850W (SD8, Harry Gestingkeit GmbH, Angermunderstr.12, D-40489, Düsseldorf). During the course of boiling 5 liters of water filled in boiling dish was initially allowed to boil, mean-while each rhizome type put in the boiled water and left for a while until it attained the temperature level required and then heater temperature level was set. While boiling was commenced temperature fluctuations were monitored on interval check using thermometer. And when the specified duration boiling for each treatment was reached then the rhizomes were taken out to a bath of twenty kilogram holding capacity to stop further boiling of rhizomes. Rhizomes were delivered to drying beds as soon as cooled. The boiled fingers were dried in open sun spread with uniform thickness of 5-7cm until they attained optimum moisture where the fingers will snap cleanly with a metallic sound. Closer supervision was followed by stirring the samples in the day time for uniform drying and covering in the night. After drying the rhizomes were polished on stretched wire mesh by hand to remove the rough surface and improve its inherent color. Finally, weight of dried rhizomes and removed corkish layer were separately recorded.

##### **Data Collected:-**

Relevant data both for analysis and comparison purposes were recorded at different stages of processing steps. Data on drying durations (hrs.) of rhizomes was recorded as soon as boiled rhizomes were brought to bed. Before and after drying data on dry weight recovery (Curing %), diameter and length shrinkage magnitude (%), weight of corkish layer removed (%) and color of polished whole rhizomes (rating) were recorded. Finally data were recorded on essential (%), dry matter content (%), total ash content (%), crude protein content (%) and crude fiber content (%) from the grounded form of rhizomes.

##### **Total ash content (%TA):-**

The percentage of total ash content was determined by using furnace apparatus. It was determined by ignition of known weight (5g) of a sample at about 550°C in muffle furnace till all the organic matter is oxidized and lost as CO<sub>2</sub>. The residual represents inorganic constituents of total ash while the loss in weight was taken as the organic matter. Procedurally, weight of empty crucible (W2) was taken and five gram of sample transferred into it (W1).

The crucibles with samples were placed in furnace and waited till the temperature reached 550±10°C. Then the temperature regulator was adjusted at 550±10°C and allowed for 5hr. to ash the mineral. When the final duration was reached the furnace was switched off and waited until the temperature dropped to about 100°C to take out the

crucibles with the help of a pair of tongs. Crucibles (samples) were placed in desiccators for cooling and then after weighed (W3) and the percentage ash content was calculated.

% Total Ash =	W3-W1	X 100
	W3-W2	

#### Crude protein content (%CP):-

Crude protein content (%) was quantified using kjeldahl (HUAYE - SLO-6, China, Shanghai) apparatus. One gram of oven dried material was placed in the digestion flask, 10g of powdered potassium sulphate, 0.5g of copper sulphate and 25ml of concentrated sulphuric acid were added to it and digestion conducted by placing the flask in an inclined position and heating it below the boiling point of acid for 10min. The temperature was raised until the acid boiled briskly. A funnel was placed in the mouth of the flask to restrict the circulation of air. Heating was continued till the solution became clear. The contents were cooled and diluted by adding 200ml of water. Zinc 0.5g and 50ml of 40% NaOH solution were added to make the reaction strongly alkaline. The contents were mixed and at once attached to the distillation apparatus. In the receiving flask 25ml 0.1N sulphuric acid was taken. When two-thirds of the liquid had been distilled, it was tested for completion of reaction. The flask was removed and titrated against 0.1N caustic soda solution using methyl red indicator for determination of Kjeldahl nitrogen, which in turn gave the protein content (Indrayan *et al.*, 2009). The crude protein content was determined with a conversion factor of 6.25 (AOAC, 1990).

% N =	1.401 (V-B)N	X 100
	W x DM%	

$$\text{Crude protein} = \% N \times 6.25$$

Where

V = volume of HCl consumed

B = blank titration

N = normality of HCl

W = weight of sample taken

DM% = dry mater of sample

#### Total dry matter content (%DM):-

Dry matter or, more specifically, moisture determination is probably the most frequently performed analysis in the laboratory. It is an important analysis, in that the concentration of other nutrients is usually expressed on a dry matter basis (as a percentage of the dry matter). The procedure consisted of weighing the sample into a tarred (previously weighed) pan, placing the sample in a 105°C oven (KARL KOLB N7 220 V1N, West Germany) for 24 h and reweighing (Galyean, 1997). The moisture in a sample was lost by volatilization caused by heat. An empty hot crucible (W1) was weighed and five grams of air dried sample transferred into it (W2) and placed in an oven. The final weight (W3) was taken and dry mater content percentage calculated.

% Total DM =	W3-W1	X 100
	W3-W2	

#### Crude fiber content (%CF):-

Essentially, the procedure of determining crude fiber involved boiling a fat-free sample of feed with weak acid followed by weak alkali. The loss in weight on ignition of the residue was crude fiber (Galyean, 1997). Fiber content (%) was expressed based on Coarse Fiber Determinater (HUAYE - SLO-6, China, Shanghai) using H<sub>2</sub>SO<sub>4</sub> and NaOH solvents, Filter bag (F58), Impulse bag sealer and muffle furnace (KARL KOLB N7 220 V1N, West Germany) and Desiccator.

% CF =	(W3-(W1 x C1))	X 100
	W2	

Where:

W1 = Bag tare weight

W2 = sample weight

W3 = weight of organic matter (loss of weight on ignition of bag and fiber residue)

C1 = Ash corrected blank bag (loss of weight on ignition of bag/original blank bag)

**Data Analysis (common for all 3 papers):-**

The collected data on different response parameters were subjected to the Analysis of Variance (ANOVA) by using SAS version 9.2 computer software (SAS Institute Inc., 2008). Pearson's correlation analysis was carried out to estimate the association among response variables. Least Significance Differences (LSD) was used for mean separation whenever the treatments have significant different effects.

The fixed effects type model and the ANOVA table lay out have the following form:

Model

$$Y_{ijkl} = \mu + Ti + \beta_j + \gamma_k + (T\beta)_{ij} + (T\gamma)_{ik} + (\beta\gamma)_{jk} + (T\beta\gamma)_{ijk} + \varepsilon_{ijkl}$$

Where  $i$  = mother, finger and mother-finger rhizome sets

$j$  = Temperature levels = 80°C, 90°C, 100°C

$k$  = boiling = 30min, 45min, 60min, 75min

$l$  = 1, 2, 3, ..., 108

**Result and Discussion:-****Nutritional Composition of Rhizome Sets of Turmeric:-****Dry matter content:-**

The data subjected to analysis of variance showed no interaction effects existed among the independent variables for dry matter content in turmeric rhizomes. However, main effects (individual factor treatments) vis-à-vis temperature levels, rhizome set types and boiling durations brought about a very highly significant ( $p=0.0003$ ) variations on the quantity of dry matter, or reversely on moisture content of turmeric rhizomes (Table 8 and Appendix Table 1). The maximum (89.04%) percentage of dry matter was recorded from boiling of rhizomes at 100°C; while the lowest (87.45%) was obtained from 80°C. Boiling at 90°C recorded midfalling value, but yielded significantly higher and lower dry matter mean values than the 80°C and 100°C boiling temperature levels, respectively. The experiment results confirmed that an increase of 10°C in each levels of boiling temperature from 80°C to 100°C, there appeared increase of 0.91 and 0.68% in mean dry matter.

**Table 1:-** Analyses of variance for Oleoresin, Essential oil, Color value, Dry matter, Total ash, Crude protein and Crude fiber

SV	DF	Mean Square Values			
		DM (%)	TA (%)	CP (%)	CF (%)
TP	2	23.04***	21.85***	10.16***	3.59***
RM	2	18.14***	3.38***	1.36***	14.68***
DR	3	7.83***	8.81***	2.24***	1.45***
TP*RM	4	0.22 <sup>ns</sup>	2.28***	0.14 <sup>ns</sup>	0.17 <sup>ns</sup>
TP*DR	6	0.81 <sup>ns</sup>	0.91*	0.12 <sup>ns</sup>	0.13 <sup>ns</sup>
RM*DR	6	1.63 <sup>ns</sup>	0.13 <sup>ns</sup>	0.06 <sup>ns</sup>	0.09 <sup>ns</sup>
TP*RM*DR	12	0.81 <sup>ns</sup>	0.70*	0.05 <sup>ns</sup>	0.10 <sup>ns</sup>
ERROR	72	1.08	0.31	0.11	0.12

NS, \*, \*\* and \*\*\* = Non-significant, significant, highly significant and very highly significant differences at 5% levels of probability respectively. DM=Dry matter, TA=Total ash, CP=Crude protein and CF=Crude fiber.

Rhizome sets responded differently to the dry matter percentage because of boiling. While the largest percent of dry matter was recorded from finger rhizome sets (88.79%) proceeded by mother-finger mix rhizome sets (88.42%); mother rhizome sets contained the lowest mean dry matter content (87.42%). Though insignificant variations existed among them, long boiling durations led to massive content of dry matter content. Boiling for 60min followed by 75min and 45min recorded the highest but invariable mean values (88.71%, 88.44% and 88.23%) of dry matter as per their order, but that of the 30min duration resulted in the lowest (87.46%) mean percentage.

Dry matter content is directly influenced by the final moisture content of the rhizomes under treatment. The secret lies on level of boiling temperature and boiling durations on different rhizome set types that directly influence the drying duration and final moisture content. Because treatments, mainly finger rhizomes receiving high temperature and long boiling duration may be forced to lose much of their moisture as compared to those treatments receiving low

temperature gradients for short durations; particularly mother rhizomes. In accordance with the current finding Govindarajan (1980) and Sampathu et al. (1988) reported that higher moisture content was observed in control (no heat treatment) samples and lower for boiled ones. A significantly negative correlation value ( $r = -0.59^{***}$ ) was noticed between dry matter content and drying durations showing that the one recorded high value for treatment or their combination the other got small value (Appendix Table 5).

#### Total ash content:-

The interaction effect among boiling durations, rhizome set types and temperature levels had significant effect ( $p = 0.0163$ ) on level of ash content of the turmeric (Table 7 and Appendix Table 1). Mother rhizomes boiled at 80°C for 30 and 45 min boiling durations contained statistically similar and the highest total ash mean values of 13.27% and 13.29%, respectively followed by boiling of finger rhizomes at 80°C for 30 min (13.08%), mother rhizomes boiled at 80°C for 60 min (12.69%) and 90°C for 30 min (12.45%) and mother-finger rhizomes boiled at 80°C for 30 min (12.83%) and 80°C for 45 min (12.42%); whereas the lowest value was recorded from 100°C for 75 min boiling of finger rhizomes (9.95%). The superiority of the treatment combinations that gave the highest yield (13.29%) is explained by more (14.52% and 25.13%) total percentage value than the grand mean (11.36%) and the least (9.95%) total ash content value. The least value deviated by about 12.41% from the grand mean value.

Total ash content amounts from finger rhizomes treated at 80°C for 30 min (13.08%) out yielded the amount of mean total ash from rhizomes boiled at 100°C for 75 min boiling (9.95%) which is the least value of total ash content. Similarly, mother-finger rhizomes boiled at 80°C coupled with 30 min duration produced high total ash mean value (12.83%), whereas one of lowest values for total ash was recorded from boiling at 100°C for 75 min (10.55%).

The overall outcome of this experiment indicated that the amounts of carbon containing compounds in the rhizomes are affected by temperature magnitudes and duration of stay on boiling. Higher temperature levels for longer boiling durations probably created room for maximum carbohydrate and other organic materials vanishing during boiling and when drying. With regard to the extent of organic compound in each rhizome set types it was observed that there exists almost no variation. Very highly significant and positive correlation between amount total ash content and dried yield recovered ( $r = 0.39^{***}$ ) was observed indicating the ash content increased as dry yield recovery increased due to treatments. (Appendix Table 5).

**Table 7:-** Interaction effects of boiling temperature levels, boiling durations and rhizome set types on total ash content (%) of turmeric

Treatment	Finger Rhizomes			Mother Rhizomes			Mother-Finger Rhizomes		
	T1	T2	T3	T1	T2	T3	T1	T2	T3
D1	13.08 <sup>ab</sup>	11.90 <sup>defgh</sup>	10.32 <sup>mno</sup>	13.27 <sup>a</sup>	12.45 <sup>abcde</sup>	11.71 <sup>efghi</sup>	12.83 <sup>abc</sup>	11.52 <sup>ghij</sup>	11.88 <sup>defgh</sup>
D2	12.31 <sup>bcdef</sup>	10.26 <sup>nop</sup>	10.67 <sup>ijklm</sup>	13.29 <sup>a</sup>	12.06 <sup>cdefg</sup>	10.25 <sup>nop</sup>	12.42 <sup>abcde</sup>	10.79 <sup>ijklm</sup>	11.09 <sup>ghijkl</sup>
D3	11.34 <sup>ghijkl</sup>	10.28 <sup>nop</sup>	10.81 <sup>ijklm</sup>	12.69 <sup>abcd</sup>	11.80 <sup>defgh</sup>	10.00 <sup>op</sup>	11.86 <sup>defgh</sup>	10.53 <sup>lmnop</sup>	10.82 <sup>ijklm</sup>
D4	10.85 <sup>ijklm</sup>	11.11 <sup>hijkl</sup>	9.95 <sup>p</sup>	11.20 <sup>ghijkl</sup>	11.43 <sup>fghijk</sup>	10.07 <sup>op</sup>	11.39 <sup>ghijkl</sup>	10.32 <sup>mno</sup>	10.55 <sup>klmno</sup>
CV (%) = 4.86                      LSD = 0.90                      Grand mean = 11.36									

T1=80°C, T2=90°C and T3=100°C boiling temperature; D1=30min, D2=45min, D3=60min and D4=75 min boiling durations. Means in the same column with the same letter are not significantly different ( $P \leq 0.05$ ).

#### Crude protein content:-

Though there was significant interaction effect observed, crude protein content mean values showed very highly significant variation ( $p < 0.0001$ ) due to individual treatment factors (Table 8 and Appendix Table 1), i.e. temperature levels, boiling durations and rhizome set types. Mean separation values pointed out that 30 min duration was sufficed to retain the highest (7.38%) mean crude protein percentage than the 45 min (7.11%), 60 min (6.86%) and 75 min (6.74%) durations. Boiling for 75 and 60 min yielded statistically similar and smallest crude protein values of 6.74% and 6.86%, respectively. Likewise the highest crude protein content value (7.56%) was attained when rhizomes



boiled at 80°C unlike the 100°C temperature degree that gave the least crude protein percentage (6.50%). There again, taking into account rhizome set types of their protein content, the highest percentage mean crude protein was found in mother rhizomes (7.21%) followed by mother-finger mix rhizomes (7.04%); in the mean time finger rhizomes contained the least crude protein content (6.82%).

Nearly about 4.88%, 7.14% and 2.63% crude protein yield advantages were observed when boiling carried out for 30min duration, at 80°C temperature level and for mother rhizomes, respectively when compared against the overall mean values of each treatment (Table 8). Also difference of crude protein content values between the highest and the lowest percents due to boiling durations, temperature levels and rhizome set types indicated 8.67%, 14.02% and 5.41% crude protein contents, respectively. The above degree of variations in crude protein content because of the three factors under consideration confirmed that the temperature levels have more impact on the crude protein content followed by boiling durations. Rhizome set types showed less degree of divergence in content of crude protein among them.

High and low mean percentage of crude protein values could be explained on the ground of inherent nature of proteins specifically their association with temperature regimes, duration of boiling and composition of protein in rhizome set types. Relatively extra resistance and capability of mother rhizomes to tolerate high temperature permit them to maintain more percent of protein. Supporting the result in this experiment, stated mother rhizomes are superior in protein content percentage than fingers, Chu *et al.* (1993) put forward that crude protein content was significantly higher for mother rhizome set (17.8%) than for finger sets (5.1-13.1%).

Since proteins are enzymes they have little chance to survive at high temperature which likely had lethal effect to majority of protein materials during boiling. When high temperature is accompanied by extensively long boiling duration, increase in loss is inevitable. Moreover, least loss in mother rhizomes could probably be for the reason that more strong and tough forms of proteins are present in them as compared to fingers which are easily liable to heat due to their delicate nature. Moreover protein loss might be associated with the degree of moisture loss during boiling and drying. It was indicated that the total protein content progressively decreased as the moisture content decreased because of boiling and drying (Chassagnez-Méndez *et al.*, 2000). Significantly negative ( $r = -0.58$ ) correlation was observed between amount crude protein content and dry matter, and positive ( $r = 0.42^{***}$ ) with dried yield recovered (Appendix Table 5).

#### **Crude fiber content:-**

The data garnered from this experiment showed that the crude fiber was very highly affected ( $p < 0.0001$ ) by treatment effect of boiling temperature levels, boiling durations and according to the three rhizome sets (Table 8 and Appendix Table 1). High variation in mean crude fiber content was observed when turmeric rhizomes boiled in different temperature levels with down falling trend when one goes from the lower to the climax. The output revealed that boiling at 80°C heat yielded the highest mean value (7.37%) over the 90°C boiling that gave mean value of 7.06%. In turn the 90°C temperature level yielded high mean crude fiber content than the 100°C that gave the lowest mean value (6.74%) among the three temperature levels. The highest crude fiber content (7.53%) was obtained from 30min duration while the least value was recorded from boiling for 75min (6.85%) boiling duration in which about 6.26% and 6.67% respective relative reductions were recorded.

In dealing with rhizome set types mean content of crude fiber was the highest in mother rhizomes (7.67%) than in mother-finger mix rhizomes (7.10%) and finger (6.40%) rhizomes, and the mix contain averaged while finger rhizomes the lowest content among the three rhizome set types. Mother rhizomes possessed 7.43% and 16.56% more crude protein when compared to the mix and finger rhizome sets respectively; the mix rhizome contained 9.86% higher crude fiber content compared to the finger rhizomes which provided the lowest mean value.

The variations in crude fiber contents, as affected by boiling durations, temperature levels and difference with respect to the rhizome set types, could be associated with the overall mean value for each factor in action. The 30min duration, 80°C level, and mother rhizome sets recorded 3.95%, 4.21% and 7.95% more values, respectively. On the other way, 6.8%, 8.55% and 16.56% difference existed between the highest and lowest crude protein contents for boiling durations, temperature levels and rhizome set types, respectively. It is obvious that the variation existed in rhizome set types is the largest value revealing crude protein content is highly affected by rhizome set types than boiling durations and temperature levels.

The reduction in mean fiber content probably could be break up of lignified plant materials by the high temperature levels and long boiling durations. Also, crude fiber is high in mothers may be because their high dry matter make ups made them potentially resistant to heat and therefore few loss of weight particularly when boiled at low temperature and duration ranges. In addition, mother rhizome sets are characterized by more fibrous nature than their respective daughters. There existed significant and positive correlation ( $r=0.75^{***}$ ) between crude fiber content with amount of dry yield recovered (Appendix Table 5).

In support of results from this experiment Renard (2005) reported, in the case of pears, the pectin fraction is degraded during boiling. In this respect, short periods do not affect the content in dietary fibre while long periods, over 1 h, lead to losses in the pectin content. Thus, it has been reported that the pectin content in the boiling water can increase upon 400% after one hour boiling, when compared with the pectin content after 20 min boiling. Further experiment result by Tatjana *et al.* (2002) confirmed that during boiling kidney-beans a solubilization of the aforementioned polysaccharides is produced, which results in a decrease of the total fibre content, mainly soluble. Purseglove *et al.* (1981) also discussed that rhizomes maintained more than one season like mother rhizomes in this case, have high accumulation of dry matter while the reverse is in quality.

**Table 8:-** Effect of boiling durations, temperature levels and rhizome set types on crude protein, dry matter, crude fiber content and diameter shrinkage of turmeric

Treatments	Crude protein (%)	Dry matter (%)	Crude fiber (%)
Boiling Durations			
30	7.38 <sup>a</sup>	87.46 <sup>b</sup>	7.35 <sup>a</sup>
45	7.11 <sup>b</sup>	88.23 <sup>a</sup>	7.14 <sup>b</sup>
60	6.86 <sup>c</sup>	88.71 <sup>a</sup>	6.89 <sup>c</sup>
75	6.74 <sup>c</sup>	88.44 <sup>a</sup>	6.85 <sup>c</sup>
<b>LSD</b>	<b>0.181</b>	<b>0.564</b>	<b>0.191</b>
Temperature Levels			
80	7.56 <sup>a</sup>	87.45 <sup>c</sup>	7.37 <sup>a</sup>
90	7.01 <sup>b</sup>	88.13 <sup>b</sup>	7.06 <sup>b</sup>
100	6.50 <sup>c</sup>	89.04 <sup>a</sup>	6.74 <sup>c</sup>
<b>LSD</b>	<b>0.156</b>	<b>0.489</b>	<b>0.165</b>
Rhizome Types			
Finger	6.82 <sup>c</sup>	88.78 <sup>a</sup>	6.40 <sup>c</sup>
Mother	7.21 <sup>a</sup>	87.42 <sup>b</sup>	7.67 <sup>a</sup>
Mother-finger	7.04 <sup>b</sup>	88.43 <sup>a</sup>	7.10 <sup>b</sup>
<b>CV (%)</b>	<b>4.736</b>	<b>1.179</b>	<b>4.979</b>
<b>LSD</b>	<b>0.156</b>	<b>0.489</b>	<b>0.165</b>

Means in the same column with the same letter are not significantly different ( $P \leq 0.05$ ).

### Summary And Conclusion:-

Primary processing is still being done with traditional means leading to many post harvest quality losses. Therefore, studies are necessary to investigate the role of different boiling durations and temperature levels on the quality of turmeric. Accordingly, the result of this study revealed that almost all of the parameters considered were significantly affected by the treatments or their interaction effects. Temperature levels, durations and rhizome set types independently brought about a significant variation on dry matter, crude protein and crude fiber. Again, rhizome set types showed significant effect on color of whole rhizome and powder. Curing percent significant differed according to boiling durations.

Dry matter content was highest for finger rhizome sets, at 100°C and for 60min boiling. Crude protein was at its peak when rhizomes boiled for 30min, at 80°C and for mother rhizome sets whereas the smallest values were recorded from 75min, at 100°C and finger rhizome sets. Crude fiber content was highest at 80°C, for 30min and in mother rhizome sets, whereas minimum at 100°C, for 75min and finger rhizome sets. Mother rhizomes boiled at 80°C for 30 and 45 min boiling durations contained statistically similar and the highest total ash mean values of 13.27% and 13.29%, respectively followed by boiling of finger rhizomes at 80°C for 30min (13.08%), mother rhizomes boiled at 80°C for 60min (12.69%) and 90°C for 30min (12.45%) and mother-finger rhizomes boiled at

80°C for 30min (12.83%) and 80°C for 45min (12.42%); whereas the lowest value was recorded from 100°C for 75min boiling of ginger rhizomes (9.95%).

Taking in consideration total ash, crude protein and crude fiber using short duration and lower temperature boiling of mother rhizome sets is regarded as effective. By considering the advantages of reducing the losses of fuel, labor, time, quality and difficulties in turmeric processing, the package of boiling conditions are beneficial to the turmeric growers and processing industries. However, though it could be not easy to control the temperature level in farmers' boiling process, exhaustive practical training sessions need to be put in place in order to make them familiar with the technology. To come up with sound recommendations, however, it would be imperative to repeat the study in replicated season and place.

**Table 1:-** Analyses of variance for Oleoresin, Essential oil, Color value, Dry matter, Total ash, Crude protein and Crude fiber

SV	DF	Mean Square Values			
		DM (%)	TA (%)	CP (%)	CF (%)
TP	2	23.04***	21.85***	10.16***	3.59***
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TP*RM*DR	12	0.81 <sup>ns</sup>	0.70*	0.05 <sup>ns</sup>	0.10 <sup>ns</sup>
ERROR	72	1.08	0.31	0.11	0.12

NS, \*, \*\* and \*\*\* = Non-significant, significant, highly significant and very highly significant differences at 5% levels of probability respectively. DM=Dry matter, TA=Total ash, CP=Crude protein and CF=Crude fiber.

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### RESEARCH ARTICLE

## EVALUATION OF IMMUNOGENICITY OF DNA VACCINE CODING OUTER MEMBRANE PROTEIN 31 (OMP31) OF BRUCELLA MELITENSIS IN MICE.

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#### Abstract

Brucellosis is causing serious medical and economic crisis, therefore there are many efforts to prevent infection through vaccination. Attenuated *Br. Melitensis* Rev 1 vaccine is considered the best vaccine available for now, but it has serious drawbacks. In the present work, Omp31 of *B. melitensis* vaccine (vectored vaccine) was evaluated in mice, in comparison with *Br. Melitensis* Rev 1 vaccine. The immune response showed similar and different trends. After vaccination, the vectored vaccine group showed nearly the similar trend in the TNF- $\alpha$ , IL-1 $\alpha$  and IL-12 (p40) levels with lower levels of IL-10, an anti-inflammatory cytokine, than *B. Melitensis* Rev 1 group. Moreover, vectored vaccine group showed lower weight, spleen and protective efficacy as those observed with *B. Melitensis* Rev 1 vaccine. In addition, vectored vaccine is less biohazardous, well-defined and non-infectious. The obtained results document effectivity of the vectored vaccine and can be considered as a promising candidate and could be included in the development of a multi-subunit vaccine in controlling of brucellosis.

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#### Introduction:-

*Brucella* belongs to  $\alpha$ -Proteobacteria causing many pathogenic problems in mammals including humans. Ruminant animals are susceptible to be infected by such bacterium all over the world. One of those affecting domestic livestock is *B. melitensis* that affect sheep and goats. Because domestic ruminants are a vital source for the economy income, especially in low income countries, brucellosis is considered as a main cause of direct economic losses. Therefore, its control and eradication is the most important goals of public health programs in endemic countries (1,2).

Rev. 1 vaccine is formerly the only officially accepted vaccine for protection against *B. melitensis* infection, which induces significant protection in sheep and goats. On the other hand, the Rev1 vaccine can cause abortions, persisting agglutinins that can lead to mis diagnosis by using various serological tests in addition, it can infect humans through exposure to aerosols or accidental self-inoculation. (3, 4).

Subunit recombinant protein vaccines are considered promising vaccines because they are effective, less biohazardous, well-defined, non-infectious and persuade long-acting protection [5, 6]. Furthermore, it is essential to

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provoke an effective vaccine with adequate immunological response against intracellular microorganisms as *Brucella* species, particularly for T helper cell (Th1) where the production of certain cytokines as IFN $\gamma$ , TNF $\alpha$ , and IL-12 (p40) are necessary for control the infection as Th2 response has a marginal function in this respect. Antigen delivery systems become obligatory needed when antigens are not effectively transported to the suitable fitting sites or presented to the immune system [7]. Our work is aimed to evaluate vectored vaccine based on outer membrane protein 31 (OMP31) expressed by *Escherichia coli* (K12) as it is nonpathogenic strain and can deliver our protein to antigen presenting cells and hence, promoting cellular immune response to control the infection with *B. melitensis* using mice model [8].

## Materials and Methods:-

### Laboratory animals:-

Forty-five female BALB/c mice with 4 to 6 week-old (obtained from a vet. Sera vacci Rec Institute–Cairo-Egypt) received one week previously, were distributed randomly into threegrups (fifteen for each). All mice were kept in cages and received water and food ad libitum.

### Strains of bacteria used:-

For cloning and propagation of the concerned plasmid, *Escherichia coli* strain JM109 competent cells  $>10^8$  cfu/ $\mu$ g (Promega, Madison, WI) were used while for recombinant protein expression, *Escherichia coli* strain K12 (Biolab, England) was applied. Bacteria strains were grown at 37°C in Luria-Bertoni (LB) broth agar that supplemented with 100  $\mu$ g/ml of ampicillin (9). For challenging purpose, *B. melitensis* 16 M was used (obtained from vet. Sera vacci Rec Institute, Cairo, Egypt) and was cultured under optimal conditions in tryptose soya agar supplemented with yeast extract 10 g/ lml (Oxoid, England) incubated overnight at 37°C for 72 hrs in 5% CO $_2$  to ensure sufficient cell density (10). The obtained bacteria were harvested and suspended in PBS and the abundance was adjusted to be  $1 \times 10^5$  CFU/200 $\mu$ l for protection experiment.

### Amplification of *Omp31* gene of *B. melitensis* 16M

Extraction and measuring the DNA of *B. melitensis* 16M were performed by using the CTAB method as previously described (11). PCR amplification of *Omp31* gene of *B. melitensis* 16M was done as described earlier (12) by using two primers, 31sd (5'-TGACAGACTTTTTTCGCCGAA-3') and 31ter (5'-CATTCAGGACAATTCCCGCC-3'). The primers were selected according to *omp31* nucleotide sequence (13)

### Recombinant *B. melitensis* *Omp31* protein:-

DNA fragment (687-bp) of *B. melitensis* responsible for encoding *Omp31* was cloned in pCAGGS (Addgene, MA, USA), expressed in *E. coli*, and purified as designated before (14). Briefly, the obtained plasmid that contained *Omp31* gene was amplified in transformed competent *Escherichia coli* (JM109) which were propagated in LB broth supplemented with 100  $\mu$ g/ml of ampicillin (9) till reached 1 nm at OD600. Intact plasmid construction and function were confirmed via sequencing across the DNA inserted. The plasmid was isolated by using a Megaprep kit (Qiagen, Dorking, UK) and the DNA concentration was evaluated using spectrophotometry at 260/280 nm. COS-7 cells were transfected as stated by manufacture's instructions with pCAGGS+*Omp31* and Lipofectamine reagent to verify *Omp31* expression which checked and confirmed by Western blotting with specific MAb A59/10F09/G010 as reported previously (15). The *Limulus* amoebocyte lysate analysis kit [Sigma, St. Louis, Mo.] was used to corroborate the purity of r*Omp31*.

### Immunization of mice:-

Mice were allocated randomly into three groups (fifteen mice in each group). The first group was vaccinated with the commonly used vaccination dose for commercial *B. melitensis* Rev 1 vaccine as positive control (16), the second group was immunized by I/P route with 0.2ml suspension of recombinant *E. coli* K12( $10^7$  CFU) bearing pCAGGS plasmid containing *omp31* gene (vectored vaccine) in phosphate buffer saline (PBS, pH 7.2). The colony forming units per ml was adjusted at OD 600 nm (OD $_{600}$ ) and the injected dose was determined retrospectively by triple plating onto tryptic soya agar supplemented with yeast extract. Finally, the third group was received PBS as negative control.

**Protection Experiments and evaluation of Brucella strain persistence:-**

To evaluate the efficacy of vectored vaccine for protection against *B.melitensis* infection, five mice from each group was challenged by intra peritoneal route (I.P) with approximately  $1 \times 10^5$  CFU/mouse of *B.meletensis* 16M. On the 30<sup>st</sup> day after vaccination, the mice were euthanized by cervical dislocation; their spleens were removed aseptically and weighed. The persistence of challenging strain of *B.meletensis* M16 in mice was determined as described previously (9, 17), by determination of *B.meletensis* CFU in the spleen. The obtained spleens from five mice in each group were macerated individually and homogenized, Ten-fold serial dilution in PBS were plated onto tryptic soy agar supplemented with yeast extract and incubated to determine the bacterial count. The experiment was conducted twice, and the results were represented as means  $\pm$  SD (n = 5) of the log CFU/spleen. Log units of protection were calculated via subtracting the mean log CFU of the vaccinated group from the mean log CFU of the control immunized group.

**Measurement of immune response against Omp31:-**

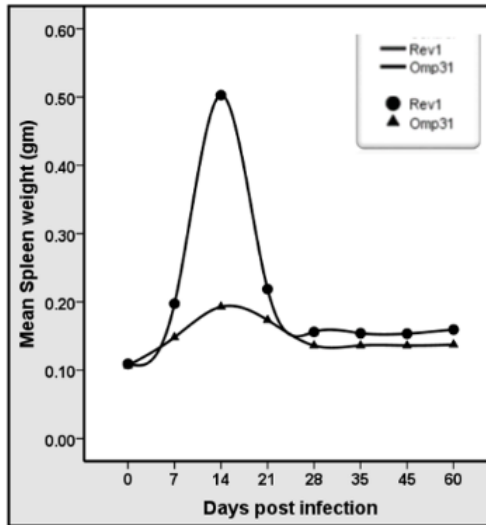
Indirect enzyme-linked immunosorbent assay (ELISA) was subjected to determine the antibody response against Omp31 in collecting sera (17). Serum titers of Antibody evaluated as the highest serum dilution inverse yielding value at OD<sub>405</sub> two times higher than of the dilution buffer (blank). The titer of IgG was recorded as means  $\pm$  SD of the log of the titers taken from five mice analyzed individually. Regarding the evaluation of Cytokine levels in the spleens of immunized mice in response to the injected vaccines (vectored vaccine and *B.melitensis* Rev1), five mice from each group were vaccinated as described above and their spleens were collected at 0, 7, 14, 21 and 28 dpi (pre-challenge period in protection experiments). CHAPS detergent (Thermo Fisher scientific, USA) was added (1% final concentration) to the homogenated mouse spleens in PBS to maintain protein activity and lysis the splenocytes [18,19]. cell debris was separated and removed by centrifugation after one hour incubation at 4 °C, and the supernatants were kept at -80 °C till use for cytokine quantification. The collected supernatants were subjected to sandwich ELISA to quantify the levels of interferon- $\gamma$  (IFN- $\gamma$ ), tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ), interleukin-1 $\alpha$  (IL-1 $\alpha$ ), IL-10 and IL-12 (p40) with commercial kits specific for mice cytokines according to the manufacturer instructions (BD Biosciences, San Diego, USA) as illustrated before [20]. The results were recorded for each immunized group as means  $\pm$  SD of the detected cytokine quantity (ng) in the spleens of five individual mice at each point of time.

**Statistical Analysis:-**

Data obtained were expressed as mean  $\pm$  standard error of the mean. It was analyzed using SPSS version 18.0 (IBM SPSS Statics 18, USA). Data were subjected to one-way analysis of variance (ANOVA) and the post-hoc test was applied for multiple comparisons. Values of P <0.05 and P <0.001 were regarded as statistically significant and highly significant, respectively.

**Results:-****Inflammatory response of used vaccines:-**

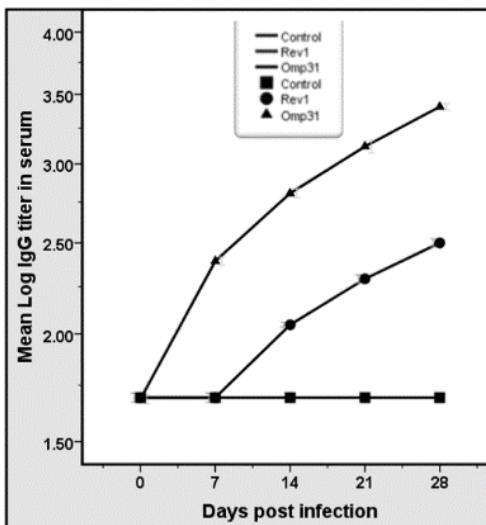
Spleen weight was taken as an indicator to compare the degree of inflammatory response in vaccinated groups. The vectored vaccine did not induce significant inflammatory response on the assay span while Rev1 group showed a strong response that reached its maximum level at 14<sup>th</sup> day post inoculation at which the spleen weight reached 4 times higher than that of vectored vaccine group, as illustrated in **Figure 1**.



**Figure 1:-** Estimation of spleen weight in vaccinated mice  
Results are expressed as means  $\pm$  SD (n=5) of the spleen weight at each point of time.

#### Humeral immunity response against *B. melitensis*:-

The serum immunoglobulin G (IgG) level was estimated in the mice of protection experiment up to day 28 post inoculation (before challenge) with either PBS (control negative), Rev1 attenuated vaccine or vectored vaccine. In mice vaccinated with Rev1 vaccine, the titer of IgG was detected in the 7<sup>th</sup> day after inoculation and increased progressively up to the end of the experiment while the IgG level was higher in mice vaccinated with vectored vaccine along the experiment. In comparison, the antibody response in the Rev 1 vaccinated group was delayed and first detection was on 14<sup>th</sup> day post inoculation and was lower than that noticed with vector vaccinated mice at all time-points checked, as shown in **Figure 2**.



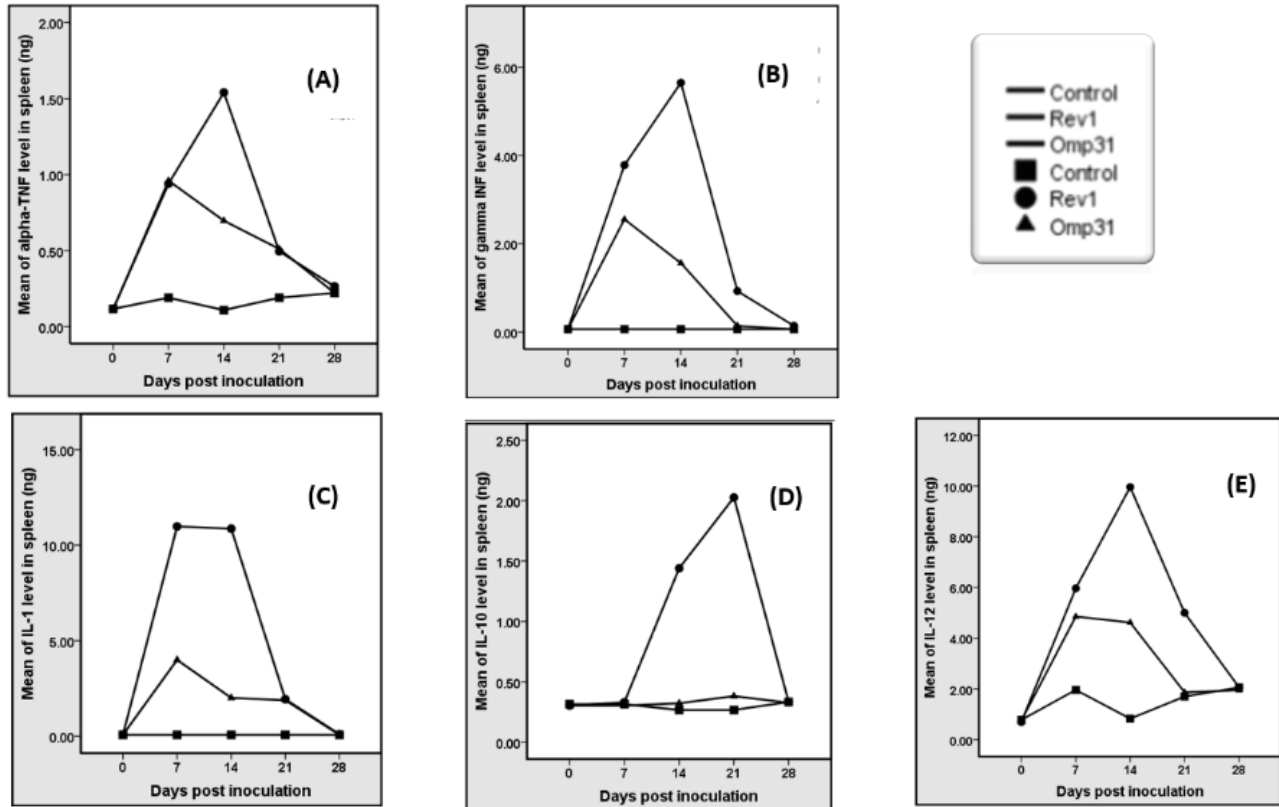
**Figure 2:-**The antibody responses in mice sera  
Results are expressed as means  $\pm$  SD (n=5) of the log of IgG titers by ELISA at each point of time.

#### Detection of spleen cytokines in mice:-

The cytokine level in spleen of inoculated mice was estimated until the day 28 post infection. Spleen of vaccinated mice with Rev1 vaccine showed the highest level of TNF- $\alpha$ , INF- $\gamma$ , IL-1 $\alpha$ , IL-10 and IL-12 (p40). Except IL-10, all cytokines in Rev 1 vaccinated group showed high levels and reached the peak at day 14 post inoculation then, begin to decrease until the day 28 at which all cytokines of the other group had profile too large extent like those evaluated in control negative group (PBS inoculated). Regarding IL-10, it has the similar trend, but its highest level was



detected on day 21 post inoculation. The strongest response was detected with both IL-1 $\alpha$  and IL-12 (p40) in the maximum concentrations around 11ng per spleen followed by the level of INF- $\gamma$  that record about 6 ng per spleen whereas the level of TNF- $\alpha$  and IL-10 showed the lowest recorded levels about 1.6 ng and 2 ng per spleen, respectively. Mice of vaccinated group with opm31 also induced cytokine production like, but to a lesser extent those of the Rev1 vaccinated group, except for IL-10 level that scored concentrations did not show statistically significant differences with those of control group (Figure 3, A-E).

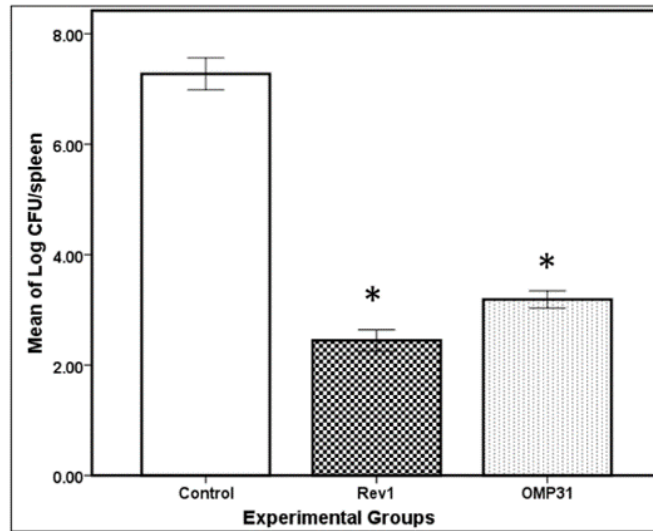


**Figure 3:-** evaluation of the levels of cytokines in spleen of mice

TNF- $\alpha$  (A), INF- $\gamma$  (B), IL-1 $\alpha$  (C), IL-10 (D), and IL-12(p40)(E). Results are expressed as means  $\pm$  SD (n=5) of each amount of cytokine in spleen at each point of time.

#### The challenge Experiment:-

All groups were inoculated with a virulent strain of *Brucella melitensis* M16 in a dose of  $0.9 \times 10^5$  at the day 28 after vaccination. After three weeks of infection, the bacteria in spleen were counted. The challenge result revealed that the rev 1 and vectored vaccines conferred nearly the same protection (P.0.05). In comparison with the control group, the two used vaccines induced reduction in the bacterial load in the mice spleen about three log units (Figure 4).



**Figure 4:-** Protection against virulent *Brucella melitensis* M16 strain by the *Brucella* vaccines in mice.

Results are expressed as means  $\pm$  SD (n=5) of the log of the CFU/spleen. Significant differences between mice immunized with each vaccine and control mice inoculated with PBS are marked with (\*) that means high significant ( $P \leq 0.001$ ).

### Discussion:-

Researchers and scientists working in the field of the disease control are always do their best to discover and synthesis alternative vaccines to live attenuated strains to be able to fend off infections especially those burden the human being health. Currently, the best choice available vaccine against *Brucella* spp. is *B. melitensis* Rev1 vaccine (21,22). So, it was used to be the reference in our study to compare the efficacy of our recombinant vaccine. Nevertheless, it has significant disadvantages that may constrict its usage. As it is live attenuated vaccine, not completely safe, there is high probability to be a potential bioterrorism agent (23), cause severe complications in immunocompromised animals (24), cause abortion, difficult to transport and delivery where it needs special requirement to maintain condition and creates serological immune responses against O that causes interference in interpretation of many serological tests especially in the discrimination between natural infected and vaccinated animals (25). In contrast, recombinant proteins based vaccines, are less biohazardous, well defined composition, avirulent and non-infectious (6).

Subunit vaccines have been studied for years and have not given sufficient protection against *Brucella* spp. (26). Many approaches had been taken for development of vaccines based on bacterial recombinants (27). One of these approaches consists of expressing the foreign antigen on the surface of transfected bacteria. Subcellular vaccines could shun the drawbacks of live attenuated vaccines where is being safer in manipulation, not causing abortion and not interfering with immunodiagnostic tests as it has different antigen (28) and having the capacity to trigger the both arms on the immune system (29).

The better protective activity for the Rev1 vaccine was forecasted and detected by the evidences of the strong inflammatory response, as increasing the immunized mice spleen weight and cytokine profiles than those provoked by vectored vaccine (Figure 1 and 2). On the other hand, the protection granted by vectored vaccine against the experimental *B. Melitensis* infection was closely equipollent to that offered by *B. melitensis* Rev1 vaccine (Figure 5). The obtained result may be attributed to many factors and reasons. The first is the greater antibodies production able them to bind the virulent inoculated *B. melitensis* strain that detected in vaccinated mice with vectored vaccine (Figure 3) and opsonized them to facilitate their phagocytosis (29). This give an advantage to our recombinant vaccine and proves the fact that the antibodies have a greater impact in the protective immunity against *B. melitensis* than that for lymphocytes (30). The second reason, it is well known that  $\text{INF-}\gamma$  is playing the essential and vital role in controlling the *Brucella* infections whereas it stimulates the bactericidal function in macrophages (31,32),  $\text{INF-}\gamma$  recorded notable high level in both vaccinated groups (Figure 3-B). Third, the stoner response of splenocytes from *B. melitensis* Rev1 mice vaccinated group in production of more  $\text{IL-1}\alpha$ , which has potent stimulation of T-helper (CD4) and T-cytotoxic (CD8) lymphocytes against the inoculated antigen (33) than

splenocytes gained from mice either vaccinated with vectored vaccine or non-vaccinated group (Figure 3-C). Finally, splenocytes of *B. melitensis* Rev1 mice vaccinated group induced powerful IL-10 response. It was established that IL-10 has anti-inflammatory effect (34, 35), this fact gives an advantage to our tested vaccine over the commercial used one.

Another positive aspect of vectored vaccine is the protective function that comes with slight degree of inflammatory response (36, 37). On the other hand, the smooth lipopolysaccharide (S-LPS) represents the main component in *B. melitensis* Rev1 vaccine (38, 39) therefore, severe inflammatory response would be occurred leading to shock or even death (40,41) when the body exposed to LPS in an excessive or systemic manner via blood. According to our results, vectored vaccine stimulate and enhance solid immune response with triggering both Th1 and Th2 lymphocytes cytokines in a form making it capable to control *B. melitensis* infection as professionally as vaccination with *B. melitensis* Rev 1. In taking into account the disadvantages of vaccination with *B. melitensis* Rev 1 (42, 43), the Omp31 depending vaccine constitutes a promising candidate and could be included in the development of a multi-subunit vaccine in controlling of brucellosis.

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### RESEARCH ARTICLE

#### ASSOCIATION OF D-DIMER IN TYPE 2 DIABETES MELLITUS.

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D-Dimer, GlycoHb A1c, Diabetic nephropathy, Cardiovascular Disease.

#### Abstract

**Context:** Diabetes mellitus is a leading cause of vascular morbidity. Etiology of diabetic vascular complications is multifactorial. Alteration of blood coagulation and fibrinolysis along with poor glycaemic control in diabetes has also been implicated in the development of diabetic vascular complications. Plasma level of D-Dimer reflects the amount of lysed cross-linked fibrin and hence is an accepted marker of hypercoagulability.

**Aim:** The aim of this study is to evaluate the clinical significance of plasma D-dimer in type 2 Diabetes Mellitus.

**Settings and Design:** This study is a cross sectional study.

**Methods and Material:** A total of 90 patients were selected based on clinical status and divided into 3 groups: 30 patients of newly detected type 2 DM, 30 patients having diabetic nephropathy and 30 patients of DM with coronary artery disease. Plasma Ddimer was measured using Second-generation latex agglutination (immunoturbidimetric) method in Cobas Integra 400 plus. The lipid profile and HbA1c were also measured.

**Statistical analysis used:** Statistical analysis was performed by one way ANOVA, scheffe post hoc test and independent t- test.

**Results:** Patients with diabetic nephropathy had significantly higher plasma D-dimer levels ( $2.48 \pm 1.28 \mu\text{g/mL}$ ) than patients without complications ( $0.28 \pm 0.12 \mu\text{g/mL}$ ) ( $p < 0.0001$ ). There were significantly higher plasma D-dimer levels in patients with coronary artery disease ( $2.05 \pm 1.06 \mu\text{g/mL}$ ) than patients without complications ( $0.28 \pm 0.12 \mu\text{g/mL}$ ) ( $p < 0.0001$ ). And there is no significant different in lipid profile in DM with or without coronary artery diseases.

**Conclusions:** Our data suggest that in DM patients presenting with coronary artery diseases without dyslipidemias, the D-Dimer can serve as a novel marker for prediction of the risk of coronary artery diseases and higher level of D-Dimer in diabetic nephropathy patients suggest that increased thrombogenic state may be related to increased susceptibility of vascular disease in these patients.

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**Introduction:-**

Diabetes mellitus comprises a group of common metabolic disorders that share the phenotype of hyperglycemia. In patients with diabetes mellitus having vascular complications, control of blood glucose levels is a crucial factor in determining prognosis. The mechanisms that mediate vascular complications in diabetic patients are not fully understood. Etiology of diabetic vascular complications is multifactorial.

Alteration of blood coagulation and fibrinolysis along with poor glycemic control in diabetes has also been implicated in the development of diabetic complications. Type 2 diabetes mellitus is a growing cause of disability and premature death, mainly because of cardiovascular diseases and chronic complications<sup>1</sup>.

Prolonged exposure to hyperglycemia is now documented in the pathogenesis of diabetic complications like nephropathy and cardiovascular disease (CVD):

1. Glycated proteins and lipids which can interfere with their normal function by disrupting the molecular conformation, alter enzymatic activity, reduce degradative capacity and interfere with receptor recognition. In addition, the glycated proteins interact with specific receptors present on all cells relevant to the atherosclerotic process which includes monocyte-derived macrophages, endothelial cells, and smooth muscle cells. The interaction of glycated proteins with their receptor results in the induction of oxidative stress and proinflammatory responses<sup>2</sup>.
2. Oxidative stress could further aggravate complications<sup>2</sup>.
3. Protein kinase C (PKC) activation by prolonged hyperglycemia and glycated protein with subsequent alteration in growth factor expression. Importantly, these mechanisms may be interrelated. For example, hyperglycemia induced oxidative stress promotes both the formation of advanced glycosylation end products (AGE) and PKC activation.

This study was undertaken to investigate the role of coagulation/fibrinolysis in the pathogenesis of diabetic complications by evaluating the association of d-dimer in type 2 DM.

**Materials & Method:-**

The study was carried out at Shree Krishna Hospital and H M Patel Centre for Medical Care and Education, a 550 bedded tertiary care rural based, teaching hospital attached to Pramukh Swami Medical College, Karamsad, from September 2013 to October 2014. A study protocol was set before undertaking this study and it was approved by the Institutional Human Research Ethical Committee.

This was a cross sectional study consisted of 90 individual above the age of 40 years are included divided into three groups. All the participants in the study were explained clearly about the purpose and the nature of the study in the language best understood by them. The samples were drawn from the participants only after obtaining a written and informed consent.

Out of this the group-1 consisted of 30 patients of newly detected type 2 DM who were recruited from those attending medical outpatient department and health check-up department. Group-2 consisted of 30 patients having diabetic nephropathy, whose serum creatinine was  $>1.4$  mg/dl, admitted in medical intensive care unit were recruited for study and group 3 consisted of 30 patients of type 2 DM admitted in emergency and cardiac ICU within 6 hrs of clinical signs and symptoms of acute coronary syndromes without any history of diabetic nephropathy were included in this study. The patients had been diagnosed depending upon the assessment as per the clinical symptoms such as chest pain with or without radiation, chest heaviness, shortness of breath, lower jaw pain, left arm pain, epigastric pain, palpitations and signs like hypotension and ECG changes suggestive of MI. The samples were collected from group 3 patients before any thrombolytic treatment. Patients were considered to be diabetic based on ADA criteria for the diagnosis of diabetes mellitus<sup>16</sup>.

All the patients with Liver disease, Malignancy, Trauma, Pregnancy, Pulmonary embolism, Disseminated Intravascular Coagulation were excluded from study to avoid false positive result of D-Dimer. The study protocol was set before undertaking this study and it was approved by institutional Human Research Ethics Committee. Plasma D-dimer was measured using Second-generation latex agglutination (immunoturbidimetric) method<sup>17</sup>, HbA1c was measured using Immunoturbidimetry Standardized according to IFCC method<sup>18</sup>, creatinine was measured using Colorimetric Compensated Jaffe kinetic method<sup>19</sup>, Triacylglycerol was measured using Colorimetric Endpoint GPO-POD Method<sup>20</sup>, Cholesterol was measured using Colorimetric Assay with Endpoint CHOD-POD Method<sup>21</sup> and HDL-

Cholesterol was measured using Homogenous Enzymatic Colorimetric Assay<sup>22</sup> in Cobas Integra 400 plus. Analysis was performed using the commercially available statistical software SPSS – 14.0 version and Microsoft excel. Values are given as mean±SD. Comparison of Renal function tests, HbA1c, D-dimer in three groups of patients by ONE WAY ANOVA and pairwise mean comparisons by Post hoc (scheffe test).

Comparison of lipid profile in DM patients with or without coronary artery diseases by independent t-test. The p value of less than 0.05 was considered statistically significant.

### Result:-

The Patients enrolled for the study were in the age group of 40 to 80 years. The mean age of the diabetic patient without complication, diabetic with nephropathy and diabetes with coronary artery diseases was 55.43±9.57, 60.93±10.57 & 62.1±7.8 years respectively.

The mean ± SD of duration of diabetes in the group 1 individuals is less than one year, whereas it is 8.64±2.34 years in group 2 and 9.28±2.88 years in the group 3.

### ONE WAY ANOVA:-

**Table 1:-** Comparison of Renal function tests, HbA1c, D-dimer in three groups of patients

Parameter	DWC (Group-1)	DN (Group-2)	DM+CAD (Group-3)	ANOVA P VALUE
HbA1c Mean±SD	8.24±1.74	8.68±2.3	9.17±2.34	0.247
Creatinine(mg/dl) Mean±SD	0.73±0.23	3.45±2.29	0.95±0.27	<0.0001
D-Dimer(µg FEU/mL) Mean±SD	0.28±0.12	2.48±1.28	2.05±1.06	<0.0001

Using ANOVA p-value we conclude that

1. There is no significant difference in at least one pair of mean of HbA1c among all three groups.
2. There is difference in at least one pair of mean of creatinine among the three groups.
3. There is difference in at least one pair of mean of D-Dimer among the three groups.
4. Post hoc (scheffe test) revealed that there is no statistically significant difference between mean HbA1c in either a pair

**Table 2:-** Pairwise mean comparisons of D-DIMER among three groups

Parameter	Mean±SD of D-Dimer (µg FEU/mL)	P-value
DWC (Group-1)	0.28±0.12	<0.0001
DN (Group-2)	2.48±1.28	
DWC (Group-1)	0.28±0.12	<0.0001
DM+CAD (Group-3)	2.05±1.06	
DN (Group-2)	2.48±1.28	0.230
DM+CAD (Group-3)	2.05±1.06	

### Post hoc (scheffe test) revealed that:-

1. Mean D-Dimer (µg FEU/mL) is statistically significantly higher in the diabetic with nephropathy patient as compared with diabetic patient without complication (P=<0.0001).
2. Mean D-Dimer (µg FEU/mL) is statistically significantly higher in the diabetic with
3. coronary artery patient as compared with diabetic patient without complication (P=<0.0001).
4. There is no statistically significant difference between Mean D-Dimer (µg FEU/mL) in the diabetic with coronary artery patient and Mean D-Dimer (µg FEU/mL) in the diabetic patient with diabetic nephropathy (p=0.230).



**T Test:-****Table 3:-** Comparison of lipid profile in Diabetic with and without CAD.

Parameters	DWC (Group-1)	DM+CAD (Group 3)	P value
<b>Total cholesterol(mg/dl) Mean±SD</b>	171.43±33.65	168.46±53.00	0.797
<b>Triglyceride(mg/dl) Mean±SD</b>	153.03±73.95	156.66±69.53	0.845
<b>HDL(mg/dl) Mean±SD</b>	42.43±11.39	35.86±8.16	0.013
<b>LDL(mg/dl) Mean±SD</b>	98.26±30.67	101.26±43.44	0.758

Independent sample t test revealed that

1. Mean HDL (mg/dl) is statistically significantly lower in diabetic with coronary artery disease subjects than the diabetic without complication individuals.
2. Mean total cholesterol (mg/dl) ( $p=0.797$ ), mean triglyceride (mg/dl) ( $p=0.845$ ) and Mean LDL (mg/dl) ( $p=0.758$ ) are not statistically significant between diabetic patient without complication and diabetic with coronary artery disease individuals.

**Discussion:-****Comparison of HbA1c:-**

In the present study, the mean HbA1c value in diabetes without complications was  $8.24 \pm 1.74$ . The mean HbA1c value in diabetic with nephropathy was  $8.68 \pm 2.3$  and in DM with coronary artery disease was  $9.17 \pm 2.34$ . This was statistically not significant with P value 0.247.

Takashi Yamada et. al.<sup>7</sup> observed that there was no statistically significant difference in HbA1c values in patients with ( $6.6 \pm 1.0$ ) or without ( $7.3 \pm 1.6$ ) microvascular complications, P value being 0.72. The comparison of the patients with ( $7.0 \pm 1.5$ ) and without ( $7.1 \pm 1.4$ ) macrovascular complications also did not show any significance difference, P value being 0.202.

The HbA1c is effective in monitoring long term glucose control in patients with diabetes mellitus. The complications of diabetes not only depend on the duration of diabetes mellitus but also on the long lasting poor glycemic control as indicated by a high level of HbA1c. Hence, there is requirement of a marker for monitoring long term diabetic complications.

On the basis of the knowledge of coagulation/fibrinolysis imbalance in DM, the observation of plasma D-dimer in complicated DM patients, we can use at least complimentary role of D dimer in early identification of complications.

**Comparison Of D-Dimer:-****Diabetes mellitus without complication:-**

In my study diabetes patients without complications with mean age of  $55.43 \pm 9.57$  years, the d dimer level was  $0.28 \pm 0.12$   $\mu\text{g FEU/mL}$  which was similar to the study by Yolanda Lopez et al<sup>8</sup> of diabetic patients, under metabolic control and presented with no signs of retinopathy, neuropathy or nephropathy (corresponding to our group 1 with a mean age of  $54.3 \pm 15.2$  years), the concentration of D-Dimer was within the normal range  $267.10 \pm 25.8$   $\mu\text{g/L}$ . This value when converted to the units used in our study is 0.26  $\mu\text{gFEU/mL}$ .

Diabetic with coronary artery diseases

When we compared plasma D-dimer levels between diabetes without complications (group 1) and diabetic with coronary artery diseases (group 3), plasma D-dimer levels were found to be significantly ( $p < 0.0001$ ) higher in diabetic patients with coronary artery diseases. Our results are similar to other studies<sup>9,10</sup>.

Tariq A Zafar(2010)<sup>10</sup> found that significant high plasma D-dimer levels in diabetic patients with myocardial infarction, compared with diabetic patients without myocardial infarction and the control group ( $445 \pm 352$   $\mu\text{g/L}$ ,  $340 \pm 249$   $\mu\text{g/L}$ , and  $156 \pm 107$   $\mu\text{g/L}$  respectively). D-dimer levels of patients with myocardial infarction were significantly higher than in the patients without myocardial infarction and the control group ( $P = 0.002$  and  $P = 0.001$ . respectively).

Ezekiel U. Nwose et al. (2007)<sup>9</sup> in a study 343 participants were selected based on the clinical status and divided into 7 groups: control, family history of diabetes, pre-diabetes with/without CVD, diabetes with/without CVD and CVD without DM. An overall significant difference between groups ( $p < 0.002$ ) and a steady rise in D-dimer levels that became increasingly higher than control as the disease progressed from pre-diabetes to cardiovascular complications was observed.

T. Yamada et al.<sup>11</sup> in their study observed that the d-dimer level in the diabetic patients without macroangiopathy was  $0.63 \pm 0.37$   $\mu\text{g/ml}$  and with macroangiopathy was  $1.12 \pm 1.24$   $\mu\text{g/ml}$ , this was not statistically significant ( $p = 0.69$ ) which is not agreement with my study. In the present study, Diabetic patient with coronary artery disease had total cholesterol level  $168.46 \pm 53.00$ , TG level  $156.66 \pm 69.53$ , HDL level  $35.86 \pm 8.16$  and LDL level  $101.26 \pm 43.44$ . In Diabetic patients without complications the TC level  $171.43 \pm 33.65$ , TG level  $153.03 \pm 73.95$ , HDL level  $42.43 \pm 11.39$  and LDL level  $98.26 \pm 30.67$  showing only small difference in the lipid profile in the two groups. There was significance difference only in the HDL level ( $p = 0.013$ ).

Our data is similar to Tariq A Zafar et al.<sup>10</sup> in which diabetics with MI, TC level being  $225 \pm 38$ , TG level  $176 \pm 81$  and HDL level  $37 \pm 5$  and in diabetics without complications, TC level  $202 \pm 40$ , TG level  $127 \pm 97$  and HDL level  $42 \pm 7$ . There are small differences in the lipid profile between the two groups.

It has been reported that over 50% of all future vascular events may occur in persons without dyslipidaemia and that plasma D-Dimer can be a novel risk marker for the prediction of future cardiovascular events in those with normal lipid profile<sup>12</sup>.

Our report suggests that besides the involvement of diabetic dyslipidemia in coronary artery diseases, diabetic hypercoagulation is another pathological process in development of CAD.

Ezekiel U. Nwose et al. (2007)<sup>9</sup> suggested that laboratory determination of both total cholesterol & D-dimer could reduce chances of making false negative decision about diabetics with CAD complication.

#### **Diabetic nephropathy:-**

When we compared plasma D-Dimer levels between diabetes without complication (group 1) and diabetic with nephropathy (group 2), the plasma D-Dimer levels were found to be significantly ( $p < 0.0001$ ) high in latter group. Our results are similar as other studies<sup>4,13,14,15</sup>.

Ichiro Wakabayashi et al.<sup>4</sup> they observed that the mean level of log converted D-Dimer after adjustment for age and sex was significantly higher in subjects with microalbuminuria ( $p < 0.01$ ) than in those with normoalbuminuria. They concluded that the D-Dimer is associated with microalbuminuria in patients with diabetes and this suggests that glomerular dysfunction is in part mediated by hypercoagulability.

J. W. J. van Wersch et al. (1991)<sup>13</sup> in a study including 116 patients with type 1 DM found that the presence of lower HDL-cholesterol, higher triacylglycerols and the elevation of fibrin monomers and D-Dimers is more pronounced in the microalbuminuria group.

Takashi Nagai et al. (1993)<sup>7</sup> studied NIDDM with and without nephropathy along with normal subjects and observed elevated levels of D-Dimer in nephropathy patients.

Kano Y, Kobayashi K et al.<sup>14</sup> In their study had been performed in 18 diabetic nephropathy patients and 16 hypertensive patients with nephrosclerosis reported higher level of D-Dimer in both group.

Cihangir Eremet al.<sup>15</sup> studied diabetic with or without nephropathy and observed no significance difference in D-Dimer.

T. Yamada et al.<sup>11</sup> in this study d-dimer level in patients without diabetic microangiopathic was  $0.54 \pm 0.17$   $\text{mcg/ml}$  and with microangiopathic  $0.88 \pm 0.90$   $\text{mcg/ml}$  there was not statistically significance ( $p = 0.264$ ) this is not similar to my study.

In Diabetics pathophysiological changes start before development of complications and severity of vascular complications was concordant with microangiopathies (eg. DN) and macroangiopathies (eg. CAD) in the patients

with an increased coagulation/fibrinolysis abnormality. Identification of circulating risk molecules (plasma D-dimer) may help to identify diabetics with high risk of vascular complications. Plasma D-dimer test is now routine and can measure easily. So we can use complimentary test in early identification of complications.

### Conclusion:-

In the present study, consisted of 90 patients of type 2 DM in the age of 40-80 years and the complication started after 6 years duration of diabetes. The study showed equal distribution of diabetes and its complication in male and female. If DM patients present with coronary artery diseases, without dyslipidemias, the D-Dimer can serve as a novel marker for prediction of the risk of coronary artery diseases. D-Dimer if employed as an additional test may improve the risk assessment for early coronary artery diseases in DM patients. In our study there is a higher concentration of D-Dimer in coronary artery diseases. We also got a higher level of D-Dimer in diabetic nephropathy patients. It indicates increased procoagulant activity in diabetic nephropathy patients. It is reasonable to assume that the higher level of D-dimer is primarily the result of increased fibrin clot formation and subsequent breakdown. The increased thrombogenic state may be related to increased susceptibility to vascular disease in these patients. D-Dimer, hence, can be used as an additional, novel biomarker of diabetic complications.

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### RESEARCH ARTICLE

#### MANAGEMENT OF MYOFASCIAL PAIN DYSFUNCTION SYNDROME BY USING DIFFERENT CONCEPT OF OCCLUSION: A SYSTEMATIC REVIEW.

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#### Abstract

The purpose of this study to evaluate the changes in the activity of muscles of mastication by using neuromuscular occlusion versus centric occlusion repositioning splint in treatment of myofascial pain dysfunction syndrome.

Search was made in 2 databases including PubMed and CENTRAL , title and abstract were screened to select studies comparing changes in the activity of muscles of mastication by using neuromuscular occlusion versus centric occlusion repositioning splint in treatment Articles which did not follow the inclusion criteria were excluded. Included papers were then read carefully for a second stage filter, this was followed by manual searching of bibliography of selected articles. The search resulted in 5 included papers. One study evaluated the patient satisfaction, while the other 4 evaluated the masticatory function . Two of them used VAS as a measurement tool , while the other two used VAS and CAT .reducing muscle activity , relief pain clicking disappearance were the main outcomes of the included papers. Conflicting results was observed between the two types of stent.

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#### Introduction:-

Myofacial Pain Dysfunction (MPD) is a musculoskeletal dysfunction involving malrelationship among the neuromuscular system, temporomandibular joints, and dental occlusion<sup>1</sup>

Pain, discomfort and disability associated with myofacial pain dysfunction can greatly affect a person's quality of life, as well as perpetuate a headache, commonly described by the patients as tension headache, or even cause a migraine<sup>2</sup>

A variety of treatment modalities have been suggested including pharmacological management, occlusal appliances, physiotherapy and many others. Occlusal splints are removable interocclusal appliances that are usually fabricated out of hard acrylic<sup>3</sup>

The objectives of splint use in the treatment of temporomandibular disorders (TMD) and myofascial pain dysfunction (MPD) include: eliminating occlusal interferences, stabilizing tooth and joint relationships, passive

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stretching of the musculature to reduce abnormal muscle activity, decreasing parafunctional habits, protecting against tooth abrasion and decreasing joint loading<sup>(4,5)</sup>

Repositioning splints: Plane bite splints increase the vertical dimension but should not affect the position of the mandible when habitual clenching occurs on the splint. It guide mandible into a different position at closing, which is supposed to facilitate repositioning of the disk and reduce the load on retrodiscal pain sensitive areas<sup>6</sup>

In the natural dentition a slide from centric relation (CR) to centric occlusion (CO) takes place mostly with a vertical and sometimes also with a lateral shift in the mandible's position. One important goal in the fabrication of a plane splint is to create an area around the contacts at habitual closing (neuromuscular position) which makes it possible for the mandibular teeth to move from CR to a CO position without such vertical or lateral shifts<sup>7</sup>

The maxillo-mandibular realignment theory proposes that the mandible is malpositioned relative to the maxilla at the position CR. It is believed that if the mandible is repositioned, a more optimum maxillo-mandibular relationship can be evolved, and the symptoms eliminated<sup>8</sup>

However CR cannot be properly registered in most patients with acute signs and symptoms of TMJ disorders. It may even be contraindicated to try to make such a registration. Any pushing of the mandible in a patient with TMJ inflammation and/or internal derangement can increase tissue injury<sup>9</sup>

For myofascial pain dysfunction syndrome patients receiving superior repositioning splints, would the use of splint with neuromuscular occlusion result in less pain intensity and improve muscle activity or not

The aim of this study to evaluate the changes in the activity of muscles of mastication by using neuromuscular occlusion versus centric occlusion repositioning splint in treatment of myofascial pain dysfunction syndrome.

## **Materials and Methods:-**

### **Search Strategy:-**

**An Electronic Search of the literature was performed on PubMed Cochrane, using the following search terms**

**:-**

1. Dentulous Jaw
2. Centric relation recording,
3. Centric relation occlusion,
4. Centric relation record
5. Occlusal splints
6. Occlusal splint therapy
7. Occlusal splint bruxism
8. Soft Occlusal splint
9. Hard occlusal splint
10. Occlusal splint and bruxism ,
11. Occlusal splint tmd
12. Nuromusclar splint
13. Oral splint
14. TMD
15. Disc displacement with reeducation
16. Disc displacement
17. 17- 9 OR 10 OR 11 OR 12 OR 13 OR 14 OR 15 OR 16
18. 8 AND 17

Hand search was done on the bibliography of the included papers. Last hand search was performed on the 25<sup>th</sup> of April – 2016

### **Selection criteria:-**

**Clinical trials comparing different occlusal splints for the dentulous patients were selected according to the following inclusion criteria:-**

- Human studies

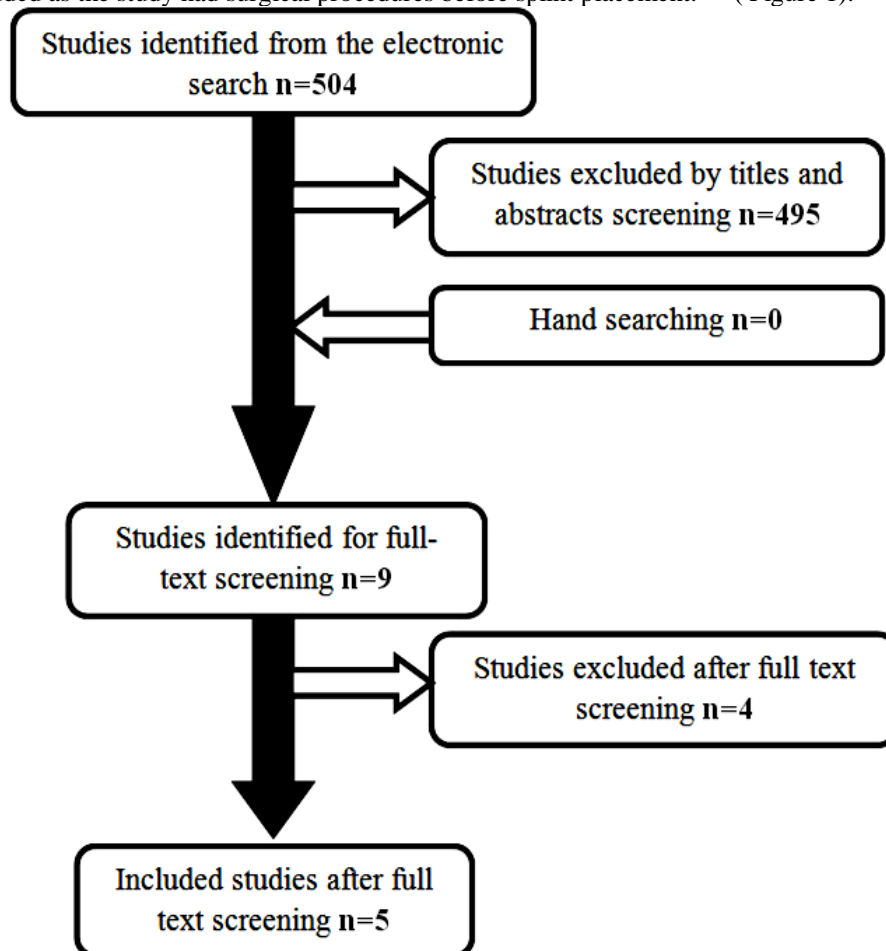
- Clicking
- Limited mouth opening
- Complete dentulous

### Study Selection:-

Retrieved titles were all screened, and all papers that met the inclusion criteria were selected. Abstracts of all headings chosen were screened and obtained for inclusion criteria. After abstracts were screened, full text studies were retrieved for the selected papers. In case both the heading and the abstract of an article wasn't enough to obtain data needed to make a decision regarding inclusion criteria, full texts were retrieved. Full text papers meeting inclusion criteria were screened upon their methodology and results. Two reviewers performed the screening procedure.

### Results:-

A total of 504 titles were identified by the electronic search. After initial titles and abstracts screening, 495 irrelevant articles were excluded and a total of 8 articles were selected for full-text screening. No additional articles were found through hand searching. After full text screening, 5 articles<sup>(10-16)</sup> were included in the present analysis. One study was excluded as edentulous patients were included which didn't match the inclusion criteria<sup>(17,19)</sup> also other study was excluded as the study had surgical procedures before splint placement.<sup>18</sup> (Figure 1).



The 5 articles included in this study were published in a period ranging from 1995 to 2012. They differed widely with respect to methodology, study designs and outcomes. So the possibility of attempting a meta analysis was eliminated. (Table 1)

**Table 1:-** Included Studies.

Study	Arch	Age(years)		Outcome
<b>Nasseret,alBraz Oral Res. 2012</b> Nov,Dec;26(6):530-5. Epub 2012 Sep 27	mandible	N	N	Pain relief Patient satisfaction Increase mouth opening
<b>Nandaet,al, Indian J Dent Res. 2011</b> Mar,Apr;22(2):303-8	mandible	N	N	Patient satisfaction
<b>Cooper BC.N Y State Dent J. 1995</b> Nov;61(9):48-53.	mandible	N	N	Patient satisfaction
<b>M Ziad Al-Ani , Stephen J Davies , Robin JM Gray , Philip Sloan and Anne-Marie Glenny</b> January 2009	maxilla	6	7	Pain relief Patient satisfaction Increase mouth opening
<b>Frisardi G.J Prosthet Dent. 1995</b> Aug;68(2):355-60.	maxilla	N	N	Increase mouth opening

**pain analysis:-**

Four studies<sup>(18- 21)</sup> has evaluated the ability for pain relief within comparison of two groups of patients . A 100 scale VAS (mm) was used to asses the ability to speak for all the four studies. No significant difference between groups was reported, Feine and Heydecke studies<sup>(18, 19, 21)</sup>. In those studies , VAS records was higher for the fixed group in studies<sup>(18,19)</sup> , while in Heydecke study<sup>(21)</sup> , VAS was higher for the removable group . While a significant difference in favour of the removable group was reported in study<sup>(20)</sup>.

A single study<sup>(21)</sup> has reported into depth the speech quality & errors by using a fixed prosthesis in one trial and a removable prosthesis in another trial. This study tested stops, fricatives & vowels between both the removable and fixed groups. The study revealed a statistically significant difference for the favour of the removable group in case of correctly produced sounds, specially for stops & fricatives, while non significant difference was observed for vowels, with higher means for the removable prosthesis.

**Electromyographic activity of the masticatory:-**

- all studies have evaluated the efficiency of mastication between oral splints . Jaw mastication muscles, and mandibular movements were recorded using an electromyographic activity. It was reported that There were no statistically significant differences in the electromyographic activity of the masticatory muscles in the different time periods The use of a Lucia jig over 0, 5, 10, 15, 20 and 30 minutes did not promote any statistically significant increase in muscle activity<sup>(22)</sup>

**Patient satisfaction:-**

Four studies<sup>(18- 21)</sup> reported the patient satisfaction with different reporting methods and outcomes. Two studies<sup>(18, 20)</sup> out of four has used a 100 mm VAS (Visual Analogue Scale) and CAT (Categorical Scales),to asses the patient own words in describing his satisfaction about the splint in different aspects, while the other two<sup>(19, 21)</sup> only used VAS. (Table 2)

In studies<sup>(18- 20)</sup> using the VAS, Significant difference was obvious between the treatment groups regarding rapid pain relief in favour of the centric splint , while non significant difference between both groups was reported regarding the clicking disappearance ,<sup>(18, 19)</sup>.

Increase mouth opening was significantly better for the repositioning splint in studies<sup>(18, 19)</sup>. On the contrary it was significantly better in favour of neuromuscular splint in study<sup>(17)</sup> ,while no significant difference was noticed in study<sup>(20)</sup> between both groups .



A contradicting outcome evaluating the general satisfaction between the two groups gave a significant difference for the centric splint group in study <sup>(20)</sup>, while reporting no significant difference between studied groups in study <sup>(18)</sup>, with higher VAS means for the repositioning splint group

### **Discussion:-**

Patients with any systemic disease were excluded from the study to decrease the variables between groups and also to be sure for the right effect of the stent <sup>(21,22)</sup>

Occlusal splint is “Any removable artificial occlusal surface used for diagnosis or therapy affecting the relationship of the mandible to the maxillae. It may be used for occlusal stabilization, for treatment of TMJ disorders, or to prevent wear of dentition.” The appliance can be made to cover the occlusal surfaces of maxillary or mandibular teeth and can be fabricated from many different materials, giving it a hard, soft, or intermediate feel. <sup>(23)</sup>

Splint therapy is considered an adjunct to pharmacologic therapy and most appropriate when nocturnal parafunctional activities can be identified. Typically, a flat-plane maxillary occlusal splint designed for bilateral contact of all teeth is fabricated. <sup>(24)</sup>

It has been hypothesized in the literature that the presence of a foreign object in the palate may reduce nocturnal jaw muscle activity, possibly due to changes in the oral tactile stimuli, a decrease of oral volume, and space for the tongue <sup>(25)</sup>

It has also been hypothesized that an intraoral splint may make the patient aware of the position and potentially harmful use of the jaw this has been labeled a “cognitive awareness” concept.

Disc displacement with reduction (DDWR) of TMJ is common in TMD clinics. Patients usually present with a complaint of joint sounds, and only few patients present with persistent TMJ pain or locking of the jaw. MRI is a standard diagnostic tool for DDWR but the goals of treatment are to reposition the disc, eliminate the joint sounds and pain, and achieve rehabilitation of jaw functions. <sup>(26)</sup>

Although joint sounds and disc displacement without pain or impaired jaw functions were considered less important clinically, the elimination of sounds contributes to a patient’s well being. <sup>(27)</sup>

A normal disc position might prevent more severe diseases from occurring early, making a noninvasive method with a short therapeutic time and less complications preferable to radical surgery or ignoring the problem. <sup>(28)</sup>

It was believed that different TMDs need different splint designs and various treatment regimens. Although upper stabilization splint is good for muscle disorders and bruxism, ARS might be suitable for DDWR, but each has its own shortcomings, which need to be overcome. These are open bite, difficulty having normal diet when wearing the appliance, and osteoarthrotic changes in the condylar form. <sup>(29)</sup>

Some patients need complex dental treatment for stabilization of occlusion. Splint therapy for TMDs may be classified into three major groups on the basis of splint functions: stabilization splints (centric splints) the neuromuscular splints, and ARS <sup>30</sup>

The stabilization splint provides a balanced bilateral occlusal contact on a flat splint surface; during lateral movement, only cuspids are in contact with the splint this method is used to stabilize occlusion, muscles, and joints. <sup>31</sup>

The ARS is used to treat DDwR and DDwoR The treatment goals of splint for DDwR of TMJ are to reposition the condyle downward and recapture the disc anteriorly, correct the relationship between the glenoid fossa, articular disc, and condyle ,improve jaw function , reduce joint pain and sounds, eliminate mechanical interference and prevent progression of the disorder <sup>(32)</sup>

We elevated the bite vertically just enough to eliminate the joint sounds, but we did not reposition the jaw anteriorly in three groups however, the conventional ARS was designed to protrude the mandible anteriorly to varying amounts. <sup>(33)</sup>

Treatment time should be long enough to recapture and to stabilize the disc, and the splint should be removed gradually. Although the length of treatment time is still controversial, we suggest 4–8 weeks, followed by slow weaning off to avoid surgery and post treatment occlusal therapy (prosthetic or orthodontic treatment).<sup>34)</sup>

In this study, we were able to perform MRI in patients to confirm the diagnosis and results of treatment this make proper diagnoses of the internal derangement before treatment. The MRI examination on patients showed a high correlation between clinical examination and MRI image finding.<sup>35)</sup>

A plastic sheet was used to be sure of standardization of position of electrode during period of follow up using fixed anatomical landmarks.

Although surface electromyography has been presented for long time as a method in dental medicine for muscular activity research and evaluation, there is no evidence about its role in TMD diagnosis. While one group of authors disagrees with regard to EMG in TMD diagnosis and treatment evaluation, others stressed on its major role in diagnosing alterations in neuromuscular function considering both views, in this investigation our aim was to evaluate masticatory muscle activity alterations in TMD patients.<sup>38)</sup>

The use of electromyography in temporomandibular dysfunction diagnosis is based upon the hypothesis that various pathologic and dysfunctional conditions, such as muscle hyperactivity, muscle fatigue and muscle imbalance, can be detected from the EMG recording. The term muscle hyperactivity has been used to describe any increased muscular activity over and above that necessary for function. Muscle hyperactivity thus includes not only the parafunctional activities of clenching, bruxing, and other oral habits but also any general increase in the level of muscle tonus.<sup>36)</sup>

In the first instance, EMG signal analyses are qualitative with the inspection of the raw signal in the last decades, the application of mathematical models and statistical analyses has offered a better understanding of EMG signal properties, allowing the evaluation of the physiologic events of muscles. Such advances have made it possible to study muscle electrical manifestations in amplitude domain as well as wave frequency.<sup>37)</sup>

However this investigation has confirmed that EMG is a useful and non-invasive method in TMD diagnosis. However, EMG is not sufficient if applied alone, but together with other methods it forms a complementary approach in TMD diagnosis.<sup>39)</sup>

The maxillo-mandibular realignment theory proposes that the mandible is malpositioned relative to the maxilla at the position of maximum tooth intercuspation (CR). It is believed that if the mandible is repositioned, a more optimum maxillo-mandibular relationship can be evolved, and the symptoms eliminated.<sup>(40,41)</sup>

More than one type of scale is used to measure patient's satisfaction. Out of those is the OHIP (Oral Health Impact Profile) which is meant to provide information about perceptions of oral health however, the complete 49 item version is not always applicable in a clinical study because its time consuming. This led to the development by Slade, a simplified version, the OHIP-14<sup>(36)</sup>. This questionnaire includes 14 items, two from each domain, selected because they have been shown to be the most frequently reported. The OHIP questionnaire includes seven main scopes<sup>(37)</sup>. Another type is the Visual analogue scales (VAS) and categorical scales (CAT) which are known to be predictable assessment tools<sup>(38)</sup>. VAS, is frequently used to measure subjective perceptions, while CAT questions are used to collect information about the patients' physical, psychological function and general health. Patients are asked to choose a word from a four-point scale that best described their response. Our included studies used a VAS scale from 0 to 100, other authors have used VAS with scores from 0 to 10 or from 1 to 5<sup>(39)</sup>. The need for multidimensional evaluation of implant therapy, using consistent instruments and valid tools when available, has been displayed in literature for many years<sup>(40)</sup>.

Conflicting results in our systematic review, is mainly due to lack of randomization in all of the included studies<sup>(18-21)</sup>, outcomes vary obviously when true randomization takes place, rather than a patient centered protocol, in matter of directing patients to a specific treatment group. Follow up period wasn't enough to judge satisfaction scores, only two months were given for patients to test their perception. Only five studies were included in our review, which isn't a valid number to synthesize a definitive conclusion about the treatment options. In two studies

<sup>(19,21)</sup> only a single scale measurement (VAS) was used while its recommended to use more than one assessment tool for more reliable outcome results.

The degree of patient satisfaction is the result of a complicated interaction between psychological and physiological factors <sup>(45)</sup>. Even though, up till now, there is no any accurate scale or a questionnaire with items related to personal behavioral habits, which might be relevant for motivating the patient to shift their choices towards a specific prosthesis design, keeping in mind conservation of the oral tissues functions <sup>(46)</sup>.

### Conclusion:-

This study clarified that Temporary splint does not cause permanent or irreversible changes in the structure or position of the jaw or teeth. It has better patient compliance, fewer side-effects, and is more cost-effective than surgical treatment

Splint using centric relation record has a greatest patient satisfaction and easy in manipulation , Pain relief was achieved in all groups use of repositioning splints might be very useful in the initial management of TMJ pain and dysfunction. Decreased internal pressure and relieve of retrodiscal tissues ,There are different types of occlusal appliances, each one has its special design, indication and precautions that should be followed so that it was strongly advised to thoroughly understand the masticatory system dynamics and perform a comprehensive examination to the TMJ and its related structures to be able to choose correct appliance perfectly with fewer complications, Further and bigger randomized controlled trials need to be conducted to verify the findings.

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### RESEARCH ARTICLE

#### PARAQUAT INTOXICATION: A FATAL POISONING, CASE REPORT & LITERATURE REVIEW.

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Paraquat is among the most dangerous poison in medical

#### Abstract

field. It causes rapid irreversible damage of lungs and lead to renal failure and liver failure causing to death. It is highly toxic compound for humans with very high mortality due to lack of antidote available. We report a case of a 17 yrs old female, who has ingested a 5ml of paraquat (1, 1'-dimethyl-4, 4'-dipyridylum) which is used as a herbicide and easily available substance in a developing countries like India. Despite it's widely availability in India, its poisoning is uncommon and diagnosis is often difficult in the absence of proper history and lack of definitive laboratory investigations.

Sometimes despite of early diagnosis we may not able to save the victim as in our case because of lack of any effective treatment.

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#### Introduction:-

Paraquat or N, N'-dimethyl-4, 4'-bipyridinium dichloride is a toxic chemical that is widely used as a herbicide primarily for weed and grass control. It is present in varying concentration and requires to be diluted prior to its use. Paraquat is highly toxic chemical to human beings. The most likely route of exposure that would lead to poisoning is ingestion. Paraquat poisoning is also possible after skin exposure if skin exposure lasts for long time or skin that is not intact (skin that has sores, cuts or a severe rash). Inhalation exposure to paraquat can irritate the airways and mucus membrane but rarely causes systemic manifestations.[1]

Paraquat causes direct damage when it comes into contact with the lining of the mouth, stomach or intestines; it causes toxic chemical reactions to occur throughout of the body primarily the lungs, liver and kidneys.

The main systemic effects are pulmonary edema, convulsions, cardiac, renal and hepatic failure [2]

We are reporting a case of fatal paraquat poisoning from Eastern Indian state of Odisha. The patient was admitted in our tertiary care hospital. This paper discussed a case of acute paraquat poisoning and detailed review of literature.

#### Case Presentation:-

A 17 years old female patient from a farmer family background was brought to our Emergency department with history of alleged consumption of approximately 5 ml of paraquat taken 11 hours prior to presentation. She had a dispute with her mother regarding her marriage and she has taken paraquat which was kept in their house for farming purpose. They brought the empty bottle of paraquat by the trade name of "Gramoxone" with them. She doesn't have any past medical or psychiatric illness. She has consumed approximately 5 ml of herbicide as a suicidal

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attempt which is followed by repeated vomiting. Primarily she was taken to Peripheral Health Centre after half an hour of consumption where gastric lavage done and she was referred to higher Centre for further evaluation and management. There was no documentation available with patient's attendant, therefore we can't confirm whether charcoal administration was done at PHC during gastric lavage.

Vitals at the time of presentation in ED are; GCS-15/15, Blood pressure at right arm 100/60mmHg, pulse rate-108/min, Respiratory rate-20/min, Temperature at axillary-98.4 F, Oxygen saturation-97% at room air, Random blood glucose-103mg/dl, bilateral pupils were normal size and reactive to light.

On Primary survey Airway was patent, Lungs were clear to auscultation, there was no respiratory distress, had normal heart sounds, Capillary refill time was < 2 seconds and all peripheral pulses were present.

Secondary survey showed her oral mucosa red and congested and rest of the examination from head to toe were unremarkable.

At Emergency patient has started on maintenance IV fluids, antiemetic and PPI for supportive measures. Foley's catheterization has been done to measure urine output.

All initial investigations (CBC, RFT, LFT, PT/INR/APTT, ECG, X-RAY CHEST, URINE TOX SCREEN), UPT (Negative) were done from Emergency.

Patient then shifted to ICU for continuous monitoring. On the First day in ICU, patient remained asymptomatic. Initial complete blood count, LFT, RFT were within normal limits. ECG revealed sinus Tachycardia with no ST-T changes. Initial chest X-Ray was within normal limits. [Figure 1].

Patient was kept nil orally and on maintenance IV fluids, antiemetics, antacid and triamcinolone acetonide mouth paste to reduce pain and swelling inside the mouth. On the second day she has developed oliguria and increased in urea and creatinine levels for which Nephrology consultation was done and advised to increase the IV fluids and Planned for Hemodialysis if renal function further deteriorates.

On fourth day patient had developed oliguria and further deterioration of her renal function, Hemodialysis was performed and kept on a regular session of hemodialysis. Patient had developed fever (T-101.3°F) for which broad spectrum antibiotic started. Urine routine examination showed 20-25 pus cells/HPF, RBC-10-15/HPF and granular cast suggestive of urinary tract infection and acute tubular necrosis. [Figure 2].

On fifth day patient had 2 episodes of hamatemesis for which Pantoprazole infusion and UGI Endoscopy done suggestive of extensive oropharyngeal and esophageal ulcerations with oozing. [Figure 3].

On the following day patient became severely hypoxic, spo2-85% while on 100% FIO2 on Non Invasive Ventilation was used. Heart rate was 124/min, Respiratory rate 36/min and blood pressure was 120/66mmHg. ABG showed PaO2 of 45.0mmHg with Respiratory alkalosis [figure 4]. Chest X-Ray was done showed bilateral alveolar shadows predominately in mid and lower zones suggestive of ARDS. [Figure 5].

Subsequently patient became drowsy, Spo2 was 80% on 100% FIO2 on NIV. In view of persistence hypoxia patient was intubated and kept on mechanical ventilation.

Patient was continued on mechanical ventilation and hemodialysis was performed on daily basis but her condition didn't improve and she expired on 11th day of her admission.

### **Discussion:-**

Paraquat poisoning is a medical challenge for emergency physician because it's rare especially in the northern part of India and patient's vitals remain stable in the initial hours of presentation apart from mouth erosions and it causes mortality in a large number despite treatment in tertiary care setting [3]. Paraquat poisoning is common in southern part of India, Srilanka and in Africa (Trinidad, Tobago, South Trinidad) [4][5][6]. A lethal oral dose of the 20% concentration solution is about 10 to 20 ml in an adult and 4 to 5 ml in a child [1]. Ingestion of large amounts (>15-20 ml of 20% ion) results in fulminant organ failure resulting in renal and hepatic failure, GI ulceration, pancreatitis.

Toxic myocarditis and death from cardiogenic shock and multi-organ failure within 1-4 days [1]. Ingestion of smaller quantities usually leads to toxicity in kidneys and lungs developing over the 2-6 days. Renal failure develops quite rapidly. Paraquat accumulates inside renal tubular cells causing reduction oxidation (redox) cycling and increase reactive oxygen species formation with subsequent proximal tubular injury [7]. A decrease in paraquat elimination due to renal failure aggravates systemic toxicity [8]. The major effect of paraquat follows its accumulation in the lungs, it accumulates in the alveolar cells of the lungs, where it is transformed into a reactive oxygen species, the superoxide radical [1]. The pulmonary lesion has two phases: an acute alveolitis over 1-3 days followed by a secondary fibrosis. The patient develops increasing signs of respiratory involvement over 3-7 days and ultimately dies of severe anoxia due to rapidly progressive fibrosis up to 5 weeks later [9].

Gastrointestinal toxicity is present in majority of the case because most common mode of poisoning is self ingestion or accidental. A burning sensation of the lips and mouth may occur within a few minutes to hours followed by ulceration. Sometimes they may result in perforation, mediastinitis or pneumomediastinum. Direct contact with paraquat solutions may cause skin burns and dermatitis [10].

Some liver toxicity (jaundice, transaminase rise) is also common in these patients.

Early diagnosis are important .we need to obtain details of the exposure, route of exposure, concentration of the product and estimated amount, time of occurrence. Measurement of plasma and urine paraquat concentration is useful both to confirm poisoning and predict prognosis [11][12]. Complete blood count, electrolytes, renal and liver function should be done regularly. Serial pulmonary function test, chest radiographs, arterial blood gas determinations may be used to monitor toxicity.

A CT Scan of the chest may be helpful in detecting early lung fibrosis or assessing long term damage in survivors [9]. Upper GI endoscopy should be performed to identify the extent and severity of mucosal injury.

Any exposure to paraquat is an Emergency and patient should be admitted even if the patient is asymptomatic. Treatment involves the assessment and management of airway, breathing and circulation as per guidelines. However mild to moderate hypoxia should not be routinely treated with oxygen as it will worsen oxidative stress and it increases mortality in animals models [13][14]. Supplemental oxygen should be withheld unless the PaO<sub>2</sub> is less than 70mmHg because oxygen may contribute to the pulmonary damage which is mediated through lipid peroxidation [15]. Maintain intravascular volume and urine output to prevent prerenal kidney injury.

Immediate GI decontamination with absorbents that bind paraquat is indicated in a patient with protected airways. A single dose of activated charcoal (1 to 2 gm/kg) can be used. Charcoal hemoperfusion can remove paraquat and has been recommended to be started as soon as possible and continued for 6 to 8 hours but there is no evidence to show that prognosis improved [1][16].

Hemodialysis and hemoperfusion has been tried in many centers to remove paraquat but the benefit of this is very limited because paraquat is rapidly distributed to the lungs and other organs [17][18].

Immunosuppression with combination of cyclophosphamide and methylprednisolone was shown to be beneficial in moderate to severe cases by prevention of ongoing inflammation that lead to lung fibrosis and death [19][20].

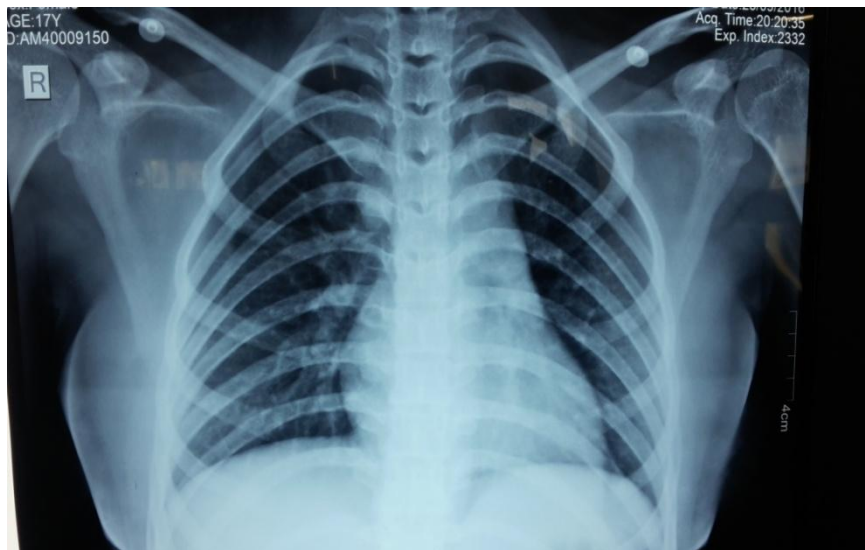
Intravenous Methylprednisolone 1gm/day for three consecutive days, Intravenous Cyclophosphamide 15 mg/kg/day for two consecutive days followed by Intravenous Dexamethasone 8mg thrice a day until pao<sub>2</sub> is >11.5kpa(80mmHg) and repeated pulse therapy with Methylprednisolone(1gm/day for 3 days) and cyclophosphamide(15mg/kg/day for 1 day) which if pao<sub>2</sub> is <8.64kpa(60mmHg)[20]. However a 2003 Systemic review of the effectiveness of immunosuppressive therapy in paraquat poisoning found lack of proven efficacy[21]. Several antioxidants like vitamins C and E have been clinically used to protect against free radical toxicity however only animals studies have been done that showed mixed response and human studies are either small or uncontrolled.

### **Conclusion:-**

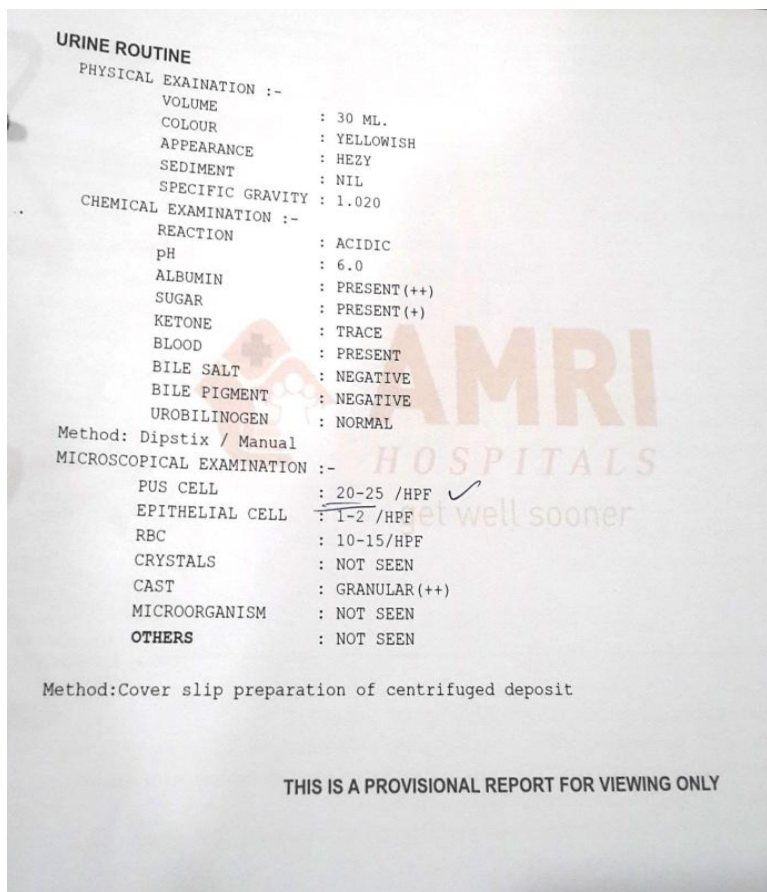
Patient presenting to the Emergency department with alleged history of ingestion of paraquat poisoning should be admitted even if they are asymptomatic initially. There is no specific antidote available and prognosis depends upon the amount of paraquat ingestion. Oxygen should be used cautiously in these patients. Early administration of



cyclophosphamide and steroids at Emergency at least 2-3 hours after paraquat exposure is important because it will not be effective once cells have already been infiltrated. However a large randomized controlled trial is required to affirm the role of Immunosuppression in paraquat poisoning.



[fig-1]



[fig.2]

**UGI ENDOSCOPY REPORT**

**SCOPE TYPE** : OLYMPUS GIFQ150

**Indication** : PARAQUAT POISONING

**Medication** : Xylocaine 10% local spray

**OROPHARYNX** : ULCERATIONS WITH FRIABILITY NOTED.

**Z LINE** : 38 cms

**G E JUNCTION** : 40cms

**ESOPHAGUS** : EXTENSIVE FRIABLE ULCERATIONS WITH WHITE ADHERENT PLAQUES SEEN BLEEDS ON TOUCH

**STOMACH** :

Fundus : Normal mucosa.

Body : Normal mucosa.

**DUODENUM** : NOT SEEN

**BIOPSY** : NOT Taken

**RUT** : Not done.

**IMPRESSION** : EXTENSIVE OROPHARYNGEAL AND ESOPHAGEAL ULCERATIONS WITH OOZING

**Recommendation:**

DR. S C SAMAL MD. DM (GASTRO)    DR. P BEHERA MD. DM. (GASTRO)    DR. A MOHAPATRA MD. DM (GASTRO)

Patient ID: 3013  
Date & Time: 29-Sep-16 11:43:30

Results: Gases+

pH	7.484	High
pCO2	27.9	mmHg Low
pO2	45.0	mmHg Low
cHCO3-	20.9	mmol/L Low
BE(ecf)	-2.5	mmol/L Low
cSO2	85.0	% Low

Results: Chem+

Na+	135	mmol/L Low
K+	4.7	mmol/L High
Ca++	0.92	mmol/L Low
cTCO2	21.8	mmol/L Low
Hct	Failed	iQC
cHgb	cnc	
BE(b)	-1.2	mmol/L

Results: Meta+

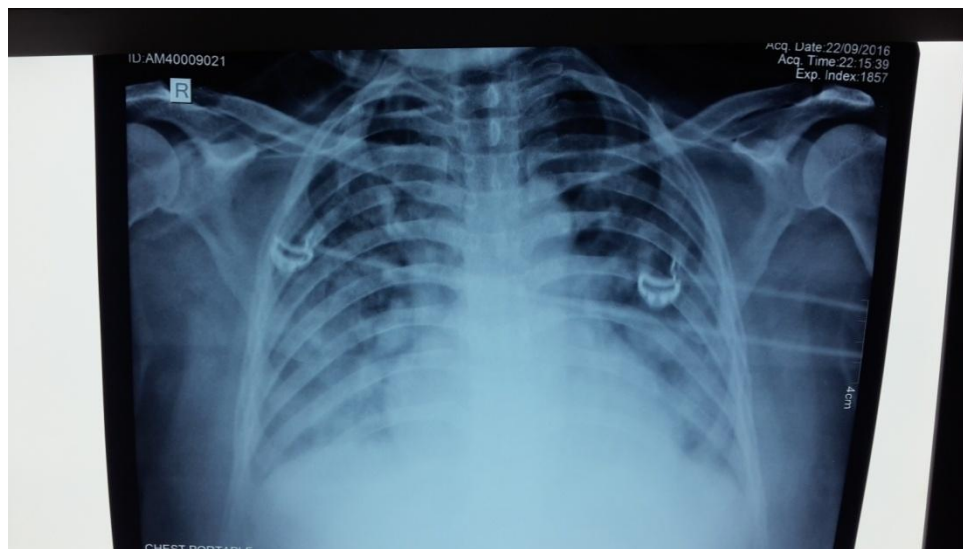
Glu	125	mg/dL High
Lac	1.03	mmol/L

Reference Ranges

pH	7.350 - 7.450	
pCO2	35.0 - 48.0	mmHg
pO2	83.0 - 108.0	mmHg
cHCO3-	21.0 - 28.0	mmol/L
BE(ecf)	-2.0 - 3.0	mmol/L
cSO2	94.0 - 98.0	%

[fig 3]

[fig 4]



[fig 5]

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### RESEARCH ARTICLE

#### ANALYSIS OF CHANGES IN BILATERAL MASSETER AND ANTERIOR TEMPORALIS MUSCLE EFFICIENCY IN COMPLETE DENTURE WEARERS. –AN EMG STUDY.

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Electromyography, masticatory muscles efficiency, motor units, complete denture, maximum voluntary contraction.

#### Abstract

**Purpose:** The loss of natural teeth leads to bone resorption and muscular hypotonicity, which may affect the structures involved in mastication. Atrophy of supporting tissues, poor adaptation, reduced masticatory efficiency, and psychosocial embarrassment are major complaints of edentulous patient wearing old/faulty denture. The need for this study is to examine the effect of old/faulty dentures and a new denture on the masticatory muscle efficiency with the help of electromyography.

**Materials and methods:** 15 edentulous patients wearing complete denture prosthesis selected as a subject for the investigation. Surface electrodes from electromyographic unit were placed in the region of right and left anterior Temporalis muscle and Masseter muscle, and the patients will be asked to perform maximum voluntary contraction. The muscle activity analyzed twice for each patient: (1) with the old/faulty dentures and (2) 5 month following insertion of new denture.

**Results:** The electrical activity during maximum voluntary contraction exhibited statistically significant improved muscle efficiency with new denture when compared to those with old dentures in place for 5 months.

**Conclusion:** New dentures or improvements in occlusion and vertical dimension produce a positive benefit to the patient by reducing the muscle effort during chewing without affecting masticatory performances. The reduction in muscle effort is likely to cause less tissue and in the end may minimize residual ridge resorption and new complete denture allows for neuromuscular reprogramming, which contributes to muscular balance of the masticatory system.

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#### Introduction:-

The “stomatognathic system” is complex system that acts as a functional unit of the body characterized by several tissues of different origin and structure that act in consonance to perform different functional tasks. It comprises the

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joint connection between the mandible and the base of the skull, which in turn has muscle and ligament connections to the neck region. It consists of skeletal components (maxilla and mandible), dental arches, soft tissue (salivary glands, nervous and vascular supplies) temporomandibular joints (TMJ) and muscles. These structures are interconnected and interrelated; when activated, they aim to achieve maximal efficiency with protection of all the participating tissues. The masticatory system is also a part of this complex stomatognathic system. In dentulous subjects, mastication is highly coordinated neuromuscular function that involves fast effective movements of the jaw and continuous modulation of forces in craniofacial system. Masticatory functions generated by rhythmic contraction of masticatory muscles. These muscles have capacity to contract during daily use of the stomatognathic system and maintain the muscle tone in mandibular rest position. Whereas, in edentulous subjects these mechanism acts with marked differences. The loss of natural teeth leads to bone resorption and muscular hypotonicity, which may affect the structures involved in mastication leading to reduced capacity in various functions of stomatognathic system[1].

When teeth are lost, a change occurs in the mandibular posture, the speech pattern, esthetics, and deglutition as well as in the individual's social, emotional and psychological behavior. Along with this, some age related changes, such as deterioration in the fast and slow-twitch fibers of the striated muscles, results in impaired muscle force. Edentulous persons have reduced capacity to perform various functions of the stomatognathic system such as occlusal forces, tactile thresholds and chewing ability. The loss of teeth and elimination of periodontal afferent innervations flow lead to changes in the neuromuscular patterns causing the reduced chewing efficiency when new complete denture replaces teeth[2]. For the patient who has previously worn dentures, the clinician must determine the OVD(occlusion at vertical dimension) based on the clinical presentation. By establishing, an appropriate OVD in the patient who has worn the same dentures for 15 years or longer can be challenging. Excessive wear of the denture teeth in a long-term wearer can cause the patient to function at a reduced OVD, possibly compromising the oral cranio-facial system. In addition, older denture wearers may suffer age-related morphologic changes, such as decreased facial height, because of mandibular ridge resorption and a downward and forward rotation of the mandible[1]. An increase in the vertical dimension may lead to changes in the oro-facial structures, i.e. jaw elevator muscles and temporo-mandibular joints. An increase in the vertical dimension may influence the masticatory performance both in a negative way, (hampered chewing cycle) and in a positive way (increased bite force).

Although, various techniques are available for examining the stomatognathic system, the electromyographic recording is one of the convenient and useful methods because it directly measures muscle activity. Electromyographic techniques have permitted more precise assessment of the muscle functions compared to previously possible clinical observation. Technological development has led to the optimization and application of computerized diagnostic systems such as electro-gnathography[3]. The first effort to apply electromyography in dentistry was made by Robert E. Moyers. It used to corroborate the neuropsychological analysis of the factors linked to prosthetic rehabilitation procedures. Electromyographic data representing muscle activity during movements of the mandible (e.g.chewing) are the result of several variables which are operating simultaneously-i.e., continual variation in muscle length, bite dimension, and temporomandibular joint axis. The study of such data has contributed to our knowledge of the relative function of the masticatory muscles and has certainly indicated the potential value of electromyographic data in dentistry[4].

## **Materials and Methods:-**

### **Sample selection:-**

Fifteen edentulous patients (eight men and seven women aged between 40 and 80 years) with complete, old maxillary and mandibular dentures, worn for over 10 years were selected for the present study. The patients were selected from the out patient department of Prosthodontics. All patients presented diminished occlusal vertical dimension (OVD), with deficient dental occlusion, and severe bone resorption, particularly of the mandibular arch. They were all asymptomatic and presented no signs or symptoms of neuromuscular and temporomandibular disorders (TMD). The selected patients were informed about the treatment to be instituted and signed a term of consent in accordance with the recommendations of the Human Research Ethics Committee.

### **Screening examination:-**

The computerized system was used for recording the EMG data. The components of this system comprises of a display monitor, a cathode ray tube and electrodes (surface and hypodermic needle). The monitor helps in screening and it display the amplitude of muscle activity by special **RMS EMG software** (figure no 1). The cathode ray tube (CRT) transmits the activity of muscle from electrode to the monitor, and the electrode, which filters the muscle



activity and it, transmits to the CRT for amplification. Surface EMG utilizes sensing electrodes placed on the skin, which allows the clinician to directly and accurately monitor muscle activity.

#### Preparation of the patients:-

On the day of EMG recording for old denture and with the new denture after 5-months follow up, any needed adjustment to the intaglio, cameo and occlusal surfaces of the complete dentures were made. During the electromyographic recording (figure no. 1), the patient was asked to seat on nonconductive chair, which reduces the interferences in an upright but relaxed position. The head was kept unsupported, and aligned according to Frankfort horizontal plane, parallel to the floor. The conductivity of the electrode-skin interface was increased using conductive gel after thorough cleaning of the skin with 99.5% alcohol swabs and skin preparation gel to enable an easy transport of electrical potentials. The electrode must be firmly attached to the skin, with adhesive tape, to avoid bias due to movements (figure no 2). The application of conductive gel reduces the impedance below 20kV. The recordings were performed 5 minutes later, which allowed the conductive paste to adequately moisten the surface. The EMG signals were filtered (0.003-1.0) and amplified with a time constant of 10mili second, and displayed on the cathod ray tube (CRT) monitor for on line monitoring.

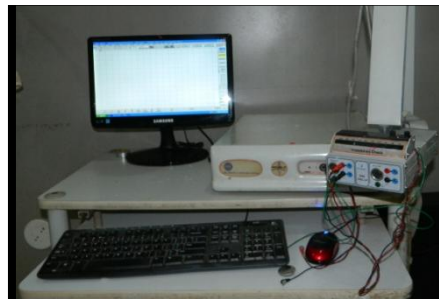


Figure No1:- Electromyogram.



Figure No 2:- Electrodes, Conductive Gel & Adhesive Tape.

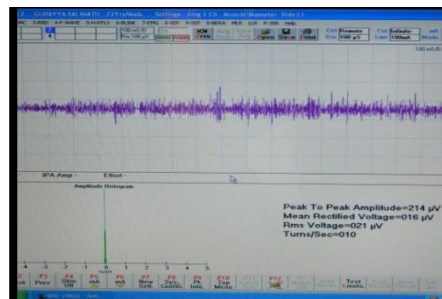


Figure No 3:- Electromyographic Recording

#### Experimental protocol:-

The wires were connected. The appliance is equipped with a trial test, which is necessary to verify the correct state of the electrodes and connections. The anatomical locations for area of interest were recognized and palpated. Each EMG recording lasted 10 s and a computer calculated the root-mean-square (RMS) value of the EMG activity (figure no.3). The subjects were allowed to practice prior to the start of the experiment. Once the patient and instruments were prepared for the collection of data, the procedure for recording muscle activity by EMG was

carried out. The electrical signals were captured and the electrical activity of the muscles was analyzed. Each EMG recording was repeated at about a 1-min interval to avoid muscle fatigue. For EMG recording the patient was asked to clench his/her teeth, and keep them clenched for two seconds. Next, the patient was asked to relax the muscles, slightly separating the teeth for another two seconds. The operator controlled all the times. The electrical activity was recorded manually for 5sec, rested for 15sec and repeated the clenching cycle 5 times. To record maximum tooth clenching, the patient maintained tooth contact for two seconds, and electrical activity was recorded. The averages RMS-EMG of the two repeated recordings were used for the statistical analysis.

### Data Collection:-

#### EMG recording for bilateral anterior Temporalis muscle: (figure no. 4 and 5):-

For recording EMG activity of anterior Temporalis muscle, two pair of miniature surface bipolar Ag/AgCl electrodes were placed over the anterior Temporalis muscle 1-inch posterior and 1-inch superior to the outer canthus of the eye with adhesive tape. These electrodes were placed parallel to the muscle fibers, with a centre-to-centre distance of 30mm to avoid the endplate region and thus to obtain stable recordings. They were positioned at the motor point, on each portion of the anterior Temporalis muscles, so that their electrical activity could be assessed. The placement of the electrode was determined by manual palpation of the muscles bilaterally. The muscle activity is checked by asking the patient to gently clench the mouth in maximal intercuspal position following the longitudinal alignment, parallel with the direction of the muscle fibres. The ground electrodes were placed over the center of forehead in order to eliminate possible external interferences. The subjects clenched manually for 5sec and rested for 15sec and repeat the clenching cycle 5 times. The highest EMG activity was considered the maximum clenching.



Figure no 4:- Emg Recording For Right Anterior Temporalis Muscles.



Figure No 5:- Emg Recording For Left Anterior Temporalis muscles

**EMG recording for bilateral Masseter muscle: (figure no. 6 and 7):-**

The EMG activity of Masseter muscle was carried out by placing two pair of miniature surface bipolar Ag/AgCl electrodes over superficial fibres of Masseter muscle. The superficial fibres of Masseter muscle originate at dorsal surface of zygomatic bone and inserted to the ramus of the mandible. A band of superficial Masseter muscle was palpated by manual method from the prominence of zygoma until the gonial angle of the mandible. The activity this muscle was assessed by forcing the teeth for clenching. These electrodes were placed 2cm above the lower margins of the mandible halfway between the mandibular angle and anterior borders of muscles. These electrodes were placed parallel to the Masseter muscle fibers, with a centre-to-centre distance of 30mm to avoid the endplate region and thus to obtain stable recordings. They were positioned at the motor point, on each portion of the muscles, so that their electrical activity could be assessed. The subjects clenched manually for 5sec and rested for 15sec and repeat the clenching cycle 5 times. The highest EMG activity was considered the maximum clenching.



**Figure no 6:-** Emg Recording For Right Masseterr Muscle.



**Figure no 7:-** Emg Recording For Left Masseterr Muscle.

In all the procedures, the capture and analyses of EMG signals were carried out as recommended by the International Society of Electrophysiology and Kinesiology (Willians 1987). Recordings and analysis of the muscles electrical activity were obtained with the mandible in the maximum voluntary clenching. The EMG signals were stored and analyzed as root mean-square (RMS) values expressed in microvolts ( $\mu\text{V}$ ) in the maximum intercuspation position (figure no. 3). Finally, a new set of complete dentures with corrected occlusal vertical dimensions, an appreciable occlusal anatomy and well-polished cameo surface were delivered to all old denture wearers. The same procedures were performed after 5-months with new set of complete dentures. The statistical analyses were performed using paired t-test. A significance level of 0.05 was adopted for all tests.



## Results:-

The data engraved from this study were subjected to statistical analyses by using paired t-test. A significance level of 0.05 was adopted for all tests. The data of the study was analyzed and the results are presented in the table 1 and 2. These tables represents the mean values of electromyographic activity of Masseter and anterior Temporalis muscles with old and new denture after 5-months of follow up during maximal voluntary contraction(MVC) in the intercuspal position.

**Table 1:-**

This data showed during maximum voluntary contraction of Anterior Temporalis Muscle. The Mean activity of 242.4 $\mu$ V on right side and 237.67 $\mu$ V on left side with old denture and, 168 $\mu$ V on right side and 166.07 $\mu$ V on left side with new denture after 5-months follow up. The paired difference between the old denture and new denture, the activity of Anterior temporalis muscle for right side is 74.4 and on left side 71.6, thus from these values it infers that right side of Anterior Temporalis muscle is more efficient than the left side of the muscle. Statistical analysis reveals highly significant increase in muscle efficiency ( $p=0.000^*$ ,  $p=0.000^*$ ) with new denture after 5-months follow up when compared to subjects with old denture during maximum voluntary contraction.

Anterior Temporalis Muscle	With old denture ( $\mu$ V)		With new denture ( $\mu$ V)		Difference		P Value
	Mean	SD	Mean	SD	Mean	SD	
Right	242.4	38.13	168	32.34	74.4	42.3	0.000*
Left	237.67	43.26	166.07	44.15	71.6	39.9	0.000*

\*Significant at  $p \leq 0.05$

**Table 2:-** This data showed during maximum voluntary contraction of Masseter Muscle. The mean activity of 231.93 $\mu$ V on right side and 230.60 $\mu$ V on left side with old dentures and, 163.13 $\mu$ V on right side and 171.73 $\mu$ V on left side with new denture after 5-months follow up. paired difference between the old denture and new denture, activity of Masseter muscle for right side is 68.8 and on left side 58.8, thus from these values it infers that right side of Masseter muscle is more efficient than the left side of the muscle. Statistical analysis reveals highly significant increase in muscle efficiency ( $p=0.000^*$ ,  $p=0.002^*$ ) with new denture after 5-months follow up when compared to subjects with old denture during maximum voluntary contraction.

	Mean	SD	Mean	SD	Mean	SD	
Right	231.93	59.12	163.13	42.73	68.8	40	0.000*
Left	230.60	46.87	171.73	75.30	58.8	61.4	0.002*

\*Significant at  $p \leq 0.05$

## Discussion:-

In dentulous subjects, mastication is highly coordinated neuromuscular function that involves fast effective movements of the jaw and continuous modulation of forces in craniofacial system[1]. These muscles have capacity to contract during daily use of the stomatognathic system and maintains the muscle tone in mandibular rest position. Whereas, in edentulous subjects these mechanism acts with marked difference. The loss of natural teeth leads to bone resorption and muscular hypotonicity, which may affect the structures involved in mastication leading to reduced capacity in various functions of stomatognathic system[2]. Masticatory function occurs because of the interrelation between organs of the stomatognathic system, proprioception, brain centers, and occlusal function. Any change in the occlusal characteristics, temporomandibular joint or masticatory muscles may affect the pattern of the masticatory movements and, consequently, their effectiveness. Edentulous persons have reduced capacity to perform various functions of the stomatognathic system such as occlusal forces, tactile thresholds and chewing ability[3].

According to Luis Angeline & Joseph a. Clayton (1960) A study conducted to evaluate the Quantitative Electromyography of the Masseter Muscle and the usefulness of electromyography depends upon the ability to characterize quantitatively the "normal" population. Moreover, it concluded that, the data now do not permit such a characterization, because of the lack of standardization in recording techniques and the obvious difficulty in expressing the resultant electromyogram in simple quantitative terms[4]. When teeth are lost, a change occurs in the mandibular posture, the speech pattern, esthetics, and deglutition as well as in the individual's social, emotional and psychological behavior. Along with this, some age related changes, such as deterioration in the fast and slow-twitch fibers of the striated muscles, results in impaired muscle force[5]. Age and muscular fatigue affect the function of

the masticatory system and this is frequently accompanied by tooth loss, prosthetic rehabilitation, and, also by the development of local and systemic circumstances that may greatly influence this physiological process and reduce the masticatory ability of elderly individuals. Because of ageing in the oral cavity, there is a reduction in food intake, as well as opting for softer foods, which leads to an imbalance in nutritional intake. This fact leads to metabolic alterations, which can cause general ageing of tissues of the body[6].

P. Slagter et al (1992) investigated the relationship between the ability of patients with complete dentures to comminute a tough artificial test food, and their answers to questions about chewing experience. It has concluded that the subjective chewing experiences of complete denture wearers were related to ability to comminute test foods and degree of resorption of mandibular ridge was related to comminute test foods[7]. The loss of teeth and elimination of periodontal afferent innervations flow lead to changes in the neuromuscular patterns causing the reduced chewing efficiency when new complete denture replaces teeth. Other factors can affect chewing ability in complete denture wearer such as age, gender, personality type, denture experience, denture quality and occlusal schemes. Ellsworth K reported that age did not affect masticatory performance except the patient who is lower than 35 years old and upper than 75 years old. Yamashita S showed that the maximum in masticatory performance found in natural dentition, lower in removable partial denture and the lowest in complete denture wearer[8]. Iwao Hayakawa et al (2000) examined changes in masticatory function of complete denture with soft liner and was shown that applying a soft lining material to the mandibular dentures of 6 edentulous patients improved masticatory function with no adverse effect on the muscular tasks[9].

However, the differences were not statistically significant. Restorative procedures, in which the vertical dimension is increased, may influence the mechanisms of chewing cycle. Furthermore, changes in masticatory muscle length resulting from vertical opening may influence the length–tension relationship. An optimum muscular force measured under static conditions occurred at a jaw openings varying between 5 and 10 mm were measured at the first molar region. Hence, increasing the vertical dimension of occlusion may increase bite force during mastication. Thus, an increase in the vertical dimension may influence the masticatory performance both in a negative way, (hampered chewing cycle) and in a positive way (increased bite force and thus better breakage of food particles)[10]. For the patient who has previously worn dentures, the clinician must determine the OVD based on the clinical presentation. By establishing, an appropriate OVD in the patient who has worn the same dentures for 10 years or longer can be challenging. Excessive wear of the denture teeth in a long-term wearer can cause the patient to function at a reduced OVD, possibly compromising the oral craniofacial system.

In addition, older denture wearers may suffer age-related morphologic changes, such as decreased facial height, because of mandibular ridge resorption and a downward and forward rotation of the mandible. These morphologic changes, manifested primarily in the mandibular arch, result in a progressive forward posturing of the mandibular denture that can lead to a reduced horizontal overlap[11]. Peyron et al. found a progressive muscular loss as age advances, ranging around 40% when individuals were 75 years old, and, also a decrease in masticatory performance. The Effect of gender on masticatory performance did not differ in complete denture wearer. On the contrary, gender affected masticatory performance in natural dentition. However, the improvement in denture quality significantly affected masticatory performance in complete denture wearer. Changes in the occlusal vertical dimension are a common procedure in prosthodontic treatment. An increase in the vertical dimension may lead to changes in the orofacial structures, i.e. jaw elevator muscles and temporomandibular joints. Furthermore, an increase in the vertical dimension will lead to a decreased activity of the jaw elevator muscles in postural position. Restorative procedures, in which the vertical dimension is increased, may alter the length of the main jaw elevator muscles as well as the position of the mandibular head in the fossa temporalis[12].

Although, various techniques are available for examining the stomatognathic system, the electromyographic recording is one of the convenient and useful methods because it directly measures muscle activity. Electromyographic techniques have permitted more precise assessment of the muscle functions compared to previously possible clinical observation. Technological development has led to an optimized application of computerized diagnostic systems such as electrognathography[3]. The first documented experiments dealing with EMG started with Francesco Redi's works in 1966. Redi discovered a highly specialized muscle of electric ray fish generated electricity. Marey made the first actual recording of this electrical activity in 1890, who also introduced the term EMG. In 1922, Gasser and Erlanger used an oscilloscope to show the electrical signals from muscles. Clinical use of SURFACE EMG [SEMG] for the treatment of more specific disorders began in 1960's and was used

by Hardyek The first effort to apply electromyography in dentistry was made by Robert E. Moyers. It used to corroborate the neuropsychological analysis of the factors linked to prosthetic rehabilitation procedures[4].

Electromyography can be used in many clinical and biomedical applications. It acts as a diagnostic tool for identifying neuromuscular diseases, disorders of motor control and, used as a control signal for prosthetic devices such as prosthetic hands, and lower limbs. Electromyographic data representing muscle activity during movements of the mandible (e.g., chewing) are the result of several variables which are operating simultaneously-i.e., continual variation in muscle length, bite dimension, and temporomandibular joint axis. The study of such data has contributed to our knowledge of the relative function of the masticatory muscles and has certainly indicated the potential value of electromyographic data in dentistry.

#### **Various applications of EMG in dentistry:-**

a) It provides an objective means by monitoring changes in muscle activity. b)To study action potentials in actively contracting lingual and masticatory muscles. c)It is used in the treatment of Myofascial Pain Dysfunction where the procedure is called a Auditory or Visual electromyographic feedback, It supplies information to the patient concerning to the muscle activity. d)To study biomechanics of jaw and facial muscle functions. e)EMG is useful for identifying asymmetry of muscle action and particularly for judging the results of the therapy. f)Used for monitoring of nocturnal bruxism and jaw muscle tracking. g)Used as one part of a full assessment protocol to determine if a patient has significant muscle asymmetries possible postural disturbances and significant muscle fatigue.

The usefulness of electromyography depends upon the ability to characterize only quantitatively the "normal" population. At present, data does not permit a characterization based on quality of a muscle activity because of the lack of standardization in recording techniques and the obvious difficulty in expressing the resultant Electromyograms in simple qualitative terms. The two main types of electrodes used for the study of muscle dynamics are surface (or 'skin') electrodes and deep electrodes (usually wire or needle)[13]. Deep electrodes: the electrodes inserted within the muscle by using two thin-coated wire filaments, which introduced by means of a hypodermal needle.They are superior to surface electrodes, as the quality of the electromyogram is better. There are lesser technical artifacts, because distance between the muscle and the electrode remains more constant. There is a risk of infection associated with the use of needle electrodes. They may also be painful. After insertion of the needle, it is always important to confirm that the needle correctly placed by asking the patient to contract the muscle being tested. The most important guideline for adequate needle insertion is to observe and palpate the muscle in contraction, while the test maneuver is being performed. This rule is applicable to almost all superficial muscles. If the needle is correctly positioned this maneuver should easily produce crisp action potentials[5].

The Surface EMG method: most widely and commonly used for recording muscle activity. Surface EMG has been advocated as a "modern scientific approach" because the output from such devices is presumed to be both "quantitative" and "objective". Surface EMG employs surface electrodes, which are non-invasive, painless and reduced risk of infection. Using a surface electrode always presents the possibility of loosening of the electrodes during nerve stimulation. Surface electrodes also give rise to errors when the distance between the electrodes and the muscle changes during muscle contraction. They are much more convenient for clinicians, more acceptable for patients and produce less movement; this is a noninvasive and user-friendly method. Surface electromyogram (EMG) analysis in studies of muscle function has attained increasing attention during recent years and has been applied to assess muscle endurance capacity, anaerobic and lactate thresholds, muscle biomechanics, motor learning, neuromuscular relaxation, muscle soreness, neuromuscular diseases, motor unit activities, and skeletal muscle fatigue[5].

Electromyographic examination of masticatory muscles may have confirming value for clinical diagnosis of myospasm (Spasmodic contraction of a muscle), which characteristically shows a marked increased in EMG activity. Surface EMG of muscles of mastication used routinely as a part of diagnosis and treatment of TMD. The duration of temporary pause in ongoing EMG activity of jaw closing muscles during maximal clench has been found to be longer, on average in a group of TMD patients. Several studies have quantitatively investigated the EMG during postural activity of the mandible and during maximal bite in the intercuspal position. The EMG values for the temporal and masseter muscles have been quantitatively investigated in these studies for control subjects without functional disorders and for patients with functional disorders.

**The purposed usefulness of surface electromyography:-**

A clinical use of SEMG has been proposed for the diagnosis and treatment of TMD. It's based on the assumption that various pathological or dysfunctional conditions can be discerned from SEMG recordings of masticatory muscle activity. The muscle activity including postural hyperactivity, abnormal occlusal positions, functional hyperactivity and hypoactivity, muscle spasms, fatigue and muscle imbalance. SEMG activity has been suggested to be useful in documenting changes in muscle function before and after therapeutic interventions as evidence of successful treatment. SEMG also has been used in biofeedback concerning the awareness and control of nocturnal and diurnal para-functional habits[14].

Masticatory forces in complete edentulous mouth directly depends on- a) the size of muscle creating the forces, b)their position in the mandible, c)type of chewing, d)shape of edentulous alveolar ridges and e)the degree of intermaxillary separation. Bite forces in complete denture wearers are significantly decreased in relation to person with natural teeth. There is fundamental difference in the distribution of functional energy in the complete denture wearer and subjects with intact teeth. Reduction of masticatory efficiency in denture wearers may be caused by irregular activity of masticatory musculature or is the consequences of irregular flow of energy during mastication[3].

**Clinical evaluations revealed the following Conditions:-**

Severe decrease in lower face height yielding poor facial esthetics, inadequate fit of complete dentures, worn denture teeth, clinically perceptible deficiency in OVD, acquired protrusive maxillomandibular relationships secondary to resorption, or angular cheilitis. The new complete dentures were made according to the procedure recommended by Zarb et al[12].

Although numerous studies have described comparison of different parameters in edentulous subjects and natural dentition, little comparative information has been regarding the complete denture patients. The data engraved from this study (Table-1) showed significant increase in muscle efficiency of right Anterior Temporalis muscle when compared to left Anterior Temporalis muscle. The mean difference between the values of electrical activity of muscles analysed in maximum voluntary contraction were higher for old denture wearers in comparison with those patients with new complete denture wearers following 5-months follow up. The data obtained from this study (Table-2) showed significant increase in muscle efficiency of right Masseter muscle when compared to left Masseter muscle. The mean difference between the values of electrical activity of muscles analysed in maximum voluntary contraction were higher for old denture wearers in comparison with those patients with new complete denture wearers following 5-months follow up.

According to Seung-Ho Lee Dang-Wan Kang (2002) showed during maximum intercuspation, chewing position, the proportionality of anterior temporalis muscle to masseter muscle activity was lower than other positions, and Naeije Shi found similar results. He also concluded that the temporalis muscle activity is especially sensitive to immediate changes in lateral positioning and that the masseter activity remains unchanged when conditions of stable bilateral occlusal contacts are present. Clinically, the use of new complete denture will allow new occlusal contacts to be reestablished, functionally benefiting the masticatory system by allowing a return to normal parameters.

Zuccolotto et al (2007) showed patients who have been edentulous for over 10 years and have adapted to their unsatisfactory prosthesis may need extra time to reestablish their musculature after changing the prosthesis and it may be necessary to consider new parameter for these patients. The above-mentioned observations indicate that the subjects with old denture wearers show greater muscle activity and hence improved muscle efficiency. The new dentures showed improved facial esthetics, adequate fit, correct maxillomandibular relationships, and anatomical teeth with cuspal morphology[14].

Having new denture after 5-months follow up for adaptability of dentures to the musculature infers minimal muscle activity and greater muscle efficiency. Due to the poor condition of dentures, these edentulous patients follow a diet based on soft foods. For that reason, it was assumed that the musculature would show hypotonicity. By suppressing proprioceptive mechanisms corresponding to the preservation of hypoactive muscle activities and eliminating possible interference from the occlusal relationship of the old dentures, new denture with improved occlusal surface and vertical dimension could promote musculature reconditioning. This fact probably occurred and allowed hypoactive muscles to optimize their electric activity.

The increase in mean temporalis muscle values is clear evidence of its role in mandibular positioning to establish a new horizontal maxillomandibular relationship. Factors such as OVD, occlusal plane conditioning, integrity and adaptation of old dentures, and the possibility of muscle hypoactivity before treatment, could cause functional imbalances. After being corrected and using new set of complete denture, these were probably characterized by an increase in muscle efficiency. In this study, patients who were evaluated during the whole period of the study, reported that they felt greater comfort and that they were pleased with the aesthetics. Seventy per cent reported that they could chew better when wearing the new set of complete dentures than they did with the old dentures. From these results, it could be concluded that new set of complete dentures allow for neuromuscular reprogramming, which contributes to muscular balance of the masticatory system.

As might be expected the data suggest that there are differences in the levels of muscular activation in elderly individuals during masticatory function. However, there is a need for further long-term studies concerning elderly individuals, with the purpose of elucidating if these results are important for dynamic, specific or non-specific functional activities. By use of new complete denture with established occlusal contacts and vertical dimension, that functionally benefits the masticatory system by allowing a return to normal parameters. Thus, the musculature's EMG activity (anterior temporalis) may be reduced, allowing muscles to work more efficiently during 'tooth' contact. Other authors have affirmed that patients with new dentures increased masticatory efficiency, even with poor muscular adaptation and reduced electrical activity in the masticatory muscles. This increased masticatory efficiency may have developed from muscular adaptation, reestablishment of OVD and occlusal surfaces. The new dentures with correctly positioned cusps facilitated intercuspation and perhaps required a lower amount of force to chew the food. This could lead to greater chewing of food and a better quality diet.

In the present study, the reduction in the number of cycles occurred mainly at the end of mastication. By electromyography, we can also see muscular changes in patients requiring prosthetic rehabilitation; therefore, we can state that rehabilitation need interferes on muscle harmony thus improvement in the efficiency of muscle activity. It is essential to explain to complete denture users, the importance of attending periodical visits in order to evaluate their dentures and oral conditions. These factors are factors intimately linked to aesthetics and functionality.

#### **Limitations of the study:-**

(1)The principal limitation of the present study is the number of analysed subjects, that was under the proper sample size to avoid type II errors. (2)In this study, 5 months was not enough time to observe increased efficiency with the new complete dentures. (3)The complex neuromuscular skills required to overcome the limitations of dentures. Adaptation of neuromuscular system takes an extended time and may be a determinant factor in influencing the EMG activity and this aspect can change the results. (4)Reestablishment of the artificial tooth cusps with anatomic teeth and conventional balanced occlusion positive outcomes can be expected. (5)Patients who have been edentulous for over 3-5 years and have adapted to their old (unsatisfactory) prosthesis may need extra time to re-establish their musculature after changing the prosthesis and it may be necessary to consider new parameters for these patients. (6)The patients investigated in the present study were healthy physiologically and psychologically and, results may be different in psychologically distressed patients. (7)Electrodiagnostic resources are still far from a concrete professional reality due to the lack of knowledge about the technique along with high-cost equipment.

#### **Further scope of the study:-**

(i)A complementary approach in TMD diagnosis by EMG with other methods is sufficient if applied. (ii)Improved masticatory efficiency would be explained by enhanced bilateral balanced occlusion obtained with the new dentures. (iii)The behavior of the dynamics masticatory muscle activity, like chewing swallowing and in rest postural position underlines the importance of an integrated analysis of both kinematics and EMG activity in the follow up of patients with new dentures. (iv)The studies should clarify the association among masticatory efficiency and alterations in anatomical occlusal form. (v)Further investigations are needed to explore the relationship between occlusal features and muscular activity, designed following specific criteria (randomization, inclusion and exclusion criteria, similarity between groups at baseline, detailed description of the protocols to facilitate replication, blinding methods) in order to establish if a causal association between these variables really exist, thus avoiding spurious associations. (vi)Longitudinal studies with the purpose to appraise the long-lasting effects of occlusal disturbance on the activity of masticatory muscles. (vii)Finally, a greater accuracy of the electromyography would be desirable to confer to the results obtained an absolute reliability.

**Conclusion:-**

According to the methodology used and according to the results obtained it may be concluded that the electrical activity of Anterior Temporalis muscle and Masseter muscle during maximum voluntary contraction was reduced; hence, muscle efficiency has been improved after 5 months with the new complete denture in place. The difference was statically significant. The results show that new dentures or improvements in occlusion and vertical dimension produce a positive benefit to the patient by reducing the muscle effort during chewing without affecting masticatory performances. And it also indicate that in edentulous subjects with a old denture used for several years, after the delivery of a new denture 5 months of follow-up, the EMG activity of right side of the anterior Temporalis muscle decreases hence, the muscle efficiency is improved as compared to other group of muscles examined. The reduction in muscle effort is likely to cause less tissue trauma and in the end may minimize residual ridge resorption.

A new complete denture allows for neuromuscular reprogramming, which contributes to muscular balance of the masticatory system. With wear of old complete dentures over a period (more than 5-6 years), lead to the compromise in esthetic and function with reduced masticatory efficiency. Thus, recognition of these expected gains to the patient is important for the dentist to make treatment recommendations about making new dentures for every 3-5years. Moreover, improvement in occlusal surface (anatomic cusp), reestablishment of new vertical dimensions significantly improves the esthetic, function and increased masticatory efficiency. However, further improvement in muscle efficiency in edentulous patient leading to better nutrition and digestion. All these factors considered for physical and psychological benefit to the patient's health, condition and well-being.

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### RESEARCH ARTICLE

#### EVOLVING DYNAMICS OF RECRUITMENT FUNCTION IN IT INDUSTRY: EMPHASIS ON THE ROLE OF INFORMATION TECHNOLOGY

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#### Abstract

Persistent and effective talent is a prerequisite for facing the tremendous challenges posed by the ever evolving and competitive business environment. While the companies are being pushed to innovate in regards to its recruitment strategies on one hand, the budgets to do the same continue to be snipped. Thus, companies have been seen to resort to use of information technology as a medium to source, select, recruit and place its candidates. The use of IT in recruitment is not only an economically feasible alternative but is also found to be a viable option in regards to its time effectiveness. *The objective of this paper has been to primarily understand the transformation which has taken place in regards to recruitment initiatives of corporates in general and IT firms in particular. Further, the focus of the study has been to gain relevant insights pertaining to the current status of technology adoption in the recruitment domain of IT firms. The significant findings from the study were that there has been a definite shift in Human Resource Management architecture. It has witnessed a thorough changeover from being merely an administrative job to today contributing towards the strategic business objectives of the firm. The adoption of information technology has reduced the overall workload of HR personnel thereby enabling them to redirect their energies towards tactical decision making. Firms have been seen shifting towards adoption of E-recruitment drives in order to differentiate their market standing in regards to the available talent pool. Even though organizations continue to witness certain resentment in terms of completely adapting to system based HR functions, stakeholders at different levels are slowly realizing the value add due to such an initiative and are thus effectively contributing towards smoother transition of the same.*

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#### Objectives:-

1. To study the traditional and modern recruitment function.
2. To understand recruitment process in IT Industry.
3. To gauge the impact of Information Technology (IT) on recruitment function.

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**Introduction:-**

Information Technology essentially refers to a process that is developed for storing, processing and transfer of data. The advent of massive transformations with regards to information technology is an evident result of rapid globalization observed during the turn of the century. The IT industry has thus undoubtedly become one of the most dynamic industries in every country. Since, it is seen to contribute heavily to the overall revenue of any country, its prime emphasis is always on enhancing productivity to the maximum extent possible. To achieve this objective, it continues to lay focus on the quality of its human resources. Due to the very same reason, there has been an evident shift in the role of HR department in an IT firm. From being merely a support function, it is today recognized as a strategic business partner, indirectly contributing to the bottom line revenues of the firm. The way in which human resource functions are carried out has seen a drastic transformation in the recent years. Human Resource activities are now broadly categorized as-

Transactional - Involving activities such as pay roll information, administration of employee benefits, etc.

Traditional - This involves the basic HR function of recruitment, selection, training and development, performance appraisal and rewards and recognition.

Transformational - These include activities that bring certain value addition such as developing innovation as an inherent culture in an organization.

Emphasizing particularly on the Recruitment function of HR, it is the process of finding and hiring the best qualified candidate for a job in a timely and a cost effective manner. Recruitment by way of information technology has led to coining of a new term called E-recruitment which is the process of recruitment through the internet. This has definitely sped up the process of competency mapping and subsequent matching of the candidates with the specific job profiles and its requirements. Also, posting jobs online through search engines allow employers to constantly be updated about the fresh talent available in the market.

Another advantage of E-recruitment is its ability to reduce the overall cost of recruitment, e.g.-postal cost, announcement cost, etc. In a recent survey, it was declared that E-recruitment helps reduce 75% of the traditional recruitment cost. It also helps in shortening the recruitment process by twelve days on an average. With such advantages coming into picture, a number of E-recruitment tools such as, IT blogs, Virtual World, Identity Management websites have been developed and utilized across organizations. (Jain, 2014) Information Technology facilitates the organization to make changes and improve its structures, processes and systems. It serves as its back-end-support mechanism. It has thus been proved umpteen number of times that Information Technology can act as a strong pillar of support to the Human Resource function in an organization.

In this review paper, emphasis has been laid on the role of IT in transforming the traditional HR activities, specifically in relation to recruitment strategies followed in the IT industry. In addition, it is has been endeavored to evaluate the pros and cons of amalgamating information technology under the overall ambit of HR's transformation journey towards becoming a strategic business partner.

**Discussion:-**

In the past decade, the business world at large has undergone a significant change. With the key focus on *strategic growth*, businesses today are witnessing rampant change, both in terms of its organization structure as well as its management pattern. To keep pace with these vagaries, effective management of human resources has become a very crucial contributing factor for the success of any firm. (Long, 2009) In order to create the requisite market standing, the pressure today is more in terms of owning high quality human resources than merely distributing differentiated products in the market. Thus, the firms are concentrating on strategically utilizing and managing its personnel at all levels, thereby building and sustaining competitive advantage over its peers. (Kay, 2000)

With this objective in mind, there is a pestering need to divert attention from the traditional Human Resource Management practices to new HRM practices wherein the team continuously focuses on delivering services in alignment with the strategic goals of the company. This in turn has resulted in enhanced expectations from human resource professionals specifically in terms of their contribution towards value adding initiatives within the firm. (Ettinger, 2009)

On the other hand, companies today are also particularly interested in adopting and implementing Information Technology tools across the board. The prime motive behind this desire to adapt to modern IT tools and technologies is to cut down on cost, achieve effectiveness in workplace and thereby improve the overall service quality. The ubiquity of internet is increasing by the day and hence there is a definite shift in the overall job content which is now seen to be more knowledge oriented than just being manual/labor specific. Further, IT tools are being employed extensively to augment routine procedures and consequently achieving the set targets in a shorter time span. (Fitzgerald, 2009)

This dissemination of Internet and technology use has widespread implications across different departments in the organizations. Human Resource function is no exception to this. There are multitude arenas in which technology has impacted the HR function. For example, there is tremendous pressure on HR to attract and retain the best talent in the industry. HR has been constantly endeavoring to do the very same by adopting various innovative techniques to differentiate its brand in the market space. Effective advertising using technology has been a crucial contributor to this effort. Another domain where technology has played a significant role is training and development. (Mamoudou, 2014)

E-Learning has been successfully adopted by certain big names in the industry like IBM Corporation and General Motors Corporation. Online Training has resulted in humungous cost savings for these firms thereby adding on to their bottom line revenues.

The amalgamation of technology and Human Resource function has also simplified the job of a HR professional to quite an extent. Real time availability of databases for ready reference, has enabled the HR personnel to focus their attention on analyzing existent records to strategically plan the career path of its employees. Another favorable effect of technology has been the ease of communication, which has in turn given substantial autonomy to HR professionals in their routine jobs. (Cappelli, 2001)

On the reporting front, certain potent tools such as Decision Support System (DSS), Online Analytical Process (OAP), have resulted in timely and quick decision making by HR professionals. Data crunching capabilities have been enhanced due to such tools, which in turn enable the HR team to generate crucial reports for analysis at the executive level. (Khera, 2012)

Now, if we talk from the Recruitment perspective specifically, we are aware that conventionally the organizations used newspaper advertisements and in-house employee referrals as major sources to attract candidates for job postings. Today, we see an evident shift from these traditional sources to certain modern means of employee selection, recruitment and placement. Social Media sites like Facebook, LinkedIn and various e-recruitment portals like Naukri.com, Monster India and Timesjobs.com are extensively used by both employees and employers to hunt for information about both jobs and job seekers. It is infact argued that, such modes of online recruiting have been a *catalyst* in promoting use of internet in other facets of HR as well. (Ramanujam, 2012) A very constructive use of online job postings is that the resumes are received in an electronic format which enable the HR team to proficiently track its candidate pool by stocking, sharing and recording resumes. This is further used to statistically analyze the accrued costs of the entire hiring process as well as the turnaround time for filling each position.

Another very interesting implication of the process is that this mode of recruitment facilitates companies to target a wider pool of talent by not staying restricted to a particular geography only. However, it is a common perception that the use of internet can sometimes also turn out to be punitive, if the authenticity and repute of the websites being used is not validated before use. Another challenge faced by HR professionals is that due to the wide access and ease of use of internet today, there is often an overload of resumes received as compared to the actual requirement for a position. (Wang, 2006)

Post the initial shortlisting, resumes are further screened with the use of smart screening software, which, simply exclude the resumes which do not include certain pre-fed key words. While this is a very advantageous tool in terms of niching down from the vast amount of applications received, a lot of people try to manipulate the entire process by including the buzzwords in their resume thereby making it through the screening process. Also, certain HR professionals have been seen to use technology to conduct online assessments as part of the selection process. While this technique helps generate instantaneous results thereby resulting in lower overall costs, the validity of the tool is again questionable to a certain extent. (Adewoye, 2012)

Videoconferencing is another widely used tool for conducting preliminary interviews online. Given the current rate of advancement in technology, it is known to be one of the most cost effective tool for gauging employee behavior before the actual personal interview is conducted. (Gulati, 2012)

Given the above backdrop, we can see that there is a definite inclination of firms today to resort to the aid of technology for its recruitment activities. However, HR is still seen to be plodding carefully on this path and prefers a personal touch while making its recruitment decisions.

Therefore, even though the use of information technology as part of the recruitment drives within a firm, has a lot to offer on the platter, specifically in terms of its time viability and economic feasibility, its actual contribution and adaptability is still debatable. (Nielson, 2002)

Now, when we talk of adopting technology as a crucial part of the HR business functions, the industry vertical which is seen to be adapting to this transition most comfortably is that of the IT sector. Since, the very core of an IT firm is the use of software and modern tools and technologies to keep abreast with the dynamic business environment, the inclination of these firms to resort to real time strategic processes is a commonly observed phenomenon.

When a case based analysis of certain IT firms was done, it was observed that since majority of the IT firms have a project based work culture, a lot of emphasis is laid on handling talent through the use of information technology. A lot of dependence is on managing the sourcing procedure, right from the application stage to the final stage of fitment of an employee for the identified position. To fill in the job positions created due to the dynamic requirements of the on-going projects, information technology is particularly used in regards to transitory recruitment. (Anderson, 2003)

However, one of the major challenges faced is in responding to the periodic resource requests with maximum accuracy and minimal cost. Also, the time gap incurred between the conversions from sourcing to placement needs to be minimum.

To quote a few examples, let us first see the case of *Microsoft*, a large multinational corporation, which resorted to the use of information technology to devise its recruitment strategies. Realizing the threat that it faced from its competitors in the market, this computer giant was forced to rethink on its approach towards recruitment. In contrast to a website which was overloaded with data, Microsoft today has a smart Career site, enabling a distinguished user experience for the aspiring job candidates. The site is not only a central repository for global recruitment at Microsoft, but also acts as a one stop solution for all the queries pertaining to working in the firm. Further, the firm has also been working towards restructuring its *employer branding* strategies with the aid of modern technology. It has also successfully made its online presence felt to a considerable extent through social media platforms such as Facebook, LinkedIn, and Twitter. In terms of monetary benefits, Microsoft saved up to £60,000 on recruitment cost by niching down on expert skill sets, through profile hunting on LinkedIn.

Another firm which was seen shifting towards adoption of effective use of information technology for making recruitment related decisions, is *Google*. Known for its innovative practices, the firm decided to develop an algorithm to determine the success rate of a candidate post his induction in Google. This helps in identifying the best talent pool in the industry. An initiative started way back in 2013, under the name of a project called Janus, the algorithm also examines rejected resumes in order to identify top performers which the company might have missed during the recruitment process. Another interesting contribution of the project has been the finding that conducting more than four interviews for filling a particular position actually turns out to be unproductive and hence consequently the cycle time of the hiring process was considerably reduced by the firm.

*Wipro* is another example of a tech giant which understood the competitiveness in the IT sector in terms of attracting fresh talent at a very early stage, thereby forcing them to develop an online portal for uploading resumes. An optimized search engine in essence, their recruitment portal acts as a medium to match the resumes received with the available positions within the firm. Once, an initial requirement mapping is done, the identified candidates are contacted through an online medium itself thereby reducing the recruitment related costs by a significant amount.

According to a Glassdoor Recruiting Survey, while majority of the companies are more than willing to add on to their recruitment numbers, shortage in available talent is becoming a major concern. Targeting this very need of firms, recruitment vendors have come up with innovative technology based mediums to enhance the overall recruitment efficiencies of such firms. The objective is to streamline the entire application and selection process through effectual use of technology. *iCIMS Inc.'s Social Distribution* is one such interface through which firms today are able to publicize their job openings and to engage potential candidates online. Contributing further to such initiatives, are certain major HR technology enterprises, such as, *Success Factors, Taleo Corp. and Workday Inc.*, who have developed mobile based recruiting applications, which has enabled the recruiters to connect with candidates on the go. This has been a game changer in today's scenario wherein, the probable incumbents are so heavily dependent on technology.

Another interesting innovation has been the Insights tool created by *HireVue Inc.* which helps companies get a comprehensive perspective about their recruiting decisions through the use of customizable dashboards. It also gives a perspective on the reliability of certain hiring choices of interviewers.

This clearly is indicative of the fact as to how even standalone vendors are coming up with certain interesting value propositions in regards to recruitment strategies adopted by firms.

As far as analytics and reporting is concerned, certain softwares (Business Intelligence Tools) are used effectively to generate relevant reports in order to further restructure the overall business strategy based on the trends observed.

Such reports may include evaluating cost incurred per employee hired, turnover rates and accrued costs, return on investment per position and so on. Although these reports might not culminate into cutting down the overall recruitment cost, they definitely help in getting to the forefront activities, which are either time consuming or are not impacting the bottom line revenues in any manner. Activities/initiatives thus identified, can be restructured to be more fruitful in nature.

The success or failure of IT systems, particularly in such B2B based firms, heavily depends on the ease of integration of one system to the other and subsequently the effective flow of information. To quote an example, the Performance review of an employee would be used as an input for competency mapping and acquiring the necessary talent thereon. (Borstorff, 2007)

Another very relevant implication of the use of information technology in IT firms is that it not only enables local sourcing but also helps in sourcing and staffing at the global level. Since, IT firms usually have employees working on projects with International clients, managing resources effectively is of prime importance. It is a general belief that a robust Information Technology system needs to be in place to cater to International arrangements in a real-time situation. (Jain, 2014)

Having analyzed the positives, certain challenges which are commonly faced by such firms also need to be discussed. The principal cause behind hindrance to an effective adoption of information technology is seen to be the lack of hand holding from the company's perspective for its employees during the change management process. Less emphasis is laid on training employees to efficiently handle the adoption of new or improved technology. Also, a lot of times, even though the resources may have been sufficiently equipped, the competency to merge the new technology in accordance with the conventional practices, might be a perplexing task. Thus, it is the duty of the HR managers to ensure that the end-users are made adequately comfortable and aware about the plausible use of IT in their daily work. (Seyni, 2014)

### **Recommendations:-**

Globalization has driven the need to align IT with the overall business strategy in all facets of an organization. The domain of Human Resource Management has been no exception to this rule and has infact become an integral part of driving business excellence in any industry across the board. Hence, in regards to creating additional value, better management of resources is becoming a critical differentiator for any firm today. Understanding its relevance, firms today, are seen to be associating HR business functions with technological transformations under the ambit of strategic initiatives.

Having discussed the entire spectrum of information technology and its impact on human resource functions in an organization in general and recruitment in particular, we would now like to make certain recommendations pertaining to the same.

First and foremost, when any kind of technological change is adopted across the organization, it is essential to recognize the key goal/motive behind the same. For example, for an IT organization, recruitment via the online mode could be due to the need to provide for/offer consistent and quality services in terms of human resource allocated to projects across different geographies.

The next step should be to identify certain key performance indicators, such as, cost of hiring, employee turnover rate, and time taken to fulfil a position. This would enable the firms to analyze the accomplished results vis-à-vis the desired outcomes. Such an investigation would help gauge the effectiveness of resorting to an IT enabled HR function.

Further, in order to win the *talent war* in today's competitive business environment, corporate executives, line managers and HR professionals should work in tandem and ensure that information technology proficiently influences the HR practices. There is a definite need to shift from the conventional HR practices to the modern approach of e-HR.

Organizations need to identify certain benchmark firms in their industry; trying to analyze their use of internet for resume hunting and job advertisements. This would enable firms to further enhance their current success level of e-recruitment. Also, the firms should try and widen their outlook in terms of utilizing online databases especially to fill critical job positions. Requisite balance should however be maintained in terms of using technology for sourcing applicant pool and maintaining the personal touch while screening applicants during interviews.

As pointed above, a lot of IT Corporations have successfully managed to adopt technology based recruitment process. However, an immediate implication has been the surfeit resumes, which HR professionals have been forced to accept and sift from. One probable solution of handling this issue could be by designing an overall e-recruitment plan and then incorporating a recommender system in it. This recommender system would enable the raters to vouch for certain resumes over the others based on their professional work experience with the individual in question or due to an otherwise personal experience with him/her.

It is also imperative that before any such wide scale implementation of technology is conducted in an organization, the level of preparedness is evaluated. Specific HR process proprietors should be willing and ready to adapt to the change that would now drive the business goals and objectives. Undermining the need for evaluating this readiness, could result in a comparatively less payback than what possibly could have been otherwise achieved by the exercise.

Preparing the critical participants at different levels of change management is of utmost importance. Since, there can be a lot of initial resentment when technology is adopted as a vital part of any HR function, management assurance to its employees is extremely important.

Additionally, during the entire transformation process, it is essential that the stakeholders are reminded time and again that HR as a function has to be seen more from a strategic standpoint now, than merely an administrative job. Since, managing change would be a continuous process, it is required that employees are given that extra support even post implementation until the entire transformation has been entrenched in the organization's culture.

In spite of all the probable shortcomings, it should be noted that the adoption of such streamlined systems would definitely positively influence the HR function in general and the recruitment function in particular. The basic aspect which needs to be kept in mind is that the entire strategy to implement technology as part of HR functioning, needs to be well planned, structured and phased out over a period of time. Since such an execution could be a key contributor to the HR transformation in the long run, it is imperative that there is successful acceptance of the process by all patrons, thereby enabling maximum value seized during the entire journey.

**Conclusion:-**

The use of information technology for recruitment is taking huge leaps and bounds especially in the IT sector. Certain trends have been predicted that are likely to take over this function of Human Resources by a storm as far as its overall approach is concerned. Major changes that are expected to be seen include:

**Social Media Hiring**—As of now, majority of the hiring/recruitment happens through websites such as Monster.com, Naukri.com etc. With the further impact of information technology, *recruitment would also be done through social media websites such as Facebook, Instagram, Twitter, etc. to find and target an even larger pool of candidates.*

For e.g. - In the present day, poaching takes place by locating people with specific skills sets through search on websites such as LinkedIn or through personal networking. Enhanced use of information technology is likely to enable poaching of required candidates through their personal accounts on Facebook as well.

**Online Video Hiring**- would also become the *most used form of recruitment* and selection. Although this mode of hiring is very much prevalent even today, it is likely to become a standalone mode of recruitment in times to come.

**Social Media Profile Verification** - In the future, whenever candidates apply for jobs online, the recruiters would be able to get an instant glimpse of their recent tweets, Facebook posts and their LinkedIn profile recommendations. This would be enabled by the *integration of applications received with various social media interfaces.*

**Increased Value Proposition** - The importance of this is increasing day-by-day and thus *effective employer branding is likely to be the real differentiating factor in the future.* This exercise if supported with proficient means of technology, is likely to help the HR professionals contact and engage a large pool of highly talented prospects. This in turn would enable the organization to grow further by strengthening their foothold in the market space.

**How Technology is likely to Kill Jobs** - Although the information technology industry is India's largest job creator, its pace in recruitment is estimated to slow down, putting the entire blame on technology for making many job profiles redundant. Indian Information Technology firm NASSCOM, is predicting a decrease in its job offerings by 13% in the financial year 2016 while InfoTech plans to reduce it by 5%-10%. Cognizant India, although plans to continue as a net hirer but its pace in recruitment is likely to decrease. With the *IT industry continuously incorporating technology and automation in its work culture*, where once, one man could assist ten customers, now one man can serve fifty customers, thereby augmenting the overall productivity levels. As an obvious outcome of this, the overall manpower requirement to do the same old jobs, has reduced.

**Cloud Computing and Recruitment** - Companies are now focusing on expertise such as artificial intelligence and cloud computing. In this particular context, it is basically the process of using databases and modern softwares for the purpose of recruitment. Such extremely potent tools in the field of recruitment, help in providing data/information as soon as desired, without finding a need to store it (real time). When it comes to sourcing the right candidate, a platform called '*private cloud*' aids in creating a common job portal for job postings and other critical information about potential hires. This one source is then further used for tracking, measuring and reporting data pertaining to potential recruits. It is easily implementable/accessible and can thus start running efficiently within a few weeks, thereby making it easier for companies to adopt it on a large scale.

These softwares have an open Application Programming Interface, which increases smooth communication amongst various systems for exchange of information. Such customized applications and solutions definitely help companies in achieving larger business goals. Thus, *cloud based recruitment is likely to be the new face of recruitment in the near future making it the most used method of sourcing potential employees.*

*The study was limited to the IT industry* in particular and hence there is a definite scope for future research in other industries as well, given that human resources are assets for any organization, regardless of its sector. Also, the variables under study were restricted to information technology and its impact on recruitment strategies. To broaden the spectrum of study, another facet of Human Resource function could be considered for further analysis. Example – HRIT and its impact on Manpower Planning.

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### RESEARCH ARTICLE

## SOME LESSONS LEARNED FROM PARTICIPATION IN STABILIZATION AND RECONSTRUCTION OPERATIONS

Peter Dimitrov.

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arms, coalition, command, conclusion, equipment, hierarchy, international peace and security, lessons, local authorities, logistics, mission, motivation, operational experience, operations, population, proposal, recommendation, relationships, satisfaction, theater, training, trucks, weapons.

### Abstract

This article presents the results of a profound research in the Bulgarian Armed Forces that probed opinion of military personnel who have participated in peace support operations for the last two and a half decades. The goal of this research was to accumulate the experience of the military who took part in peace support operations, and to produce some lessons in order to improve further participation in such operations. The research team chose to do the survey by conducting interviews with military personnel who took part in peace support operations. A total of 237 military personnel were interviewed. Subsequently, the team concentrated on processing information through specialized software. There were two types of analyses - quantitative and qualitative. The results of both methods were scrutinized and compared, though the priority was given to the qualitative method. The team wrapped up the survey results in a report, distributed among military institutions and the units of the armed forces. The general conclusions of the report were that the Bulgarian Armed Forces had made significant progress in the preparation and participation in peace support operations. Military personnel who participated gained vast experience in performing different duties and responsibilities in Theaters. They performed various tasks with merit and pride and withstood difficulties of different character. During the interviews they shared willingly and openly their experience and opinion as to how to improve future preparation and performance of our units for these types of operations. Survey results came out to be more strategically and operationally geared rather than tactically orientated. The research has been highly praised and supported by the Ministry of Defense, operational HQs and units.

It turned out that although positive results were predominant there was still a lot of ground for improvement in almost all researched areas. So much so, that the research team produced a list of recommendations to improve national legislation concerning participation in peace support operations, optimization and enhancement of personnel selection and career development, raising level of ambition in operations, improving national logistics and administration, and arming and equipping the units with advanced technological items corresponding to the requirements of the contemporary operational environment.

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**Introduction:-**

The world is changing at a hectic pace in many aspects. Geopolitical and strategic shocks of high magnitude are determining the new world order and are altering our perceptions of conflict. Despite those changes, conflict is still ubiquitous and ever present in the pursuit of political goals by other means. Science, technology and globalization will greatly influence the nature of future conflicts. Military scholars are creating and implementing new security paradigms, such as cyber warfare, hybrid warfare, antiterrorism, etc. They predict the future dimensions and actors in conflict and military operations. However, whatever military operations will be like in the future, they will require post conflict stabilization and restoring the state of the affected country back to normal. Therefore, to achieve this end, the military will need the knowledge and know-how about dealing with the challenges of stabilization and reconstruction.

The modern trend in conflicts turned out to be a decisive operation that continues for a very short time, carried out by ad hoc coalitions followed by long and tenuous stabilization operations that produce numerous casualties, as well as the expenditure of enormous resources and political energy. This is another premise to prove the necessity of knowledge and experience from the field of stabilization and reconstruction operations. The most important weapon of the military from the battlefield is the knowledge that they gather, analyze, disseminate and implement in their future activities.

Most knowledge management experts claim that the most important and informative knowledge is tacit knowledge. They argue that while explicit knowledge comes from mere study and defines “know-what”, tacit knowledge epitomizes “know-how”, i.e. the results of experiential learning. Therefore it is important for the military to invent such methods and tools that make possible collecting and processing unarticulated subjective insights, judgments, and experience, which personnel acquire by participating in military operations. One of the tools that proved to be successful is the empirical study that engages the target audience and extracts tacit knowledge. As a final result it proceeds with the information and turn conclusions of the study into plausible recommendations for the leadership.

Having in mind all of the above, a team from the Defense Advanced Research Institute (DARI) adjunct of “G. S. Rakovski” National Defense College in Sofia has conducted a research and has finalized a comprehensive empirical study named “Lessons from the Participation in Operations for Support of International Peace and Security”. This study was initiated as a part of a larger multinational scientific project, led by the European Research Group on Military and Society (ERGOMAS) that is taking place currently, and is scheduled to be finished by the end of this year. There are eleven countries from Europe, North and South America, Africa and Asia who participate into the project.

Particularly, the goal of the Bulgarian project was to sum up the accumulated experience of the units from the Bulgarian Armed Forces that took part in operations in support of international peace and security, and to formulate some lessons with respect to improving the manning, equipping, training, and enhancing the performance of Bulgarian military personnel in multinational operations of that type.

The research was conducted in several military units of the Bulgarian Armed Forces. The research methodology was developed on the basis of two concomitant approaches i.e. qualitative and quantitative approaches. The core of the research was a semi-structured questionnaire to lead the research team in the survey. The principal tool of the survey was an interview that followed the logic of the questionnaire. All interviews with military personnel were held on site. They were conducted with different depth, scale, span, and length as the research team took into consideration knowledge, competencies and experience of the interviewees. Data processing was done by specialized qualitative and quantitative analysis software (SPSS and En Vivo). Conclusions from the research were drawn through analyses and synthesis of the survey results. On the basis of the conclusions, the research team developed a set of recommendations, aimed at improving participation in multinational operations in support of international peace and security.

The study necessitated a lot of work (about 350 man-hours) for doing the interviews and more than two months for the analytical activities. In the course of research the team enjoyed full cooperation from the commanding officers and the surveyed personnel.

Sample of the Research:-

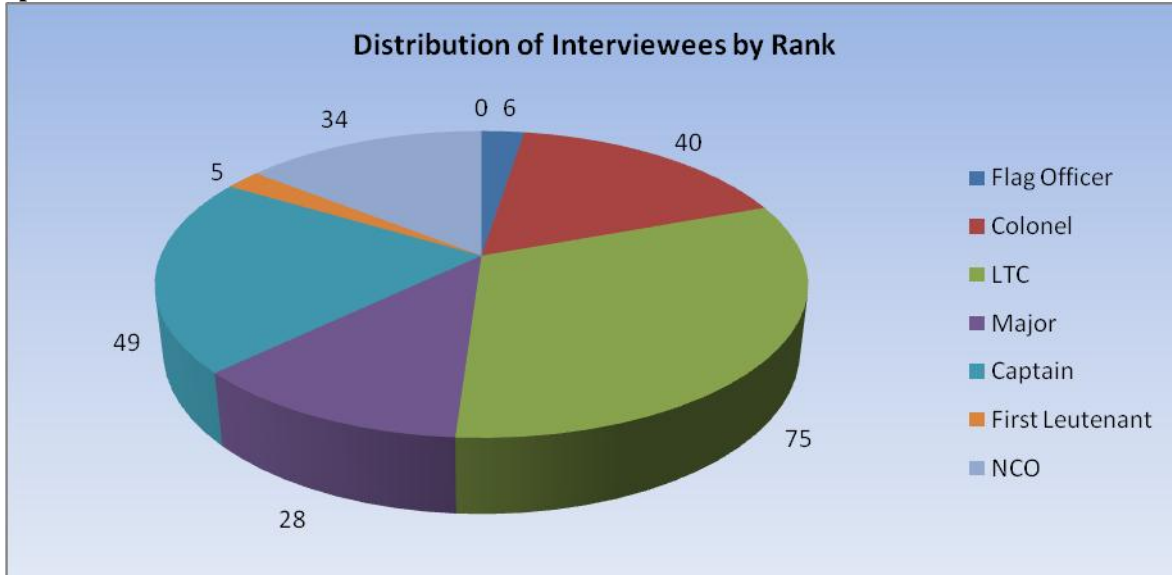


Figure 1:-

A total of 260 interviews of the surveyed personnel were taken. Some of the interviews did not provide the necessary information, so the team discarded them. There were 237 interviews that were taken into consideration for analysis. 226 of the respondents were males (95 percent) and there were 11 females (5 percent). 82 percent of the interviewees were married, and the rest were single. Many of the interviewees had participated in more than one mission, so that prior to calculations it was accepted that each separate participation was taken as a single event for analysis. There were 489 events in total. Distribution of personnel by arms was as follows: Army-89 percent, Air Force-9 percent, and Navy- 2 percent. The distribution of respondents by rank is shown on Fig. 1.

The scope of the research extended from Bulgarian participation in PKO after the end of the Cold War up to 2014. Distribution of participation of Bulgarian contingents in PKO is shown on Fig.2.

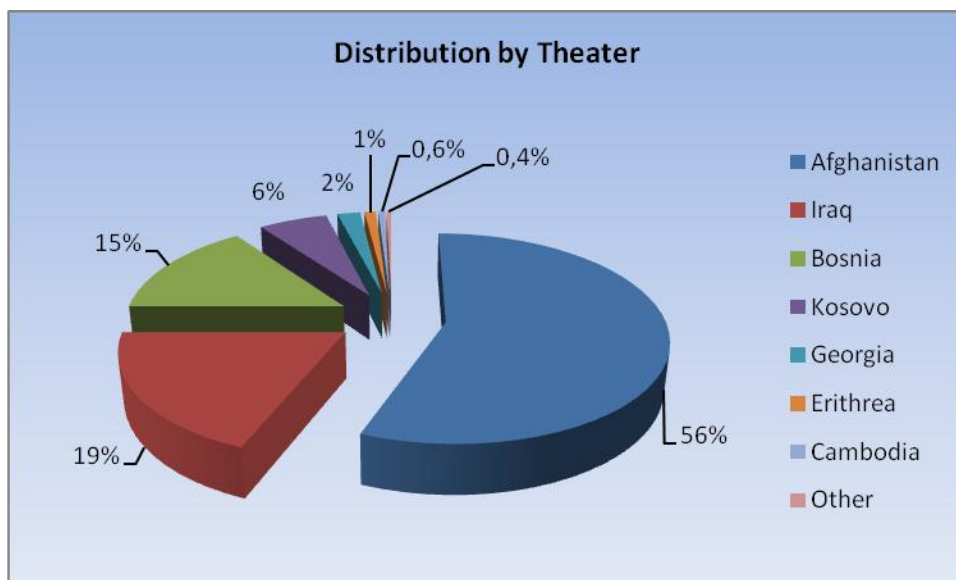


Figure 2:-

**Quality of Training:-**

According to the analysis of the respondents' answers, concerning pre-deployment training, it seems that **the quality of training** for participation in operations in support of international peace and security has improved significantly for the last ten years. Most of the interviewees insisted that training had undergone a noticeable evolution. In the respondents' opinion, the cornerstone of this positive change was Bulgarian participation in the stabilization and reconstruction phase of operation Iraqi Freedom and the NATO mission in Afghanistan.<sup>1</sup> The majority of respondents reiterated that our participation in these operations marked a radical change of approach to training. Planning, organization and conduct of predeployment training since then has been systemically updated and streamlined, in accordance with the specific requirements of mission tasks, as well as the conditions of their accomplishment. Interviewees shared the opinion that following 2004, new methods and forms of training of units were implemented, to quote:

- conduct of training in conditions and environment close to the real situation in missions;
- training with weapons and equipment, with real organizational structures and equipment;
- use of opposing forces during training accompanied by imitation and live firing exercises;
- use of instructors who had already taken part in similar missions;
- use of advanced forms of training of staffs through computer simulations.

Most importantly, the research team concluded the fact that the predominance of commissioned officers shared that the commanders on training sites received all rights, tools and authority to train the personnel in the manner that they deemed necessary, in order to meet the mission standards. The research concluded that it was very productive for the newly created missions for the Bulgarian Armed Forces to use mobile training teams from nations that have already participated in those missions. Another important conclusion of the research concerning training was that all respondents united around the premise that joint training on various NATO member states ranges had been extremely helpful and productive. This kind of training, according to most of the military personnel who attended it, had been vital to their real preparedness for missions. Notably, they mentioned training ranges in Germany, the Netherlands, Poland, Norway, and Romania.

Support to pre-deployment training was another issue of the research. It came to the conclusion that support has improved a lot. Respondents shared that all initial training for new missions has suffered from poor support. This applied also to some missions that alter conditions in the course of their conduct. They pointed out some drawbacks like insufficient number of vehicles to practice driving and special tactics; accepting provisions by replacing mission vehicles with substitutes, which affected training in undesirable ways; deficiencies of the special equipment, etc. Many interviewees pointed out that our training ranges did not correspond completely to the real missions' conditions and created wrong perceptions and expectations.

Some of interviewees had the opportunity to go through online pre-deployment training. They shared the opinion that this training played significant role in enhancing their knowledge about the host country, its nature, culture, the customs of the indigenous population, etc. They praised online training and admitted that it had provided most of them with the necessary information about their real duties and responsibilities. This applied mostly to officers who took part in missions in various NATO or EU headquarters.

Induction training on site was also included in research. In 47percent of the researched cases, respondents shared that they had undergone induction training in the mission area. One of the conclusions was that during the initial missions there was little or no induction training, especially when all participants received their zones of responsibility and respectively their tasks in Theater. As a result of the previous experience of allies, and lessons learned, extensive training had been implemented. In this case during rotation and hand off it was ensured that there was enough time for the incoming units to gradually become accustomed to their tasks by the "right seat rider" system with the outgoing units. This approach was highly praised by all interviewees concerned. They pointed out that this type of organization of mission hand off was highly effective for the incoming contingent. Induction training was conducted with almost all staff officers in the multinational headquarters. Many of the respondents admitted that this training helped them a lot to adapt to their real staff tasks, and gradually increase their contribution to their respective departments. They also shared the opinion that had they not undergone this smooth transition they would not have been able to perform their functional duties and responsibilities.

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<sup>1</sup>Bulgaria took part in Iraq stabilization with infantry battalions and other contingents from 2003 till the end of 2008, and in Afghanistan from 2002 and is currently taking part in Resolute Support.

Responses with regards to specialized training had also been taken into research considerations. The team explored how this training influenced the knowledge and skills of the trainees in improving their preparedness to deal with their respective functional duties. The majority of interviewees (78 percent) answered positively about specialized training on host country peculiarities, governance, specificity of national culture, as well as how to behave and apply intercultural communication. Most of the respondents expressed very high appreciation of countries' handouts, distributed to all personnel prior to deployment (Afghanistan, Bosnia, and Iraq). About a third of the researched personnel pointed out that specialized training for their respective position was not satisfactory enough. This applied mainly to officers who were assigned to staff positions in the headquarters of the multinational forces, ISAF HQ, or the like.

Language training was also an issue for the research. Predominance of interviewees shared that initially, once deployed to mission area military personnel faced difficulties communicating in multinational environment and with the local population. Later on, they overcame the psychological barrier, gained self-confidence and became more proficient in communicating with other nations. It was established that language training of non-commissioned personnel did not fully meet requirements.

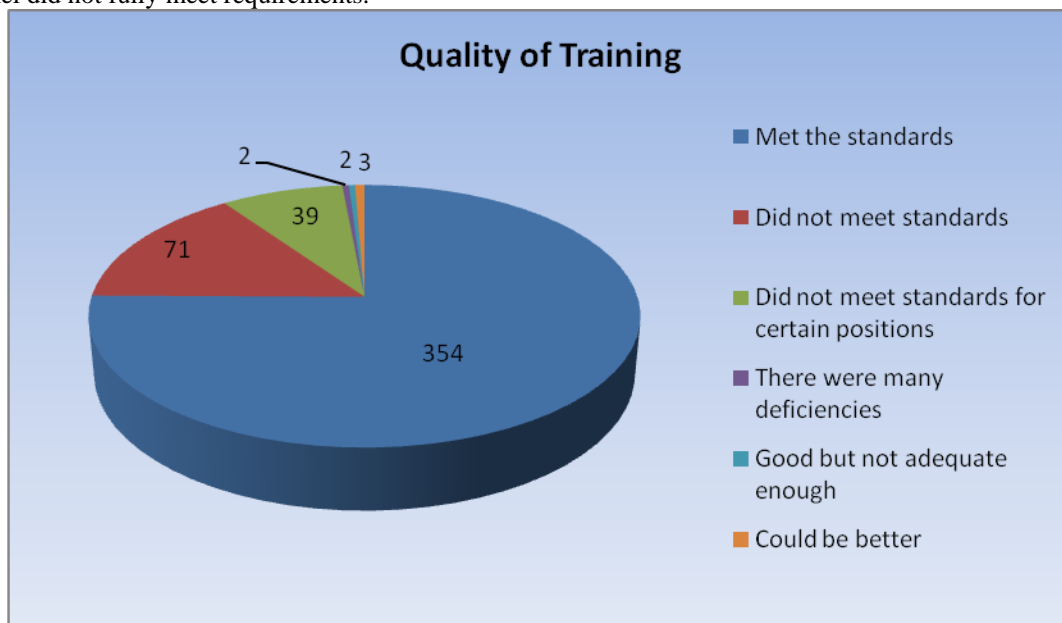


Figure 3:-

The results in Fig. 3 clearly show that in the majority of cases respondents (354, 72 percent) gave a positive assessment of pre-deployment training. They believed it was necessary to improve support of training. Interestingly enough, most of the generals and senior officers expressed the opinion that the quality of training is a function of commanders' leadership qualities.

There was an extensive research on **logistic support** of contingents in this study. The results of the interviews show that logistics is a key factor for the successful accomplishment of tasks. The main issues that the research team explored were related to individual clothing and equipment of the military; armament and equipment of contingents; accommodation, dining, communal services, and medical support. The team explored as separate research issues: the quality and ergonomics of clothing, and individual gear: Kevlar helmets, backpacks, flak jackets, tactical goggles, tactical vests, gloves and other equipment. The majority of respondents (Figure 4) evaluated the quality of individual equipment as good, meeting the mission requirements. One third of the respondents expressed the opinion that there were certain drawbacks in the provision of individual equipment. Every fifth respondent believed that the individual equipment of the military for the mission was not good enough. Individual clothing and footwear emerged as a central bone of contention in the research and people think that logisticians need to improve them in future.

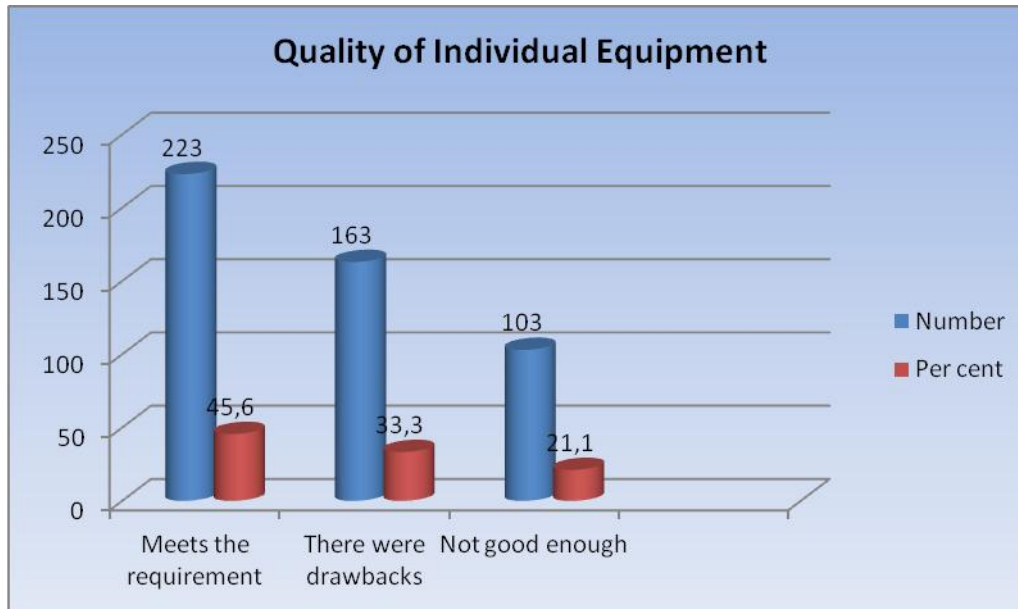


Figure 4:-

A large number of military shared their opinion that the logistic support of the contingents had undergone a positive development. They think that in the process of incremental participation of the Bulgarian Armed Forces in missions abroad the commanders and staffs that were in charge of manning, equipping and training the units had gained experience and responded adequately to the needs of contingents. Each subsequent contingent deployed was much better equipped than the previous one. Some respondents shared that in most of the cases where negative assessments were given, it was due to overreaction by some of the personnel and it did not correspond to the real situation. They thought that contingents had been equipped with all the best the Armed Forces had at their disposal at that time.

The team paid particular attention in the study to personal and crew-served weapons and equipment. The majority of respondents expressed a positive opinion about armament and other crew-served equipment which they used during the missions. They estimated that the available weapons (individual and collective) had decent tactical performance and met the requirements of concurrent peace keeping operations. The same opinion was expressed about the performance of vehicles and other equipment. The interviewees shared that in most cases the equipment was in line with the mission requirements. In some missions, in Afghanistan in particular, part of the tasks was performed with equipment provided by the coalition partners, which according to respondents was also adequate for the assigned tasks.

In 28 percent of the explored cases respondents said that the armament and equipment corresponded to some degree to the missions' requirements. According to them, the tasks could be accomplished with the available weapons and equipment, but with a number of caveats. In this case assessments of weapons were more positive, rather than negative. Talking about vehicles, there were mixed feelings. Many respondents said that during the first missions (Cambodia, Bosnia, Kosovo, Iraq 1.2) they had to do their duties with available standard equipment at that time (mainly Russian - UAZ, ZIL, BRDM, GAZ, BTR-60 PB), but these were the realities, and albeit conditionally, the equipment performed adequately. Around 6 percent of the interviewees estimated that the above mentioned armament and equipment did not meet mission requirements. Some soldiers thought that the above mentioned equipment was hopelessly outdated and they performed their duties with difficulty. In Iraq and Afghanistan all vehicles and other military equipment of the coalition were equipped with diesel engines, but Bulgarian contingents were equipped with gasoline ones, so that their refueling in Theater was a challenge for logisticians. What is more they did not provide ballistic protection for personnel.

Analysis of research results for accommodation, food and communal services shows that this was one of the areas with a very high degree of approval. In 92 percent of cases the interviewees praised this type of support. There was a central support for accommodation, meals and communal services in general. As a common practice those types of

services were included as clauses of the Memorandum of Agreement between the lead country (organization) and the rest of participants. Following the deployment accommodation, meals and communal services have been traditionally provided by civilian contractors. Typical responses of the interviewees in this area were like: "The accommodation, food and services were excellent. Everything was excellent; there was no shortage of anything, everything one wished was available. There were very good living conditions, there was air-conditioning, Internet was available, and you name it." There were, however, about 5 percent of the respondents who expressed dissatisfaction with organization of accommodation, meals and communal services. Finally, in approximately 3 percent of the cases, the military openly stated that the conditions were unsatisfactory. Further analysis made it possible to pinpoint the missions in which soldiers identify logistics as poorly organized. The gaps are most closely associated with the initial missions in Afghanistan (ISAF-1, 2, 3, 4), Iraq (SFIR 1, 2) and especially the mission in Cambodia. Medical support of contingents was widely praised by respondents.

The military who was part of the project proposed a lot of recommendations for the further improvement of logistics, such as improving the quality of clothing and footwear and procuring them for universal wear both within the country and abroad; procuring adequate individual equipment; modernization of individual arms by equipping them with night vision capabilities, modern optical sights and the like.

Taking into consideration that the country as a NATO and EU member has commitments to achieve certain capability goals, there will be a necessity for us to seriously change and improve in this area. That said it will influence the overall look of military. The opinions of respondents and analysis lead to the conclusion that the future participation of Bulgarian units in operations in support of international peace and security will require a radical improvement in the planning and logistic support.

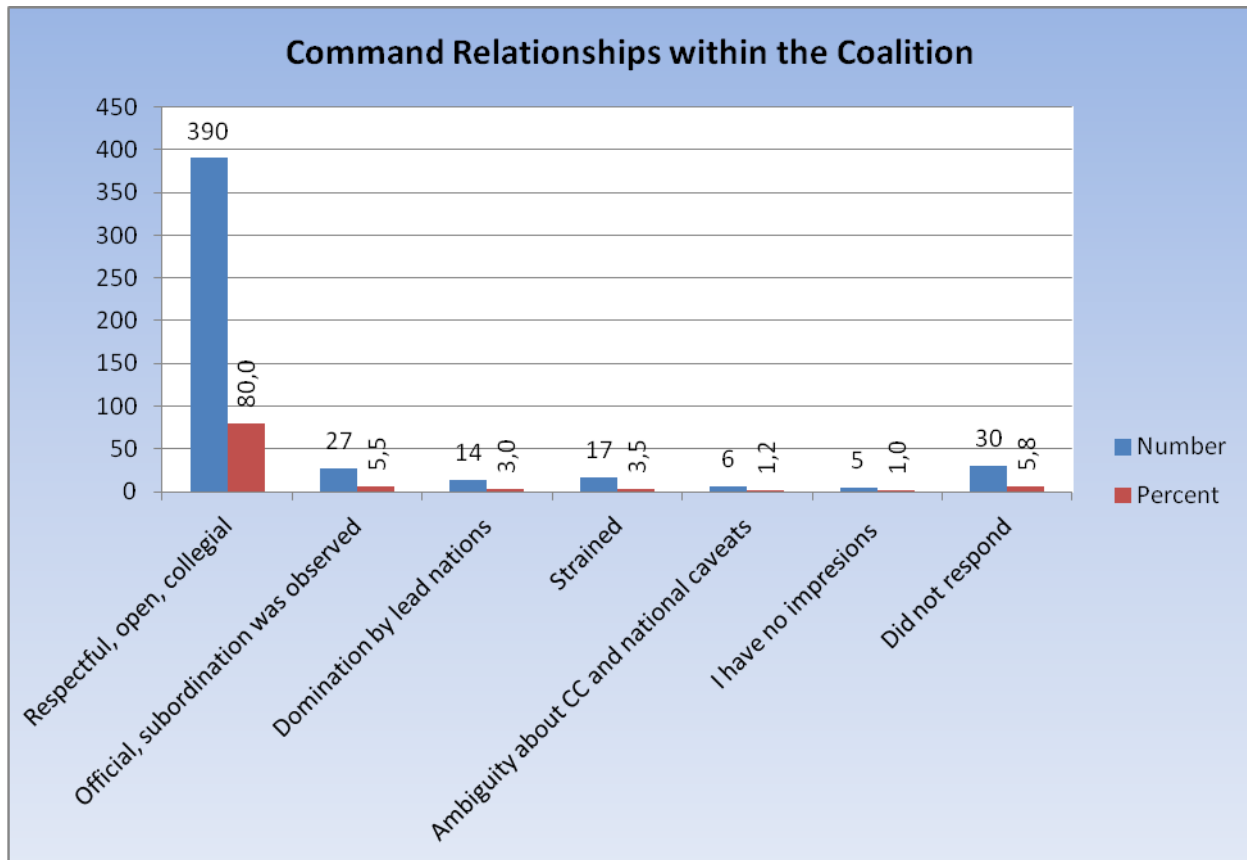
Another central question for research in this study was the issue of relationships in missions, both in multinational environment within the framework of multinational coalitions, where Bulgarian military was involved as well as within national contingents. The link between relationships and the effectiveness of command and control was explored. Several key questions were answered, namely: hierarchy in coalitions and the degree of autonomy for independent decision making; the nature of the command relationships within coalitions; command relationships in the Bulgarian contingents, and the nature personal relationship with coalition partners from other nations and the local population on a daily basis.

The research team examined the **hierarchy within the coalitions** and the ability of our commanders to take independent decisions, to defend them and to put them into effect in accomplishing their units' tasks. Notwithstanding the restrictions, a majority of the commanders said they had the necessary autonomy of action in order to freely command and control their units. Some estimate that during the missions they had greater freedom of action than in everyday military life in Bulgaria. "I had a great degree of autonomy, greater than in Bulgaria." The largest group of officers (37 percent of cases) reported that they had a limited degree of autonomy for independent decision making. The reasons for this were based mostly on the fact that they occupied positions as staff officers in the multinational headquarters. One third of the respondents, mostly officers on staff positions and the majority of NCOs and soldiers reported that they worked in units in which they were not able to take independent decisions, i.e. they had held executive positions. To the fullest extent this applies to officers who held staff appointments in multinational HQs (MNF-I, MNC-I, ISAF HQ, etc.). Officers occupying such positions said that in most cases they were executive officers and fulfilled their tasks. They shared that in most of the cases they would propose something concerning the job; their proposals were not taken into consideration and remained without consequences.

The majority of respondents (almost 80 percent) evaluated the **relations within the coalition** as decent, well-intentioned and collegial (Fig. 5). Coalition partners demonstrated understanding, sympathy and helpfulness. In most cases, they were responsive and accurate. A significant percentage of respondents shared that there was a certain initial stage of studying each other during the mission, the so called "examination stage", and then partners treated you the way you had performed: "Initially there was a stage of study, but if you won their trust, coalition partners were very cooperative, benevolent and helpful." Another group of soldiers (5.5 percent) had the opinion that command relationships within the coalition were official (diplomatic) and reasonable subordination was observed. A very small proportion (approximately 3 percent) believed that there was an element of domination by the partners of the leading nations over the others within the coalition. For this reason, some general and senior officers proposed that Bulgaria should have a higher level of ambition and should be represented in multinational HQ proportionately



to the contribution of troops we provide. In this way, they deemed, we would have more influential role on decision making process within the coalition.



**Figure 5:-**

A small percentage of soldiers believed that there was tension between the Bulgarian troops and coalition partners. They think that there had been a „double standard“, as a result of which there was no fair distribution of daily chores among partners in the zone of operations. Some received easier tasks, while others were charged with the most laborious and dangerous ones. Some interviewees shared that differences in perceptions of operational command and operational control often occurred, as well as misperceptions regarding capabilities and national caveats of the Bulgarian contingent.

Nearly three-quarters of respondents expressed the opinion that the **relations within national contingents** were good, principled and well mannered. Many of the respondents evaluated the relationships during missions as better than those in Bulgaria. They think that hardships and threats tie people together, imbue friendship, and create a common sense of responsibility, loyalty and dedication to the group. These characteristics were manifested in teams and formations and made units more cohesive. "When on a mission, people are much more disciplined and execute their duties more accurately, clearly and promptly."

According to the majority of respondents the commander plays a vital role for the morale and discipline of his (her) unit, as well as for the state of morale within the unit. He is the principle driver for the successful accomplishment of tasks. The commander strongly influences his military formation throughout the mission, especially in difficult times, when a quick and correct decision is needed. Caring for people and leading by personal example earns the trust of subordinates. "The integrity of the commander is very important. The commander must apply the principles of leadership. He should be close to his people. If he does not think and care about his people their trust evaporates very soon."

Almost one fifth of respondents shared the opinion that morale during the missions was good. However they thought that there was not a clean line of subordination apparent, especially between the national commander and the units. This was due to distanced locations and lack of perception what was going on the site of the unit. Another small group of soldiers (about 5 percent) indicated that relations had been strained in many cases, when national commanders had taken decisions without paying attention to unit commander's opinion or considerations. This was due to the collocation of national commander and unit commander. A small group of soldiers reported that tensions had arisen once in a while when there was no fair distribution of labor within the units, i.e. some soldiers took more tasks than others.

Another field of exploration was **relations with other participants** in the missions, present in the same zone of responsibility. First, the team analyzed the relations with coalition partners. According to the analysis' results over two thirds of respondents (78 percent) defined relations with coalition partners as well-intentioned, honest, professional and even friendly. At the same time another group of soldiers (about 7 percent) defined relations with coalition partners as professional and polite. This group thought that in the course of working together with coalition partners relations had had a more formal and polite character, as subject to the necessary subordination and mutual respect without seeking greater proximity. There were different views expressed by nearly 9 percent of the respondents that deserve attention. These soldiers argue that there was a tendency of „double standards" that they have felt in one way or another, taking into account the attitude of some coalition partners. Along with the prevailing positive assessments of relations with coalition partners, the analysis of the data shows that there were some negative assessments that may deserve attention. Some of them (a very small group- of less than 4 percent) said that at times, relations with the coalition partners were strained. This is mostly associated with the perception of domination attempts, arrogance, dismissive attitude and others.

The research team also investigated **relations with local authorities** and indigenous population. About 42 percent of the respondents reported such relations. The rest of personnel had no contacts with locals, because of the fact that they performed their duties in contained environment, or at remote sites. Most soldiers who had contacts define these relations as very good, collegial and cooperative. They worked together with understanding, cooperation and well-disposed interaction. The majority (64 percent) of the respondents indicated that they had working relationships with local armed forces in the mission area. Most of them define the relationships as collegial, very good, fair, honest and professional. Representatives of the local armed forces have shown cooperativeness and understanding. In general, they had good attitude towards the Bulgarian teams because previous teams have created a good foundation. Respondents reported that many Iraqi and Afghan troops had previous knowledge about Bulgaria and have demonstrated good feelings. A small number (less than 2 percent) of respondents said that at some point, relations with local Armed Forces were strained (green on blue accident in Afghanistan; the events in Karbala, Iraq, 2004). More than half (60 percent) of the respondents define their relations with the local population in the mission area as very good and normal. The attitude of Afghans to Bulgarians has been very good, unlike some other nations. Some Afghan people had ties with Bulgaria because they had graduated from Bulgarian universities, so that they preserved good memories. That is why they showed empathy and friendliness. Some soldiers shared that when they travelled throughout Afghanistan and local people saw their national flags waving on vehicles, they would raise their hands and salute. To the best of their knowledge, honesty, openness and integrity in relations were important factors for the success of the mission.

Some of the respondents suggested bringing to negotiations and planning conferences a higher level of ambition that corresponds proportionately to Bulgarian contribution to operations in support of international peace and security. According to most of them there must be an even distribution not only in numbers of troops' participation but also in key coalition positions. They support their suggestion with the argument that those who take part in these types of operations should have the leverage to take part in decision making process. Thus this would increase our share of responsibility in missions and would increase respect on the international arena.

Respondents underlined the necessity to increase the requirements for commanders' leadership qualities and professionalism. Commanders must be able to work with people, to motivate and lead them towards successful achievement of mission goals and tasks. The refinement of command relations within the contingents, keeping a clear line of command and control and strictly observing subordination, as well as enhancing the confidence of the Bulgarian military were other suggestions of the respondents.

The research team was convinced that after exploring relationships in missions and the almost unanimous answers of the respondents, a main conclusion could be drawn, that the Bulgarian contingents performed their duties with dignity and valor. For more than two decades they have proven to be respected and reliable partners in operations in support of international peace and security.

Achievement of self-sustainment and equality in the missions and tasks accomplishment, acquisition of better armament and equipment, as well as professionalism, strengthen the self-esteem and confidence of our personnel with regards to their capabilities and in relations with the coalition partners. Openness, integrity, benevolence, tolerance and ability for intercultural communication in the mission area increase the guarantees for good relations and successful cooperation with local authorities, the armed forces of the host country and the local population.

### **Morale and Discipline:-**

Another issue that emerged in the research as one of the most important topics was the theme of morale and discipline. In the opinion of the majority, morale proved to be the most important component of the combat power of the units and their ability to perform duties and accomplish various tasks. Data analysis has shown that the majority of the interviewed military (51 percent) determined the level of morale as good. They expressed the opinion that there was a good level of morale, discipline and cohesion in the contingents there. People were ready to share the difficulties of everyday military chores and showed willingness and ability to overcome tensions that had arisen in the course of mission. Many respondents expressed the opinion that "relationships among military personnel in missions were relatively better than those back home. Dangers kept people and units cohesive and disciplined."

Another group of soldiers (38 percent) shared that the level of morale was satisfactory. They said that in general morale was good, but once in awhile it happened that certain individuals showed temporary weaknesses. Those aberrations were mended by the commanders', colleagues' and friends' aid and the affected soldiers overcame their difficulties and successfully continued to carry on their duties. According to respondents, these deviations did not significantly influence the performance of units. "Overall, the level of morale was good. There was always someone who tried to „go astray" but the team drew him back to doing everyday duties and things got better."

A small group of respondents (6 percent) believed that morale in missions was not good enough. They thought that the level of morale of some units was rather unsatisfactory. Some interviewees recounted various isolated cases of attempts of dereliction of duties, violation of discipline and the like. They thought that these abnormalities affected negatively the image of Bulgarian contingents in the coalition and undermined national dignity. On the other hand, they shared that negative events greatly diminished the morale and discipline in units. This kind of disruption created an atmosphere of mistrust, tension and uncertainty. In those cases, they pointed out, commanders' role was crucial to mend the microclimate and alleviate the strain. Some respondents shared that morale and discipline depended greatly on the mission itself: "The nature of the mission determined the level of morale. Units were much more cohesive and people helped each other and backed one another in the toughest military missions. When on a mission there was less of a threat and there was more free time, there were more conditions for violations of any character."

The study leads to the conclusion that the Bulgarian contingents in missions demonstrate high morale and discipline. It also concluded that it were the commanders and staffs that needed to focus on improving morale and discipline, especially within the framework of participation in PKO of any type. It is necessary to make efforts in mastering the necessary command and leadership practices to maintain good organizational and psychological climate in the formations.

The research team also analyzed the degree of **satisfaction** of the interviewees from participation in missions abroad. The vast majority of soldiers shared their positive assessments and **self-esteem**. Most of respondents insisted in their feedback that they were satisfied with their participation because they had fulfilled their duties with honor and dignity and had contributed to the overall achievement of the mission's duties and tasks. According to more than 90 percent of respondents another major factor for their satisfaction was that those activities helped them enhance their professional knowledge and skills and their ability to cope with various situations in a complex environment. They believed that this was particularly important in cases where they played a vital role to help their colleagues and the whole unit to cope with missions and tasks. The positive self-esteem of the participants in missions vary depending on the issue that has proved most important to them, such as the achievement of "successful cooperation

and mutual assistance with peers", "positive interaction in multinational environment", "good relationship with local authorities and the local population", "contribution to common mission and tasks", etc.

Commissioned officers who occupied commanding positions hold dear certain aspects of their command that raised significantly their self-assessment. In their opinion a great deal of the successful accomplishment of tasks was due to good leadership and implementation of good command practices. Most of them connect success and personal satisfaction with completion of the mission without any loss of life. "I was greatly pleased and relieved when every one of my subordinates came back safe and sound"; "I am proud that I took command of 60 people and brought all of them back home." Some respondents of this category said that it was a great relief for them that the mission had been conducted without incidents.

Another aspect of self-esteem the respondents thought very important was the organization of work, the perception of significance of soldiers' work and the positive attitude one received from international partners. The majority of interviewees shared that it was essential for them that by doing their job they contributed to overall success. This category could also include people who emphasized positive evaluation by coalition partners. They adopted the mission as a kind of personal fulfillment and self-realization.

The **motivation** of soldiers to take part in missions in support of international peace and security was another fundamental question of the survey. The graphs are shown on Figure 6. The research team discussed with respondents the factors that motivated them to participate in missions abroad. During the interviews, the typical factors with a high degree of recurrence emerged as follows: the challenges of the mission; opportunity to work in a multinational environment; enhancing personal knowledge and skills; proving oneself as a professional; financial benefits; to contribute to the mission; getting to know new people, places and cultures and others.

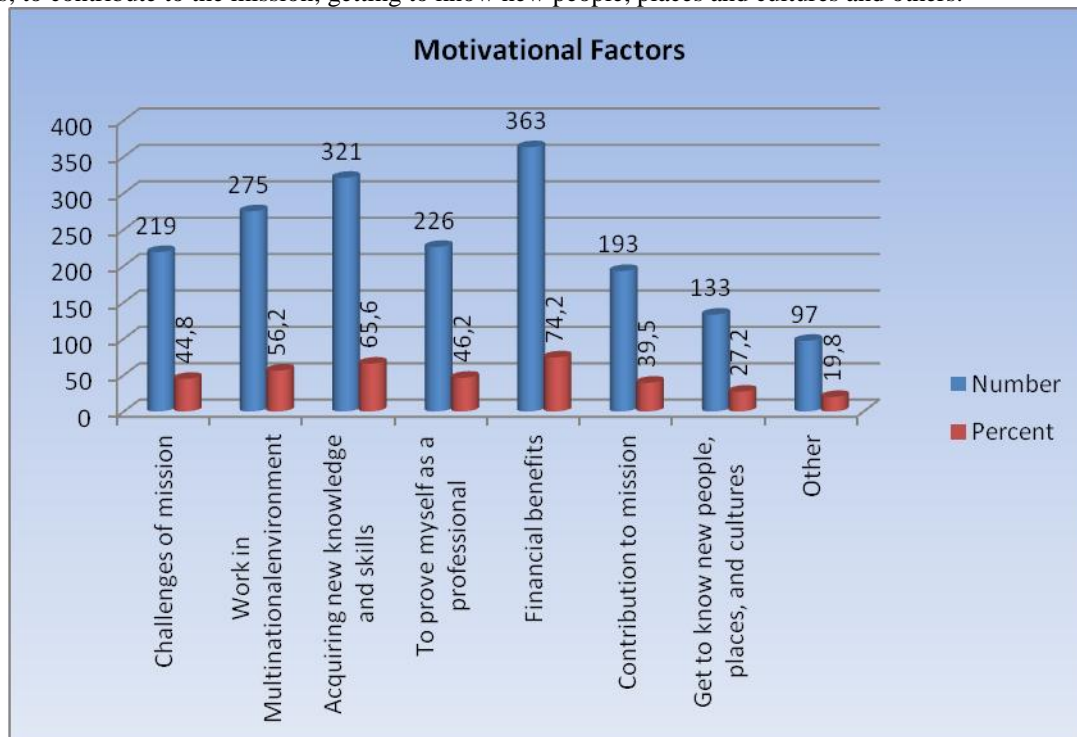


Figure 6:-

Asked if they would apply for participation in another mission, 92 percent of respondents answered, in one form or another, that they were willing to take part in missions once again. Almost all soldiers, NCOs and junior officers categorically manifested their willingness to go on a mission again. The most important factors that motivate soldiers for further participation in missions abroad are the financial benefits, the opportunity to enhance their knowledge and skills, to work in multinational environment, and to prove their professionalism.

In the final part of the survey the research team discussed with respondents their specific proposals in the areas of research to improve the participation of our units in operations in support international peace and security. Figure 7 below shows the results of this discussion.

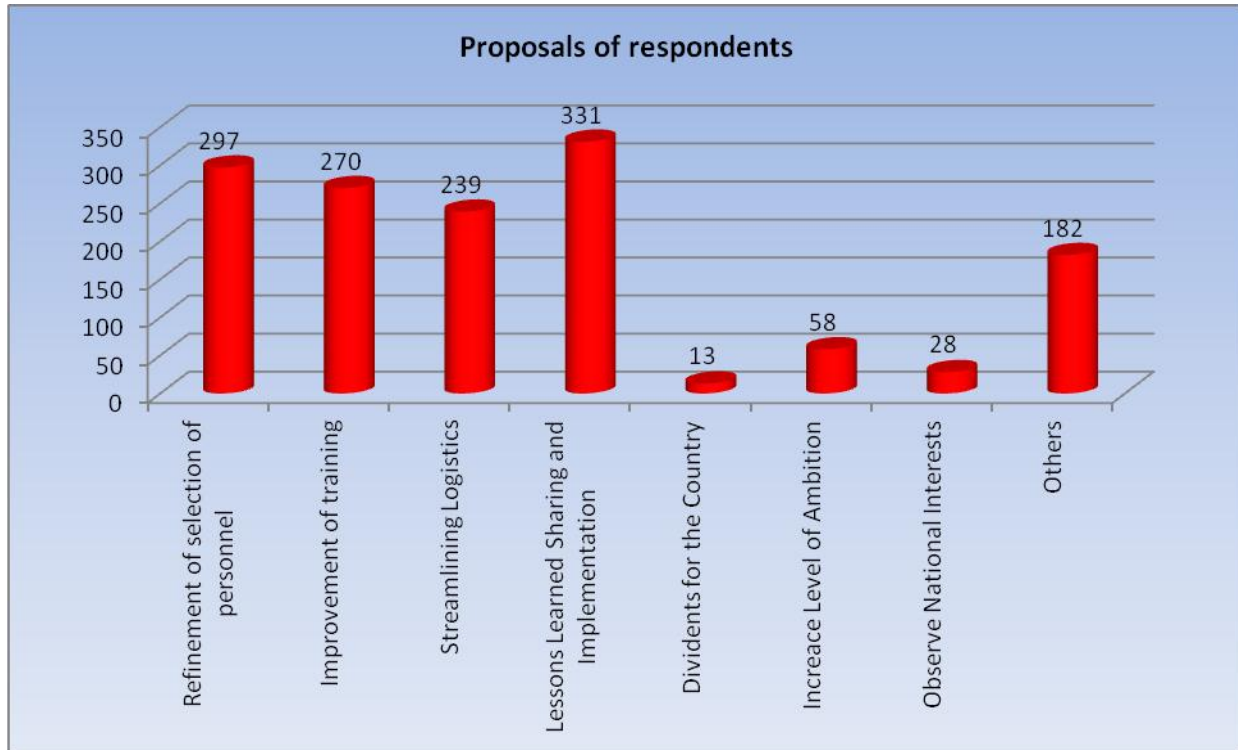


Figure 7:-

It was an opened question so that respondents might propose more than one option. Interviewees suggested reasonably that selection of personnel for participation in missions abroad should be refined; training of contingents should be improved and simulate as much as possible the real conditions of the mission; logistics and support should to be refined in order to meet missions' requirements. Most of the interviewees put a special emphasis on lessons learned sharing and their implementation in practice in order to avoid mistakes and employ the best practices. Respondents offered some proposals of strategic, institutional and administrative nature.

### Conclusion:-

In conclusion the survey results demonstrated that despite the positive results from the participation of Bulgarian contingents in operations in support of international peace and security there were areas that needed development and improvement. Based on data analysis and the proposals of the respondents it was clear that there was a ground for further improvement of the preparation of contingents of the Armed Forces for participation in peace support operations. All proposals should lead to final conclusions that should be taken into consideration by the civilian and military leadership, in order to translate them into actions and reach tangible results.

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### RESEARCH ARTICLE

## PROTECTING BIO-INNOVATIONS: COMPARATIVE STUDY ON INNOVATION PERFORMANCE TRENDS IN INDIA AT GLOBAL LEVEL

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### Abstract

It has been long recognized that innovation performance varies considerably across nations. This observation rises immediately to important set of questions. The land mark judgment of "Diamond vs. Chakrabarty 1980 on genetically engineered bacterium changed the status of biotechnology. It has been 36 years since this landmark decision, from that time it affected the lives of virtually everyone on earth and continuous to be in the news of benefits and controversies. This revolution in biotechnology all over the world has resulted in the issuance of thousands of patents, the formation of hundreds of new companies. The objective of this study is in the context of patentability in Biotechnology, analysis of the current patent filing situation in India, PCT filing trends in the IPR. The second objective of the study is to observe the innovation performance of India on the basis of GII report 2016 in comparison with different geographic regions G7, BRICS and SAARC.

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### Introduction:-

Biotechnology is called as industrial Art of the biological sciences and often falls into controversies of playing with god creations, for its genetic manipulation techniques. The United Nations Convention on Biological Diversity<sup>1</sup> as defines biotechnology as "Any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use." There are few ethical concerns and public opposition in specific areas, but overall biotechnology became a passionate research subject from past few decades and continuous to be so because of its capability of solving many problems in health and hunger. World got benefitted in medical therapies, genetic testing, crop yields and renewable fuels.

Biotech industry has recognized the potential importance of obtaining patent rights and especially where competitors are involved, enforcement of those rights. The market dynamics of world biotechnology reveals the potential of this sector. The anomaly in patenting biotechnological products arises because patent law was intended to satisfy the requirements of the industrial technology. The increasing use of patents to protect inventions by public, private and research organizations is closely connected to recent evolutions in innovation processes, economy and patent regimes. One of the compounding aspects of such laws is the relationship between the patent system and the inputs and output of biotechnology research. The issue of living organisms such as micro organisms, plants, animals, or naturally occurring substances such as DNA and proteins, cloning and bioinformatics is still a matter of concern. The biotechnology industry relies heavily on patents. This role of patents in the global economy has become part of

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a much wider discussion in terms of research, ethics, investment, business and economic development strategies. For some developing countries shifting from initially weaker patent to stronger patent system is important path of economic development. What we need to understand is that Biotechnology research and developments are never going to be end and it will continuously challenge legal and ethical issues related to it. For example the recent announcement of synthetic human genome project “HGP-write<sup>2</sup>” which intended to construct human genome by synthesizing the human genome and inserting those strings into human cells growing in labs.

#### **Objectives of the study:-**

The objective of this study is in the context of patentability in Biotechnology, status of biotechnology patent filings during past few years in India, analysis of the India multi-dimensional facets of innovation performance at global level on the basis of selected parameters from Global Innovation Index report (GII-2016)<sup>3</sup>. For this purpose the study focused on international organizations G7, SAARC and BRICS group of countries with view on India. Comparison of patenting procedural variations of selected countries.

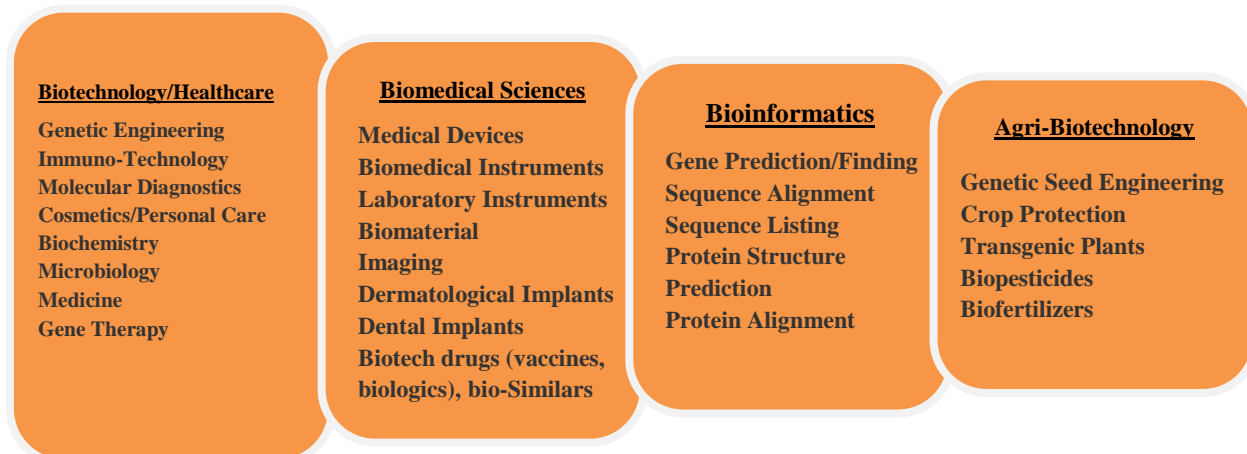
- To study the status and scenario of patents filed in office of the Controller General of Patents, India.
- To study the difference between national patent filing and International patent filing.
- To identify the Bio Innovations patentability Factors in selected countries.
- To analyze Innovation performance of selected geographic regional groups through selected parameters of Global Innovation Index report (GII-2016).

National and International Status of India in Bio-innovations: Patents are indicators of knowledge economy and innovation capacity of a country. The patent filing status of India in comparison with global level indicates output of research, industrial capacity for innovation. The requirement of such study about Indian Biotechnology research and investments. In Biotechnology sector India has quality research institutes and researchers, at the same time India gets huge R&D investments because of large consumer base and domestic market. India had become top 12 destination in the world with 2 percent share of the global biotechnology business of the world and ranked 3<sup>rd</sup> in Asia-Pacific region (APEC). In recent list of Global Innovation Index 2016 - 'Winning with Global Innovation' India is ranked 61. As a investment destination and as a center of research for biopharma technology industry, India is to reach \$11.6 billion by 2017- according to Global Industry Analysis.

Here the study requirement is on “how to protect our biotechnology inventions and innovations of private investors in R&D institutes. Is our patent system is uniform and strong compared to global patent protection, Is there any gap in regional patent filings, research expenditure and patents filed by non residents from abroad.

Bio-Pharma technology segment continues to dominate biotech industry with big share in the overall revenue. The attractive reasons for capital investment in biotechnology are to gain market share and expanding a company's platform of products to increased efficiencies and increased R & D potential. Increase in competition resulted significant increase in IP disputes. Patent litigation became an instrument of competition. Most commonly these disputes arises from prior art, license fees, patent infringements, misinterpreted clauses in licensing or sublicensing agreements. In global market place it is very important to seek patent protection for major inventions at least in those countries where patenting laws are very strong. Patent litigation became an instrument of competition.



**Fig 1:-** Promising areas of Bio-innovations for Patents.

In globalized scientific research and economic competition, Indian patent law underwent significant changes during the last fifteen years. From 2005, Government of India accorded priority to IPR protection in Biotechnology. India became party to several international treaties that directly impact on biotechnology regulation and management. In respect of Patents, India is a member-state in World Trade Organization (WTO) with effect from 1995, Convention establishing World Intellectual Property Organization, (WIPO), Paris Convention for the protection of Industrial Property with effect from 1998, Patent Co-operation Treaty (PCT) with effect from 1998, Budapest Treaty with effect from 2001 responsible for the promotion of the protection of intellectual property throughout the world. In the past few years, there have been several extensive techno-legal disputes and litigations after patents were issued. The patent controversies of turmeric and basmati cases in U.S and neem by European patents office as an anti-fungal product raised important questions about the weak Indian Patenting system. These analyses points' two critical needs: India must fill the gaps in its statutory framework, and the government must build a stronger policy system.

TRIPS agreement<sup>4</sup> was introduced to guarantee the same minimum standards of protection across countries. In India the Patents (Amendment) Act, 2002<sup>5</sup> introduced product patent protection to all fields of technology i.e drugs, food, technology and significant changes with regard to the patentability of biotechnological inventions by specifically allowing for the patentability of microorganisms with the requirement of article 27.3(b) of the TRIPS Agreement. Plant breeder's rights received official international recognition in 1961 at Paris International Convention for the Protection of New Varieties of Plants, called UPOV.

#### **Bio Innovations patentability factors:-**

The comparative look at the procedure in patentability for Bio-innovations and patent is particularly important because of IP's impact on research are particularly crucial to the companies which want to invest in R & D activities in biotechnology and to expand its biotech business internationally. It is important for them to understand the differences. This biotechnology assessment of IP trends will help in taking decision on investment or choosing the country for protection. Another trend in expansion of biotechnology business is international collaborations in research and technology transfer. Tech transfer trends often reflect foreign investments in biotech. "If any Indian company wanted to expand its base in other part of the world , ex. in South Africa, then the Indian company must know the Biotech regulations and Patent protection of that particular geographic country.

Country	Types of protection for inventions	Term of protection	Subject matters excluded from patentability or not considered to be inventions
India	Patents	20 years from the date of filing Extension of patent term is not possible	<b>Excluded from patentability:</b> - Plant and animals varieties - Inventions contrary to morality/public order - not considered to be inventions: - Discoveries - Isolated parts of human beings - Traditional knowledge - Scientific theories/mathematical methods - Presentation of information <b>Not considered to be inventions:</b> - Discoveries - Scientific theories/mathematical methods - Diagnostic, therapeutic and surgical methods for the treatment of humans and animals
South Africa	Patents	20 years from the date of filing Extension of patent term is not possible.	
Japan	Patents Utility models	Patents: 20 years from the filing date Extension of patent term is possible on: Regulatory approval for pharmaceuticals Regulatory approval for agricultural chemicals	
Denmark	Patents Utility models	Patents: 20 years Utility models: 10 years Extension of patent term is possible on the following grounds: Regulatory approval for pharmaceuticals Regulatory approval for agricultural chemicals	
Germany	Patents Utility models	Patents: 20 years Utility models: 10 years Extension of patent term is possible on the following grounds: Supplementary protection certificates based.	
United states of America	Patents Trade secrets Design patents	Patents: 20 years from the filing date Trade secrets: indefinite Design patents: 14 years from the date of grant Extension of patent term is possible on the following grounds: Regulatory approval for pharmaceuticals Patent Office delay	
Republic of Korea	Patents Utility models	Patents: 20 years from the filing date Utility models: 10 years from the filing date Extension of patent term is possible on the following grounds: Regulatory approval for pharmaceuticals Regulatory approval for agricultural chemicals	

The studies on comparing different countries patent systems will provide information on uniformity of International procedures and minute differences in national patent laws, regulatory regimes, IP barriers, differences and requirements of labelling bio products. In international patent filings there are many other issues which are common in patent industry across nations trying to solve are differing judicial standards for enforcement, compulsory licensing, adequate data protection patent office inefficiency and infringement.

#### **India at Bio-Patents and Procedure for Patent filing:-**

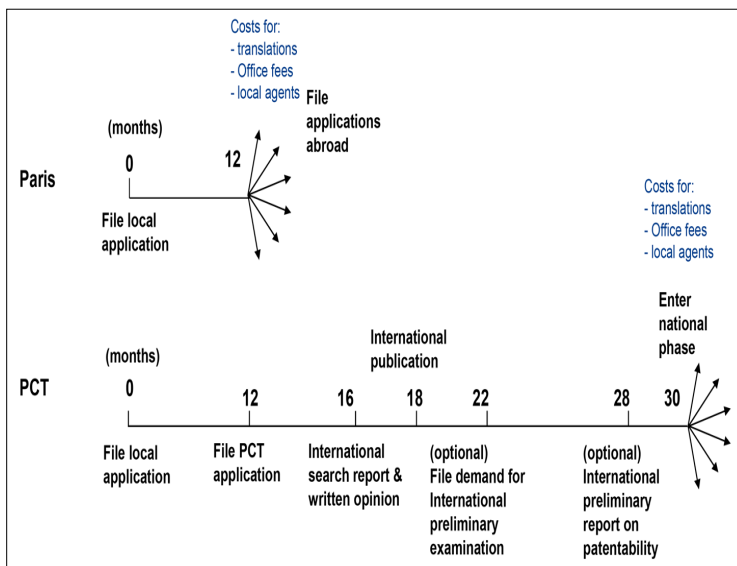
The TRIPS agreement which came into effect on January 1, 1995 harmonized the process of patenting of all WTO member countries at global level. TRIPS established the minimum standards for patentability and covers areas from pharmaceuticals to information technology, business practices to human gene sequences. The most relevant provision is Article 27 of TRIPS regarding patentable subject matter. Article 27.1 sets up the three basic patentability requirements, i.e., novelty, inventive step (non-obviousness) and industrial applicability (utility). The

patenting of life-forms and living processes is covered under Article 27 sets down minimum standards for many forms of IP regulation as applied to nationals of WTO Members.

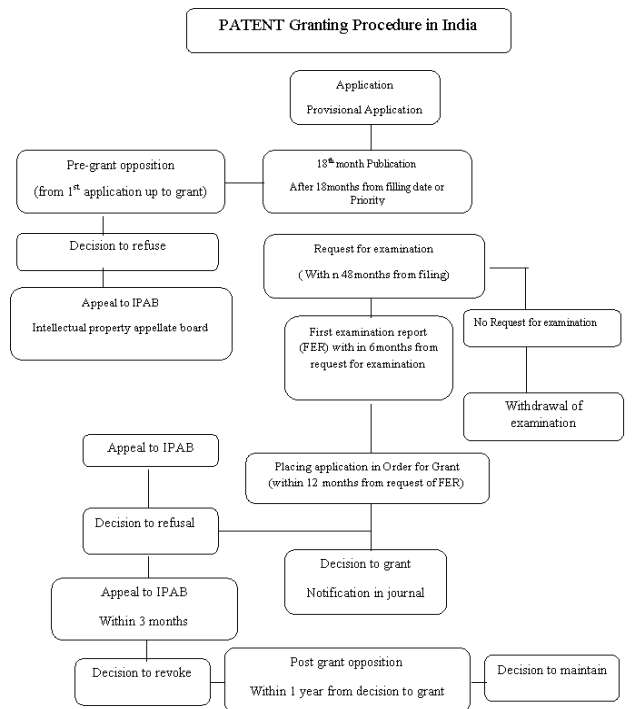
The fundamental requirement for a patent is Novelty, patentable subject matter, Inventive Step (Non-Obviousness) and Industrial applicability. Any invention is new when it is not anticipated by prior art. The Sufficient Disclosure of an invention, disclosed in the application to patent office, an inventor will obtain rights on the invention after going through established procedure. In India the Patent Office, under the Department of Industrial Policy & Promotion (DIPP), Ministry of Commerce & Industry, performs the statutory duties in connection with the grant of patents for new inventions and registration of industrial designs. The Patent System in India is governed by the Patents Act, 1970 (No. 39 of 1970) as amended by the Patents (Amendment) Act, 2005 necessitated by India's obligations under TRIPS. Indian IP rules were amended 2003, 2005, 2006, 2012, 2013, 2014 & 2016.

Patent rights were granted by each country through their national offices but one needs to understand that except in case of PCT applications, the patents issued by national patent office's provides a statutory right to the owner to stop others from using, selling or working out his invention, and exploit it commercially only within the territorial limits of the country for almost 20years.

The PCT application elaborately called as Patent cooperation treaty is a procedure established by WIPO to match the needs of inventors and business investors to protect their inventions in chosen countries required for them with a single application filing at regional office (RO). The advantage patent system is mainly to protect inventor's right and avoid duplication.



**Fig 2:-** International patent Filing. Paris and PCT Route.  
Image courtesy: <http://www.wipo.int/pct/en/faqs/faqs.html>



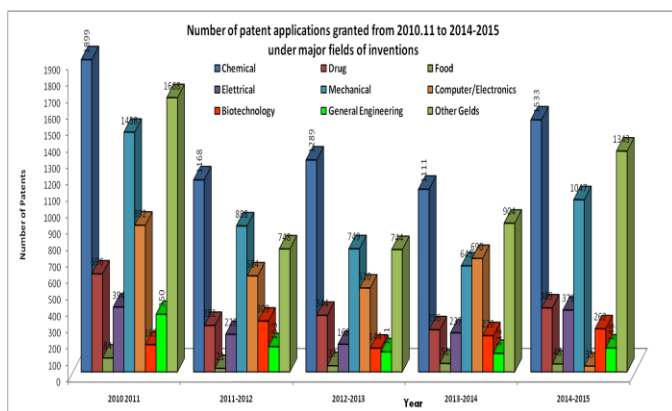
**Fig 3:-** Patent Filing procedure in India.

In India the patent act was enshrined in the Patents Act, 1970. The rights granted by IP office India is operative only in India. The patent process starts with an application by the true and first inventor(s) alone or jointly the applicant in the Indian Patent Office. Rules, procedures, form numbers, processing fee is followed as per provisions of the India patent Act 1970 (Fig-3). Only one patent will be issued for one invention on the basis of three prerequisites, novelty 'non-obviousness' or 'inventive step' and industrial applicability to align it with the definition of article 27 of the TRIPS. Inventors who required patent protection in many countries there are three basic approaches to procuring international patent protection existed (direct, traditional filing route Paris convention and Patent Cooperation Treaty (PCT) Chapter II). The World intellectual property organization WIPO International Bureau administers the process of PCT application preliminary search, evaluation, Publication on PATENTSCOPE search database and communicate documents to offices but does not grant the international patent<sup>6</sup>. The single application now can be

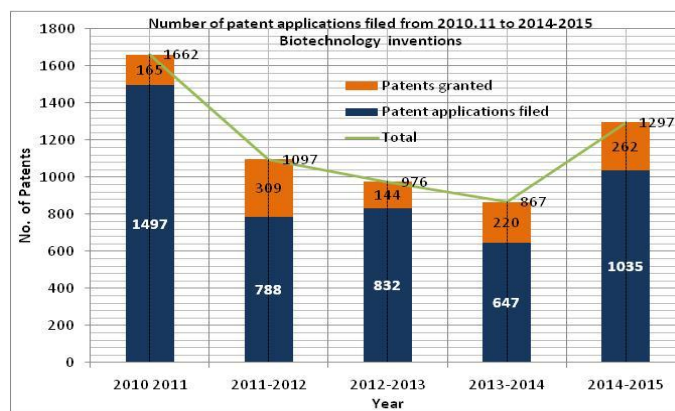
transmitted to any of the designating country required by the applicant in the list of 145 member countries national patent offices. The patent is finally issued only by the national patent office of the particular country. The direct approach is filing individual applications on same date separately in every country which is expensive, Paris convention procedure which is least expensive provides advantage of 12 months of time after the first or priority filing date in any PCT contracting member country, which In PCT one can file a single “international” patent application in India as receiving office under PCT, an international treaty with more than 145 contracting states administered by WIPO. Nationals/Residents of India can file an international application with the Indian Patent Office. The PCT process is divided into two Chapters, Chapter I and Chapter II. In Chapter II application will pass through international phase which includes International Searching Authority patent search and an International Search Report. PCT has two phases, an international phase when the international applications are in the International Bureau, and national phase which is the designated country patent office. (Fig- 2).

**Patenting trends in India:-**

The Indian patent act Section 3 (Patent Amendment 2003) defines Patentability Criteria of Novelty, Inventive step, Industrial applicability. The trend in India patent filings are published in the annual report of Controller General of Patents, Designs & Trade Marks. The number of patent applications under major fields of inventions granted from 2010-11 to 2014-2015 indicates technological developments of related to chemical, food biotechnology fields related to other engineering sectors of electrical ,mechanical, general engineering and computer elated inventions. Every year the increasing number of domestic and foreign patent filings with national patent office indicates that India is emerging nation for bio research and commercialization in Biopharma, and Biotechnology. Realizing the economic importance of Biotechnology patents the government research institutes, universities and private companies are interested in getting protection for the inventions. The analysis of the patent filing trends shows the number of patent filings in Biotechnology is in the increasing trend and in 2014-2015 out of 1297 patent applications 262 patents were granted.(Fig-4&5). Among top Indian applicants (Institutes / Universities) Indian Institute of Technology (IIT) tops with 337 patents. In scientific research organizations, Council of scientific & industrial research (CSIR) is second with 317 patents followed by DRDO with 98 patents, ICAR with 68 patents. ( Fig-7). In top ten PCT patent filings by foreign inventors at India National patent office, United States tops the list with 8,237 applications followed by Japan, Germany, and Netherlands. (Fig-6).



**Fig 4:-** Number of patent applications filed from 2010-11 to 2014-15 under major fields



**Fig 5:-** Number of Biotechnology total patent applications Filed and granted from 2010-11 to 2014-15 in Indian.

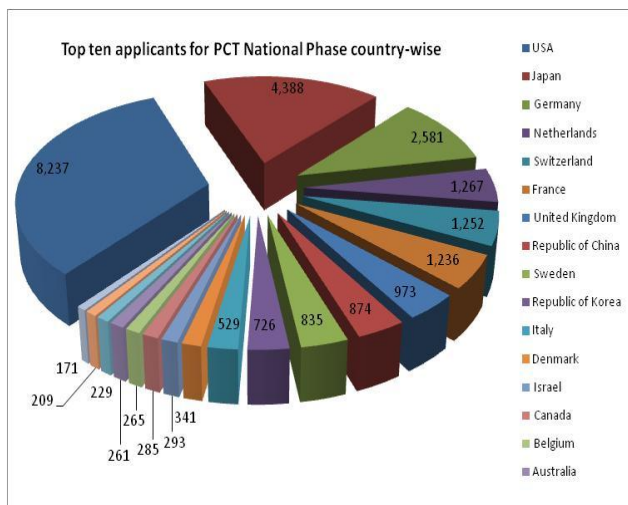


Fig 6:- Top applicant countries for PCT National Phase in India

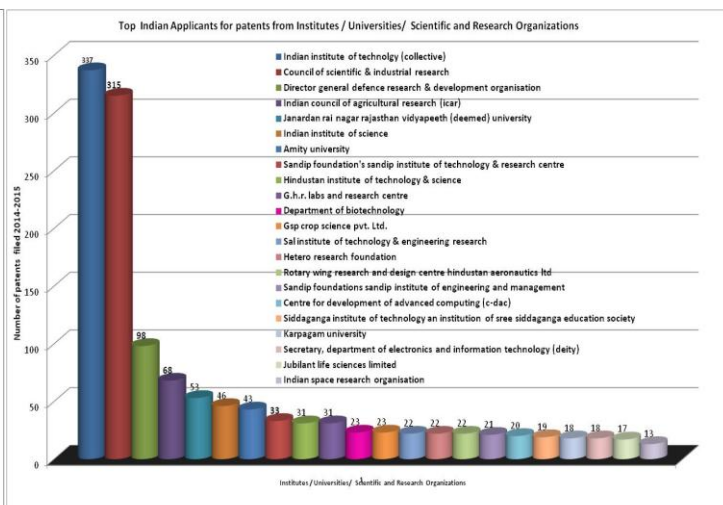


Fig 7:- Top Indian Applicants for Patents from Institutes and Universities

#### Analysis:-

The research collaborations with universities, private funding from companies in universities should be encouraged. Government should improve measures to improve a systematic mechanism to produce more patents and entrepreneurs from Bio sector. India is signatory to many conventions in Biotechnology innovations, ethical committees, rights groups. India have an image of good market for Bio-Pharma, Bio-Agriculture and Bio-energy sectors, this image will improve more if India focuses on Patenting system ,encouraging domestic patent filing by the researchers will improve the status. To improve innovation performance research and development funding expenditure from Gross domestic product (GDP) is important but this alone will not improve India status. Protection of intangible assets and innovation absorption is also important. In India the connectivity between universities, funding agencies and Industries is not promoted much. To improve the domestic patent filings by Indian researchers combination of Publication-Patent concept should be encouraged with legal help from the institution .The more industry collaborations and doctoral research for real applied technological problems may improve innovations. Innovation promotes more innovation, so promotion technology transformation towards economic development. Harmonizing global mechanisms, deploying more subject specialists as patent examiners, patent analysts and quick justice to patent disputes, preventing technology infringement for patents will encourage domestic and foreign patent filings.

#### Innovation Performance International Trend:-

Innovation Performance is linked to many factors of a country. It may not be possible to calculate the value accurately but capacity of innovation performance output is possible to estimate on the basis of selected parameters. There are many international organizations like World Bank, WIPO, OECD which releases index of performance of world countries based on reports, policy studies on economic, industrial and scientific resources available. This part of the paper tried to analyze the status of India innovation performance at national level and international level comparing the selected countries geographic regional associations based on the data available on National patent office, Global Innovation Index, World Bank development indicators on science and technology.

#### Methodology:-

This paper evaluates the impact of innovation inputs provided and outputs mainly focusing on research and development in India. For this purpose for comparison the selected countries data where India is a member country had been analyzed as different geographic regional associations of emerging national economies, Brazil, Russia, India, China and South Africa (BRICS). The South Asian Association for Regional Cooperation (SAARC) and G7 countries. BRICS group represents fast growing economic countries of the world. The SAARC regional group where India is also a member represents developing countries. The G-7 regional bloc of industrialized democracies

United States, United Kingdom, France, Canada, Italy, Japan, Germany are developed technologically and tops the innovations list. Comparing these countries data will give an idea on the level of inputs to be pumped in to the system to get preferable outputs. It determines the linkage between the innovation input and output parameters

THE GLOBAL INNOVATION INDEX (GII) is a yearly publication of INSEAD indicates innovation performance of the world countries on the basis of selected parameters of innovation outputs and inputs. This gives an idea for a country innovation performance to maximize the benefits from its research and development expenditures, technology creation, absorption international collaboration, the diffusion of technology knowledge across borders. For many policy makers and business leaders, this is a benchmark to perform a country towards its efforts in knowledge economy. GII index was started in 2007 by INSEAD and from past nine years and it became synonymous for reference to Innovation. In collaboration with WIPO, it is published by Cornell University, United Nations, World Bank and its knowledge partners The Confederation of Indian Industry from India. The GII report 2016 covers total 128 economies, 97.9% of global GDP and represents 92.8% of the world's population. The Global Innovation Index 2016 ranks India moving up to 66<sup>th</sup> rank compared to its previous year rank 81 in 2015

The Innovation Index GII-Input Indicators: Research and development (R&D), Researchers, Gross expenditure on R&D (GERD), Global R&D companies, average expenditure top 3, QS university ranking average score top 3 universities, Knowledge workers, Intellectual property payments, Innovation linkages, Patent families filed in at least two offices, University/industry research collaboration, Knowledge absorption, Research talent in business enterprise

Two output pillars capture actual evidence of innovation outputs: Knowledge and technology outputs and Creative outputs. GII-Output Indicators: Knowledge impact, Knowledge diffusion, Intellectual property receipts, Creative outputs, Intangible assets, Patent applications by origin, PCT international applications by origin, Utility model applications by origin, Knowledge and technology outputs, Knowledge creation, Scientific and technical publications, Citable documents H index. This GII report helps researchers to find out country specific linkages between Public, research, innovation and technology absorption the final observations are what makes a country to transform in to regional innovator to global innovator. In many ways India is always compared with China because of demographic similarities, GDP and economic growth. The China innovation ranking is top 25<sup>th</sup> at innovation Index and top 5 patent filing country in WIPO rankings. Brazil which is very similar economic, industrial and scientific resources is very similar outputs like to India

#### **Analyzing Global Innovation Index:-**

The Global Innovation Index 2016 with theme "Winning with Global Innovation." explores the Innovation quality and share of innovation carried out via globalized innovation networks.

The GII Indicator Rankings & Analysis report shows list of 128 countries where Switzerland tops the list and Yemen ranked 128 is least. In the list of G7 countries which represent 46% of the global GDP, United Kingdom (3) ranks at, United States (4) in the list, Canada (15), France, Germany (10), Italy (29), Japan (16), China (25<sup>th</sup>) and most of the Southeast Asian countries are performing well. The Association of Southeast Asian Nations (ASEAN) member country Singapore ranked 6<sup>th</sup>. In contrast, no member country of the South Asian Association for Regional Cooperation (SAARC) features in the top 50. India leads the way at 61, followed by Sri Lanka (91). Nepal (115), Bhutan (96), Bangladesh (117), and Pakistan (119), all ranked 100<sup>th</sup> up or below.

India is a member country in BRICS and SAARC. The GDP of India is very high among the SAARC nations. In the SAARC regional group R&D expenditure percentage in GDP India(0.82%). Pakistan (0.29), Sri Lanka (0.1), Nepal (0.3) Among SAARC nations in GII innovation index India ranked at 66<sup>th</sup> and the other nations ranks are Pakistan 119, Sri Lanka 91, Nepal (115), Bangladesh 117. In innovation performance India is showing improvement in GII index. In innovation input-parameters of knowledge absorption and innovation linkages Bhutan is doing best. In knowledge diffusion Nepal is doing better than India following sustainable practices in dispensing knowledge. In intangible assets and patent applications Sri Lanka is doing better on performance index.

World bank Indicators among SAARC nations patent filing trends India has much gap in number of patents filed by foreign inventors and the domestic inventors, comparing with Sri Lanka where domestic innovators patent filing is much than the foreign inventors. India is maintaining study growth in foreign patent filings at USPTO, EPO and WIPO. This indicates India has more technological advancement and R&D investments competing with developed



nations. The other SAARC countries like Srilanka, Nepal , Bhutan ,Pakistan, Bangladesh also creating favorable innovation ecosystem in producing creative out puts and protecting intangible assets.

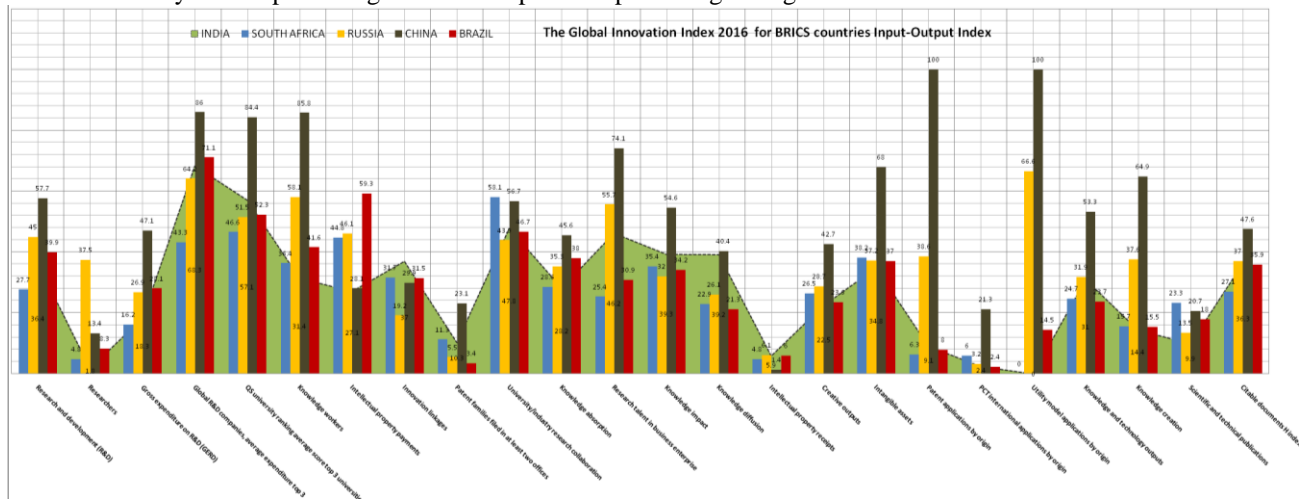


Fig 8:- The Global Innovation Index 2016 for BRICS countries Input-Output Index of selected parameters.

In the BRICS regional group R&D expenditure percentage in GDP, China (2.05%) is similar to the countries in G7 group. Brazil (1.24%) and Russian Federation (1.19%) is spending more than India (0.82%) and South Africa(0.73%).( Fig-10). China Innovation performance in GII index comparatively leading than rest of the four countries and in many of Input-output parameters closer to G7 group of High income countries. The other four nations were similar overall performance rankings. In Global innovation index China rank improved to 25<sup>th</sup> and became first developing nation to reach High economic countries list in innovation performance. The four BRICS nations ranked as Russia (43), South Africa (54), India (66), Brazil (69). The G7 countries which contribute high R&D expenditure percentage in GDP, United States (2.73%), Japan (3.58%), Germany (2.87%), United Kingdom (1.7%), France (2.26%), Italy(1.29%) are on top of the list in Innovation performance. United Kingdom (3), United States (4) , Japan (16), Germany (10), France (18), Italy (26).

**Comparative analysis of Science and technology world Development Indicators:-**

The world bank every year release set of cross country comparable data of more than two hundred countries which includes more than fourteen hundred parameters is a guide to policy planners, analysts, economists and researchers<sup>7</sup>.The “Science and technology world development indicators” which provides data on number of researchers in Research and development (R&D) working in a country per million people, productivity of Scientific and technical journal articles, Expenditures for R&D percent of GDP Patent applications filed at national offices by residents, nonresident domestic and foreigners innovators. The statistical analysis of this data for selected countries indicates current scenario of science development in different geographic regions.(Fig-9)

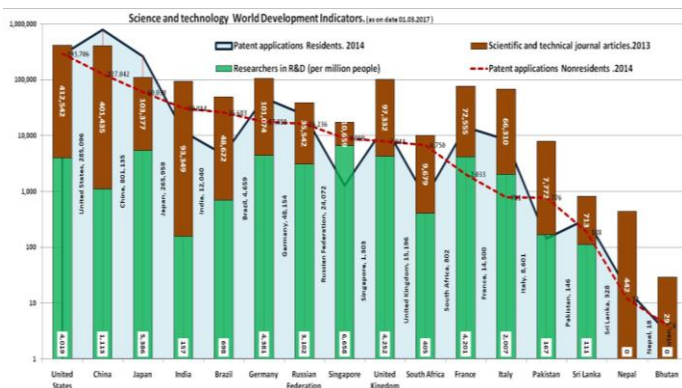


Fig 9:- Science and technology world Development Indicators of countries taken as sample (Data Source-The World bank, as on date 01.03.2017).

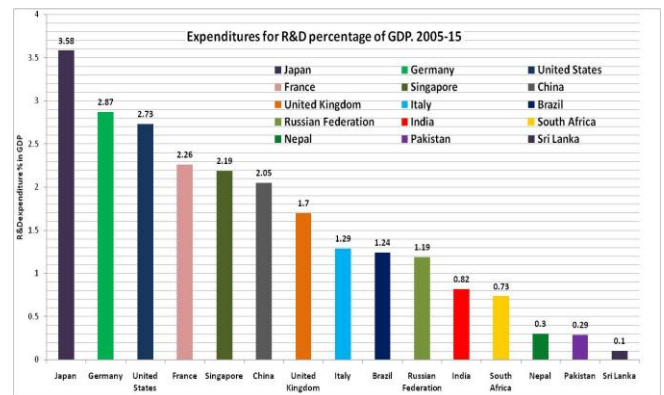


Fig 10:- Expenditures for R&D percentage in GDP 2005-15, of countries taken as sample.

United States, Germany, Japan and United Kingdom have maintained consistency in four observed parameters. Singapore is on top for having highest number of researchers and maintained balance between research publications and patent filings. This indicates scientific policy which optimizes technology innovation and applicability of innovations. India is least in the Researchers in R&D (per million people) selected sample list of sixteen countries however in terms of publishing scientific publications India is in Sixth position. The number of Non-resident patent filing is more compared to the resident patent filing. China tops the list in resident patent filings which indicates aggressive patent filings and cooperative patent system for Innovators. At the same time China is in second position in patent filings by nonresidents indicates conditions of technology protection for licensing, manufacturing, technology collaborations between companies and research institutes.

### **Conclusion:-**

The National and International filings are possible with a single application in established patent procedures according to TRIPS agreement. The Biotechnology patent filings are raising every year in India through national filings and PCT is an indication of technology transfer trends and knowledge sharing. Correlating patent filing data with R&D Investment percentage of GDP indicating the necessity of improving Domestic patent filing by Indian residents and speedup the process of granting procedures. Spending on R&D is important basic factor for all the countries to do better in Innovation Index. But it depends on the GDP income of a country to invest in long term innovation goal and knowledge economy. The Global Innovation Index, innovation parameters interlinked with each other. Large investment may not necessarily raise the innovation capacity. Data indicating that GDP and innovation have direct relation but optimizing basic and applied research goals, international collaborations in technology development, technology protection, improving national patent office capacity towards global standards remained as important factors. The uneven investments of low income and high income level countries has developed innovation divide. Besides investments the other important factor is increasing awareness, education and technology absorption capacity of the people. The policy changes will help to improve this crucial, vibrant and competitive knowledge economy.

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### RESEARCH ARTICLE

## CHARACTERISTICS AND USES OF ZEOLITES AND CLAYS AS CATALYTIC SUPPORTS. A REVIEW.

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#### Abstract

The economic significance of catalysis is enormous because most industrial chemical processes are catalytic. The use of heterogeneous catalysts and their importance have grown in recent years as a result of the economic and environmental benefits it has, compared to homogeneous catalysts. In that sense, a study deals with the use of catalytic supports on which active phases are deposited, is also developed. This review focuses on the most widely used catalytic supports, zeolite and clays. Among the topics discussed in this report are characteristics, types, synthesis and applications of the catalyst support referred above.

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#### Introduction:-

During last years, environmental organizations and some sectors society have claimed for a strict control over effluents generated in processes like oil extraction or use of dyes, which may pollute the environment. Therefore, efforts are being made to perform the replacement of the classical stoichiometric processes with homogeneous basic catalysts, such as sodium hydroxide, potassium ethoxide, by processes with heterogeneous basic catalysts to decrease generation of these contaminants and increasing economic and environmental benefits (Martín, 2001). Among materials that can be used as catalyst, zeolites and clays are the most widely used as their porous structure has interesting properties to be used in catalysis, ion exchange and adsorption. However, another materials, natural or synthetic, have also been used through the years as catalyst support in the catalyst.

The support performs many functions, but the most important one is the maintenance of high surface area for the active component. Support functions as stable surface over which the active component is dispersed in such way that sintering is reduced. To work as a catalyst, the support must resist higher temperatures, than the active component, which means a higher melting point, and must be easily manipulated to produce optimum texture properties. The most direct effect of the support on the catalyst is related to dispersion and morphology (Mirzaei, Vahid, & Torshizi, 2013). For applications, these materials have been characterized by X-ray diffraction analysis (XRD), Fourier-transfo infrared spectroscopy (FTIR), scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDX), reflectance, and cation exchange capacity analysis (CEC) and other techniques.

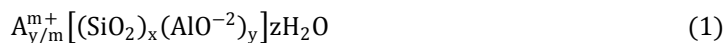
The main objective of this review is to present two materials commonly used as catalyst supports, their characteristics, sources, synthesis and industrial and environmental applications as catalytic supports. Zeolite and clay supports are widely used due to their properties such as high surface area, thermal stability, strong acidity and presence of nanosized spaces within their pores.

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**Zeolite:-****Introduction:-**

Zeolites consist of interconnected aluminosilicate building blocks of  $\text{AlO}_4$  and  $\text{SiO}_4$  tetrahedral units, which form three-dimensional framework with linked channel systems and well defined micropores. Because of their high degree of open pores and microporous nature, these materials possess very high surface area (Kim, Rajesh, & Yu, 2013) and it is possible to find more than 170 different zeolite crystal structures and their crystallographic data from the database of the International Zeolite Association (IZA). Natural zeolites were discovered around 1756 by geologist A. Cronstedt when he observed that certain minerals when heated, melted and boiled at the same time, then called them Zeolites (Greek for "zeo" boil and lithos stone) (Martín, 2001). Generally, the following chemical formula is used to represent zeolites,



where A is charge-balancing cation with valance m, (x + y) is the number of tetrahedral units per crystallographic unit cell, x/y is the ratio of silicon to aluminum and z is the number of water molecules associated with the zeolite unit cell. The ratio x/y usually varies from 1 to 5 although pure silica form of zeolite is also available with x/y being infinite (Kim et al., 2013).

Zeolites are the catalyst supports more employees and their industrial applications are due to their physicochemical properties, which have favored the use in many industrial processes such as adsorption, ion exchange and molecular sieving (Musyoka, Missengue, Kuisakana, & Petrik, 2014). Mainly have been studied acidic zeolites for their industrial importance, but environmental advantages offered by basic zeolites, such as replacing processes that generate large amounts of contaminants, makes their study is in development (Martín, 2001).

**Zeolite synthesis:-**

The first synthetic zeolite was produced in 1950 by Union Carbide Linde Corporation in United States to be used as ion exchangers, and then increase their use as catalysts, adsorbents or detergents. Synthetic zeolites have been taken an unprecedented growth, to the extent that today various patents related to the synthesis of these materials are known (Rios, Williams, & Castellanos, 2006). Zeolites are typically synthesized under hydrothermal conditions from alkaline aqueous solutions. A typical hydrothermal zeolite synthesis can be described in briefest terms as follows: 1. amorphous reactants containing silica and alumina are mixed together with a cation source, usually in a basic medium; 2. the aqueous reaction mixture is heated (for reaction temperatures above 100°C), often in a sealed autoclave; 3. For a period at synthesis temperature, the reactants remain amorphous; 4. After the above "induction period", the crystalline zeolite products are formed; 5. Gradually, most amorphous materials are replaced by an approximately equal mass of the zeolite crystals (Cundy & Cox, 2005). Most used silicon sources are aqueous colloidal silica (Zhang, Tang, Zhang, & Yang, 2013), silica foam (Nabavi, Mohammadi, & Kazemimoghadam, 2014), sodium silicate, tetraethyl orthosilicate (Zhang, Tang, & Jiang, 2013), and a mixture of them (Zhang, Tang, & Jiang, 2013). Sodium aluminate (Mousavi, Jafari, Kazemimoghadam, & Mohammadi, 2013; Nabavi et al., 2014; Zhang, Tang, Zhang, et al., 2013) or a mixture of sodium aluminate, aluminum sulfate, alumina, aluminum hydroxide and aluminum isopropoxide (Zhang, Tang, & Jiang, 2013) are the alumina sources. Cation source, usually is sodium hydroxide (Nabavi et al., 2014; Zhang, Tang, & Jiang, 2013; Zhang, Tang, Zhang, et al., 2013).

Typical hydrothermal synthesis using chemicals is described above and times and conditions for each case vary according to the type of zeolite to be obtained. However, the high cost and limited availability associated to these chemicals have promoted the search for alternative low cost raw materials. Some of the alternative unconventional feedstocks are coal fly ash, rice husks, natural clay minerals and bagasse, among other feedstocks. The type and source of silica and alumina feedstock strongly influence the quality and the purity of the final zeolite product (Musyoka et al., 2014).

**Synthesis of different types of zeolites:-**

Synthesis of zeolites from clays obtained from South Africa has been investigated. The conventional alkaline hydrothermal treatment of the starting material (90 °C for 8 h) was preceded by a fusion step (550 °C for 1.5 h) to improve the solubility of aluminium and silicon. X-ray diffraction patterns showed that a mixture of hydroxysodalite zeolite and zeolite X was formed when starting from bentonite and red clay, whereas the main zeolitic product formed from white clays was hydroxysodalite zeolite. Upon addition of extra Al to the synthesis mixture, zeolite X

was found to be the main zeolitic material that was formed after the hydrothermal crystallization. A well defined morphology for the formed zeolite X was observed when starting from red clay synthesis feedstock (Musyoka et al., 2014).

In another study, mine waters obtained from coal mining operations in South Africa were used as a substitute for pure water during the synthesis of Na-P1 and X zeolites from coal fly ash (Musyoka, Petrik, Fatoba, & Hums, 2013). When circumneutral mine water was used for Na-P1 synthesis, extra cations did not have any profound effect in the crystallization of this specific zeolite. For zeolite X case, a mixture of hydroxysodalite and zeolite X was obtained, which was unlike. Use of the acid mine water, for Na-P1 synthesis only a single phase hydroxysodalite zeolite could be obtained, whereas for X zeolite synthesis had the formation of hydroxysodalite zeolite with trace amounts of zeolite X. Both zeolites, Na-P1 and X zeolite have applications in water treatment.

Moreover, a variety of organic compounds have been degraded over iron or copper exchanged zeolites. Fenton like processes have been used in the catalytic treatment of phenol, azo dye and others, such as is shown in Table 1 (Garrido-Ramírez, Theng, & Mora, 2010).

**Table 1:-** Catalytic degradation of organic compounds over iron or copper exchanged zeolites through different Fenton-like processes (Garrido-Ramírez et al., 2010).

Compound	Catalyst/support	Process	Reference
Remazol Brilliant Orange 3C	Fe(III)-exchanged natural zeolite	Photo-Fenton	Tekbas et al. (2008)
Indigoid dye C.I. Acid Blue 74	Fe-ZSM-5 synthetic zeolite	Photo-Fenton	Kasiri et al. (2008)
Reactive Brilliant Blue KN-R	Fe-NaY and Fe-ZSM-5	Fenton-like reaction	Chen et al. (2008)
Azo dye Acid Violet 7	Fe(III) immobilized Al <sub>2</sub> O <sub>3</sub> catalyst	Photo-Fenton	Muthuvel and Swaminathan (2008)
Azo dye Porción Marine H-EXL	Fe-exchanged Y zeolite	Wet hydrogen peroxide oxidation	Neamtu et al. (2004b)
Acid Brown	Mn-exchanged Na-Y zeolite	Wet hydrogen peroxide oxidation	Aravindhan et al. (2006)
C.I. Reactive Yellow 84 (RY84)	Fe-Y zeolite	Wet hydrogen peroxide oxidation	Neamtu et al. (2004a)
Phenol	Cu-Y-5	Wet hydrogen peroxide oxidation	Zrnčević and Gomzi (2005)
Chlorinated phenols	Fe-Beta zeolite Fe-4A zeolite	Fenton-like reaction	Doocey et al. (2004)
Phenolic solutions	Fe-NaY, Fe-USY and Fe-ZSM-5	Fenton-like reaction	Ovejero et al. (2001b)
Phenol	Fe(III)-HY catalyst	Photo-Fenton	Noorjahan et al. (2005)
Phenol	MFI zeolite	Wet hydrogen peroxide oxidation	Ovejero et al. (2001a)
Phenol	Cu-ZSM-5	Wet hydrogen peroxide oxidation	Valkaj et al. (2007)
1,1-Dimethylhydrazine and ethanol	Fe-MFI zeolite catalyst	Fenton-like reaction	Kuznestsova et al. (2008)
1,1-Dimethylhydrazine	Fe-ZSM-5 zeolite	Fenton-like reaction	Makhotkina et al. (2006)
Carboxylic acids	Fe-ZSM-5	Wet hydrogen peroxide oxidation	Centi et al. (2000)
Acetic acid	Cu-NaY zeolite	Wet hydrogen peroxide oxidation	Larachi et al. (1998)
2,4-xylidine	Fe(III)-zeolite Y	Fenton-like reaction	Rios-Enriquez et al. (2004)

**Novel Support applications:-**

Different zeolite nanocrystals as ZSM-5, Beta polymorph A (BEA) and Faujasite (FAU) were used as solid supports for the preparation of Ag nanoparticles with different morphologies. Silver nanoparticles supported on zeolite crystals are considered for enhancing the efficiency of hybrid photovoltaic solar cells due to their plasmonic properties, besides Ag nanoparticles could induce light scattering and increase the number of photons entering the cell. The problem of hole-electron recombination or loss of excitation in classical solar cells can be solved with the fabrication of very thin photovoltaic solar cells (few hundreds of micrometers) using Ag nanoparticles on zeolites. Incorporation of silver in zeolites has antimicrobial and medical applications because when moisture or liquid film gets in contact with Ag-zeolite, silver ions are released to the bacteria by forming chelate complexes with the DNA and block the transport processes in the cell.

Also, zeolites have been functionalized with molecular targeting vectors that enable specific high affinity binding to in vivo molecular targets (such as cell surface receptors). In addition, these materials possess unique properties that enable radionuclides and contrast agent metals to be concentrated for applications in magnetic resonance imaging (MRI) and positron emission tomography (PET) (Zaarour, Dong, Naydenova, Retoux, & Mintova, 2014).

**Mineral Clays:-****Introduction:-**

Clay is hydrated aluminosilicate whose chemical formula is  $Al_2O_3 \cdot 2SiO_2 \cdot 2H_2O$ . Its chemical composition is characterized by the presence of amounts of Mg, Mn, Fe, Ca, Na and K, mainly. Clays belong to a particular class of minerals known phyllosilicates or sheet silicates. Silicates are, from a practical point of view, the set of most important minerals of nature as they constitute 25% of the known minerals and about 40% of the most common.

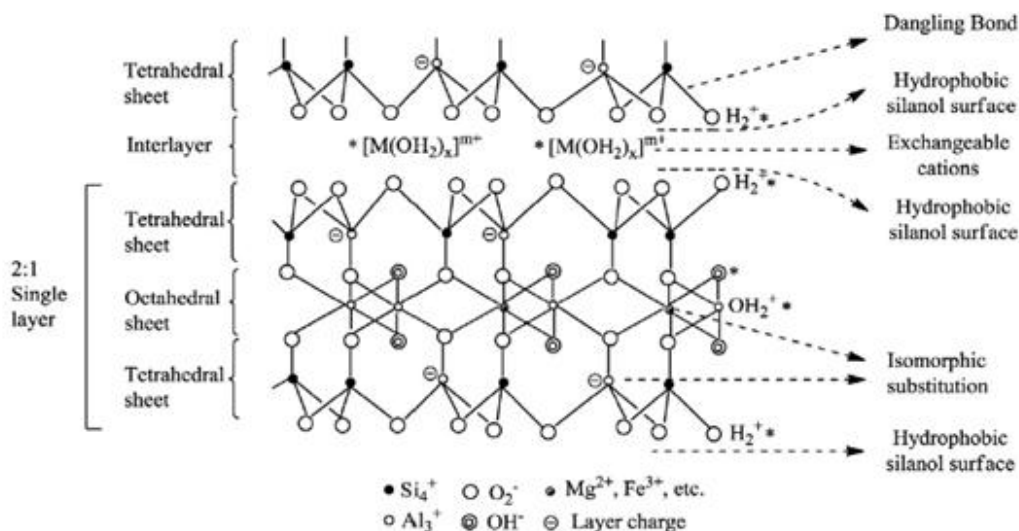
Phyllosilicates are a large family of minerals that commonly show layered structures and include kaolin, smectite, chlorite, mica and serpentine groups. Based on their layered structure, clay minerals can be categorized as types 1:1 or 2:1. Each layer forming a clay mineral particle is fundamentally built of one or two tetrahedral silicate (Si\O) sheets and one octahedral metal oxide/hydroxide (M\O or M\OH) sheet. A 1:1-type clay mineral consists of one tetrahedral sheet and one octahedral sheet.

Examples of 1:1-type clay are kaolinite, halloysite and serpentine. A 2:1-type clay mineral is composed of an octahedral sheet between two tetrahedral silicate (Si\O) sheets, and examples of 2:1-type clay minerals include vermiculite, montmorillonite, saponite, and sepiolite (Zhou & Keeling, 2013).

**Active sites:-**

Some properties of the clay minerals such as the exchange capacity, good catalytic support, large surface area, mechanical and chemical stability and low price, make them suitable as heterogeneous catalysts. At this respect, clay minerals such as, montmorillonites, iron-enriched zeolites, kaolinite, allophanes, goethite, magnetite and wustite, have been used as solid catalysts in the heterogeneous Fenton and electro Fenton reactions or to prepare modified electrodes (Garrido-Ramírez, Mora, Marco, & Ureta-Zañartu, 2013). The inherent properties of clay minerals also make them chemically active and adsorptive, thereby leading to a variety of uses as absorbent and catalyst products.

In clay minerals, the active sites may arise from 1. "Broken edge" sites and exposed surface of aluminol and silanol groups, 2. Isomorphic substitutions, 3. Exchangeable cations, 4. Hydrophobic silanol surfaces, 5. Hydration shell of exchangeable cations, and 6. Hydrophobic sites adsorbed on inorganic molecules (Figure. 1). These peculiar chemical features combined with the nanometer scale layering and the interlayer spacing, allows for a variety of functional materials with potential applications in advanced technologies, in particular, nanotechnology (Zhou & Keeling, 2013).



**Figure 1:-** Schematic drawing of 2:1- type clay mineral showing active sites (Zhou & Keeling, 2013).

Considering the development of the clay minerals as catalysts, their chemical functions generally need to be intensified to improve efficiency. Possible ways of making ‘catalytically active sites’ within and onto the matrix of clay minerals are with active species in the framework of clay minerals, which can be made accessible; through the ions within the interlayer space, judiciously exchanged with active components for catalysis purpose; with functional nanoparticles (NPs) or clusters onto or within the clay nanostructure (Zhou & Keeling, 2013).

#### Clay mineral modification:-

For several decades, modified clay minerals have been an important alternative for the generation of materials with potential applications in catalysis, either as catalysts or catalyst supports, due to their low cost and abundance. Their physicochemical and mechanical properties allow a very wide range of possibilities for structural, textural and chemical modifications. There are two methods for modifying a clay mineral, pillaring and delamination (Pérez, Montes, Molina, & Moreno, 2014).

The Pillared InterLayered Clays (PILCs) synthesis procedure can be divided into three main steps (Ramirez et al., 2007): (i) Preparation of polyoxocations by careful hydrolysis of certain multivalent cations, which under appropriate conditions give rise to cationic polymeric species; (ii) Ionic exchange of the original charge-compensating cations of swellable smectite clays by the polyoxocations before synthesized, this exchange giving rise to the so called ‘‘intercalated clays’’ and (iii) Stabilisation of the intercalated clays by calcination at relatively high temperatures, which transform the metastable polyoxocations into ‘‘pillars’’, stable metallic clusters, close to oxihydroxy phases. The most widely used pillaring agent is aluminum, however, there are different poly-oxohydroxy metal cations can be used as pillaring agents like chromium, titanium and iron (Park, Jung, Seo, & Kwon, 2009).

The process of clay mineral modification can lead to arrangements of the laminar face–face type as in the case of pillared clays, where microporosity is predominant, or edge-type or edge-side edge aggregates, as in the case of delaminated clays, which are predominantly meso and macroporous materials (Pérez et al., 2014).

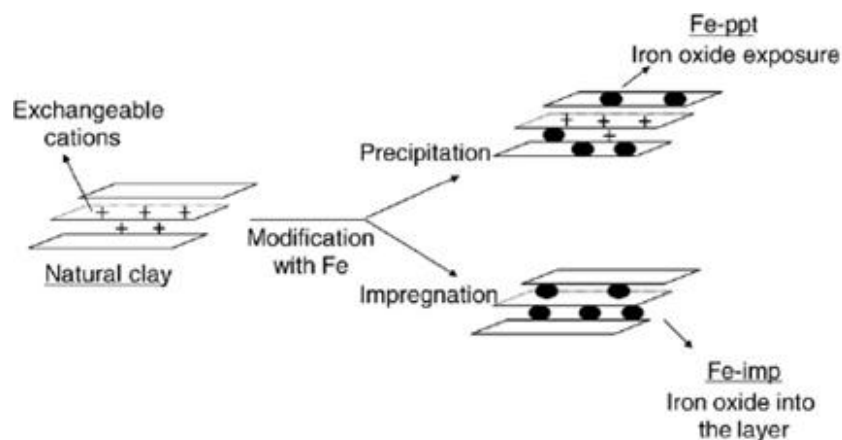
PILCs, intercalated with Al and containing iron or copper species (Garrido-Ramírez et al., 2013; Nogueira et al., 2011; Ramirez et al., 2007; Sanabria, Alvarez, Molina, & Moreno, 2008), have been used for the oxidative degradation of organic compounds through the Fenton-like reaction. Catalyst with intercalation of metal (Fe-Al-PILC) have higher basal spacing than for their Fe-PILC counterparts (Li, Lu, & Zhu, 2006). In Table 2 are showed catalysts for the degradation of recalcitrant organic compounds via Fenton-like reactions.

**Table 2:-** PILCs as heterogeneous catalysts for the decomposition of various organic compounds via Fenton-like reactions (Garrido-Ramírez et al., 2010).

Compound	Catalyst/support	Clay	Process	Reference
Azo dye X-3B	Fe-PILC	Bentonite	Photo-Fenton	Li et al. (2006)
Al-Fe-PILC				
Methylene blue	Fe-PILC	Natural montmorillonite	Photo-Fenton	De León et al. (2008)
Orange II	Hydroxyl-Fe-PILC	Bentonite	Photo-Fenton	Chen and Zhu (2006)
Acid Light Yellow G	Fe-PILC (catalyst)	Natural bentonite	Photo-Fenton	Chen and Zhu (2007)
Azo dye Orange II solution	Al-PILC impregnated with Fe	Natural saponite	Fenton-like reaction	Ramírez et al. (2007a)
Ciprofloxacin (fluoroquinolones)	Fe-PILC	Laponite (synthetic hectorite)	Photo-Fenton	Bobu et al. (2008)
Phenol	Mixed (Al-Fe)-PILC	Commercial Greek bentonite	Catalytic oxidation wet with $H_2O_2$	Barrault et al. (2000a)
Phenol	Al-Cu-PILC	Commercial Greek bentonite	Catalytic oxidation wet with $H_2O_2$	Barrault et al. (2000b)
4-Nitrophenol	Fe(III)-exchanged PILC	Montmorillonite	Fenton-like reaction	Chirchi and Ghorbel (2002)
Phenol	Al-Al-Fe- and Al-Ce-Fe-PILC	Natural Colombian bentonite	Catalytic oxidation wet with $H_2O_2$	Carriazo et al. (2005a)
Benzene	Al-PILC as supports for Cu, V, Fe	Natural sodium montmorillonite	Fenton-like reaction	Pan et al. (2008)
p-Coumaric acid and p-hydroxybenzoic acid olive oil mill wastewater	Cu-PILC	Commercial bentonite	Catalytic oxidation wet with $H_2O_2$	Caudo et al. (2007)
Polyphenols olive oil mill wastewater	Cu-based zeolite	Zeolite and commercial bentonite	Catalytic oxidation wet with $H_2O_2$	Giordano et al. (2007)
Cu-PILC				
Wastewater from agro-food production	Cu-PILC	Commercial bentonite	Catalytic oxidation wet with $H_2O_2$	Caudo et al. (2008)

**Clays characterization:-**

Heterogeneous catalysts prepared by a modified raw-clay with iron oxides, have been used in oxidative reactions of toluene. Fe-ppt and Fe-imp were prepared by precipitation and impregnation of iron oxide, respectively (Figure 2.) (Nogueira et al., 2011). The measurements of specific surface area indicated an increasing of the surface area from  $17 \text{ m}^2 \text{ g}^{-1}$  for raw clay, to  $62 \text{ m}^2 \text{ g}^{-1}$  for Fe-ppt catalyst. However, for Fe-imp sample the particle size distribution was found to be even more uniform than for the raw clay. Also, it is interesting to observe that there are iron phases with high crystallinity in the Fe-ppt compared with the Fe-imp, indicating a higher exposure of iron oxide.



**Figure 2:-** Preparation scheme of iron oxide on montmorillonite (Nogueira et al., 2011).

Alumina-pillared montmorillonite was used as a support in the oxidation of chlorobenzene over palladium and platinum. The catalysts were prepared by wet impregnation (Aznárez et al., 2015). The selectivity to chlorobenzene was considerably higher over the Pd/Al-PILC catalysts than over their Pt/Al-PILC counterparts, due palladium is known to be a more active chlorination catalyst than platinum.

Due to the increase in the emission of gaseous pollutants into the atmosphere, adsorption and/or retention of gases by clays has also been studied (Volzone, 2007). The presence of the different interlayer cations in smectite, changes the behavior of the clay minerals in aqueous dispersions and also the adsorption of gases. It has been demonstrated that the adsorption of  $O_2$ ,  $N_2$ ,  $CO$ ,  $CH_4$ ,  $C_2H_2$  and  $CO_2$  gases by different cation exchanged montmorillonites, decrease in the order  $H^+ > K^+ > Ca^{2+} > Al^{3+} > Na^+$  montmorillonite. The capacity for adsorption of gases by PILCs follows the order: Al-PILC  $\cong$  Zr  $>$  Ti  $>$  Cr-PILC and the gas adsorption capacity of all these PILCs follow the order  $CO_2 > CH_4 > N_2 = O_2$ . The modified-Al-PILCs are better solid adsorbents than Al-PILCs for  $CO_2$ ,  $CH_4$ ,  $N_2$ ,  $O_2$ ,  $C_2H_2$ ,  $CO$ .

### Conclusions:-

Desirable characteristics of a catalyst-support are stability, inertness, reusability, high surface area, porosity and appropriate chemical structure. Among a wide range of support-materials, so far, materials that appear to meet optimally these characteristics optimally are Zeolite and Clays. Supports keep the catalytic phase highly dispersed, thus protecting it from sintering and supported catalyst has shown better catalytic performance for catalytic processes. The type of the modification affects the activity of the supported catalysts because modifications affect substantially the chemical nature of the surface and on the pore texture formation. Results suggest supported catalyst are employed in antimicrobial, medical and environmental applications.

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### RESEARCH ARTICLE

#### ROLE OF INNOVATIVE PEDAGOGICAL TOOLS IN ENHANCEMENT OF THE QUALITY OF ENVIRONMENTAL EDUCATION IN PRIMARY SCHOOLS: AN INDIAN PERSPECTIVE.

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Innovative, Pedagogy, Environmental Sustainability.

#### Abstract

It goes without saying that education without experiential exposure is futile. Learning anything is best understood when it is retained for long and this can be ensured only when the knowledge that one has gained can be applied to real life situations. **Environmental Education is a course which teaches an individual the basic essence of the living surroundings.** Having understood the significance and the implications of doing a course on environmental education, **the study undertaken gives an insight into the different pedagogical tools that have been adopted across the three top notch schools in Pune.** Emphasis has been laid on such tools because this channel facilitates the flow of knowledge from the learned to the learners. The **objective** of the study was to analyze the **Role of Innovative Pedagogical Tools and Teaching Techniques** adopted by primary level schools to evaluate the effectiveness in terms of predefined learning outcomes of environmental education. **Primarily, an in depth study of the composition mix of the theory-practical element that exists in the pedagogy used by each of the schools was examined** followed by evaluating the success of the respective composition mix. Since the research was extended to more than one school it helped us to give a broad outlook in terms of the innovative modes adopted in the delivery mechanisms. The study helped us to **find the highlights; the positives and negatives of the techniques used to impart the subject matter.** It also examined the limitations on part of the students, teachers and the parents that hinder the smooth functioning of the teaching-learning process and seeks to give valuable suggestions so that the activity is translated into a more meaningful practice. **It was also found that there is a fundamental change in the existent syllabi of environmental education in schools** which now promotes cognitive capacity and resourcefulness in order to make the child curious about social phenomena thereby nurturing the curiosity and creativity of the child particularly in relation to the prevalent environmental uncertainties and related sustainability goals. **The research intends to help policy makers in formulating an appropriate response strategy** with regards to primary level education in India. Finally, the research aimed to develop and implement an effective tool kit for environmental education, based on the identified

gaps and assessment. The study was however **limited to survey results based on research carried out in three schools of Pune.**

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### **Introduction:-**

**“What sculpture is to a block of marble, environmental education is to the children!” - Joseph Addison:-**

The role of education as a facilitator of social and economic progress is well acknowledged universally. Education is the most critical input for endowing people with the requisite skills and knowledge for productive employment opportunities in the future. Thus, continuous enhancements in the methods of education delivery are not only expected to augment efficiency but also amplify the overall quality of life. Education facilitates children to set an objective in life and consecutively enables them to work towards that set goal, exploiting their true potential in the process. This role of education stands uncontested and valid even today.

However, due to immense competition in every sphere and the constant pressure to perform well, the role of education has been reduced to simply being an instrument of material success. Individual ambitions and unreasonable competitive practices are placed above the joy of learning and gaining knowledge from each other.

It needs to be understood that students are not just young people for whom adults should devise solutions. They are critical observers of their own circumstances and needs, and should be participants in discussions and problem solving related to their education and future prospects. Hence, participatory learning and teaching, emotion and experience need to have a definite and valued place in the classroom. The topic of our research paper is “Role of Innovative Pedagogical Tools in Enhancement of the Quality of Environmental Education in Primary Schools: An Indian Perspective”.

The prime motive behind selecting environmental education was due to the fact that only this course had the leverage of including innovative techniques to a considerable extent. In addition, it was also imperative to question whether or not environmental education at the elementary level ensures that the future population is more concerned and aware about the environment and issues related to it.

### **Objectives:-**

1. To analyze the scope and significance of Environmental Education being imparted in Indian schools as part of the Primary Level Education in India.
2. To determine the relationship between the use of innovative pedagogical tools and enhancement in the quality of education at primary level in schools.

### **Limitations:-**

1. The study was limited to three schools in the city of Pune.
2. The study was limited to the subject of Environmental Education.

### **Review of Literature:-**

**Gupte, Medha (2015)** in her paper titled “Does information and communication technology (ICT) have an important role to play in Indian higher education?”, has researched about how ICT can play a crucial role in transforming the current education scenario in India from the point of view of three critical stakeholders: teachers, students and government. She further explains that if used creatively, CT will not only make a big difference in the current teaching-learning methodologies practiced in Indian schools but also help in the incorporation of 21<sup>st</sup> century skills like digital literacy, innovative thinking, creativity, sound reasoning and effective communication. The study attempts to give a comprehensive outlook on how ICT is likely to enhance the quality of education through blended learning, by augmenting the traditional chalk and talk method.

**NCERT (2005)**, in its review of the National Curriculum Framework, specifically pointed out that it is imperative that learning at school be seen beyond the use of textbooks and greater emphasis be laid on experiential learning while imparting knowledge. The document suggested to adopt a comprehensive strategy which would ensure learning without any kind of burden on the students.

Further, the report recommended the need for a fundamental change in the existent syllabi of environmental education in schools so as to promote cognitive capacity and resourcefulness in order to make the child curious about social phenomena, starting with the family and moving on to wider spaces and to finally nurture the curiosity and creativity of the child particularly in relation to the prevalent environmental uncertainties prevailing in the world.

### **Research Methodology:-**

#### **Sampling Method used and Size of Sampling:-**

#### **Sampling Technique:-**

*Probability Sampling Technique* was used to carry out the research. Under this, the following technique of sampling was used:

*Stratified Random Sampling* – The first step entailed identifying a particular *cluster* (area) to narrow down the population size. For this, the case perspective of Pune was taken into consideration and the observations were assumed to be representative of the situation pan India. Further, within Pune as well in order to create *stratified random samples*, three schools were identified to carry out the primary spade work. Additionally, to form even smaller groups/strata from within these schools, teachers were characterized based on their designation. Finally, the *stratum* which was chosen for the study was that of the PRT (Primary Teacher) teachers responsible for Environmental Education in their respective schools.

#### **Sample Size:-**

A field visit was undertaken across three renowned schools in Pune. The sample size comprised of fifty respondents comprising of School Teachers (TGT, PRT, PGT) i.e., approximately seventeen per school.

#### **Data Collection:-**

##### **Primary Data**

Primary data collection was the principal mode of enquiry. It involved collecting data through a questionnaire consisting of twenty questions which essentially aimed at bringing out relevant data to meet the objectives of the research.

##### **Secondary Data:-**

The critical data sources included; Environment Education (EE) curriculum in Schools, Recommendation by NCF (National Curriculum Framework) 2005, Various Publications targeted at enhancing environmental education such as that of Eklavya, National Council of Educational Research and Training (NCERT), and Centre for Environment Education (CEE), Other Books available in the market, alternate books/ games/ audio- visual exposure given by schools if any.

Other Sources of secondary data collection encompassed; journals and previously published papers available over the internet.

#### **Data Analysis:-**

Once the relevant data had been gathered, the researchers undertook both qualitative as well as quantitative analysis of the same.

#### **Qualitative Analysis:-**

As part of the qualitative study, an *experimental design* was structured, which entailed conducting a brief classroom session in each of the three schools. Such kind of analysis is condensed under the umbrella of '*Observations through being Participant in Education Delivery*' methodology.

#### **Quantitative Analysis:-**

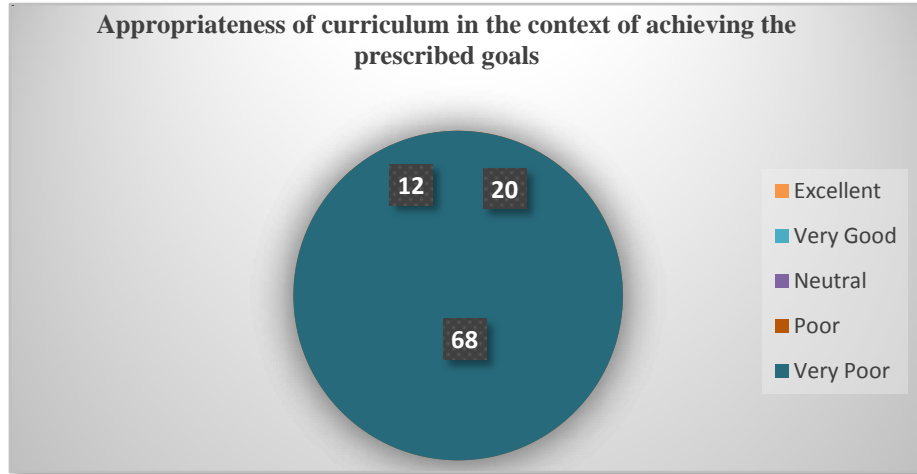
On the other hand, the survey results were used to scientifically and objectively classify the data using certain commonly used tools such as *SPSS, Microsoft Excel and Microsoft Power Point*. Relevant *excel formulas, charts and graphs* were then used to further infer and test the applicability of the existing hypothesis.

**Hypothesis:-**

- **H0 (Null Hypothesis):** Innovative means of teaching does not have any role to play in enhancing the quality of education being imparted at various levels.
- **H1 (Alternate Hypothesis):** Innovative pedagogical tools augment the overall understanding of a student and there is a definite behavioral change which can be observed in the student as a result of the same.

**Results:-**

**Figure 1:-** Level of Agreement on appropriateness of curriculum in achieving prescribed environmental education goals



**Discussion:-**

From the above Figure 1, it is seen that 68% of the respondents agreed that the curriculum was appropriate enough to achieve the prescribed environmental education goals at Primary level in schools. The respondents opined that present syllabus is designed to forge an integrated perspective for the primary stage of schooling that draws upon insights from Sciences, Social Studies and Environmental Education.

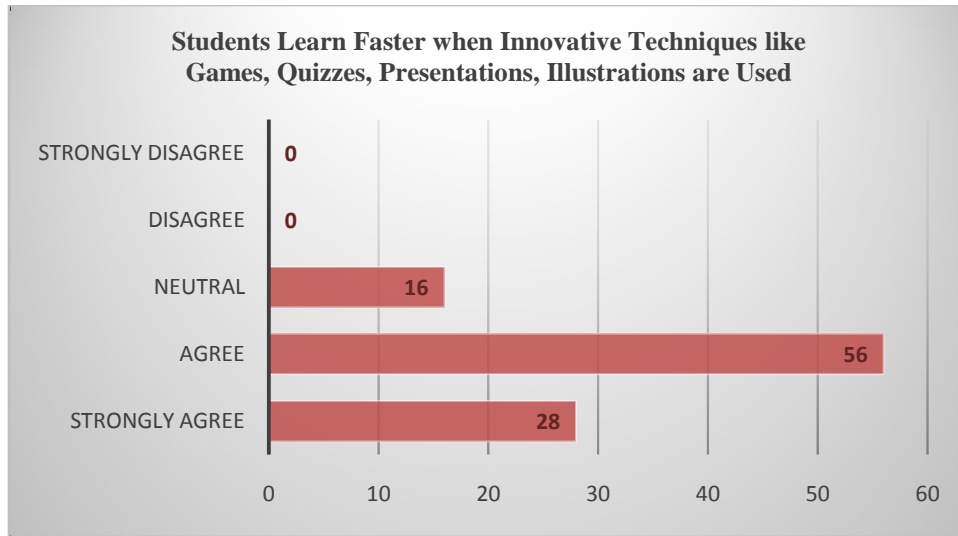
**Table 1:-** Level of Agreement pertaining to long term objectives being targeted by the proposed curriculum.

SNo	The Curriculum Targets to Achieve Certain Long Term Objectives (Behavioural Change/Awareness/Social Benefit)	n=50	Percentage
a)	Strongly Agree	14	28
b)	Agree	22	44
c)	Neutral	8	16
d)	Disagree	4	8
e)	Strongly Disagree	2	4

**Discussion:-**

From the above Table 1, it is evident that most of the respondents firmly believed that the proposed curriculum definitely contributes towards inculcating a behavioral change amongst students in regards to developing sensitivity towards the environment.

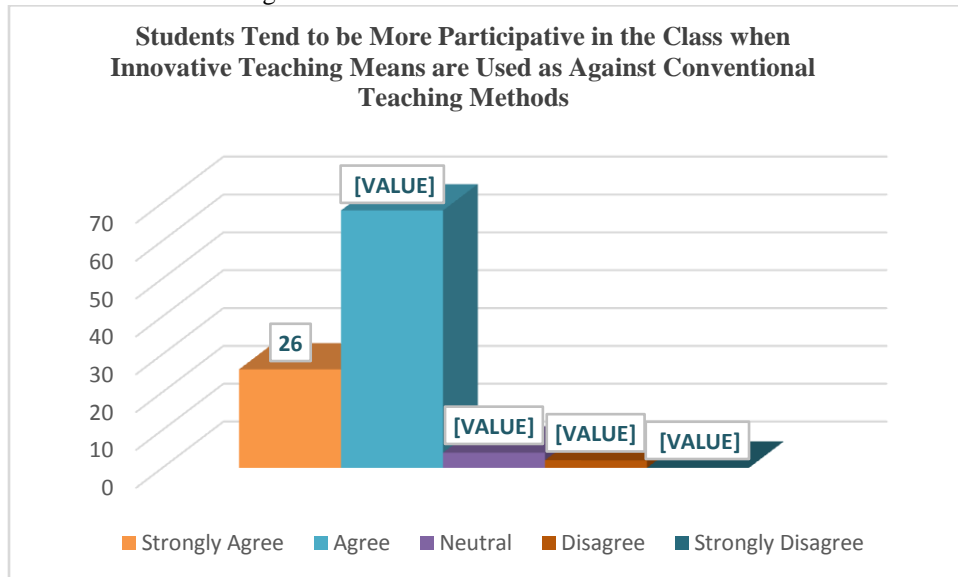
Figure 2: Level of Agreement on the statement that students learn faster with innovative techniques like games, quiz, presentations and illustrations are used



**Discussion:-**

From the above Figure 2, it can be seen that 56% of the teachers agreed with the notion that innovative methodologies have a definite positive role to play towards imparting quality education and ensuring faster learning amongst the students. Further, they also believed that, text books should only be used as guidelines in terms of what topics need to be covered. The prime focus should be on alternative teaching techniques. Learning by rote is must in terms of enhancing reading and writing skills but for experiential learning it is imperative that innovative methods be used.

Figure 3: Level of Agreement that the students tend to be more participative when innovative teaching means are used rather than conventional teaching methods

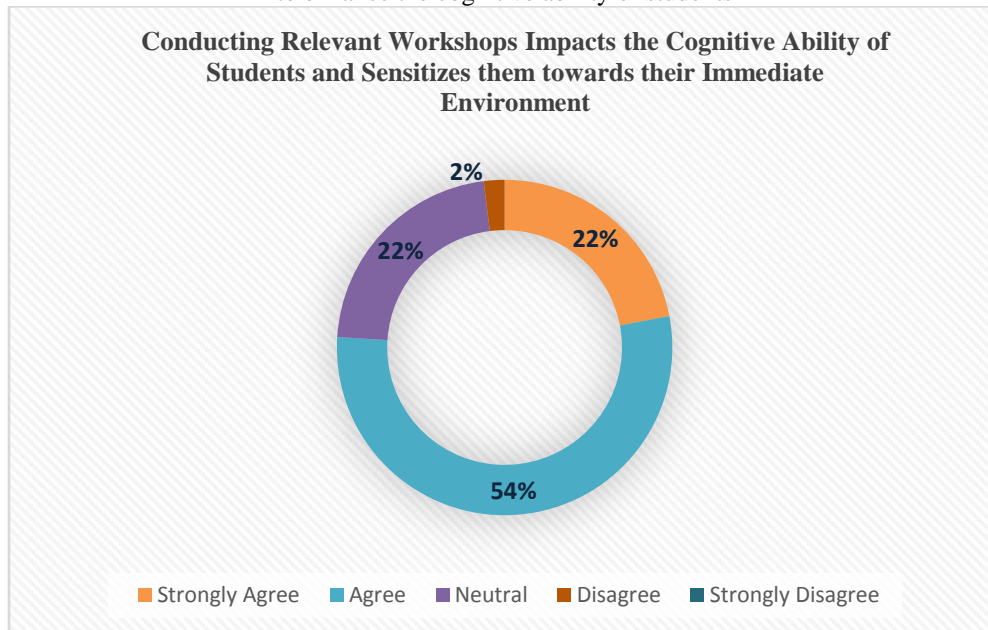


**Discussion:-**

From the above Figure 3, it can be seen that 68% of teachers agree that students tend to be more participative and enthusiastic in class when innovative teaching means are used as against conventional teaching methods. They further opined that since it is a life subject, rather than gaining theoretical knowledge only, understanding of the concepts through practical experience is more important. An interesting initiative which was highlighted includes - a No-Vehicle Day on a weekly basis to reduce the pollution level.

Further, they also believed that if the curriculum is focused on learning by doing approach then the students tend to be more enthusiastic, active and participative in the class.

**Figure 4:-** Level of Agreement on the fact that conducting relevant workshops on Environmental related issues tend to enhance the cognitive ability of students



**Discussion:-**

From the above Figure 4, it can be inferred that more than 50% of the respondents agreed to the fact that conducting relevant workshops on current Environmental related issues tend to nurture the curiosity and creativity of the child particularly in relation to the natural environment. Teachers also felt that these workshops engage the child in exploratory and hands-on activities and helps them acquire basic cognitive and psychometric skills through relevant observation, classification and inference.

**Hypothesis Testing:-**

In order to establish a quantitative relationship between Innovative Techniques adopted and Performance of the Students in Environmental Education subject, **two variables namely Quantitative Performance Technique (QPI) and the Number of Sessions conducted using Innovative Teaching Methodologies** were studied.

Mathematically; **QPI = Grand Total Marks of Students Appeared / (Total Number of Students \* Number of Subjects)**

A Correlation (Bivariate) analysis was done using SPSS. A Two-tailed test (which allows positive or negative correlation) was done to calculate Karl Pearson’s Correlation Coefficient.

*Note* – For this particular test, the subject wise marks of Class IV students from all the three schools, were collected and studied.

**Table 2:-** Calculation of p value.

		QPI	Number of Innovative Sessions
<b>QPI</b>	Pearson Correlation	1	0.760
	Sig (2-tailed)		0.001
	N	20	20
<b>Number of Innovative Sessions</b>	Pearson Correlation	0.760	1
	Sig (2-tailed)	0.001	
	N	20	20

\*Correlation is significant at the 0.01 level (2-tailed).

Since, the p value is  $\leq 0.05$  (significance level), the test is significant (there is a significant relationship between the number of sessions held using Innovative Techniques and the QPI).

Also, the value 0.760 indicates a **strong positive Pearson correlation** between the two variables, that is,  $r(18) = 0.760$ ,  $p = 0.001$ .

The above result **rejects the null hypothesis** which states that “Innovative means of teaching does not have any role to play in enhancing the quality of education being imparted at various levels”.

Hence, the **alternate hypothesis** which states that “Innovative pedagogical tools augment the overall understanding of a student and there is a definite behavioral change which can be observed in the student as a result of the same” can be **accepted**.

### **Conclusion:-**

The conclusion of the entire study are being discussed in the light of the objectives.

**The first objective** of the study was to “analyze the scope and significance of Environmental Education being imparted in Indian schools as part of the Primary Level Education in India”.

It was found that increasing concern on Environmental Education (EE) in India gained impetus after its importance was recognized by the Government and requisite policies were framed subsequently to introduce Environmental Education in schools. After execution of the planned study, one of the key findings was that there was a difference in the learning outcomes across the three schools. In case of the first school under study, it was observed that the curriculum focused more on learning by doing approach. In line with the stated objectives of the curriculum it was felt that the students were more enthusiastic, active, participative and willing to learn. Further, it was analyzed that they were able to apply the knowledge in a better way when resorted to innovative means. On the contrary, in the other two schools, students were seen to be more mechanistic in their response as the school authorities preferred text book based learning. The restrictive exposure given to the students lead to a limited applicability of their knowledge in real life situations which further narrowed down their scope of thinking. Another interesting result which can be inferred is that particularly in case of government aided schools due to lack of in service programmes/training of the teachers their ability to implement the prescribed curriculum effectively in the class, has been restricted. On the other hand, due to continuous training of the teachers in the other schools they have been able to enhance the quality of education delivery.

**The second objective** of the study was to “determine the relationship between the use of innovative pedagogical tools and enhancement in the quality of education at primary level in schools”.

There was a definite positive connection which could be established between the use of innovative pedagogical tools and enhancement in environmental education at the primary level. Certain positive initiatives were taken by the schools like Cleanliness Drives (Kirkoskar Clean School Green School Programme), Participation in the Green Olympiad at the National Level which encouraged students to develop knowledge about the global environment situation.

Although the schools have adopted the E-learning method of education yet there is ample scope for augmenting the effectiveness of the delivery mechanisms. Since the study involved a very broad base of students, one of the core issues which came to light was the existence of a language barrier. During certain instances this was an evident obstacle towards imparting vital knowledge. So, in order to overcome this problem, the teachers have to ensure that at all times certain parity exists while conducting classes.

It was also observed that in majority of the classes since the strength of the students is high it leads to two pertinent problems- firstly, the grasping power of all the students is not similar as a result of which special attention needs to be given to certain students. Secondly, the attention span of the students varies and thus they tend to get distracted easily. An implication of this is that only some of them actually benefit from the classes. Another appalling gap which continues to persist in the whole system is the trivial role played by the parents due to lack of adequate education and awareness. There is a discontinuity in the learning process which is carried from the classroom to their respective homes. Finally, we could say that since the level, scale and form of implementation of the teaching methods varies in different schools, there is ample scope for further research in the same domain by considering a wider spectrum.

**Recommendations:-**

A comprehensive outlook emerged post the intensive research. In lieu of the Participant-Observant Method, critical stakeholders were identified and it was observed that each one of them had an imperative role to play. The prominent links which arose out of the study include:

**Weakest Link – Parents:-**

**Policy Level:** The policy design is highly desk bound and the policy makers fail to take into consideration the viability of the same. It needs to be realized that the learning process is not confined to the schools only. Therefore, more focus should be laid on After School Centers so that continuity in the learning process is maintained. It is thus imperative that the whole system is streamlined and is more cost effective so that it does not automatically exclude the people who cannot afford it.

**Strongest Link – Teachers:-**

**Policy Level:** At the policy level, work needs to be done towards capacity building of the teachers. The teachers need to be adequately trained on a regular basis by improvising on the Teacher Training Packages.

**Critical Link – Pedagogy:-**

**Policy Level:** In order to ensure experiential learning in the schools certain subsidy mechanism should be put in place. This will ensure that the schools especially the government aided schools have adequate funds available for implementing the requisite tools. Also, a uniform content needs to be developed, taking usage of pedagogical tools into account, in order to maintain an overall parity level across all the schools.

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### RESEARCH ARTICLE

#### PATIENT'S PERSPECTIVE ON BEDSIDE TEACHING: A CROSS-SECTIONAL STUDY.

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 medical students; medical education;  
 clinical skills

#### Abstract

**Background:** Bedside teaching is an important part of the medical education system. It is extremely impossible to develop good physicians without the interaction with the cases. The lack of students' experience and the lack of privacy of the patients may cause negative attitude of the patients toward the students and may limit the benefit of bedside teaching. In this study we are trying to evaluate the attitude of patients and their perspective toward bedside teaching.

**Method:** Cross-sectional study. A self-administered questionnaire was distributed among inpatients from 4 different hospitals in the holy city of Makkah, Saudi Arabia.

**Results:** A total of 300 participants completed the questionnaire, 149 of them were males (49.7%) and 151 were females (50.3%). 90.3 % (271) of the patients allow both male and female medical students to view their medical file, 90 % (270) patients allowed both genders to take their medical history and personal data in the presence of a doctor, and 81.7 % (245) allowed both genders to do so even in the absence of a doctor. The majority of patients allowed both male and female medical students to be present during rounds (266; 88.7 %), in OPDs (260; 86.7 %), and in the operation room if they were having surgery (196; 65.3 %). Regarding physical examination, 77 % (231) allowed both genders to be present while a doctor is examining them, 67.3 % (202) allowed both genders to examine them in the presence of a supervising doctor, and 56 % (168) allowed themselves to be examined by both genders even in the absence of a supervising doctor. When patients were asked about their acceptance regarding diagnostic and other procedures, 77.7 % permit male and female medical students to be only present, while 54.7 % (164) permit them to perform such procedures

**Conclusion:** The study showed an overall positive attitude toward medical students regarding bedside teaching and education in different hospitals in the city of Makkah, Saudi Arabia. This attitude however was influenced by different sociodemographic aspects, especially gender, level of education and monthly income. The majority of patients knew that they had the right to refuse medical students.

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**Introduction:-**

Bedside teaching is an important part of the medical education system. It is extremely impossible to develop good physicians without the interaction with the cases. The lack of students' experience and the lack of privacy of the patients may cause negative attitude of the patients toward the students and may limit the benefit of bedside teaching [1]. In this study we are trying to evaluate the attitude of patients and their perspective toward bedside teaching. Bedside teaching is an important part of medical education system as it is facilitator of student development of professional skills as well as communication skills, they also act as exemplars of their conditions and diseases [2].

Patients' autonomy gives them the right to refuse medical students. This issue makes the bedside teaching a conflict to be a cornerstone in medical education. In a study has been done at the University of Newcastle in Australia, 100% of students thought that bedside teaching was the most effective way of learning clinical skills such as communication and physical examination [3]. Thus direct contact of the students with patients would play a crucial role in the development of clinical reasoning, communication skills, professional attitudes and empathy.

Convincing the patients of the great benefits of bedside teaching would create a sense of personal health care and trust, and enhances the respect that develops with the teaching doctor. These can be achieved by several methods such as explaining to them the benefits of bedside teaching as it is important part as the textbook learning, realizing the importance of the triple relationship between doctor, patient and student by including them in an open conversation, patient-student relationship [4].

Patients are generally satisfied about bedside teaching with little reluctance to students. According to a study by Rima M Sayed-Hassan and her colleagues at Damascus University teaching hospital, 67.8% approved the presence of medical students during the medical consultation, and 58.2% expressed comfort with the presence of medical students [5].

Another study by Yousef Marwan showed that 80% would permit medical students to take their history with the presence of a supervising doctor; but 51.2% refused without the presence of a supervising doctor. 62.2% refused medical students to examine them without a supervising doctor, the majority of the patients 57.4% would allow students to be present while the doctor is examining them and 54% to examine them with the presence of a supervising [6].

**Method:-**

The is a cross-sectional study, data were collected during the month of March 2015, from patients at several hospitals in the holy city of Makkah, KSA (Al-Noor Specialist Hospital, Hera General Hospital, King Abdulaziz General Hospital, and King Faisal General Hospital). The data were collected using a self-administered modified questionnaire developed by *Yousef Marwan* in his research [10]. The questionnaire has 23 questions divided into two main sections: section one was about the sociodemographic of the patients, while section two was about patients' perception of medical students and bedside teaching.

The analysis was done using the Statistical Package for Social Sciences (SPSS) with two-tailed P-value < 5% to be considered significant. Descriptive statistics for every variable were computed, as well as cross-tabulation between section one and two.

**Results:-****Sociodemographic Characteristic:-**

Our total sample is 300 patients from different hospitals, genders, occupations, age, and education. Of them 100 patients were from Al-Noor Specialist Hospital, 100 from King Faisal General Hospital, 50 from King Abdulaziz General Hospital, and 50 from Hera General Hospital. The samples were taken from both internal medicine and general surgery departments. There are 149 males (49.7%) and 151 females (50.3%). 243 of the sample were Saudi Arabian (81%) whereas 57 were non-Saudi (19%).

Of the sample, there were 191 married (63.7%), 77 single (25.7%), and 32 (10.7%) divorced or widowed. The education level distribution is as follows: Less than intermediate (88,29.3%), Intermediate (56,18.7%), High school (79,26.3%), Diploma (27, 9%), University or higher (50,16.7%) the mean age of the participants was 40.02 years old (Table1).

#### Reaction Toward Students:-

90.3 % (271) of the patients allow both male and female medical students to view their medical file, 90 % (270) patients allowed both genders to take their medical history and personal data in the presence of a doctor, and 81.7 % (245) allowed both genders to do so even in the absence of a doctor. The majority of patients allowed both male and female medical students to be present during rounds (266; 88.7 %), in OPDs (260; 86.7 %), and in the operation room if they were having surgery (196; 65.3 %). Regarding physical examination, 77 % (231) allowed both genders to be present while a doctor is examining them, 67.3 % (202) allowed both genders to examine them in the presence of a supervising doctor, and 56 % (168) allowed themselves to be examined by both genders even in the absence of a supervising doctor. When patients were asked about their acceptance regarding diagnostic and other procedures, 77.7 % permit male and female medical students to be only present, while 54.7 % (164) permit them to perform such procedures (Table 2). Data analysis with two-tailed P-value < 0.05 to be considered significant showed that different sociodemographic are statistically associated with the overall acceptance of medical students. Male students were more accepted by male patients, while female students were more accepted by female patients. Analysis also showed that patients who were biased by gender had low level of education and low monthly income.

**Table 1:-** Sociodemographic of participants.

Characteristics	Subgroups	
	N	%
<b>Hospital</b>		
Al-Noor Specialist Hospital	100	33.3
King Faisal General Hospital	100	33.3
King Abdulaziz Hospital	50	16.7
Hera General Hospital	50	16.7
<b>Department</b>		
Medicine	133	44.3
Surgery	167	55.7
<b>Gender</b>		
Male	149	49.7
Female	151	50.3
<b>Nationality</b>		
Saudi	243	81.0
Non-Saudi	57	19.0
<b>Marital Status</b>		
Single	77	25.7
Married	191	63.7
Divorced / Widowed	32	10.7
<b>Education level</b>		
Less than intermediate	88	29.3
Intermediate	56	18.7
High school	79	26.3
Diploma	27	9.0
University or higher	50	16.7
<b>Occupation</b>		
Student	28	9.3
Policeman / Army	10	3.3
Fireman	51	17.0
Clerical worker	7	2.3
Professional	155	51.7
Administrator	49	16.3
Unemployed	0	0
Other	0	0
<b>Monthly family income</b>		
Less the 10000 S.R <sup>a</sup>	247	82.3
10000 - 20000 S.R	46	15.3
20000 - 30000 S.R	7	2.3

S.R, Saudi Riyal.

**Table 2:-** Reaction of patients regarding the presence of medical students in the hospitals.

Questions	Answers			
	Only Males	Only Females	Both Males and Females	Neither Males nor Females
	n (%)	n (%)	n (%)	n (%)
Would you permit medical students to read your medical file?	8 (2.7)	5 (1.7)	271 (90.3)	16 (5.3)
Would you permit medical students to be present in the outpatient clinic if you were having a consultation with your doctor?	16 (5.3)	13 (4.3)	260 (86.7)	11 (3.7)
Would you permit medical students to be present in the ward rounds if you were admitted in the same ward?	19 (6.3)	12 (4.0)	266 (88.7)	3 (1.0)
Would you permit medical students to be present in the operation room if you were having a surgery?	12 (4.0)	37 (12.3)	196 (65.3)	55 (18.3)
Would you permit medical students to take your medical history and personal details from you with the presence of a doctor?	12 (4.0)	9 (3.0)	270 (90)	9 (3.0)
Would you permit medical students to take your medical history and personal details from you without the presence of a doctor?	5 (1.7)	19 (6.3)	245 (81.7)	31 (10.3)
Would you permit medical students to be present while your doctor examining you?	12 (4.0)	40 (13.3)	231 (77.0)	17 (5.7)
Would you permit medical students to examine you with the presence of a doctor?	26 (8.7)	47 (15.7)	202 (67.3)	25 (8.3)
Would you permit medical students to examine you without the presence of a doctor?	28 (9.3)	43 (14.3)	168 (56.0)	61 (20.3)
Would you permit medical students to be present while you're having diagnostic/other procedures (e.g. x-ray, drawing blood, inserting catheter, endoscopy...etc)?	22 (7.3)	18 (6.0)	233 (77.7)	27 (9.0)
Would you permit medical students to perform diagnostic/other procedures on you (e.g. x-ray, drawing blood, inserting catheter, endoscopy...etc)?	11 (3.7)	13 (4.3)	164 (54.7)	112 (37.3)

### Discussion and Conclusion:-

The acceptance of medical students in hospitals was variable based on multiple aspects. Overall medical students were allowed to view the medical file, be available during rounds and in OPD. This high acceptance may be attributed to the indirect contact between the medical student and patient, as well as the small role the medical students play in the medical care provided. These results are similar to what have been founds in other studies [7,8,9].

Only a small number of patients did not allow medical students from taking their medical history with and without the presence of a supervising doctor. This refusal maybe because these patients have a low confidence in the skills of the medical students in obtaining a sufficient history that will help guiding the treating doctor in reaching the final diagnosis, also some patients may view this as a time wasting process, since they already gave their history to the treating physician. Previous studies demonstrated another possible reason, which is that patients don't feel comfortable discussing their sexual history and issues with medical students [11, 12, 13].

Regarding physical examination, the majority of patients permitted medical students to not only observe, but also to examine them in the presence and absence of a supervising doctor. These results are similar to the findings of Monnickendam et al in his research [8], where a small number of patients refused to be examined by medical student in the presence of a doctor and alone (7.2 % and 33.6 % respectively).

Less than one quarter of our patients refused the presence of medical students in the operation room when they are being surgically treated. Which is less than what was found by Yousef Marwan[10].Where the refusal was 26.7 %.

A possible explanation for this refusal is that patients may feel uncomfortable exposing their bodies to medical students, or maybe they believe that medical students may participate in the operation causing complications and unwanted outcomes.

When it came to allowing medical students to attend and/or perform diagnostic and other procedures, most of our patients had a high level of acceptance. Opposite results were observed by Yousef Marwan[10], Chipp et al. [14], and Passaperuma et al. [15].

Data analysis showed that in all aspects of patients' perspective toward medical students, female expressed a higher level of acceptance toward female medical students compared to male patients. These results were supported by similar findings from other studies [7, 14, 12]. An easy explanation for such behavior, is the embarrassment a female patient would feel being exposed, particularly to a male medical student, especially here in Saudi Arabia where the majority of the population is Muslim and raised in a conservative way. Another observed association was between the low level of education and low monthly income, and the attitude toward medical students, these patients showed a lower level of acceptance toward both male and female medical students, with the latter having a higher level of acceptance, probably due to the fact that the majority of patients with low level of education and low monthly income were females.

68.7 % (206) of the patients believed that the presence of medical students in hospitals had no effect on the quality of health care, while 27.3 % (82) believed that their presence improves the quality, and only 4 % (12) believed that it decreases the quality. Those patients with the positive believes probably thought that since medical students spend a lot of time in history taking, physical examination, reviewing their medical file, and discussing the case with their clinical tutors, they may discover some missing details that will aid in reaching the final diagnosis. However, those with the negative believes probably think that the supervising doctor will spend more time teaching the medical students than caring for his/her patients.

81.7 % (245) of our patients knew that they had the right to refuse medical students from history taking, physical examination, reading their medical file, and other aspects involving their health care, while only 18.3 % (55) did know that they had such right.

In conclusion, the study showed an overall positive attitude toward medical students regarding bedside teaching and education. This attitude however was influenced by different sociodemographic aspects, especially gender, level of education and monthly income. The majority of patients knew that they had the right to refuse medical students.

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### **Conflict of interest:-**

The authors have no conflict of interest to declare.

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### RESEARCH ARTICLE

#### AMBIGUITY IN THE SILENCES AND PAUSES OF PINTERESQUE DRAMAS.

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#### Manuscript Info

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##### Key words:-

Silence, trademark, failure, dots

#### Abstract

This paper aims at highlighting, by means of a synthetic approach in combination with analytical elements, some of the elements and peculiarities of Pinter's dramas, which made him one of the most important playwrights of postmodern era. We will mainly focus on his silences and pauses he is so famous for, which became a trademark of his dialogue otherwise called the "Pinter Pause". We will explore how failure in communication and the breakdown of human relations paved the way for ambiguity, nebulousness and menace. Our aim is to make clear Pinter's ideas on silences and pauses when he used them, what he meant and we will reveal that the uttered and spoken word is important, but the most important is what is left unsaid, the idea understated beyond silences. Elements of postmodern literature found in his work made it difficult to understand and analyze Pinter's work, often referred to and classified as illogical and irrational. Finally, we will try to restate once again the importance of silences and pauses expressed by 3 dots(...) in the Comedies of Menace, as the only way to penetrate through the real hidden significance of these dramas.

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#### Introduction:-

This paper will deal with peculiarities of Pinter's absurd dramas so as to reveal his influence on audience and explore how his ambiguity paved the way for multiple readings leaving his plays open-ended. One of the main elements of an absurd drama is the dramatic conflict in the traditional meaning. It is thought that conflicts of personality clashes are closely related to a temporary and strict attitude, in a meaningless world, these kind of conflicts are meaningless too. The absence of a traditional dramatic conflict in an absurd play can be explained with the absence of events and movements on the stage which is totally different to what frequently happens in a traditional play. For the very same reason we could say that the absurd plays can be given the name of the Situational Theatre's plays. Despite the fact that Pinter was first criticized by both the audience and the critics for the nature of his plays which appeared to be a combination of bestial language and characters as well, he was one of the most distinguished playwrights who dominated the second half of the 20<sup>th</sup> Century and one of the most influential since George Bernard Show. Bock and other critics agreed on one point that all of Pinter's plays written after "The Homecoming" never had the quality of his very first plays (Bock.H. 2008). The originality of his fiction and the greatest impact of his works was seen in his early years with his early plays despite the first rejection of his peculiar approach.

Pinter's positioning in the british drama was gradual, but at the same time very influential and strong once the critics were introduced to the Plays of the Theatre of Absurd, which in 1960 became a separate dramatic literary movement, coined by Martin Esslin (Schumacher, C. 1990). The sense of evasiveness, aggressiveness, violation of identity and the self were major themes depicted in his plays. Many critics tried to classify them as plays of menace,

identity, memory, and political plays which all aimed at highlighting and exploring the specific principles of the human existence, but Pinter did not like being classified and being part of any literary movement. He tried to deploy the characteristics of the Theatre of Absurd which "strived to express the anguish and the uselessness of the human condition, the inadequacy of the rational approach by the deliberate abandonment of rational devices and discursive thought. (Esslin, 2004)

#### **Pinteresque plays and ambiguity:-**

His plays were given the name of naturalist, realist, existentialist and impressionist dramas (Randisi. J. L.1984). He was very much distinguished for his style and ability to use certain elements in a versatile style that his themes were accepted as his trademark in the history of Playwriting. As far as his artistic personality was concerned, he was well-known for the frequent use of such elements:

- Absence of deliberate or accidental communication between characters
- Decoded conversations and silence
- Lack of logic, coherence and rationality in the dramatic narration
- Characters' fixations and jealousy
- Use of pauses and silences to express what was left unsaid
- Characters' outer fearfulness
- Characters' isolation
- The unknown threat that was at the very center of their lives
- Their mental anguish, their neurosis and psychosis
- The abandonment of language and rationality as means of communication
- The benefit from elements of traditional drama
- Everyday language, slang
- Lifelike characters and situations
- The difficulty of reaching and understanding the immediate meaning

As Esslin puts it, the most important thing for Pinter was to reveal to the audience that what we spoke every day was illogical and senseless (Esslin. M. 1965)

*Truth in drama is forever elusive. You never quite find it but the search for it is compulsive. The search is clearly what drives the endeavor. The search is your task. More often than not you stumble upon the truth in the dark, colliding with it or just glimpsing an image or a shape which seems to correspond to the truth, often without realizing that you have done so. But the real truth is that there never is any such thing as one truth to be found in dramatic art. There are many. These truths challenge each other, recoil from each other, reflect each other, ignore each other, tease each other, are blind to each other. Sometimes you feel you have the truth of a moment in your hand, then it slips through your fingers and is lost.*

#### **Harold Pinter (Pinter. H : 2005)**

According to him, everything said or unsaid can be either true or untrue or it can be both. You never know for sure which is which. Truth is relative. There are no hard distinctions between what is real and what is not, what is true and what is false. A thing is not necessarily either true or false because it can be both at the same time. These assertions still make sense and do apply to the exploration of reality through art. So as writers we can stand by them, but as citizens we cannot, as citizens we must ask: What is true? What is False? He created lifelike situations where characters, their actions and dialogue came out to be unreal at the end. Firstly, he set his characters in a concrete environment: a room, a house or an enclosed shelter which symbolized "warmth and coziness towards the threatening outer world", which on the other hand served as a prison itself (Bock, H.1981).



In that room, characters were dominated by a feeling of “loneliness, aggressiveness, separation and loss” which served as Pinter's main themes in his Comedies of Menace. They were given such a name because they perfectly combined humor and threatening elements. They were unique works of art and you can never find similar dramas elsewhere, he can't be compared to any other contemporary playwright. Pinter's characters were totally paralysed, afraid of the outer world and its intruders. Through the character of Rose in “*The Room*” Pinter wanted to reveal to both readers and the audience, the sense of insecurity given through her fear of going outside the room she inhabited (Gale.S. H. 1996). They were totally scared from the world outdoor and they preferred to create their own worlds/ realities with their own rules and live peacefully there better than observe the rules outside the room. The element of Room was very much used by Pinter in most of his works. What draws our attention as readers and audience is the ambiguity and we do not understand where it came or derived from. This sense of ambiguity creates tension, a sense of insecurity and menace which is given in the text by the use of the 3 dots (...), pauses, silences or the deliberate lack of communication among characters, whose autonomy, the sense of past and future were unstable.

Another very important element that threatens these characters and makes ambiguity stronger is the idea of an intruder coming from the outside without being invited. The feeling of being threatened leads us to another issue, the one of power and violence, which are powerfully given through dramatic elements of theatre for example the total darkness, poor lightning and lights fade. In those few moments of darkness, the familiar environment became threatening and hostile. Despite the high load of aggressiveness and shadows of doubt of his dialogue, he tried to come to terms with a comic model in his plays. Such a model was first used in his first play “*The Room*”. Some of the main features of this model were incongruity, illogical outcomes, frequent repetition and restating over and over what we already knew as an audience. Two of these elements were clearly visible in the dialogue between Rose and Mr. Kidd, the landlord- incongruity as far as the term Bed-Room of his sister was concerned and an illogical and irrational conclusion of the conversation. The first intrusion occurred with the entry of the landlord, Mr. Kidd, whose evasiveness and vague answers to Rose's inquires served, as much as Bert's silence, to increase Rose's uncertainty about the world outside and undermine the security of her room.

- Rose: How many floors you got in this house?
- Mr. Kidd: Floors? (He laughs). Ah, we had a good few of them in the old days.
- Rose: How many have you got now?
- Mr. Kidd: Well, to tell you the truth, I don't count them now. Oh, I used to count them once... I used to keep a track on everything in this house... That was when my sister was alive, but I lost track a bit after she died.
- When Rose asks him if anyone lived upstairs, “Up there?” Mr. Kidd ponders, “There was one but gone now.”
- Rose: what about your sister, Mr. Kidd ?
- Mr. Kidd: What about her?
- Rose: Did she have any babies?
- Mr. Kidd: Yes, she had a resemblance to my old mum, I think. Taller, of course.
- Rose: When did she die then, your sister?
- Mr. Kidd: Yes, that's right; it was after she died that I must have stopped counting... [

The conversation is vague, unclear and it gives us the impression that what Mr Kidd is referring to are people not floors. It eventually becomes a series of attacks and counter-attacks and Mr. Kidd seems very keen on pinpointing Rose's vulnerabilities when he says that Rose's room has once been his bedroom. This fact inevitably reminds Rose of her status as tenant and temporary occupant of the room. Comicity in this and other plays comes as an important feature of the conflict itself. What still remains important to pinpoint as a trademark of Pinter are these three elements: Pauses, silences and 3 dots (...) instead of one full stop. They have a different meaning, not the one we expect them to have (Pinter.H in Gussow 1994). Pause is a pause because of what has just happened in the mind and guts of the characters... and a silence means that what happened before made everybody unable to speak for a while until they recover from what had happened before the silence took place.

Silences carry upon the importance of pieces of dialogue. They create an island of sounds and have their own dramatic significance. They become more powerful when they are in isolation, pause in itself does not mean that the action is over; in fact it implies that the character is still active, looking for new words to use, a new way of being saved or a new interactional approach. On the other hand *Silence* is a defense tactic which signals the end of communication. What Pinter had in mind was that words were not the only way to communicate with the world, we often notice other elements when we make use of silence. Through silence we can transmit much more, we can become deaf because of such deafening silence which carries and conveys more meaning and significance than

words can. We have to read through the lines and uttered words, we communicate more by staying silent. Since communication among characters has failed, it can open ways to a multiple of readings and interpretations on Pinter's plays. This makes his plays ambiguous, unclear and difficult to decode and interpret. They are open-ended plays and one can interpret them from their view point.

Pinter thought that if we stay silent we highlight our actions. We could perfectly communicate only by means of our movements and gestures, so in this way words get replaced by gestures, as it frequently happens in Pinter's works. His plays rarely start with uttered words, but we see the opening of the curtains and the appearance of one or two actors are standing up, sitting or lying down. Silences are broken by their utterances but they will soon give way to silence once again, and this time it will prevail. Pinter knew these small tricky details perfectly well since he was both an actor and art-director and he knew how to manipulate the dramatic action to make the audience experience what was happening on stage. In this and other plays like "*The Birthday Party*" and "*The Dumb Waiter*", he used certain techniques borrowed from Alfred Hitchcock's melodramas, so as to increase suspense and tension.

What seems to be a sinister and evil situation, in fact it is not and vice versa. This viewpoint was adopted by Hitchcock. Paranoia was intertwined with ambiguity, evasiveness and a spark of black humor. His plays still remain enigmatic, encoded and very mysterious. We never really understood who Riley was, or who were McCann and Goldberg and who they worked for, and we never got to know the previous profession of Stanley in "*The Birthday Party*". All these enigmatic elements and unanswered questions increase the symbolic significance of his works. His plays depict characters with a disoriented personality. Even nowadays, his plays remain ambiguous, unclear, doubtful and full of mystery. His most enigmatic play was considered "*The Homecoming*" since Monna Lisa (Carpenter. Ch. A). Characters were not given a proper identity and we cannot understand if the story they narrate is true or not.

"*The Homecoming*" is full of implications, vagueness, uncertainties and ambiguity. Max is a butcher, but Lenny calls him "a dog who cooks", his "driver" Sam cannot drive, Teddy who is a philosophy lecturer cannot answer a philosophical question which makes us doubt about his profession. When things are not well defined, it leaves room for multiple interpretations and readings and brings forth ambiguity in his plays. Apart from ambiguity and fear, he also made use of absurd elements and because of this, his plays started in a funny or comic way and ended up in physical or psychological violence. Menace is hidden behind the front door and it can dress up in different forms and ways. One such technique Pinter used to create panic and terror was absence of concrete physical violence on stage, but characters and the audience perceived it was in the air, in the circumstances and in everything surrounding them.

### Conclusion:-

So in Conclusion we could say that the master of the absurd and ambiguity had a very unique style, full of ambiguity and uncertainty which made his work impenetrable for a period of time and even nowadays. It will always be like this if human communication fails and people do not communicate, they eventually will just listen but they will never hear what the others have to say. We often communicate through a different means of communication and this is Silence. It seems a paradox but, it may be true because we say more when we say nothing at all. We reflect and meditate better if in pause, otherwise it will result a useless process. The master of pauses and silences helped us view the world from a different perspective through his plays.

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### **RESEARCH ARTICLE**

#### **TIME COURSE OF ALLODYNIA IN THE CHRONIC CONSTRICTION INJURY MODEL OF NEUROPATHIC PAIN.**

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#### **Abstract**

Injury to the peripheral nerves results in chronic neuropathic pain that its mechanism is not well understood. Associated with neuropathic pain is allodynia, painful sensation to non-painful stimuli. Since the mechanism is not fully understood, there is yet no effective treatment for allodynia. The aim of this study is to monitor the time course of tactile allodynia after induced injury to the sciatic nerve. To achieve this aim, 4 Lewis rats were used. Baseline measurements were taken one day before performing chronic constrictive injury (CCI) model of neuropathic pain. Comparing with the contralateral paw, on the first day after CCI, the paw withdrawal threshold of the ipsilateral paw started to decrease, but did not reach the level of significance. The sixth day though, paw withdrawal threshold in ipsilateral was significantly different. Thus, successfully establishing allodynia. On the fifteenth day, measurements of paw withdrawal threshold increased, showing tendency to recovery from CCI. These changes may be related to different immune reactions to nerve injury. Knowing the role of different immune cells and relating them to the time course of allodynia development may give us an idea about the mechanism, and thus, an effective treatment.

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#### **Introduction:-**

Pain is an undesirable sensation to intense stimuli. Depending on the intensity and duration of pain, it can be classified as either acute or chronic. There are many types of pain; each type is a clue of an underlying condition. Nociceptive pain is a type of protective pain to either external stimuli such as needle prick, or internal stimuli such as angina pain. Nociceptive pain stops whenever the noxious stimuli are handled and removed (1). Inflammatory pain which is the result of a tissue injury. In the inflamed area, sensations are exaggerated and prolonged to prevent further damage and to complete the healing process (1;2). Neuropathic pain results from nervous system damage. It is divided into two categories based on the location of injury: Central neuropathic pain, which can result from strokes or spinal cord injuries (3). The second type is peripheral nervous system injury, which we will focus on in our study.

The peripheral nervous system responds to injury in two ways: axonal degeneration or segmental demyelination. Either ways, if the injury is too proximal and the cell body is to be affected, it will result in neuropathic pain. Injury to the peripheral nerves is usually associated with allodynia, which is pain produced by non-painful stimuli.

Studies of neuropathic pain are done more often on animal models, which experience different types of allodynia, which is feeling pain from non-painful stimuli, or hyperalgesia, increase sensitivity to painful stimuli. There are many mechanical injuries to the peripheral nerves that can induce allodynia: Chronic Constriction Injury (CCI) when applied on a rat model resulted in cold and mechanical allodynia (4). Partial Sciatic nerve Ligation (PSL) also induced mechanical allodynia (5). A study on the sciatic nerve was to observe a steady state of allodynia and hyperalgesia after transecting different combinations of the three branches of the nerve. Large levels of mechanical allodynia resulted after transection of tibial and sural nerves (6).

Mechanisms of neuropathic pain are still not fully understood despite the research that has been done. In this study, changes in allodynia after nerve injury at different time points will be investigated, which will add to the general understanding of the concept of neuropathic pain.

## Methods:-

### Animals and surgery:-

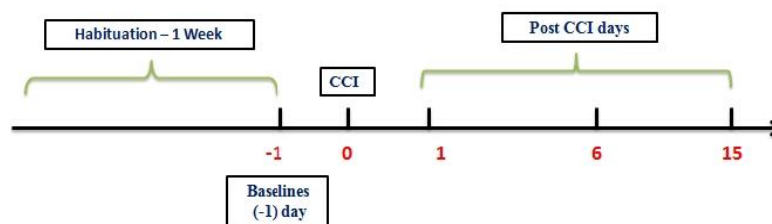
Male Lewis rats (Charles River, UK) at 11-13 weeks of age were used. All experimental animals were housed in standard plastic cages designed to allow easy access to food and water ad libitum. All animals were kept in appropriate room temperature ( $24\pm 1^\circ\text{C}$ ). All experiments complied with King Faisal University and international ethical guidelines for conduct of research on animals. Also, efforts were made to minimize the numbers of animals and their suffering. The CCI of the sciatic nerve was performed on rats anesthetized using isoflurane. During the surgical procedure, the sciatic nerve was exposed at the level of the middle of the thigh and freed of adhering tissue. Four ligatures (4.0 chromic gut) were tied loosely around the nerve such that its diameter was slightly constricted with about 1 mm spacing. After this, the incision was closed in layers by suturing of the muscle tissue and by metal clips on the skin. The surgery was performed under aseptic conditions.

### Allodynia measurement:-

Paw withdrawal threshold (PWT) allows us to assess tactile allodynia by using automated von Fray-type system, which is the mechanical planter test apparatus (Ugo Basile, Milan, Italy). Before testing the rats, they are given a week to habituation to the settings. The tests are held at mornings, and the environment is kept under control. Baseline standard measurements of PWT were taken on day -1, which is a day before the procedure, 10 min were allowed for rats to acclimate to the surroundings. 15 min to habituate over a mesh floor while placed in Perspex enclosure (Ugo Basile). Then, a metal filament is forced against the rats' planters that goes from 0 g to 50 g over 15 seconds. The paw withdrawal threshold can then be recorded by observing paw reflexes. The test is done three times with 2 minutes interval between each test stimulus. This is to avoid causing hypersensitivity in the rats' planters.

### Experimental design:-

4 rats were used to study tactile allodynia changes at different time points. At first, before testing the rats, they were given a week of habituation to the surrounded settings. Next, the baseline measurements were taken on day (-1), the day before the surgery. Then, the CCI of the sciatic nerve was performed on day (0). After that, on the days post CCI (1), (6), and (15) the measurements were taken on the ipsilateral and contralateral paws of each rat. See **figure (1)**.



**Figure 1:-** Days of behavioral testing and CCI surgery.

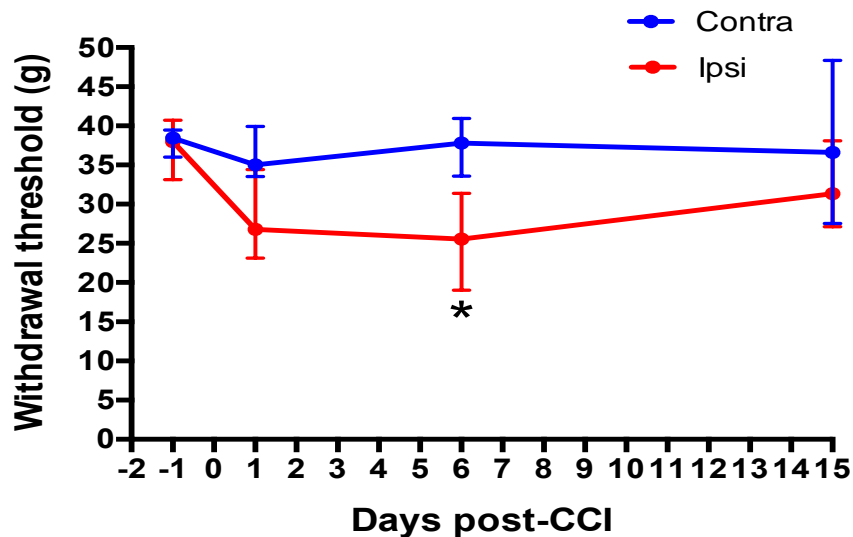
## Results:-

### General behavior of animals after CCI:-

In general, animals were looking well, drinking, eating, exploring and showing normal level of activities. After CCI, there were no reported illnesses or abnormalities in animals except that they were avoiding using the injured paw when stepping or putting their full weight on it. They were depending more on the non-injured paw when standing and walking.

### Time course of allodynia:-

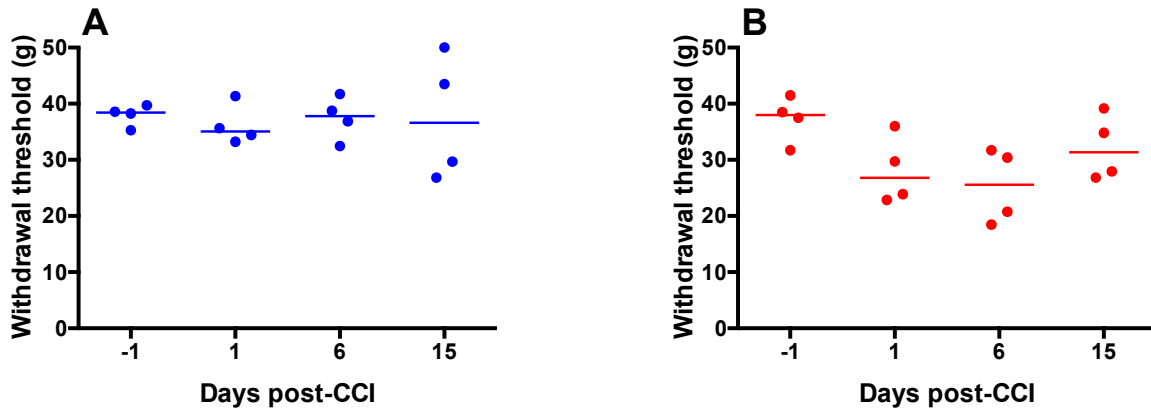
**Figure 2** represents changes in paw withdrawal threshold measurement (g) at different time points by comparing the median of the paw withdrawal threshold for the contralateral and ipsilateral paw. On day -1, which is the day for baseline measurements, there was no significant difference between the median of paw withdrawal threshold of the ipsilateral and the contralateral paw. Early after CCI on day 1, the median of the paw withdrawal threshold for the ipsilateral paw started to decrease, which indicates that the animals started to develop allodynia. On day 6 post-CCI, there was a significant decrease in the median of the ipsilateral paw withdrawal threshold compared to that of the contralateral paw ( $p < 0.05$ ). Indicating that allodynia was established in the injured paw. On day 15 post-CCI, the median paw withdrawal threshold in the ipsilateral paw showed a tendency to recovery from allodynia, as the median ipsilateral paw withdrawal threshold increased and had no statistically significant difference from that of the contralateral paw.



**Figure 2:-** Changes in paw withdrawal threshold measurements (g) at different time points. The blue line (● Contra) refers to the contralateral paw. The red line (● Ipsi) refers to the ipsilateral paw. The star (\*) indicates a significant difference ( $p < 0.05$ ) between the medians of the contralateral and the ipsilateral paw withdrawal threshold. Data are presented as medians and interquartile range.

### Variability of allodynia measurements:-

**Figure 3** shows that there is a behavioral variation between the animals' paw withdrawal thresholds (g) on different time points at both the contralateral and ipsilateral paws. This could be the result of genetic variation between the animals or due to technical difficulties.



**Figure 3:-** Behavioral variability of animals in paw withdrawal thresholds at different time points. Graph (A) shows the behavioral variation between the animals in the contralateral paw. Graph (B) shows the behavioral variation between the animals in the ipsilateral paw.

### Discussion:-

Looking at the time course progression of allodynia after nerve injury may add to the understanding of the underlying mechanism of neuropathic pain. After exposing the rats, in the current study, to the chronic constriction injury (CCI) of the sciatic nerve, their paw withdrawal threshold to tactile stimuli has been measured. Compared to their contralateral side, their ipsilateral paw established allodynia with a significant difference 6 days after the procedure. Behavioral variations have been taken into consideration, and continuous assessment showed that on day 15, the ipsilateral paw showed tendency to recovery where there was no significant difference with the contralateral paw.

Contribution of immune cells in nerve injury might have a direct effect on exaggerating neuropathic pain in the periphery (7). A study on partial nerve ligation (PNL) model had shown that at the site of injury, resident mast cells are the first respondent. Degranulation of mast cells due to activation releases proinflammatory mediators such as Histamine (8-10). These proinflammatory mediators have an algogenic effect on the site of damaged nerves (7). It was seen that giving histamine receptor antagonists to neuropathic rats suppresses mechanical allodynia, which means there is a direct connection between mast cells degranulation and allodynia (9). Thus, the mast cells may have contributed to the presence of allodynia in the first few days after the CCI (7).

During the early stages of neuropathic pain, neutrophils are recruited by mast cells to the injury area (11). In CCI model, it was observed that there was significant infiltration of neutrophils in the ipsilateral side of the rat. But there was no noticeable infiltration in the contralateral side (12). The contribution of neutrophils in neuropathic pain is that they are responsible for the release of proinflammatory mediators, such as chemokines that attract macrophages (13;14).

The phagocytic cells, macrophages, have a role in making neuropathic pain a chronic condition. Whenever there is an injury to the nerve, the blood-nerve barrier will allow circulating macrophages to join the resident macrophages in the nerve itself; this takes 2-3 days after injury (15). The hematogenously derived macrophages outnumber the resident macrophages and start releasing pronociceptive mediators (7;16). Along with the phagocytic function, this can explain the significant changes of allodynia on day 6. A study was done to test this concept by attenuating macrophages recruitment to the injured nerve. The result was reduction in neuropathic pain behaviors and delayed Wallerian degeneration of the nerve (17;18).

Resident mast cells and the recruited neutrophils and macrophages are not the only immune cells that were found in nerve injury area; T cells of both types were found in some nerve injury models (19). After CCI on athymic nude rats, which have no T cells, mechanical allodynia was attenuated, which points to the role of T cells in the establishment of allodynia (20). According to the cytokines produced by T cells, they can be divided into T helper type 1 and type 2. In which, type 1 produce proinflammatory cytokines, and type 2 produce anti-inflammatory cytokines (7). Further investigations on the nude rats revealed that after transferring type 1 helper T cells, their

levels of pain have increased. However, transferring type 2 cells gave an opposite result, it decreased their pain sensitivity (20). Thus, T helper Type 2 cells might have contributed to the tendency to recovery on day 15.

Cytokines are important factors affecting neuropathic pain. Cytokines can be produced by the different immune cells, or one induces the production of others (7). Macrophages secrete many proinflammatory factors; one is IL-1 $\beta$  (21). The effect of IL-1 $\beta$  had been tested in the periphery by different administration routes. It resulted in prolonged allodynia and hyperalgesia (22-25). When IL-1 $\beta$  binds to its receptors, it initiates several mechanisms resulting in inflammatory and nociceptor gene transcription (26;27). In CCI model, there is an up regulation in IL-1 $\beta$  mRNA (28;29). A study found that neutralizing antibodies to IL-1 $\beta$  receptor, IL-1 Type 1 receptor, caused reduction in associated pain behaviors in neuropathic rats (30;31). IL-1 $\beta$  has been considered as an algogenic agent that has a role in neuropathic pain (7).

In several neuropathic pain models, TNF- $\alpha$  mRNA are increased (32) along with increased protein expression (33;34), and enhanced expression of TNF- $\alpha$  receptors 1 and 2 after CCI (35) have been associated with development of allodynia.

Another cytokine, which is found to have a contribution in neuropathic pain mechanisms after CCI, is the proinflammatory cytokine IL-6 (19). It was seen that IL-6 knockout mice, genetically engineered mice that lack IL-6, had an attenuated mechanical allodynia after CCI (36). Thus, there is a link between existence of IL-6 in injury site and mechanical allodynia (19).

Paw withdrawal thresholds were not the same in all rats that were tested. There was variability even when the rats were in the same circumstances. Such variance might be due to gene polymorphisms resulting in variation in pain sensitivity. Technical factors play an important role in this matter too. When placing the ligature around the sciatic nerve, we can never tie exactly in all rats. Thus, the amount of damage created is never the same.

### **Conclusion:-**

Neuropathic pain is not the result of change in one cell; it is the interactions between immune cells and their proinflammatory secretions. Understanding the different actions of each, contribute to the general understanding of neuropathic pain. After analyzing the results, there was a significant difference in paw withdrawal threshold between ipsilateral and contralateral sides on the sixth day. Macrophages and Helper T cells Type 1 might be the cells contributing to this difference. Different cytokines secreted at the site of injury may have had a direct effect on the time-course of allodynia.

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### RESEARCH ARTICLE

#### ENZYME ACTIVITY PROFILING OF EXO- $\beta$ -1,4- GLUCANASE, ENDO- $\beta$ -1,3- GLUCANASE AND PROTEASE IN *STREPTOMYCES* SPECIES FROM HIGHLAND, MIDLAND AND LOWLAND AREAS OF KERALA, INDIA.

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#### Abstract

Variability in land use have substantial influence on biological properties of soil that persistently associates with soil quality, evaluated by microbial and biochemical indicators in soil. Kerala, located in the southwestern tip of India, geographically divided into eastern highland, central midland and western lowland. The natural classification of Kerala's landmass is an excellent illustration for describing land use types and environmental changes. This study scrutinizes the comparative activities of exo- $\beta$ -1,4-glucanase, endo- $\beta$ -1,3-glucanase and protease in *Streptomyces spp.* from different highland, midland and lowland areas of Kerala. Soils collected from 7 different locations of each land area were analyzed for estimating enzyme activity by semi-quantitative and quantitative approaches. A significant fluctuation in exo- $\beta$ -1,4-glucanase activity was observed in three land use systems, showed high activity in highland areas where natural vegetation occurs and significantly decreased to lowland regions, mostly arable areas. Number of *Streptomyces* isolates also revealed a decreasing trend from highland to lowland areas. pH, electrical conductivity (EC), soil organic carbon (SOC) and soil organic matter (SOM) were showed a significant correlation with the number of *Streptomyces* isolates. The variation of exo- $\beta$ -1,4-glucanase activity from highland to lowland suggested the sensitivity of the enzyme as an ecological and a soil quality indicator, hence it can be used as a conspicuous indicator of environmental changes.

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#### Introduction:-

Soil microbial biomass and their enzyme activities in soil are very sensitive to environmental stresses and changes in soil management practices. The exposure of soil to degradation primarily affected its biological properties and diminishes the productive capacities. Enzyme activities in soils are the useful contenders, which provides information about soil ecological stress linking soil degradation (Yang et al., 2012). Rigorous anthropogenic activities, primarily land changes, from forest to intensive agriculture, causing severe consequence on soil quality and drastic health problems in plants (Matson et al., 1997). Microbial enzymes that mediate the biogeochemical

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cycles, in addition, promptly responds to environmental signals considered as sensitive indicators of environmental variations and soil qualities (Schloter et al., 2003). In addition, it can also be used as active measures of soil productivity and effect of pollutants (Tate, 1995). In recent years, there have been a growing interest in the exploration of microbial diversity as a tool for indicating environmental and ecosystem changes.

Conversion of natural ecosystem to arable land masses by human interventions intensify the use chemical fertilizers and pesticides (Matson et al., 1997). It extremely affect soil biota, by changing their population and biochemical activities. Moreover, soil mineralization is accomplished by the metabolic and enzyme activities of soil microorganisms. The soil enzyme activities are sensitive to soil biochemical characters like pH, temperature, electrical conductivity, soil water potential etc. Considering the environmental significance of exo- $\beta$ -1,4-glucanase, endo- $\beta$ -1,3-glucanase and protease, these three were incorporated in the scenario. Exo- $\beta$ -1,4-glucanase and endo- $\beta$ -1,3-glucanase are cellulosome complex enzymes (Zhang and Zhang 2013). The activities of  $\beta$ -glucanases and protease in soil are regulated by many factors like climate, organic matters and soil properties. The modulation of these enzyme activities in different ecosystems by the input of pollutants and the impact of climate change, requires investigation (Sinegani and Mahohi, 2010; Vranova et al., 2013).

*Streptomyces* communities are the most fascinating members in the world of microbial diversity. They are most cherished organisms with great research interest due to high pharmacological and commercial concern. They are filamentous Gram positive soil bacteria, contribute significantly to the turnover of complex biopolymers such as lignocellulose, hemicellulose, pectin, keratin, and chitin. Subsequently there is vital evidence accessible due to the introduction of genome and protein sequencing data, *Streptomyces spp.* has been continuously screened for the production of various enzymes (Sharma, 2014). They are also serving as good models for the production of vital metabolites and enzymes with respect to stress response. Many evidences indicated that *Streptomyces spp.* have been isolated from diverse habitats like deserts (Hozzein et al., 2008), marine (Valli et al., 2012), protected forest areas (Thakur et al., 2007) etc. Very less information is available regarding variation of *Streptomyces* isolates between different geological land areas.

Kerala is located at the south- western corner of Peninsular India, between  $8^{\circ}17'30''$  N and  $12^{\circ}47'40''$  N north latitudes and  $74^{\circ}27'47''$  E and  $77^{\circ}37'12''$  E east longitudes. The geographical landscape of Kerala exhibits high variability in distribution of the landmass. Based on the physical features of Kerala, its total landmass naturally categorized into three geographical zones namely high land, mid land and low land. These regions run parallel to each other from northern end to southern end of the state. Highlands are the mountain ranges located in the eastern ends mainly sloping down from the Western Ghats. Lowlands are the unique agricultural areas in Kerala that cover coastal areas, back waters, lagoons and river deltas. Major parts of low land areas lies below the sea level. Midland is located between highland and lowland, characterized by undulating hills and valleys. This study scrutinizes the enzyme activity profiling of exo- $\beta$ -1,4-glucanase, endo- $\beta$ -1,3-glucanase and protease in *Streptomyces spp.* in different highland, midland and lowland areas.

## Materials and Methods:-

### Site description and soil sampling:-

The investigated sample sites were widely distributed in three geographical zones of Kerala, namely highland, midland and lowland areas (Figure 1). Seven different locations were selected from each land areas. Highland soil samplings were done in Western Ghats areas like Chinnar, Munnar, Marayur, Anaimalai, Nelliampathy, Agasthyakoodam and Wayanad. Midland areas were Bonacaud, Palode, Kallar, Neryamangalam, Kothamangalam, Ottapalam and Thaliparamba. Lowland areas represented primarily paddy fields from different locations namely Kainakkari, Puthupalli, Mankombu, Changanasseri, Nedungad, Mavelikkara and Thiruvalla. The location, elevation, land use type etc were provided in Table 1. In each location, three sampling points were randomly apportioned at a distance of 30 m and upper organic layer of soil approximately 5 to 10 centimeters of depth were aseptically taken by an auger.

### Enrichment, isolation and purification of *Streptomyces*:-

Soil samples were mixed with 1%  $\text{CaCl}_2$  and incubated at  $28^{\circ}\text{C}$  for 10 days before use for enrichment. Standard dilution plate technique was followed for the isolation of Actinomycetes. For each sample, one gram soil was oven dried and suspended in 9mL sterile distilled water and thoroughly vortexed for 30 min at 150 rpm at room temperature. The suspension was serially diluted to obtain  $10^{-1}$  to  $10^{-6}$  dilutions. 1.0 mL of  $10^{-3}$  to  $10^{-6}$  dilutions were plated on Inorganic salt-starch agar (ISP-4) media (Starch,10g;  $\text{K}_2\text{HPO}_4$ ,1g;  $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ ,1g;  $\text{NaCl}$ ,1g;

(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>, 2g; CaCO<sub>3</sub>, 2g and Trace salt solution, 1ml). After incubation of 7 days at 28<sup>o</sup>C *Streptomyces* like isolates were selected randomly based on their morphology. Number of total *Streptomyces* colonies were evaluated and transferred to Yeast extract- malt extract agar (ISP-2) plates (Yeast extract, 2g; Malt extract, 10g and Dextrose, 10g) to check the purity and maintained by periodical sub culturing.

#### Semi-quantitative screening of Enzyme Activities:-

The *Streptomyces* strains were initially screened for detecting exo -β-1,4-glucanase activity on synthetic medium containing Avicel (Sigma, USA) as the sole carbon source. The composition of medium was as follows: Avicel, 1%; yeast extract, 0.1%; Peptone, 0.1%; KH<sub>2</sub>PO<sub>4</sub>, 0.1% and MgSO<sub>4</sub>.7H<sub>2</sub>O, 0.05%. The strains were spot inoculated on Avicel agar plates and incubated for 5 days at 28<sup>o</sup>C. After incubation 0.1% congo red dye was spreaded over the plates and washed with 1 mol.L<sup>-1</sup> NaCl, used as a destaining solution. Exo-β-1,4-glucanase production was indicated by the presence of a pale halo around the colonies. A semi quantitative approach was used for measuring the enzyme activity that is the enzymatic index (EI) of strains were calculated using the expression.

$$EI = \frac{\text{Diameter of hydrolysis zone } (\varnothing h)}{\text{Diameter of colony } (\varnothing c)}$$

The endo-β-1,3-glucanase activity was screened using AZCL- Pachyman (Megazyme, USA) agar plates with medium composition of AZCL- Pachyman, 0.2%; Yeast extract, 0.1%; Peptone, 0.1%; KH<sub>2</sub>PO<sub>4</sub>, 0.1% and MgSO<sub>4</sub>.7H<sub>2</sub>O, 0.05% by spot inoculation and incubated 5 days at 28<sup>o</sup>C. Presence of blue zones around the colonies were indicated as enzyme activity by potential strains. The EI values were calculated by measuring diameters of blue halo and colony.

Protease production of *Streptomyces* isolates were screened on skimmed milk agar containing Casein enzyme hydrolysate, 5%; Yeast extract, 2.5 and Glucose, 1%. The plates were spot inoculated and incubated at room temperature for 5 days at 28<sup>o</sup>C. Positive isolates were detected by the appearance of clear halos around the colonies. The enzymatic index (EI) of strains were calculated.

#### Quantitative Enzyme Assays:-

The exo-β-1,4-glucanase assay was carried out by measuring reducing sugars by DNS method (Miller, 1959) liberated from 0.5% (w/v) Avicel which is dissolved in 100mM sodium- acetate buffer (pH 5.0) was used as substrate. 0.5 ml of filtrate was added to 1 ml of 0.5% Avicel and incubated at 30<sup>o</sup>C for 1hr in shaker incubator. 2 ml of DNS reagent was added and incubated in boiling water bath for 5 minutes. After adding 0.5 ml 40% Rochelle salt the absorbance was taken at 540 nm wavelength using visible spectrophotometer. One unit of exo-β-1,4-glucanase activity (U mL<sup>-1</sup>) was defined as the amount of enzyme that released 1μmol of reducing sugars as glucose equivalents from one ml of Avicel per minute under given assay conditions (Oliveira et al., 2014).

Endo-β-1,3-glucanase activity was estimated by measuring the release of reducing sugars in a reaction mixture of 0.5ml of enzyme and 1ml 0.2% (w/v) CM- curdlan (Megazyme, USA) in 100mM sodium- acetate buffer (pH 5.0) incubated at 30<sup>o</sup>C for 1hr and the remaining procedures were similar as exo-β-1,4-glucanase assay. Enzyme activity was expressed by 1μmol of reducing sugar released per minute under standard assay conditions.

The protease enzyme activity was determined by a modified method of Rupali (2015). Casein is used as substrate for determination of protease activity. 1% (w/v) of casein in 50mM phosphate buffer (pH 7.0) was used as substrate and incubated with 0.5 ml enzyme solution at 37<sup>o</sup>C for 30 minutes. The reaction was stopped by adding 2 ml of 100 mM trichloroacetic acid. After centrifugation at 7000 rpm for 15 minutes, 0.5 ml supernatant was taken and added 2 ml 0.5 M Na<sub>2</sub>CO<sub>3</sub> and 0.5 ml diluted Folin phenol reagent, then kept it in incubation under dark conditions for 30 minutes. The absorbance was read at 660 nm. One unit of protease activity is defined as the amount of enzyme that liberated 1μmole of tyrosine per ml per minute under standard assay conditions.

#### Determination of Soil pH and Electrical Conductivity:-

Soil pH and electrical conductivity (EC) were determined in 1: 3.0 soil/water ratio by a combination glass electrode HI98129, Hanna Instruments.

**Determination of Soil Organic Carbon and Soil Organic Matter:-**

The soil organic carbon (SOC) content was estimated by dichromate oxidation method in which the oxidation of  $K_2Cr_2O_7$  in a concentrated  $H_2SO_4$  medium and the excess dichromate was measured using  $(NH_4)_2Fe(SO_4)_2$  (Yeomans and Bremner, 1989). Soil organic matter (SOM) were determined according to Pribyl, 2010.

**Statistical analysis:-**

All part of experiments in this study were performed in triplicate. Data were presented as mean  $\pm$  SD. The p values  $<0.05$  were considered statistically significant. To determine the correlations between the parameters linear regression analysis (Pearson method) was performed.

**Results and Discussion:-****Number of *Streptomyces* Isolates:-**

Morphologically different 95 *Streptomyces* strains were isolated from 21 locations of three different land areas viz. highland, midland and low land. The number of strains showed a decreasing trend from highland to lowland (Figure 2). Soils from natural ecosystem were observed higher microbial content when compared to agricultural ecosystems. Highland areas in Kerala mainly Western Ghats regions represents high levels of biological diversity, less unexplored and mostly covers with protected land mass. Due to the lack of anthropogenic activities, number of *Streptomyces* isolates are significantly high in these areas when compared with other two geographical landmasses such as midland and lowland areas. Taxonomically diverse *Streptomyces* species are found in forest soils, they are involved in recalcitrant biopolymer degradation. This leads to the prominence of *Streptomyces* in forest nutrient turnover (Bontemps et al., 2013). According to Zhou et al., 2016, rich plant biomass in paddy field expects high number of hydrolase producing organisms, however gets only very small fraction of isolates from the area. Application of the high level of mineral fertilization along with chemical weed control agents predominantly detriments the biological activity of the soil because of higher loss of micro-organisms due to rigorous chemical plant protection (Bielińska and Pranagal 2007). The number of isolates showing a decreasing trend from highland to midland to lowland. This study, clearly reveals the relation between ecological variations and *Streptomyces* population, hence number of *Streptomyces* isolates can be considered as a delicate indicator of environmental changes.

**Screening of Enzyme Activities:-**

All the 95 isolates were evaluated for semi-quantitative exo- $\beta$ -1,4-glucanase, endo- $\beta$ -1,3-glucanase and protease production. From the total 95 isolates 85 strains were shown exo- $\beta$ -1,4-glucanase activity (equivalent to 89% of the strains evaluated) 60 shown endo- $\beta$ -1,3-glucanase activity (equivalent to 63% of the strains evaluated) and only 61 shown protease activity (equivalent to 64% of the strains evaluated). This is based on the observation of growth and measurement of hydrolysis halo, used for calculation of the enzymatic index (EI). The pale halo around the exo- $\beta$ -1,4-glucanolytic colonies corresponds to the zone of Avicel (specific substrate for exo- $\beta$ -1,4-glucanase) degradation (Figure 3a), blue colouration around endo- $\beta$ -1,3-glucanolytic colonies indicating the zone of Pachyman (specific substrate for endo- $\beta$ -1,3-glucanase) degradation (Figure 3b) and appearance of clear zone around the colonies surrounded by white color background indicated the presence of protease activity, corresponds to the zone of protein degradation (Figure 3c).

Strains from different land areas were given significantly wide ranges of EI. Exo- $\beta$ -1,4-glucanase activity was more prominent in high, mid and lowland isolates. In highland isolates, EI of exo- $\beta$ -1,4-glucanase, endo- $\beta$ -1,3-glucanase and protease were shown in between 2.17 to 6.03, 2.0 to 8.53 and 1.03 to 3.03 respectively (Table 2). Midland isolate EI values were ranged from 1.80 to 7.27, 1.8 to 5.0 and 1.20 to 3.13 for exo- $\beta$ -1,4-glucanase, endo- $\beta$ -1,3-glucanase and protease respectively (Table 3). In lowland soil isolates the EI values of exo- $\beta$ -1,4-glucanase was in between 1.50 to 4.20, endo- $\beta$ -1,3-glucanase in between 2.30 to 3.63 and 1.40 to 3.03 for protease (Table 4).

**Table 1:-** Location, elevation and descriptions of soil sampling areas.

Area	Location	Elevation	Description	Land use type
<b>Highland</b>				
Chinnar	10°18'20.99"N latitude 77°12'19.36"E longitude	1,005 m	Lower mountain forest	Protected area with natural vegetation
Munnar	10°05'21.29"N latitude 77°03'27.16"E longitude	1,477 m	Hill station	Natural vegetation
Marayur	10°15'11.91"N latitude 77°09'31.20"E longitude	949 m	Natural sandal wood forest	Natural vegetation
Anaimalai	10°10'02.62"N latitude 77°03'51.67"E longitude	1,577 m	Mountain	Natural vegetation
Nelliampathy	10°32'00.73"N latitude 76°41'35.76"E longitude	999 m	Hill range	Natural vegetation
Agasthyakoodam	8°37'29.47"N latitude 77°14'08.21"E longitude	1,238 m	Hill range	Natural vegetation
Wayanad	11°36'49.41"N latitude 76°06'05.22"E longitude	957 m	Mountain forest	Natural vegetation
<b>Midland</b>				
Bonacaud	8°40'47.52"N latitude 77°10'00.64"E longitude	336 m	Protected forest	Natural vegetation
Palode,	8°44'32.04"N latitude 77°01'34.67"E longitude	115 m	Reserve forest	Plantation
Kallar	8°42'36.39"N latitude 77°07'16.01"E longitude	113 m	Natural forest	Natural vegetation
Neryamangalam	10°02'57.52"N latitude 76°46'19.82"E longitude	110 m	Natural forest	Natural vegetation
Kothamangalam	10°03'50.51"N latitude 76°39'07.24"E longitude	55 m	Cultivated area	Agricultural vegetation
Ottapalam	10°46'32.84"N latitude 76°21'34.19"E longitude	63 m	Cultivated area	Agricultural vegetation
Thaliparamba	12°02'20.71"N latitude 75°21'59.93"E longitude	64 m	Cultivated area	Agricultural vegetation
<b>Lowland</b>				
Kainakkari	9°30'44.53"N latitude 76°23'38.81"E longitude	1 m	Paddy field	Agricultural vegetation
Puthupalli	9°33'22.28"N latitude 76°33'37.64"E longitude	3 m	Paddy field	Agricultural vegetation
Mankombu	9°26'08.77"N latitude 76°24'30.81"E longitude	1 m	Paddy field	Agricultural vegetation
Changanasseri	10°18'20.99"N latitude 77°12'19.36"E longitude	1 m	Paddy field	Agricultural vegetation
Mavelikkara	9°15'38.79"N latitude 76°30'44.35"E longitude	2 m	Paddy field	Agricultural vegetation
Nedungad	10°04'36.91"N latitude 76°13'02.35"E longitude	2 m	Paddy field	Agricultural vegetation
Thiruvalla	9°24'37.32"N latitude 76°32'01.36"E longitude	1 m	Paddy field	Agricultural vegetation

**Table 2:-** Primary screening of exo- $\beta$ -1,4-glucanase, endo- $\beta$ -1,3-glucanase and protease in highland isolates. Data are expressed as mean  $\pm$  standard deviation (SD) of three replicates. Values are statistically significant at  $P < 0.05$ 

Strain	Exo- $\beta$ -1,4- glucanase	Endo- $\beta$ -1,3- glucanase	Protease
	Mean EI $\pm$ SD	Mean EI $\pm$ SD	Mean EI $\pm$ SD
ch1	4.10 $\pm$ 0.089	3.60 $\pm$ 0.200	NA
ch3	4.30 $\pm$ 0.155	2.50 $\pm$ 0.300	1.63 $\pm$ 0.153
ch5	3.73 $\pm$ 0.137	2.13 $\pm$ 0.252	1.83 $\pm$ 0.321
ch7	4.13 $\pm$ 0.137	3.00 $\pm$ 0.300	NA
ch8	3.80 $\pm$ 0.089	NA	NA
ch15	4.13 $\pm$ 0.052	NA	NA
ch16	4.20 $\pm$ 0.089	NA	NA
ch18	4.10 $\pm$ 0.322	NA	1.53 $\pm$ 0.351
ch20	4.00 $\pm$ 0.089	2.80 $\pm$ 0.100	1.80 $\pm$ 0.100
ch21	4.20 $\pm$ 0.179	3.40 $\pm$ 0.458	1.50 $\pm$ 0.265
ch22	4.50 $\pm$ 0.089	8.53 $\pm$ 0.058	1.30 $\pm$ 0.100
ch23	4.00 $\pm$ 0.089	3.00 $\pm$ 0.346	NA
al6	3.30 $\pm$ 0.089	NA	NA
al9	4.03 $\pm$ 0.052	NA	NA
al10	3.87 $\pm$ 0.052	NA	1.20 $\pm$ 0.200
al13	2.73 $\pm$ 0.137	6.90 $\pm$ 0.100	1.50 $\pm$ 0.200
al14	2.30 $\pm$ 0.155	4.60 $\pm$ 0.458	NA
al19	6.03 $\pm$ 0.137	3.10 $\pm$ 0.265	1.30 $\pm$ 0.265
al22	2.50 $\pm$ 0.089	2.00 $\pm$ 0.300	1.03 $\pm$ 0.208
mn1	3.83 $\pm$ 0.137	3.10 $\pm$ 0.200	2.07 $\pm$ 0.115
mn2	4.07 $\pm$ 0.207	2.10 $\pm$ 0.200	1.90 $\pm$ 0.100
mn3	3.13 $\pm$ 0.137	3.80 $\pm$ 0.265	NA
mn5	4.67 $\pm$ 0.186	3.80 $\pm$ 0.265	1.40 $\pm$ 0.100
mn6	3.47 $\pm$ 0.137	2.60 $\pm$ 0.300	3.00 $\pm$ 0.173
mn7	3.80 $\pm$ 0.089	3.80 $\pm$ 0.200	2.00 $\pm$ 0.300
mn8	4.13 $\pm$ 0.137	4.10 $\pm$ 0.361	3.03 $\pm$ 0.252
mn9	4.27 $\pm$ 0.137	2.75 $\pm$ 0.466	1.90 $\pm$ 0.200
mn10	3.40 $\pm$ 0.089	3.10 $\pm$ 0.265	1.43 $\pm$ 0.153
mn11	3.53 $\pm$ 0.137	2.50 $\pm$ 0.265	2.20 $\pm$ 0.200
mn12	4.13 $\pm$ 0.137	NA	2.00 $\pm$ 0.200
km2	3.40 $\pm$ 0.089	4.10 $\pm$ 0.173	1.23 $\pm$ 0.153
mr1	4.07 $\pm$ 0.137	2.57 $\pm$ 0.306	2.57 $\pm$ 0.153
mr3	4.77 $\pm$ 0.137	3.10 $\pm$ 0.100	3.03 $\pm$ 0.252
mr8	5.03 $\pm$ 0.052	2.90 $\pm$ 0.200	3.03 $\pm$ 0.153
mr9	4.67 $\pm$ 0.186	NA	1.90 $\pm$ 0.100
mr7	2.17 $\pm$ 0.137	4.80 $\pm$ 0.300	2.03 $\pm$ 0.306
mr2	3.57 $\pm$ 0.052	4.60 $\pm$ 0.100	1.30 $\pm$ 0.265
mr17	5.03 $\pm$ 0.137	3.10 $\pm$ 0.265	NA
mr18	3.47 $\pm$ 0.052	NA	NA
mr19	3.75 $\pm$ 0.089	2.50 $\pm$ 0.265	NA
ag21	4.03 $\pm$ 0.186	NA	2.50 $\pm$ 0.173
ag28	4.10 $\pm$ 0.089	2.50 $\pm$ 0.300	1.93 $\pm$ 0.115
nmp6	NA	NA	NA
nmp5-3	NA	3.30 $\pm$ 0.265	3.03 $\pm$ 0.306
amla5	4.40 $\pm$ 0.089	3.90 $\pm$ 0.100	NA
amla31	3.40 $\pm$ 0.155	2.50 $\pm$ 0.265	NA
ala8III	4.10 $\pm$ 0.473	4.30 $\pm$ 0.265	2.10 $\pm$ 0.200
a6-2	3.80 $\pm$ 0.237	3.33 $\pm$ 0.416	1.50 $\pm$ 0.100
wy2	3.40 $\pm$ 0.358	3.40 $\pm$ 0.173	1.23 $\pm$ 0.153
wy5	3.40 $\pm$ 0.358	3.70 $\pm$ 0.200	1.93 $\pm$ 0.058
wy8	3.40 $\pm$ 0.358	4.20 $\pm$ 0.361	1.83 $\pm$ 0.153
wy9	4.50 $\pm$ 0.322	3.60 $\pm$ 0.265	1.50 $\pm$ 0.173
s40a5	3.50 $\pm$ 0.179	3.00 $\pm$ 0.200	NA

**Table 3:-** Primary screening of exo- $\beta$ -1,4-glucanase, endo- $\beta$ -1,3-glucanase and protease in midland isolates. Data are expressed as mean  $\pm$  standard deviation (SD) of three replicates. Values are statistically significant at  $P < 0.05$ 

Strain	Exo- $\beta$ -1,4- glucanase	Endo- $\beta$ -1,3- glucanase	Protease
	Mean EI $\pm$ SD	Mean EI $\pm$ SD	Mean EI $\pm$ SD
nr2	4.63 $\pm$ 0.137	4.60 $\pm$ 0.346	1.50 $\pm$ 0.200
nr3	7.27 $\pm$ 0.225	NA	NA
nr1	4.63 $\pm$ 0.052	3.50 $\pm$ 0.361	1.53 $\pm$ 0.208
nr22	3.37 $\pm$ 0.137	NA	NA
nr23	3.90 $\pm$ 0.089	3.30 $\pm$ 0.300	2.03 $\pm$ 0.153
nr24	2.97 $\pm$ 0.186	NA	1.30 $\pm$ 0.265
pa1	4.00 $\pm$ 0.179	4.30 $\pm$ 0.200	1.53 $\pm$ 0.252
pa4	3.90 $\pm$ 0.089	5.00 $\pm$ 0.600	1.40 $\pm$ 0.200
pa7	3.07 $\pm$ 0.052	NA	NA
kr6	4.07 $\pm$ 0.103	3.30 $\pm$ 0.265	1.20 $\pm$ 0.265
kr7	4.47 $\pm$ 0.052	2.80 $\pm$ 0.100	1.40 $\pm$ 0.200
ko1	4.80 $\pm$ 0.179	3.40 $\pm$ 0.361	1.73 $\pm$ 0.208
ko6	NA	NA	NA
ko8	5.10 $\pm$ 0.089	3.20 $\pm$ 0.361	3.13 $\pm$ 0.321
ko9	4.50 $\pm$ 0.089	5.00 $\pm$ 0.600	1.70 $\pm$ 0.200
ot5	4.12 $\pm$ 0.207	3.10 $\pm$ 0.100	NA
ot7	4.20 $\pm$ 0.155	3.50 $\pm$ 0.300	NA
ot10	NA	3.90 $\pm$ 0.265	NA
ot11	NA	NA	2.10 $\pm$ 0.200
th1	4.33 $\pm$ 0.273	3.30 $\pm$ 0.436	2.03 $\pm$ 0.153
th2	NA	2.50 $\pm$ 0.300	2.30 $\pm$ 0.265
th5	3.40 $\pm$ 0.155	3.50 $\pm$ 0.300	NA
b1	NA	NA	NA
b2	1.80 $\pm$ 0.237	1.80 $\pm$ 0.300	1.40 $\pm$ 0.100
b3	NA	NA	1.30 $\pm$ 0.265
b4	NA	NA	NA
b5	NA	4.60 $\pm$ 0.346	1.50 $\pm$ 0.200

**Table 4:-** Primary screening of exo- $\beta$ -1,4-glucanase, endo- $\beta$ -1,3-glucanase and protease in lowland isolates. Data are expressed as mean  $\pm$  standard deviation (SD) of three replicates. Values are statistically significant at  $P < 0.05$ 

Strain	Exo- $\beta$ -1,4- glucanase	Endo- $\beta$ -1,3- glucanase	Protease
	Mean EI $\pm$ SD	Mean EI $\pm$ SD	Mean EI $\pm$ SD
pl1	3.40 $\pm$ 0.082	NA	NA
pl2	3.40 $\pm$ 0.216	3.03 $\pm$ 0.153	2.33 $\pm$ 0.153
pl3	1.50 $\pm$ 0.163	2.77 $\pm$ 0.252	NA
mk5	3.13 $\pm$ 0.125	3.10 $\pm$ 0.200	NA
mk6	3.60 $\pm$ 0.245	2.83 $\pm$ 0.351	1.47 $\pm$ 0.416
cs2	2.30 $\pm$ 0.216	3.60 $\pm$ 0.300	1.73 $\pm$ 0.252
cs3	3.30 $\pm$ 0.283	NA	2.50 $\pm$ 0.200
mv1	4.00 $\pm$ 0.163	3.63 $\pm$ 0.351	NA
mv2	2.30 $\pm$ 0.216	2.30 $\pm$ 0.300	2.80 $\pm$ 0.200
mv3	3.60 $\pm$ 0.082	2.87 $\pm$ 0.321	1.70 $\pm$ 0.200
nd5	3.60 $\pm$ 0.141	2.90 $\pm$ 0.200	NA
th1	2.80 $\pm$ 0.163	NA	NA
th2	1.70 $\pm$ 0.163	NA	1.40 $\pm$ 0.265
ki2	1.70 $\pm$ 0.082	2.90 $\pm$ 0.100	3.03 $\pm$ 0.252
ki3	4.20 $\pm$ 0.163	3.30 $\pm$ 0.265	NA



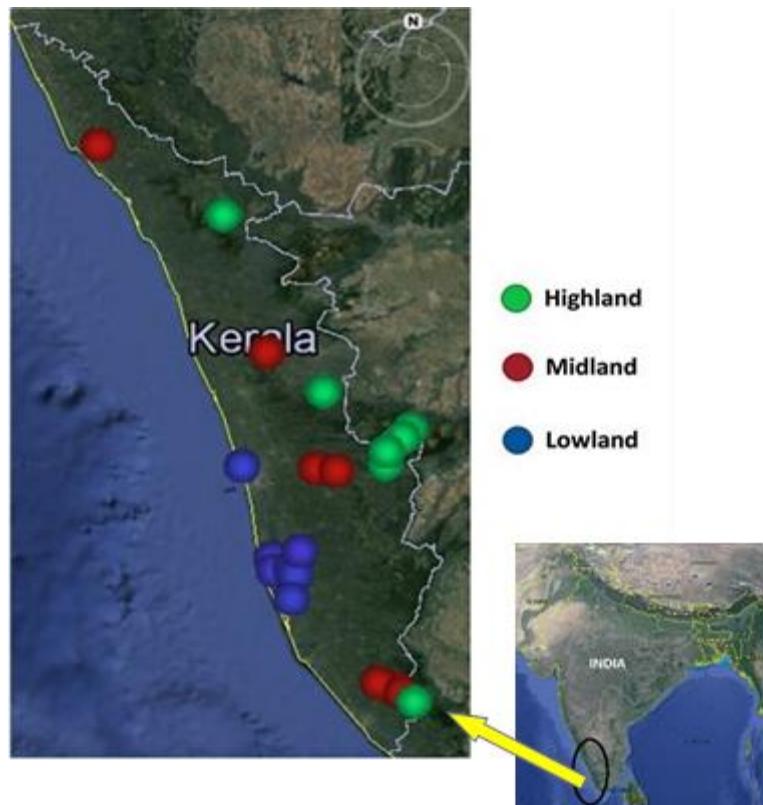


Figure 1:- Map showing soil sample collection sites.

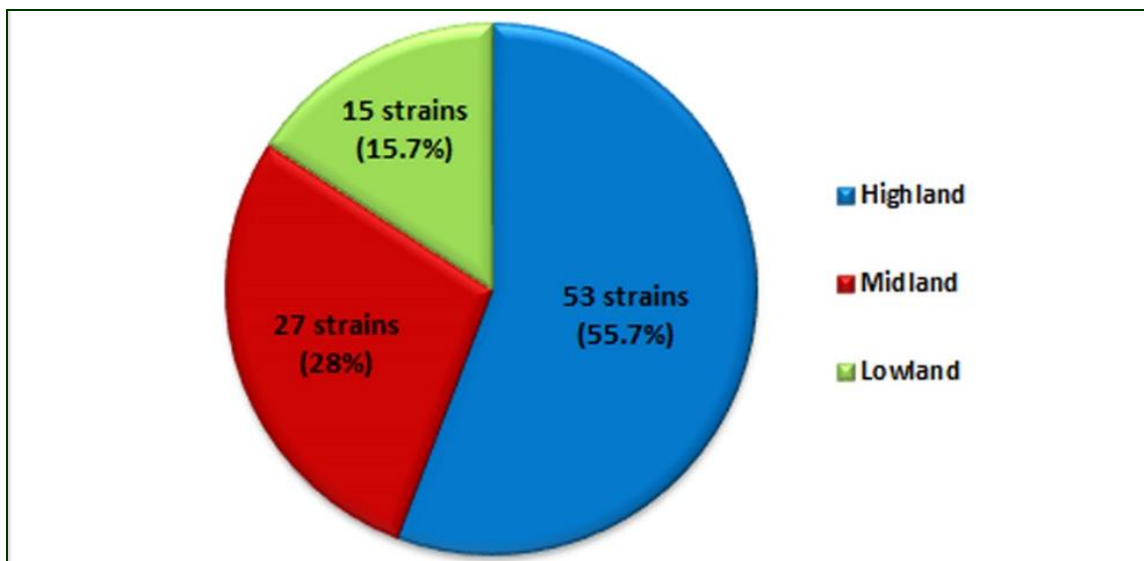
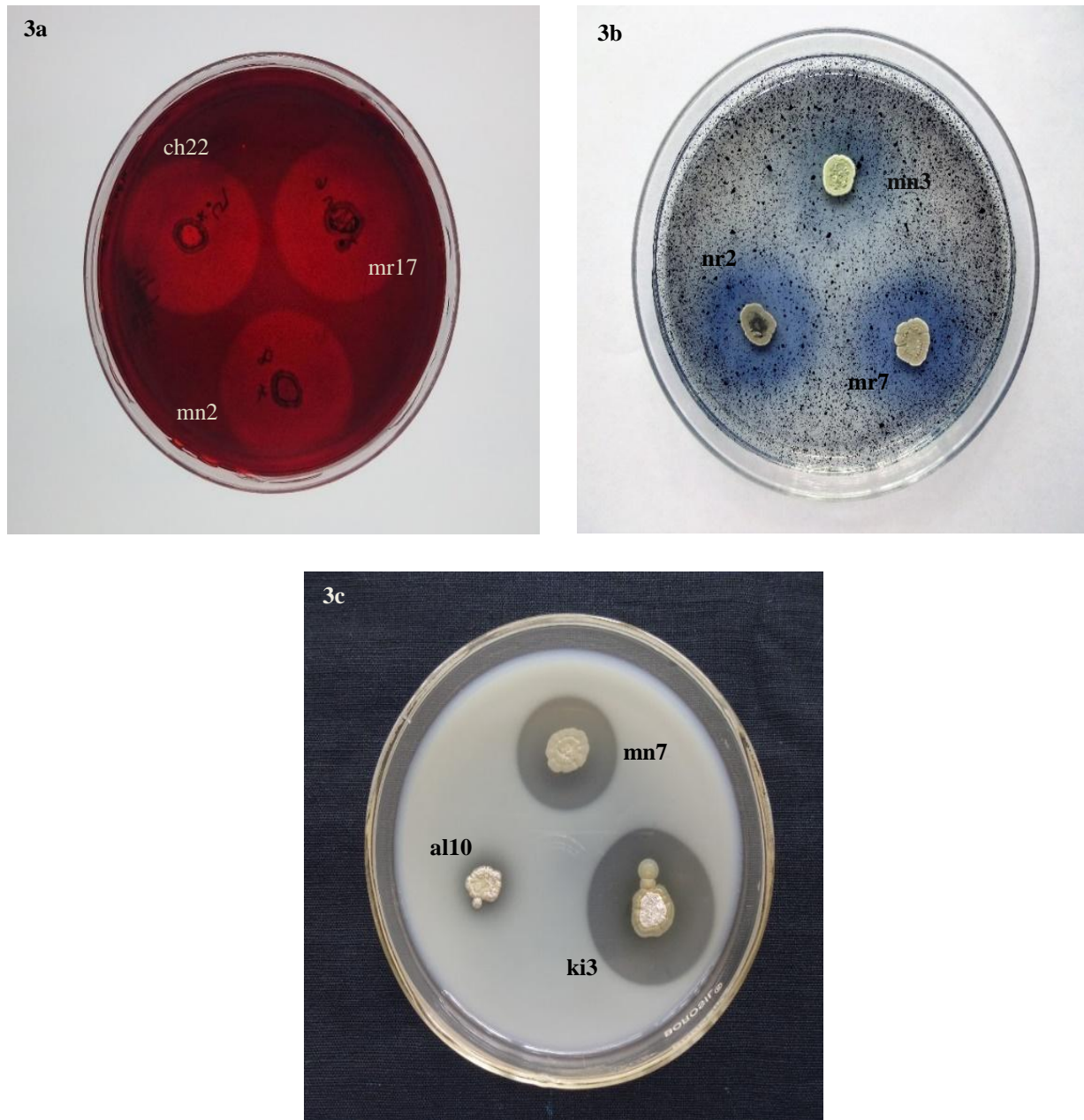
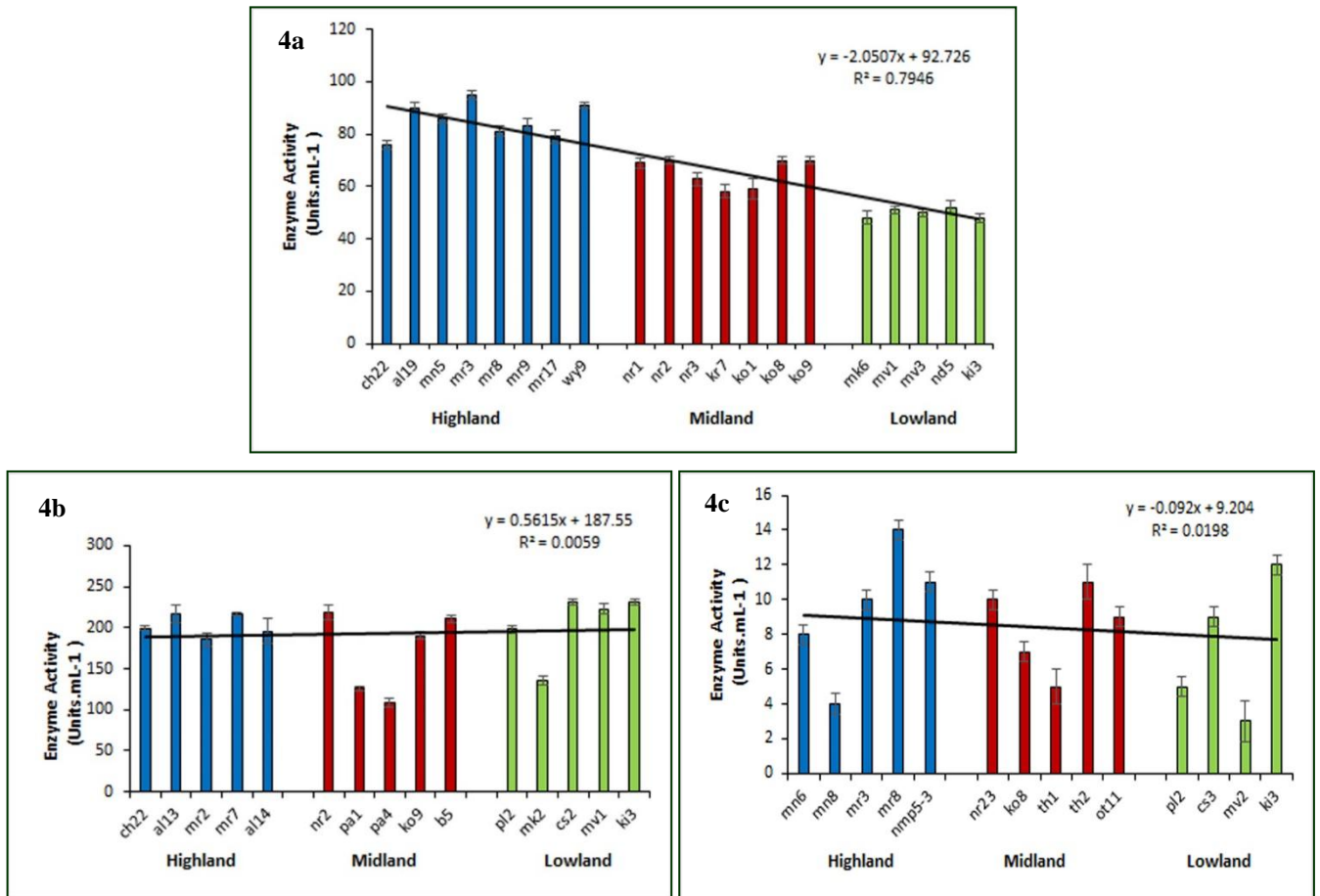


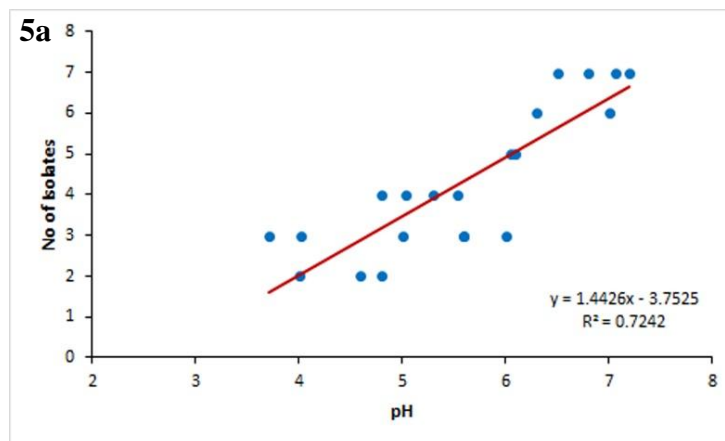
Fig. 2:- Pie chart showing the percentage profile of *Streptomyces* isolates from highland, midland and lowland areas.



**Figure 3:-** Semi-quantitative screening plates of exo- $\beta$ -1,4-glucanase (3a), endo- $\beta$ -1,3-glucanase (3b) and proteases (3c).



**Figure 4:-** Comparison of exo-β-1,4-glucanase (4a), endo-β-1,3-glucanase (4b) and protease (4c) activities in highland, midland and lowland. Datas are expressed as mean ± standard deviation (SD) of three replicates. Regression equation and line of fit shown. Values are statistically significant at P<0.05.



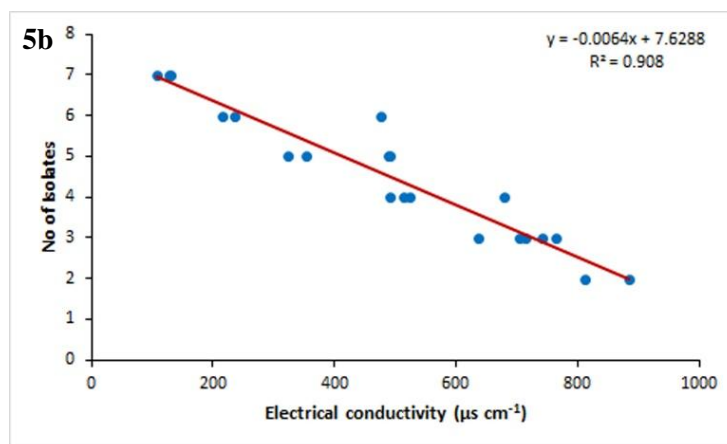


Figure 5:- Linear regression between numbers of *Streptomyces* isolates and soil P<sup>H</sup> (5a); Electrical conductivity (5b)

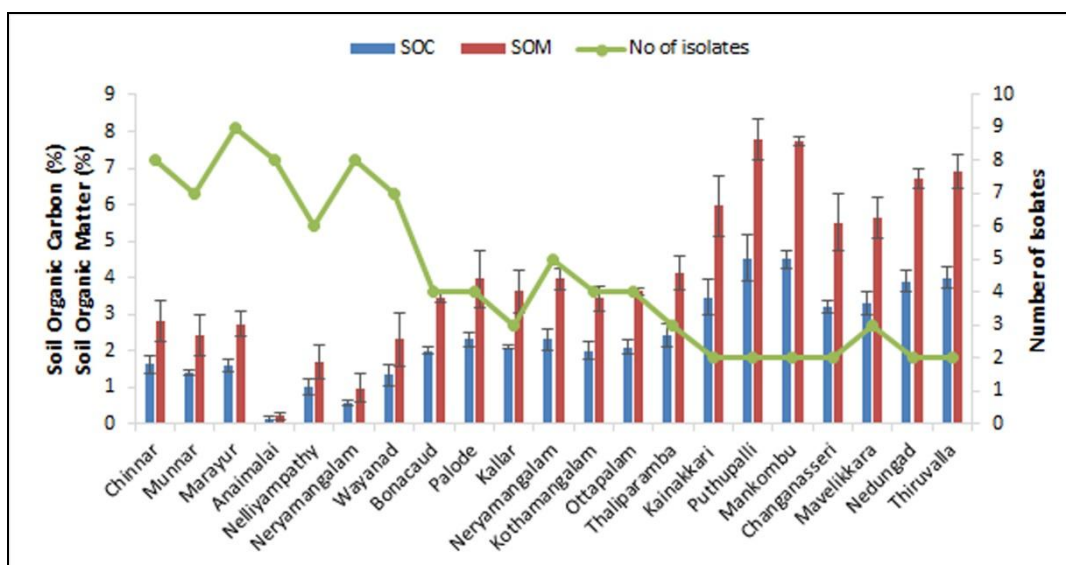


Figure 6:- Relationship of soil organic carbon (SOC) and soil organic matter (SOM) with number of isolates. Datas are expressed as mean  $\pm$  standard deviation (SD) of three replicates. Values are statistically significant at  $P < 0.05$ .

### Quantitative Enzyme Assays:-

As a result of semi-quantitative primary screening, strains with high EI values were considered as potent enzyme producers and were selected for quantitative enzyme assays. 8 isolates from highland areas and 7 isolates from midland areas, both expressed EI values in and above 4.5 and 5 isolates from low land area with EI values in and above 3.5 were selected for exo- $\beta$ -1,4-glucanase assay. Endo- $\beta$ -1,3-glucanase assay was carried out with highland strains showed EI values in and above 4.5, midland strains with EI values in and above 4.0 and lowland strains with EI values in and above 3.0. Protease quantitative assay was done with selected isolates from highland with EI values in and above 3.0, midland and lowland with EI values in and above 2.0.

The quantitative assay clearly revealed that activity of exo- $\beta$ -1,4-glucanase in highland was ranged between 95 to 76 Units.mL<sup>-1</sup>, in midland between 70 to 58 Units.mL<sup>-1</sup> and in lowland it was in between 48 to 52 Units.mL<sup>-1</sup>. The exo- $\beta$ -1,4-glucanase activity was recorded highest in highland areas and gradually decreased in low land areas (Figure 4a). Here the activity was greatly affected by land use type. Endo- $\beta$ -1,3-glucanase activity were ranged from 136 to 231 Units.mL<sup>-1</sup> and protease activity was from 3 to 14 Units.mL<sup>-1</sup> in all land types. So there was no significant variation in the activities of endo- $\beta$ -1,3-glucanase (Figure 4b) and protease (Figure 4c) in different land areas. The

significant variation of exo- $\beta$ -1,4-glucanase activity from highland to lowland suggest the sensitivity of the enzyme as an ecological and a soil quality indicator, so it can be used as a prominent indicator of environmental changes.

Knowledge in relation with soil enzyme activities provides necessary information relating to soil fertility. Land disturbances can negatively affect soil fertility, may leads to the manual addition of soil fertilizers and weedicides, adversely affect soil microbial population. In other words soil functional diversity in some extent is controlled by microbial enzyme activities (Gonnety et al., 2012). Among the three enzyme activities explored, exo- $\beta$ -1,4-glucanase expressed great variation in their activities in three different geographical land areas. It displayed highest levels of activities in high land areas and the lowest activity was observed in lowland areas. Midland areas showed an activity in between highland and lowland. When considering Kerala's geographical land masses, the anthropogenic activities are increasing from highland to lowland. In this study, exo- $\beta$ -1,4-glucanase activity decreased with increasing anthropogenic activities. This trend was not observed in endo- $\beta$ -1,3-glucanase and protease. In the light of these observations we can consider exo- $\beta$ -1,4-glucanase as a best sensitive indicator for environmental changes. According to Gao et al., 2010, depending on the type of land use, land management and type of enzyme, the absolute enzyme activities may vary in different land areas. Activity of soil enzymes is more related to physical and chemical properties, geology and land uses of soil. Improper land management is obvious in majority of agricultural systems, by the rotating cultivation of crops. Soil quality degradations due to frequent land use changes decline soil microbial biomass and enzyme activities in arable soils compared with natural vegetation (Mganga et al., 2015). Kerala's natural geographical land classification is a best example for changes in environment and land use types. Highland areas are mostly covered with natural vegetation. A combination of natural and agricultural land areas are seen in midlands. But almost all part of lowland areas are arable lands. In this study, the results evidently validates that the sharp declining of number of *Streptomyces* strains and activity of exo- $\beta$ -1,4-glucanase enzyme by changing the environment from natural vegetation to arable lands.

#### **Soil pH and Electrical Conductivity (EC):-**

p<sup>H</sup> and EC are the most significant parameters for measuring soil quality. Soil samples collected from three land areas were showed slight variations in pH. Soils under natural vegetation was characterized with high pH that means they are low acidic soils when compared with agricultural vegetation. pH values significantly decreased from higher to lower land regions. pH in highland areas ranged from 7.2 to 6 and in midland areas it was in 6.1 to 5.0. The highest acidity was noted in lowland regions, where the soils collected from paddy fields ranged from 3.7 to 4.8. This may be due to the application of herbicides and heavy fertilization of soils over the years for agricultural practices. A significant positive correlation ( $r^2 = 0.724$ ) was shown between soil pH values and number of *Streptomyces* strains (Figure 5a). Along with number of *Streptomyces* isolates pH values also showed a decreasing trend from highland to low land. Significantly very low pH was detected in lowland areas. Decrease in pH was another strong reason for lowering microbial content and soil enzymatic activity. An increase in the concentration of hydrogen ions in soil has a negative effect on its enzymatic activity (Acosta-Martinez and Tabatabai, 2000).

Highest EC was recorded in lowland soils, ranged in between 679 to 885  $\mu\text{s cm}^{-1}$ . In midland and highland it was detected at a range of 447 to 635  $\mu\text{s cm}^{-1}$  and 107 to 352  $\mu\text{s cm}^{-1}$ . It gradually decreased from lowland to high land. Number of microbial isolates and activity may be affected by EC. A highly significant negative correlation ( $r^2 = 0.908$ ) was shown in between number of *Streptomyces* isolates and soil EC values (Figure 5b). EC values indicate large accumulation of soluble salts in soils. Negative significant relationship between EC and number of isolates validates that increasing salinity and sodicity tremendously affect the soil *Streptomyces* community. With increasing salinity microorganisms tend to dehydrate, diminishes microbial growth and activity. Microbial biomass and enzyme activity decreased exponentially with increase in EC (Rietz and Haynes, 2003).

#### **Soil organic carbon and soil organic matter:-**

SOC and SOM percentage was increased with decreasing altitudes. Highest SOC and SOM percentage was reported in lowland areas, unfortunately the area with very less estimated number of *Streptomyces* isolates (Figure 6). SOC and SOM showed an increasing trend from high land to low land areas, whereas a decreasing trend was obtained in case of number of strains. 3.5 fold increase in SOC and SOM percentage were detected in lowland areas and 2 fold increase in lowland areas when compared with highlands. It may be expected that due to the loss of microbial load in agricultural lands by improper soil management practices reduces the rate of carbon mineralization (Chander et al., 1998).

**Conclusion:-**

The study was conducted to observe how *Streptomyces* isolates and their enzyme activities fluctuate between the natural geographical land areas in Kerala, highland, midland and lowland. According to this study, large number of *Streptomyces* strains were isolated from highland areas, the inhabitant of natural forest, compared to other land areas. pH and EC were highly correlated with the obtaining results, that point out to soil quality. Cumulative anthropogenic activities such as change in land uses especially from forest to rigorous agriculture for sustaining livelihood cause severe consequence on soil quality. Among the three enzymes we have selected for this study, the enzyme exo-  $\beta$ - 1,4- glucanase from paddy field isolates showed declining activity than high land and midland isolates. So we can use this enzyme as a most sensitive indicator of environmental changes. Soil *Streptomyces* biomass and enzyme activities are very sensitive to change in environment and are crucial for maintaining soil quality. In conclusion, unsuitable land use and depletion of nutrients due to the extensive practice of agricultural chemicals influenced soil enzyme activities and microbial dynamics and demonstrated poor soil quality.

**Acknowledgement:-**

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### RESEARCH ARTICLE

#### CARDIAC TOXICITY AFTER ACUTE YELLOW PHOSPHOROUS INGESTION: CASE REPORT.

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Yellow phosphorous arrhythmias,  
myocardial infarction, hepatic failure.

#### Abstract

Yellow phosphorus is an inorganic substance used in fire crackers, fertilizers, and as rodenticide. It has very strong garlicky odor and the toxic dose ranges from 15-100 mg. Therefore, in a 70 kg adult the dose would be approximately 0.2-1.4 mg/kg<sup>[1]</sup>. The fatality rate has previously been reported to be between 10-50%<sup>[2]</sup>. The present study report a case of acute yellow phosphorous due to intentional ingestion causing fulminant hepatic failure with cardiovascular involvement of atrial fibrillation and acute inferolateral myocardial infarction. Thereafter, we evaluate the challenges in appropriate management of the case.

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#### Introduction:-

Elemental phosphorus exists in two forms—red and yellow. Red phosphorus is nonvolatile and unabsorbable, and therefore nontoxic when ingested. Yellow phosphorus (also referred to as white phosphorus), the most readily available source is rodenticide as powders containing 2 to 5% of compound.<sup>(3)</sup>

Yellow phosphorous is a severe local and systemic toxin causing damage to gastrointestinal, hepatic, cardiovascular, and renal systems. Acute cardiovascular collapse accounted for majority of the deaths. We describe here a case of acute yellow phosphorus poisoning that led to fulminant hepatic failure and developed acute myocardial infarction with atrial fibrillation.

The heart is one of many organs affected by phosphorus, and several electrocardiographic abnormalities have been reported<sup>(4,5)</sup>. However, changes diagnostic of or consistent with myocardial infarction have not been described in previous studies. In the present study we treated a patient with acute yellow phosphorus poisoning whose electrocardiogram disclosed changes interpreted as evidence of acute infarction of the infero-lateral wall of the left ventricle. Eventually, the patient recovered with conservative management with resolution of the abnormal electrocardiographic pattern within few weeks.

#### Case Report:-

A 60-year-old man was brought to the hospital with an alleged history of consumption with suicidal intent of an unknown quantity of rodenticide paste (Ratol, containing 3% yellow phosphorus). He was taken to the local hospital minutes after ingestion and gastric lavage was done. After 2 days he was brought to the emergency due to persistent

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vomiting and jaundice. There was no history of lethargy, altered sensorium, or convulsions. There was no history of abdominal pain, breathlessness, or oliguria.

On admission, the patient was conscious, known diabetic since 2 months and afebrile with blood pressure as 100/60 mm Hg and vitals being stable. Mild pallor and icterus was present, but no edema was seen. The liver was palpable 2 cm below the costal margin, soft, and with rounded margins. Other systems were essentially normal.

Results of the investigations done on the day of admission and subsequently are shown in Table 1. Blood smear for malarial parasites and viral markers were negative. Chest X-ray done was normal and abdominal sonography showed mild hepatomegaly.

On the second day of hospital stay, he was noticed to be lethargic and drowsy. A diagnosis of West Haven classification of Grade 2 hepatic encephalopathy was made and the patient was given intravenous (IV) fluids with 10% dextrose, IV cefotaxime, vitamin K and pantocid. He was also started on oral lactulose. Intake and output was strictly monitored and blood glucose was measured six-hourly.

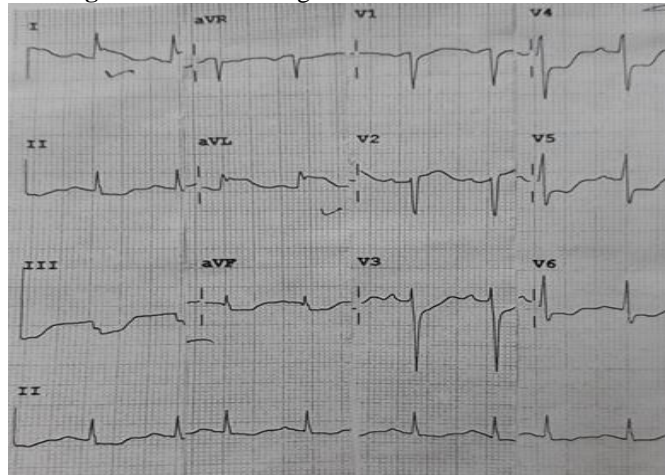
Despite initiation of antihepatic failure therapy, he progressed to coagulopathy on day 2 of admission with prolonged PT and aPTT and was administered 4 units of fresh frozen plasma.

**Table 1:-Lab Investigations.**

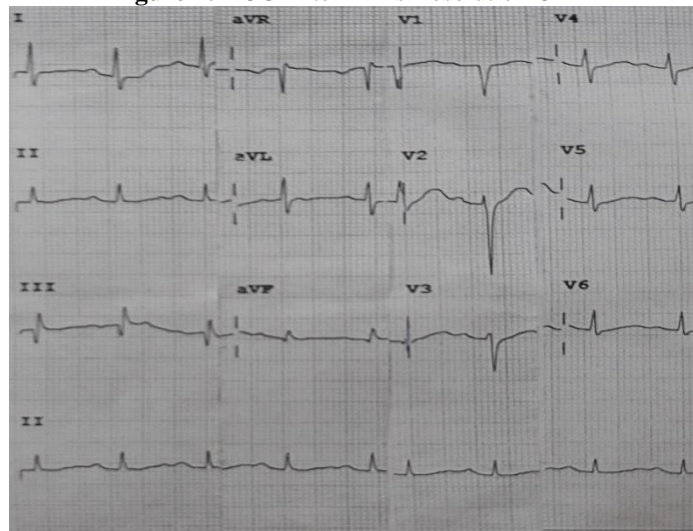
<b>LAB PARAMETERS:</b>	
HB	16.4g/dl
WBC COUNT	5400 cells/mm <sup>3</sup>
PACKED CELL VOLUME	49.7%
MCV,MCH,MCHC	Normal limits
PLATELETS	189000 cells/mm <sup>3</sup>
SERUM ELECTROLYTES	Na[138], K[3.6], CL[98], Ca[8.3]
BLOOD UREA NITROGEN	22.18mg/dl
SERUM CREATININE	1mg/dl
BLOOD GROUPING	B positive

**Table 2:- Liver Function Test & Coagulation Profile:**

<b>Day1</b>		<b>Day3</b>		<b>Day 5</b>		<b>Day10</b>	
<b>LFT</b>		<b>LFT</b>		<b>LFT</b>		<b>LFT</b>	
Sr.Bilirubin	mg/dl	Sr.Bilirubin	mg/dl	Sr.Bilirubin	mg /dl	Sr.Bilirubin	mg /dl
Total	15.8;	Total	16.07;	Total	12.6;	Total	10.6;
Direct	13.4;	Direct	12.21;	Direct	8.7;	Direct	6.7;
Indirect	2.4;	Indirect	3.86;	Indirect	3.9;	Indirect	3.9;
SGOT	860 U/L	SGOT	194 U/L	SGOT	101 U/L	SGOT	101 U/L
SGPT	930 U/L	SGPT	466 U/L	SGPT	213 U/L	SGPT	213 U/L
ALP	123 U/L	ALP	125 U/L	ALP	124 U/L	ALP	124 U/L
TOTAL PROTEIN	5.9 g/l	TOTAL PROTEIN	5.38 g/l	TOTAL PROTEIN	4.8 g/l	TOTAL PROTEIN	4.8 g/l
A/G RATIO	1.81	A/G RATIO	1.26	A/G RATIO	1.53	A/G RATIO	1.53
<b>COAGULATION PROFILE</b>		<b>COAGULATION PROFILE</b>		<b>COAGULATION PROFILE</b>		<b>COAGULATION PROFILE</b>	
PROTHROBIN TIME	76.8	PROTHROBIN TIME	22.6	PROTHROBIN TIME	16.3	PROTHROBIN TIME	12.8
CONTROL	12.6	CONTROL	12.5	CONTROL	12.5	CONTROL	12.6
INR	6.8	INR	1.86	INR	1.65	INR	1.32
aPTT	-	aPTT	39.6	aPTT	-	aPTT	31.2
CONTROL	-	CONTROL	30.6	CONTROL	-	CONTROL	30.6

**Figure 1:- ECG Changes Of Acute Inferolateral MI.**

On day 5 of admission he developed chest pain and ECG findings were suggestive of atrial fibrillation with fast ventricular rate along with ST-T CHANGES and broad QRS complex with troponin T positive pointing to acute inferolateral myocardial infarction. Echocardiographic findings included RWMA of basal inferior and lateral wall mildly hypokinetic with fair LV systolic function with EF 45%. He was stabilized with initial doses of anti platelets, statins and sorbitrate with anti arrhythmic and other supportive measures.

**Figure 2:-ECG After 24hrs Resolution Of MI**

Over 24hrs ECG changes were monitored from evolving phase to resolution phase. He was treated after a plateau period of 10 days, the sensorium started improving, with a simultaneous improvement in his laboratory parameters [Table 2]. Thereafter, he made a partial recovery and was stabilized and discharged after few weeks.

### Discussion:-

Yellow phosphorus is an inorganic substance that can get absorbed through skin, mucus membrane, respiratory and gastrointestinal epithelium. After absorption, the peak level is reached after 2 to 3 hours of toxic oral ingestion. Bile salts are important for absorption of phosphorus. Because of water content and low oxygen tension, phosphorus remains stable in gut for longer period.<sup>(3)</sup>

Fernandez and Cannarez, in their series of 15 patients have reported a mortality of 27% which confirms that yellow phosphorous is extremely lethal when ingested<sup>(6)</sup>. Phosphorus is a general protoplasmic poison causing cardiac, hepatic, renal, and multi-organ failure. The patient with yellow phosphorus intoxication passes through three stages. The first stage occurs during the first 24 hours in which patient is either asymptomatic or has symptoms of local

gastrointestinal irritation. The second stage occurs between 24 to 72 hours after ingestion. It is an asymptomatic period where there may be mild elevation of liver enzymes and bilirubin in this stage. The third stage (advanced) occurs after 72 hours until the resolution of symptoms or death.[1]This stage is characterized by multi-organ failure<sup>(3,7)</sup>. Our patient presented to us in stage 3 of intoxication with encephalopathy, acute liver failure, and coagulopathy.

Patients may present with acute hepatic failure, coagulopathy, and deranged liver function, as was witnessed in our patient. Central nervous system effects include changes in mental status like confusion, psychosis, hallucinations, and coma. Some patients may develop acute tubular necrosis and present with acute renal failure.<sup>(8)</sup>

Cardiac toxicity includes hypotension, tachycardia, arrhythmias, and cardiogenic shock<sup>(9)</sup>. Alteration in ECG such as inverted T waves, changes in QRS complex, tachycardia, arrhythmias and decreased ventricular contractility has been reported<sup>(8)</sup>. In a cross sectional study where 85 patients were studied, dysrhythmias were noted in only two patients, another four showed tachy-bradycardia<sup>(10)</sup>. Damage to myocardium reported in studies included fatty infiltration of the muscle, markedly dilated heart chambers, and necrosis of myocardium<sup>(8)</sup>. Pathological changes in heart were also reported by Tally et al.<sup>(9)</sup>. In our case, the hepatic and cardiac dysfunction was self-limiting and recovered with supportive therapy.

Our patient manifested with arrhythmias and myocardial infarction as a consequence of cardiac toxicity. His cardiac involvement started after 7 days of consumption, thus emphasizing the importance of anticipating this complication as a delayed manifestation. This presentation can complicate the preexistent multi-organ failure.

There is no specific antidote for yellow phosphorus. Treatment is directed at removal of the poison with gastric lavage and supportive therapy. Careful monitoring of hepatic, cardiac and renal function and management of their failure is required.<sup>(11)</sup>

Mortality rates were 23% for patients who had early symptoms of vomiting or abdominal pain; 73% for those where the first manifestation of intoxication was restlessness, irritability, drowsiness, stupor, or coma; and 47% for patients who had a combination of these GI and CNS symptoms initially.<sup>(12)</sup>

### **Conclusion:-**

Our case report highlights the possibility of late onset persistent cardiac dysfunction as a sequelae with yellow phosphorous poisoning necessitating a high index of suspicion for the same. The indiscriminate use of yellow phosphorus in the manufacture should be eliminated. Physicians should therefore be aware of the toxicity and its management.

### **Limitations:-**

Patients with diabetes are at high risk for developing cardiovascular disease and associated morbidity and mortality, and this risk increases dramatically with age. In the present study, we are uncertain, if the Acute MI is a manifestation of either the toxicity or a age related event precipitated with the associated stress.

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### **RESEARCH ARTICLE**

#### **DUCTAL CARCINOMA OF BREAST WITH EPITROCHLEAR LYMPH NODE METASTASIS : A RARE CASE REPORT.**

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Carcinoma breast; Invasive ductal carcinoma; Metastasis; Epitrochlear lymph node

#### **Abstract**

Metastasis to epitrochlear lymph node from primary invasive breast malignancy is extremely rare and to the best of our knowledge, only one case has been reported in literature till date.

Here we report a case of invasive ductal carcinoma of breast in a premenopausal female who developed metastasis to ipsilateral epitrochlear lymph node almost two and a half years post treatment of the primary tumour.

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#### **Introduction:-**

Metastatic breast cancer (also known as stage IV or advanced breast cancer) is the cancer that has spread beyond the breast to other organs of the body. The five leading sites of metastatic involvement at autopsy are lung, bone, lymph nodes, liver, and pleura<sup>3</sup>. A few cases of unusual metastasis to urinary bladder, retroperitoneum, gall bladder, colon, rectum have been reported before.<sup>5,6,7</sup> Here we report a post-treated case of breast cancer with metastasis to epitrochlear node, which is an extremely rare site of metastasis. The time interval between treatment of primary tumour and development of metastasis being about two and a half years. The case being presented here, happens to be the second case report of its kind as per literature.

#### **Case Report:-**

A 47 years old premenopausal female presented to our out-patient department in February 2014, with the complaint of painless right breast lump of two months duration. She was a known diabetic and hypertensive and on regular oral medication. On examination, general condition of the patient was good. A 4x4 cm lump was palpable in the upper outer quadrant of right breast which was non tender, mobile, firm to hard in consistency. Overlying skin and nipple areola complex was normal. There was no palpable lymph node in right axilla and supraclavicular fossa. Contralateral breast, axilla and supraclavicular fossa was unremarkable. Fine needle aspiration cytology of right breast lump (done outside) was suggestive of ductal carcinoma in situ. Core needle biopsy of the same revealed invasive ductal carcinoma grade II; ER/PR/Her2neu negative. Metastatic work up showed no evidence of metastasis (cT2N0M0). In view of early stage of the disease (stage IIA), upfront modified radical mastectomy was done in April 2014. Post operative histopathology was suggestive of invasive ductal carcinoma grade II; tumour size 3.5x3x3 cm; lymphovascular and perineural invasion negative; lymph nodes 20/20 negative (pT2N0M0). The patient further received six cycles of adjuvant chemotherapy (Cyclophosphamide, Adriamycin, 5 Fluorouracil regimen). She tolerated the treatment well and was kept on regular follow up. However, the patient defaulted.

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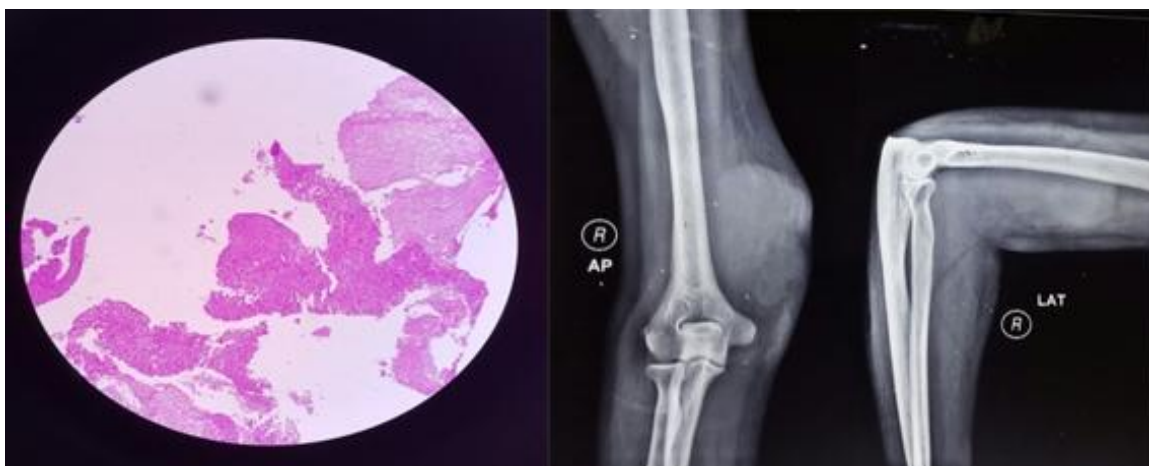
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In August 2016, patient presented to us again with complaint of painful swelling over the medial aspect of her right elbow of 3 months duration. As per patient, the swelling was rapidly progressive in size. On examination, general condition of the patient was well preserved. Primary disease was locoregionally controlled. Contralateral breast, axilla and supraclavicular fossa was normal. Diffused swelling measuring approximately 10x8 cm was palpable over medial aspect of right elbow which was tender and inflamed, firm to hard in consistency, fixed to underlying structures. X ray (right elbow) showed a lobulated soft tissue swelling at posteromedial aspect of lower end of right arm without any evidence of bony involvement. Biopsy of the epitrochlear lymph node showed fibrous tissue infiltrated by tumour composed of malignant epithelial cells having pleomorphic hyperchromatic nuclei exhibiting increased mitosis. Cells arranged in clusters and in glandular pattern in the background of lymphoid tissue, suggestive of metastatic adenocarcinoma; ER/PR/Her2neu negative. Metastatic work up done was unremarkable. As epitrochlear lymph node was the only site of metastasis, patient was advised for surgical excision with wide margin of the involved lymph node. However she refused any surgical intervention and defaulted to followup.

In January 2017 she again came to us with progression in size of epitrochlear node swelling associated with marked increase in pain along with multiple nodules over right neck region. On examination, general condition of the patient was average, right chest wall and axilla was normal with multiple right supraclavicular lymph nodes, contralateral breast, axilla and supraclavicular fossa was normal. Multiple ulcerated lesions with discharging sinuses were present over medial aspect of right elbow. Multiple non tender, mobile and firm nodules were palpable over right cervical region involving level IV and V; largest measuring 4x3 cm. Fine needle aspiration cytology of the neck node was suggestive of metastatic adenocarcinoma. All other Metastatic work up was otherwise unremarkable. In view of progressive disease patient was further advised for palliative chemotherapy.



**Fig 1:-** Metastatic epitrochlear lymph node, Progressive disease (Epitrochlear with Cervical lymph nodes).



**Fig 2:-** H&E of IDC; X ray (Right Elbow).

**Discussion:-**

Breast cancer is the most common malignant disease in females. In these patients, distant metastases is the main cause of death.<sup>1</sup> Approximately 10–15% of patients with breast cancer have an aggressive disease and develop distant metastases within 3 years after the initial detection of the primary tumour.<sup>2</sup> The five leading sites of metastatic involvement at autopsy are lung, bone, lymph nodes, liver, and pleura. The incidence of metastasis in these five sites were: lung 57-77 %, bone 49-74%, lymph nodes 50-76%, liver 50-71%, and pleura 36-65%.<sup>3</sup> The most commonly involved axillary lymph nodes are the level I nodes, they are involved in more than 90% of all patients with any number of positive axillary lymph nodes. Involvement of only level I lymph nodes occur in approximately 60% of the patients. Involvement of level II lymph nodes without involvement of the level I lymph nodes is uncommon. Involvement of level III lymph nodes with negative levels I and II lymph nodes is rare, occurring in < 3% of all patients with positive axillary lymph nodes<sup>4</sup>. A few cases of unusual metastasis to urinary bladder, retroperitoneum, gall bladder, colon, rectum have been reported before.<sup>5,6,7</sup> Lymph node involvement is the most important determinant factor for distant metastasis. In this case all dissected axillary node was negative. The chances of skip metastasis to the epitrochlear lymph node are very rare. The exact pathogenesis is not known for this kind of metastasis. To the best of our knowledge there has been only one case of epitrochlear nodal metastasis reported in literature.<sup>8</sup>

The epitrochlear lymph nodes are part of the superficial lymphatic system of the upper limb. There are usually one or two of these lymph nodes. As a general rule, the epitrochlear station drains the lymph from the last two or three fingers and from the medial aspect of the hand itself. The drainage areas of the upper limb are widely variable interindividually. Some lymphatic vessels arise from the epitrochlear nodes and extend to the axillary station.<sup>9</sup>

Epitrochlear lymph nodes may be enlarged as a part of generalized lymphadenopathy, isolated enlargement of epitrochlear lymph nodes is very rare. Malignant causes include lymphoma and malignant melanoma. In transit metastasis to epitrochlear node are encountered from primary melanoma of the forearm, wrist and hand. Cat scratch disease, leprosy, leishmaniasis and tuberculosis are a few reported benign causes of isolated epitrochlear lymph node enlargement.<sup>10</sup>

There is no definite guideline regarding treatment of epitrochlear nodal metastasis. Surgical resection of the node is to be done where possible, provided there are no other sites of metastasis. This patient was reluctant for surgery, so planned for palliative radiotherapy and was further subjected to chemotherapy on progression of disease.

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### RESEARCH ARTICLE

#### A STUDY ON 3-BODY ABRASIVE WEAR BEHAVIOUR OF ALUMINIUM

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#### Manuscript Info

##### Manuscript History

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#### Abstract

Metals and alloys have found their many role in many applications like structural and corrosive, environment. The alloys/composites having high strength to low weight ratio have gained attention of many researchers. In the above work, Aluminium metal matrix composite was prepared by die casting route, by varying the weight % of reinforcement. Made composite specimens are subjected to 3-body abrasive testing by varying applied load and time, the epoxy particles of 900 grit size were used as abrasive particles. It was observed that with increase of weight of wear resistance of composite was also increasing and on comparison it was found reinforced composite gives good wear resistance to the base alloy.

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#### Introduction:-

Since last two decades, composite materials have attracted researchers than their counterpart Monolithic materials due to ability to alter their physical properties and mechanical properties by varying filler phase. Based on type of matrix phase, composite are divided into metal matrix (MMC), polymer matrix (PMC), ceramic matrix composites (CMC) . MMCs have good strength, thermal conductivity, damping properties, low coefficient of thermal expansion and lower density. For these reasons it is preferred in tribological applications.

#### Experimental Procedure:-

##### Material:-

In this work, as already mentioned, Aluminium alloy was used as metal matrix composite. In this alloy, magnesium has poor alloying element, hence magnesium was used as wetting agent for proper mixing. The chemical composition and mechanical properties are given in table 1 and 2[13].

**Table 1:-** Chemical Composition of Al 8011

Material	Fe	Si	Mn	Zn	Cu	Ti	Cr	Mg	Al
Weight %	1	0.8	0.2	0.1	0.1	0.06	0.05	0.04	97.5

**Table 2:-** Mechanical Properties of Al 8011

Density	Elastic Modulus	Strength to Weight Ratio	Ultimate Tensile Strength	Thermal Expansion
2.72 g/cm <sup>3</sup>	91GPa	50kN-m/kg	110Mpa	31.8µm/m-k



**Reinforcement:-**

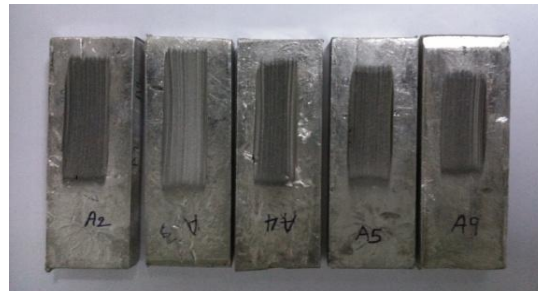
Graphite powder of an average size of 50 microns were used as reinforcement, Graphite powder has physical properties like good electrical and thermal conductivity, high purity, and temperature stability. Graphite is a well-recognized solid lubricant which also has the advantage of low density. In graphite reinforced Aluminium Matrix Composites (AMCs), Graphite serves as a solid lubricating layer between the composite and rubbing surface helping in reduction of composite wear and does not need any additional solid and liquid lubrication [14].

**Composite preparation:-**

The Al-cr composite was fabricated by two step mixing stir casting method, stirring speed was gradually increased up to 600rpm and it was done for about 500sec. When compared to conventional stirring, double stir casting results in more uniform microstructure . The Al 8011 alloy ingots, were cut into small pieces using hand press, placed in graphite crucible and heated in a resistance furnace up to  $750^{\circ}\text{C}$  above its melting point ( $860^{\circ}\text{C}$ ), the maximum temperature level of furnace being  $1200^{\circ}\text{C}$ .



**Figure 1 a:-** Specimens before wear test.



**Figure 1 b:-** Specimens after wear test.

**Result and Discussion:-**

In 2-body abrasion process, particles are rigidly attached to the second body, where as in 3-body abrasion process, wear is caused by loose abrasive particles which can freely move between contact surfaces. The wear rate in the three-body abrasion is lower when compared two-body abrasion [16]. The results of 3-body abrasive wear test for various combinations of applied load and time were tabulated.

**Microstructure:-**

Figure 2(a) shows optical micrograph of Al alloy 8011 with 2% reinforcement, at 30 magnification scale. Similarly figures 2(b), 2(c) and 2(d) show micrographs of 4%, 6% and 8% reinforcement in Al alloy 8011 respectively. The microstructures show that uniform distribution of graphite particles throughout the aluminium alloy. This indicates that there is good bonding between the alloy and reinforcement particles resulting in good wear resistance.

**Conclusion:-**

3-Body Abrasive wear behaviour of Al was studied in this work.

The samples were subjected to wear test by varying the load in the range of 10-40 kgs for various durations of time at constant speed of 600 rpm. From the experimental investigation following main conclusions are drawn:

Successful fabrication of 8011 Aluminum composite reinforced with cu is possible by simple two- step stir casting process.

On comparison it is found that reinforced composite gives good 3-D wear resistance than base Al alloy.

**Reference:-**

1. Himanshu Kala, K.K.S Mer and Sandeep Kumar A review on mechanical and tribological behaviours of stir cast aluminium matrix composites 2014 *procedia Material Science* **6** 1951- 1960.
2. [www.azom.com/article.aspx?ArticleID=8782](http://www.azom.com/article.aspx?ArticleID=8782).



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### **RESEARCH ARTICLE**

#### **EMPLOYER BRANDING AND IT'S IMPACT ON ATTRACTION AND RETENTION IN IT FIRMS: AN EMPIRICAL STUDY.**

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##### **Key words:-**

Employer Branding, Internal Customers, Employee Value Proposition, Attraction and Retention Strategies.

#### **Abstract**

One of the key sources of competitive advantage today is taken to be talented human capital base. In lieu of the same, different firms have been seen to employ the generic marketing strategies to augment the complete employment experience. In this context, employees are viewed to be 'Internal Customers' and the 'Job' as a product, which the firm offers to its personnel. The practice of adherence to such marketing principles under the purview of human resource management, is today popularly christened as 'Employer Branding'. Given the relevance that the firms today are laying on this concept and the committed efforts initiated by them towards becoming the 'Employer of Choice', is clearly reflective of the significance of this employee friendly strategy. Employer branding is thus defined as "a targeted, long-term strategy to manage the awareness and perceptions of employees, potential employees and related stakeholders with regards to a particular firm" (Sullivan, 2004). It is thus emerging as a potent tool to convey the 'Employee Value Proposition' to existent and plausible recruits. It would be interesting to note that due to such dedicated efforts by varied organizations (spanning versatile industries) the current and potential employees tend to form certain perceptions about the employer brand. This dissertation therefore aims to study certain relevant dimensions of employer branding and their subsequent impact on effectively attracting and retaining, employees. The focused group for collecting data entailed employees currently working in certain prominent IT giants and Business School students who are likely to enter the corporate sector in the upcoming days. A survey was conducted and a total of two hundred responses was collected for subsequent analysis. Further, exploratory factor analysis was undertaken using SPSS for reducing the identified dimensions into certain tangible and relatable factors. It was finally concluded that strategic employer branding has a direct (positive) implication on retaining critical talent pool. Also, branding and other pertinent advertising strategies employed by organizations facilitate in enhancing employer attractiveness for potential hires. Thus, the 'Brand Promise' which the employers of today are extending to their workforce, has been comprehensively discoursed in the paper.

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**Introduction:-**

Conventionally, Branding as a concept has often been used to differentiate an organization's products in general over that of its competitors. Today, with the entire transition from an industrial age to a more information oriented age, Branding now is seen from versatile perspectives. From adding economic value to its customers and its other relevant stakeholders, this strategic tool of creating a distinguished identity is now also focused on developing the right attraction and retention policies for its employees. Thus, the new buzz word today is 'Employer Branding' wherein organizations are particularly shifting focus towards creating a positive perception in the minds of the key stakeholders, potential recruits and current employees. Given that this entire initiative involves a mind-set level change, this exercise is definitely a long term one. The term which picked up popularity in the last decade of the previous century, is now adopted by a lot of global organizations as part of their premeditated human resource initiatives. With immense competition in every sphere, the obvious outcome was poaching of critical talent resulting in dearth of an endowed workforce. Perturbed by this growing scarcity of potential recruits, a lot of firms realised the importance of creating lucrative incentives to adequately attract and retain the right talent pool.

At a broader level, branding of such kind entailed dedicated efforts by any organization towards conveying to its current and potential employees that it is a 'desirable place to work'. The 'Pre-eminent Employer' image is something all organizations strive for, clearly highlighting the value addition they perceive with this entire exercise. The leadership of esteemed organizations are evidently aware of how requisite investment in skillful human resources can bring in long term gains thereby subsequently enhancing the overall performance of the organization. It is thus a wholesome package which is offered to an employee whether it is in terms of the economic gain (lucrative salary packages and equitable income opportunities), the functional upliftment (through training and managerial facilitation) or the most pertinent of all, the psychological contract (sense of autonomy at workplace).

There are certain minimal expectations that any employee has out of his/her employment today. These anticipations could vary from a suitable organization culture, to lucrative pay packages, streamlined job activities, right job fitment and managerial effectiveness. Keeping this view in mind, two sets of questionnaires were prepared. One questionnaire entailed seventeen variables, selected for data collection from employees of renowned IT firms. The intention was to cater to the 'retention' element of the intended research. The respondents had to rate the relevance of the identified variables in regards to their contribution towards creating a differentiated brand. The second questionnaire comprised of questions directed towards students in their final year of management degree. The objective behind selecting this particular sample of respondents was to gather their opinion around what 'attracts' them to opt for a given employer brand over the other. A total of eighteen variables were considered in this case which were mostly overlapping with the first questionnaire but with the addition of certain relevant variables which were fitting contextually. The rankings were done on a Likert Scale ranging from 'Very Important' to 'Unnecessary'. These were further ramped up with certain demography related questions. Finally, to determine crucial 'psychographic aspects', an exploratory factor analysis was conducted on the collected data set.

**Problem Statement:-**

In increasingly competitive labour markets of today, attracting and retaining critical talent has become a matter of grave concern. Employers need to understand the range of factors that influence career decision making and in particular the role of employer branding in attracting the 'best fit' employee who would subsequently contribute towards the premeditated goals of an organisation. The problem therein lies in trying to understand the impact and relevance of employer branding as an essential element of attraction and retention strategies and devise suitable ways through which companies could maximise their brand awareness in the employment market.

**Objective of the Study:-****Primary Objective:-**

To understand the nature of relationship between employer brand image and employee attraction and retention.

**Specific Objective:-**

1. To identify and list certain attributes that make up a 'desirable' employer, subsequently creating a strong, genuine and lasting employer brand.
2. To understand as to what extent the branding strategies implemented by IT firms impact the potential recruits' decision about joining the firm.

**Hypothesis 1:-**

- H0 (Null Hypothesis): Strategic Employer Branding does not have any role to play towards retaining employees in a firm.
- H1 (Alternate Hypothesis): Strategic Employer Branding reinforces the entire employment experience thereby positively *influencing* the retention levels within a firm.

**Hypothesis 2:-**

- H0: Branding and advertising strategies do not lead to attracting employees with superior skills and knowledge.
- H1: Branding and advertising activities executed as part of the recruitment experience *positively impact* the candidate pool; thereby leading to better potential recruits.

**Review of Literature:-**

Employer Branding as a concept has gained importance in recent times. As an ideology, it can be said that this is an extension of the conventional marketing principles which primarily focused on generating the requisite customer satisfaction (Gupta, 2014). While until recently, the entity 'customer' comprised of individuals external to the organization, the paradigm shift in employer mind-set has resulted in introduction of the concept of an 'internal customer' (Chhabra & Sharma, 2014). The apparent question which now arises is that who are these internal customers and why are organizations today willingly ready to prioritize them over their revenue generating counterparts.

In the rampant competitive business environment of today, the only logical answer to this question is that these customers are none other than the organization's personnel. (Lievens & Highhouse, 2003). The rationale necessitates that if an employee is considered to be a customer then in all likelihood the product in question is the Job which he/she is currently or likely to be associated with in the future. The Job as a product should therefore be able to attract, inspire, develop, satisfy and retain employees. Further, a strategic value chain would ensure that a contented employee serves the customer (external) satisfactorily (Moroko, 2008).

Building further on this value proposition it can be said that employer branding is about providing an all comprehensive employment experience. Now, while this might sound an execution level strategy, it first and foremost requires a visionary leadership (Pingle & Sharma, 2013). Leaders who not only understand the value addition that a talented workforce brings to the table, but also have the conviction to deal with the nuances of this imperative change. Further, these front runners are the ones who would set the culture rolling thereby empowering the people on the ground to devise and execute differentiated human resource practices (Priyadarshi, 2011). The alignment of branding strategies with HR practices might therefore be a long drawn process but once set in the right direction is likely to have only positive implications (Tuzuner & Yuksel, 2009).

A renowned employer brand would invariably maintain its position in the competitive labour market through attractive engagement and retention initiatives, thereby resulting in unquestionable brand loyalty. Given the magnitude of impact and benefit this particular exercise is likely to generate, it is definitely not a trivial undertaking (Buttenberg, 2013). A phased approach of implementation needs to be followed and the first critical step is realising the unique value proposition that the firm in question has to offer. The differentiating factor thus identified needs to be broken down into relevant attributes/dimensions in order to further determine the core values/characteristics that set the organization apart. Once your latent strengths and weaknesses have been identified, the next important step entails understanding in-depth your probable target audience. This involves identifying current and potential recruits who are currently/or are likely to be associated with your brand. This would enable the firm to effectively communicate its value proposition internally as well as externally, instigating the requisite level of affinity in the bargain. Once you are successful in 'selling' your brand in a righteous manner, the next logical step is to actually fulfil the promise that you have made to your (internal) customers and ensure that your image of a virtuous employer continues to remain intact (Davies, 2008).

A strong employer marque can thereby result in two immediately realisable benefits. First, ensuring that the right set of talent is 'attracted' towards the organization and second that the desirable 'retention' levels are maintained. 'Employer attractiveness' in very simplistic terms can be defined as the anticipated benefits that are perceived to be realisable by current or plausible workforce, thereby motivating them to choose one brand over the other in the competitive labour market.

Thus, this notion is closely associated with the behavioural and psychological traits of any individual, thereby making it an interesting research area for far too many academicians and corporate managers (Alnaçık & Alnaçık, 2012).

Further, this bond which is created through a persuasive brand image, also contributes towards retaining employees for a longer duration of time. The benefits might invariably be intangible but the compelling sense of belongingness which surfaces eventually, is enough to ensure continuum loyalty. Hence, it can be said without doubts that a lucrative 'Employee Value Proposition' is a potent tool for becoming the employer of choice (Agrawal & Swaroop, 2009).

While these tactics have been popularly adopted across the board, one of the most prevalent industries which puts this perception to effective use, is that of Information Technology (IT). A reasonable explanation for this could be the fact that the IT industry is essentially 'people driven' and hence establishing the indispensable psychological contract with its people, is of utmost importance to them. Further, it can also be said that since the industry practices involve client facing roles and responsibilities, a highly convinced and dedicated employee is critical for their survival (Jenner and Taylor, 2009). An employee who is likely to stick around inspite of the dynamic work environment, is the one who would eventually generate concrete economic benefits for them. Thus, professed to be one of the most employable business, firms in IT industry have been actively involved in executing employer branding strategies. The endeavour has been to ensure that the employee's ethics and values are in perfect alignment with the broader vision and mission of the organization, thereby ensuring that these individuals are developed into innate brand ambassadors for the firm in question. Given the immense potential for study in this domain, the researchers decided to niche down the scope to IT industry (Ritson, 2002).

Another interesting facet of this research work is the bifurcation which has been made in relation to the respondents which have been targeted. While one segment constitutes of existent employees who have been successfully retained within firms due to certain employer branding initiatives, the other section comprises of students who are latent recruits for such organizations. Students are often expected to be lured by hefty pay packages and other tangible benefits but past research work in the domain has proved otherwise. While compensation may be a supreme decision criterion related to their employment, students are also often seen to consider a variety of other facades (Dam, 2006). These could include dimensions such as an established corporate profile or effective advertisement/promotional strategies that are adopted by their potential employers. Thus, such predictive factors that motivate recruits to apply for a particular job vacancy, is still an unopened Pandora box in the research field. The current study thus attempts to bring to the forefront such underlying aspects, in the bargain, answering certain critical questions for the managers of giant IT organizations (Vijayalakshmi & Uthayasuriyan, 2016).

## **Research Methodology:-**

### **Pilot Study:-**

In order to gauge the feasibility of the intended research, a pilot study was instigated. Keeping in mind the overall objectives of the study, two questionnaires were framed. These were then filled out by 10 respondents per questionnaire (10% of total sample size).

Based on the analysis of the responses from the identified stakeholders and discussions/deliberations within the team, the authenticity of the established hypothesis was discussed. This enabled us to reinstate our intention to conduct further research in the recognised domain.

### **Sample Details:-**

- A field visit was undertaken across certain renowned brands in the field of Information Technology.
- The Sample Size comprised of 100 respondents (employees working in IT firms, specifically targeting new recruits and employees who are part of middle level management). A healthy male to female ratio was maintained while collecting the responses.
- A separate Sample of 100 respondents was collected which comprised of Student Managers currently pursuing their post-graduation study from reputed B-Schools in the city.

### **Data Collection Tool:-**

The data collected for this study primarily constitutes of the following two sources:

- **Primary Data:** Primary data collection has been the principal mode of enquiry. It entailed collecting data through two well-structured questionnaires consisting of twenty or more questions which essentially aimed at bringing out relevant information to meet the overall objectives of the research. The responses were filled out in a hard copy format as the survey was personally conducted by the researchers in each of the aforementioned areas.
- **Secondary Data:** Data which is originally collected for a different purpose but we use it as reference for our research work, encompasses secondary data. Various sources of secondary data collection comprised of journals, newspapers, databases and previously published papers available over the internet.

#### Validation of Hypothesis:-

Once the relevant data had been gathered, the researchers undertook quantitative analysis of the same -

#### Quantitative Analysis:-

The survey results were used to scientifically and objectively classify the data using certain commonly used tools such as **Statistical Package for the Social Sciences (SPSS) and Microsoft Excel**.

For detailed analysis/interpretation of the survey results, certain appropriate tests were run using SPSS and relevant conclusions were made thereon. **In order to validate the authenticity of the alternate hypothesis certain psychographic dimensions were considered and a Factor Analysis was done on them to club them under relevant Factor heads.**

To get further insights pertaining to our hypothesis, appropriate excel formulas, charts and graphs were also used. This enabled us to further infer and test the applicability of the existing hypothesis.

Moreover, since the research work has been a field study, the researchers were also be able to come up with a concrete outlook based on the observations they made pertaining to the employee/student behaviour (while they responded to the questions asked). Such kind of analysis can be condensed under the umbrella of 'Observations through being Participant in actual Field Study' methodology which later also towards building our overall opinion about the study.

To measure the qualitative responses, such as those related to the respondent's feelings, perception, likes, dislikes, interests and preferences, the **scaling technique** has been used.

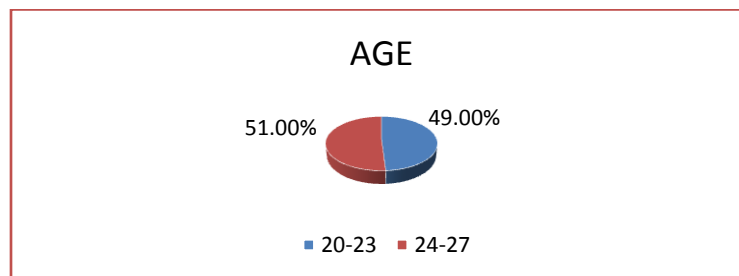
For this research, a type of an interval scale, known as a **Likert scale**, was incorporated in the questionnaire. This measurement scale was developed by Rensis Likert. Under this, the respondents were asked to indicate a degree of agreement or disagreement to a series of statements. Each scale item had five response categories ranging from 'Very Dissatisfied' to 'Very Satisfied'.

#### Data Analysis and Interpretation:-

The subsequent pages display certain graphical representations along with related discussions based on the survey results.

#### Part 1:- Student Questionnaire.

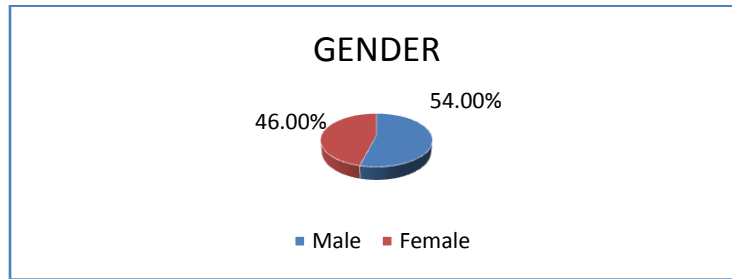
##### Age:-



**Fig 1:-**Age of the Respondents.

Out of the 100 respondents, 51% of the students interviewed were in the age group of 20-23 years and 49% of the students belonged to the age group of 24-27 years.

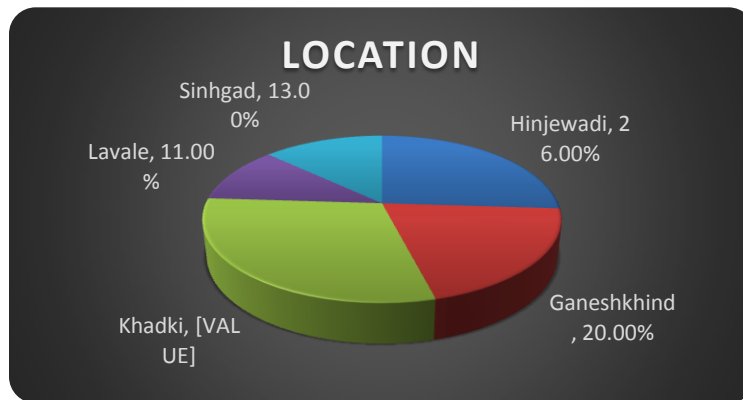
**Gender:-**



**Fig 2:-**Gender of the Respondents.

Out of the 100 students surveyed, 46% were female and 54% were male.

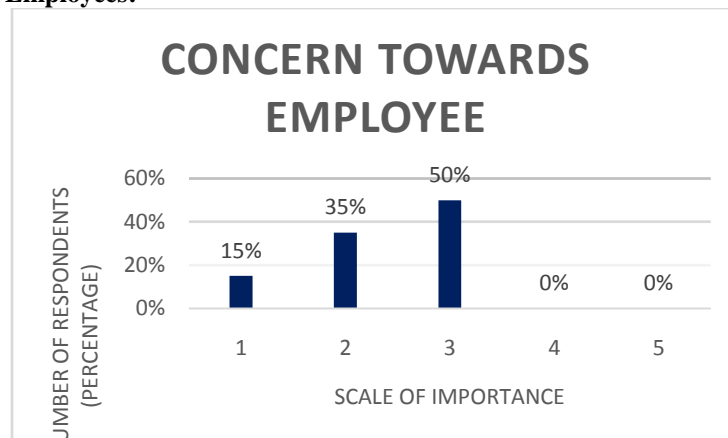
**Location:-**



**Fig 3:-** Location of the Respondents

It was observed that out of the 100 respondents, majority of the respondents were from the B-Schools in Khadki, Hinjewadi, and Ganeshkhind consisting of 30%, 26% and 20% of total respondents respectively. Other B-Schools comprised of 13%, 11% of total respondents.

**Concern towards Employees:-**



**Fig a:-** Concern towards employees.

**Discussion:-**

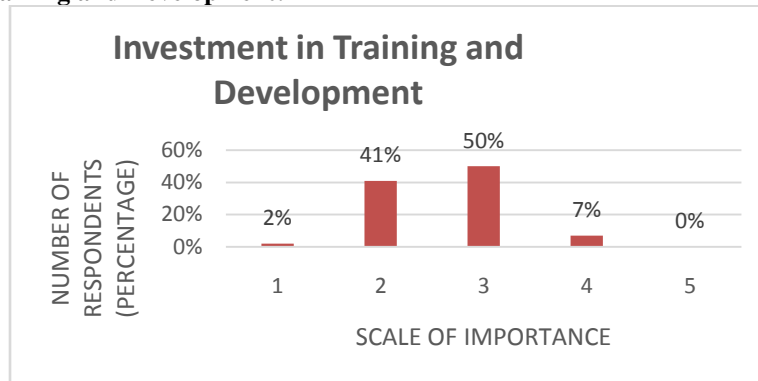
The above figure represents responses of students in regards to the work environment of an organization, particularly about ‘concern towards employees’.

The figure illustrates that 50% of the students have given a neutral response to concern towards employees. It is not the most important factor that affects their attrition or retention although 35% of the students feel it is an important factor which is considered by them. Only 15% students feel that this factor holds a lot of importance and have



responded to it as a very important factor. No respondent states that this factor is either not important or unnecessary stating that every student considers it a relevant factor while selecting their future employer.

**Investment in training and Development:-**



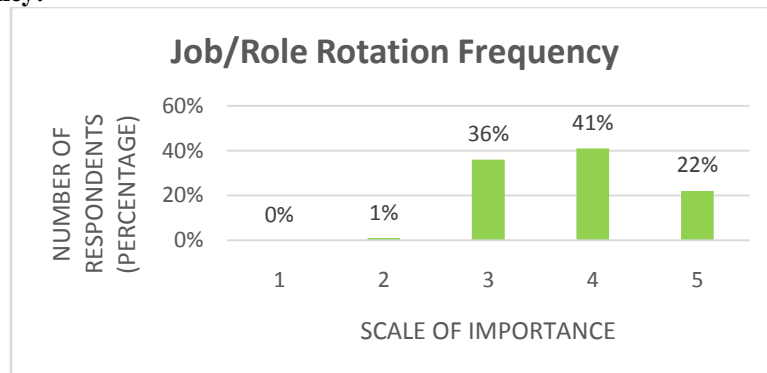
**Fig b:-**Investment in training and development.

**Discussion:-**

The above figure represents the level of importance a student attributes to investment in training and development by its plausible future employer.

The figure elucidates that 50% of the students take a neutral position while demonstrating the importance given to investment in training and development whereas 41% of the respondents find it an important factor. Only 2% of the respondents find it to be a very important factor. There are no students who state that training and development is unnecessary and does not impact their decision making.

**Job/role rotation frequency:-**



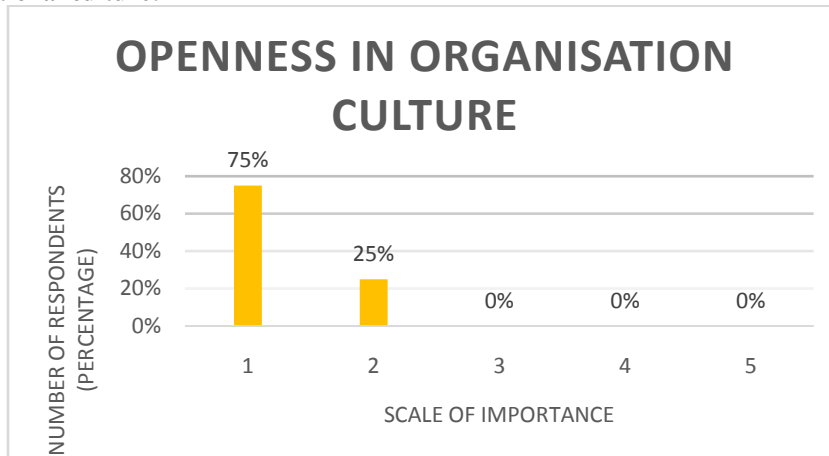
**Fig c:-**Job/role rotation frequency.

**Discussion:-**

It is observed that most students after MBA do not consider job/role rotation a dominant factor while selecting their future company and find job rotation and mobilization acceptable.

The figure states that 41% of the employees do not find this an important factor while 36% of the respondents have given a neutral response to it. While 22% of the respondents find this as an unnecessary factor, there is however no student that finds it a very important or most important factor.

**Openness in organizational culture:-**



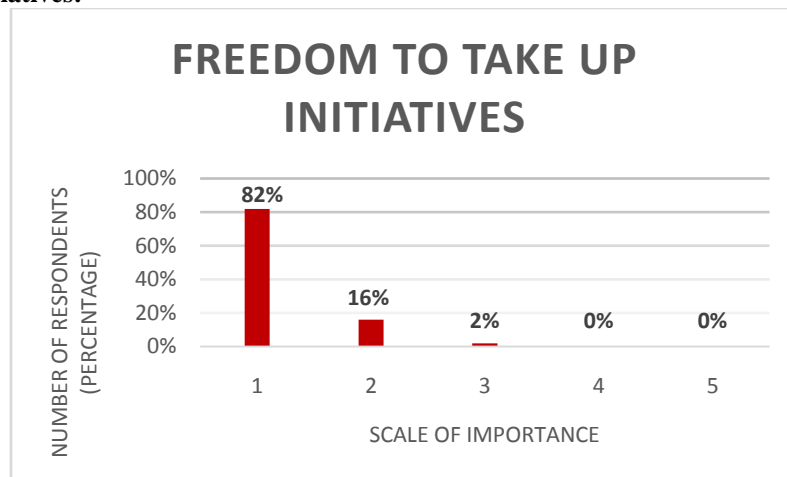
**Fig d:-** Openness in organizational culture.

**Discussion:-**

It is observed that openness in the organizational culture holds high importance amongst individuals while selecting their future company.

The above figure depicts that 75% of the respondents find it important to have openness in the organizational culture while 25% find it to be a very important factor. There are no students with a neutral, not important or an unnecessary response in regards to this variable.

**Freedom to take up initiatives:-**

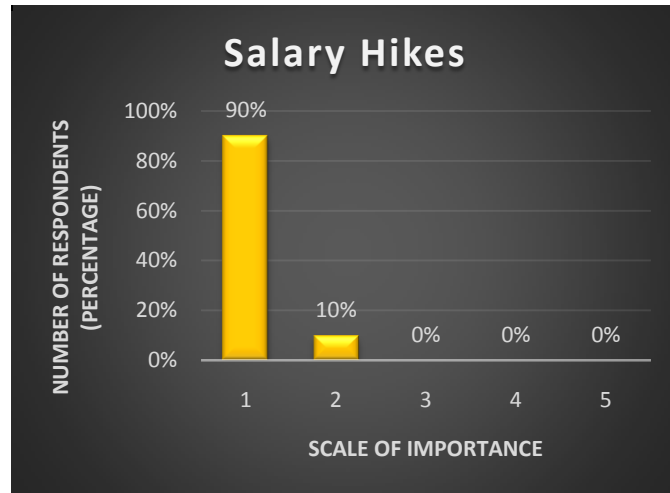


**Fig e:-** Freedom to take up initiatives.

**Discussion:-**

With the newer generation entering the corporate sector we can see the paramount importance provided to and the need amongst them to take up initiatives on their own. The above figure depicts the same by illustrating that 82% of the employees give very high importance to having freedom to take up their own initiatives. This is one of the major factors that affects their decision while selecting their future employer while 16% of the respondents find it important with 25% giving a neutral response to it. No respondent finds freedom to take up initiatives not important or unnecessary.

**Salary hikes:-**



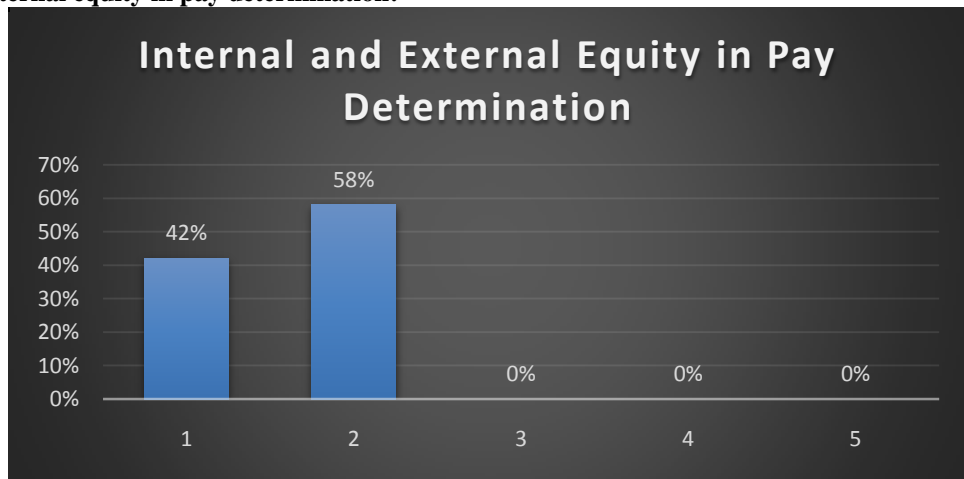
**Fig f:-**Salary hikes.

**Discussion:-**

It can be observed by the above figure that regular salary hikes are an important variable considered by students while choosing their future hirer.

90% of the respondents have stated it to be a very important factor while 10% state it to be important. No respondent has provided a neutral, not important or unnecessary factor response in this scenario.

**Internal and external equity in pay determination:-**



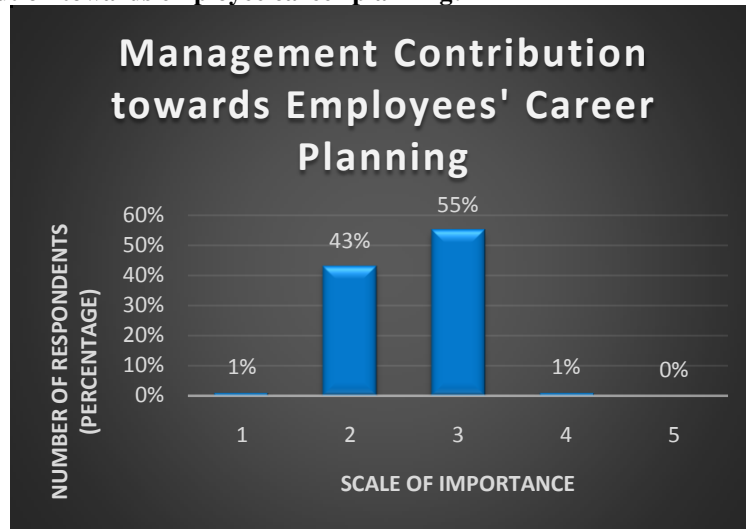
**Fig g:-** Internal and external equity in pay determination.

**Discussion:-**

The above figure states that internal and external equity in pay determination holds high value for students as 58% of the students have considered it to be an important factor while selecting their future employer with 42% stating it as a very important factor.

No respondent considers this factor to be neutral, not important or unnecessary.

**Management’s contribution towards employee career planning:-**

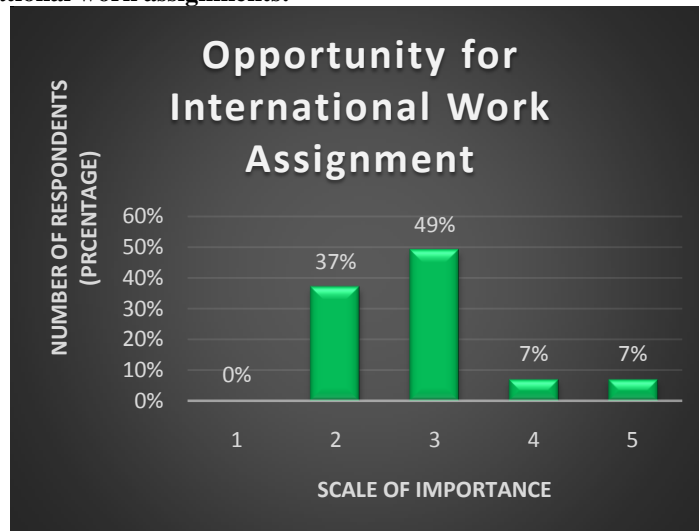


**Fig h:-**Managements contribution towards employee career planning.

**Discussion:-**

It can be seen that maximum respondent’s i.e.55 % students have provided a neutral response to this factor. Being the first company post MBA, it is very unlikely for the respondents to continue in the said firm for a very long time and thus management’s contribution in career planning holds a neutral spot while 43% of the respondents find it an important factor.1% response is recorded for both very important and not important with no one responding to it as an unnecessary factor.

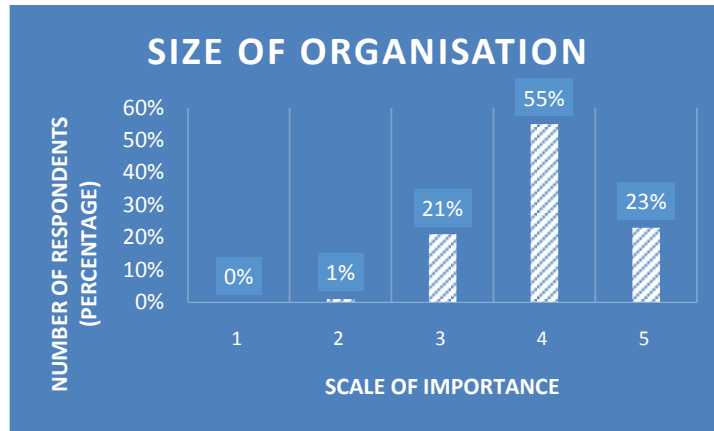
**Opportunities for International work assignments:-**



**Fig i:-**Opportunities for International work assignments

**Discussion:-**

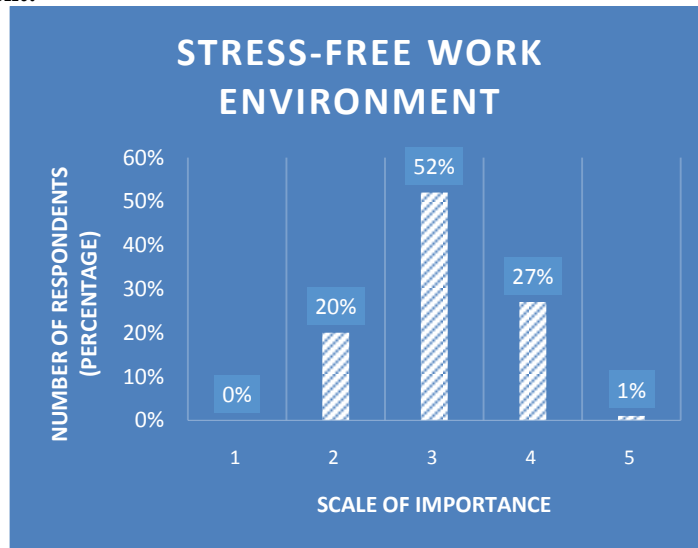
It can be observed by the figure above that maximum respondents i.e. 49% of them find it a neutral factor that plays a role while selecting their employer while 37% of them find it an important factor that is considered while decision-making. 7 % of the responses have been recorded for both not important and an unnecessary factor. No respondent finds this factor as very important.

**Size of the organization:-****Fig j:-** Size of the organization**Discussion:-**

It is observed that 55% of the respondents do not consider the size of the organization an important factor while selecting their future employer while 23% consider it an unnecessary factor.

21% of the respondents have given a neutral response to this with only 1% finding it important.

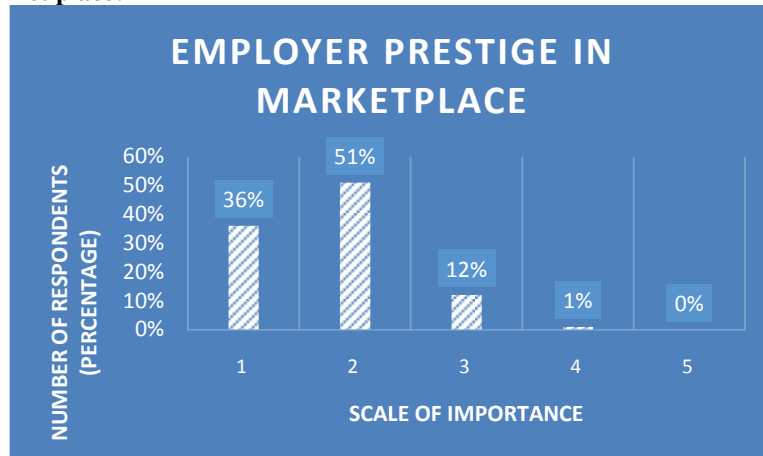
No respondents considers this to be a very important factor.

**Stress-free work environment:-****Fig k:-**Stress-free work environment**Discussion:-**

It can be seen that students do not consider a stress free work environment very crucial with 52% giving a neutral response to it and 27% finding it not important as they feel they can handle and work well in stress.

20% respondents do consider it an important factor while only 1% finds it unnecessary and no responses have been recorded for this factor to be highly important.

**Employer prestige in market place:-**



**Fig l:-**Employer prestige in market place.

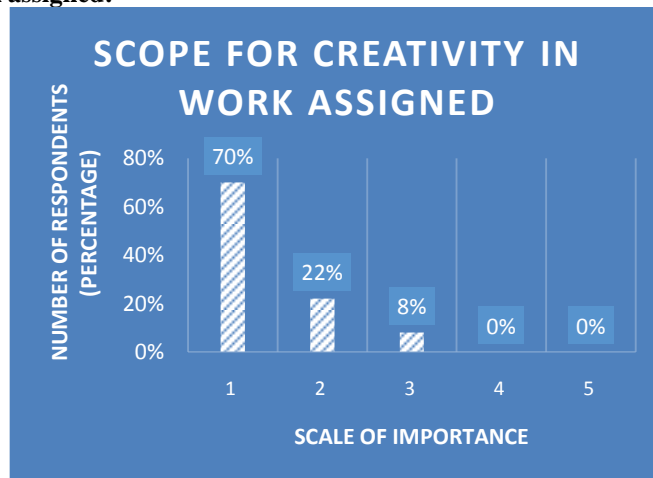
**Discussion:-**

Employer prestige and the brand name holds high dominance for the respondents.

It can be observed that maximum respondents i.e. 51% of the students find it an important factor while deciding and selecting their future employer with 36% of the students find it a very important factor, thus making this as one of the major factors influencing the decision taken.12% of the respondents have provided a neutral response with only 1% response for it being not important.

No respondent has stated that it is an unnecessary factor.

**Scope for creativity in work assigned:-**



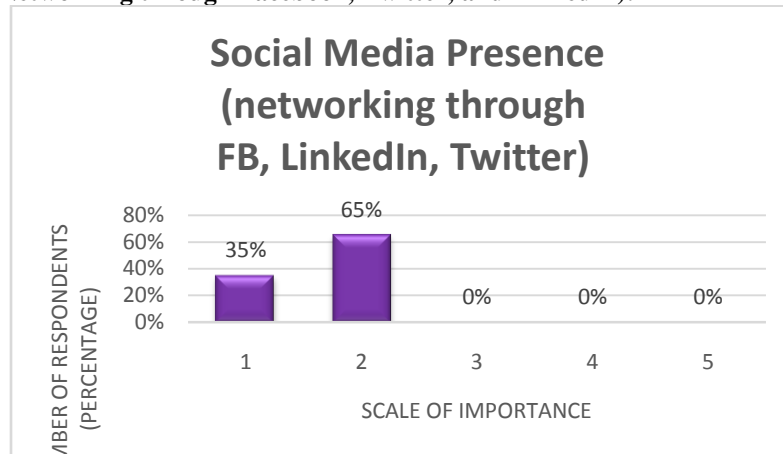
**Fig m:-**Scope for creativity in work assigned

**Discussion:-**

It can be observed from the above figure that respondents find it necessary to have scope of creativity in any project they handle with 71% of them stating it to be a very important factor with 22% of them finding it important.

Only 8% of the respondents have given a neutral response to creativity as a criterion. No respondent finds this factor not important or unnecessary stating that scope of creativity in work is crucial.

**Social media presence (Networking through Facebook, Twitter, and LinkedIn):-**



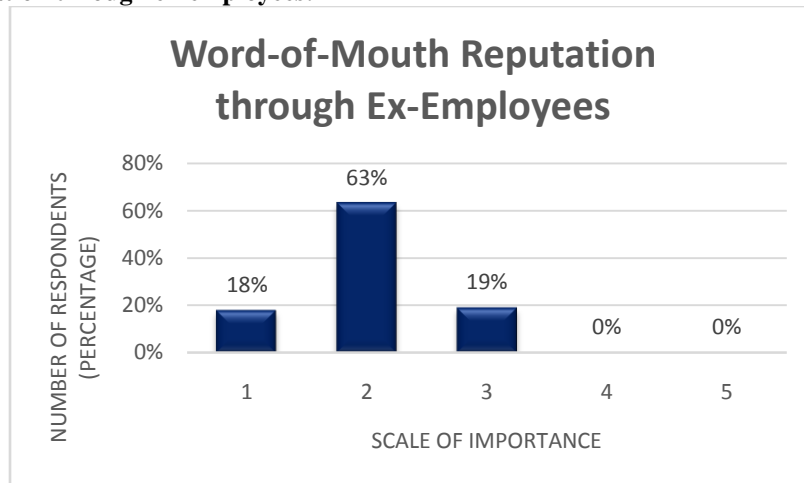
**Fig n:-** Social media presence (Networking through Facebook, Twitter, LinkedIn)

**Discussion:-**

All respondents find social media presence a major influencer and attractor while selecting future hirers.65% of the respondents hold this factor as an important one with 35% of the respondents finding it a very important factor.

No respondent considers it to be neutral, not important or unnecessary stating the high significance of social medial marketing.

**Word-of-mouth reputation through ex-employees:-**

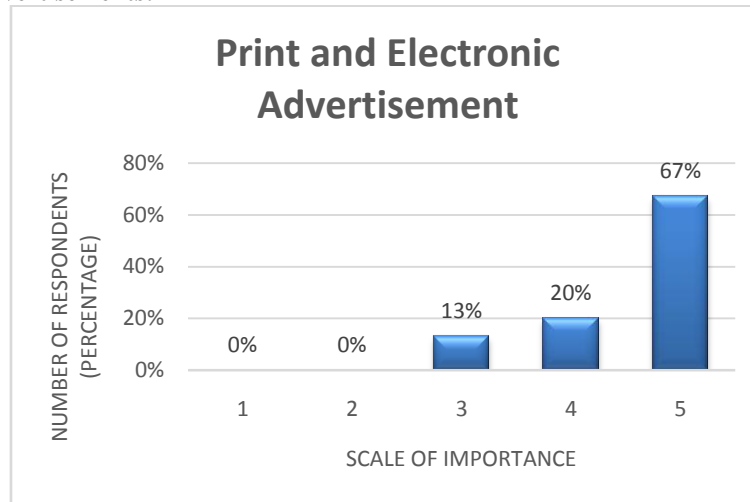


**Fig o:-**Word-of-mouth reputation through ex-employees

**Discussion:-**

Maximum respondents consider word of mouth advertising before taking their employment decision. The above figure states that 63% of the employees consider this to be an important factor before they make their decision with 18% finding it very important and 19% giving a neutral response. No response has been recorded for this factor to be not important or unnecessary thus depicting its major influence on respondents.

**Print and electronic advertisements:-**



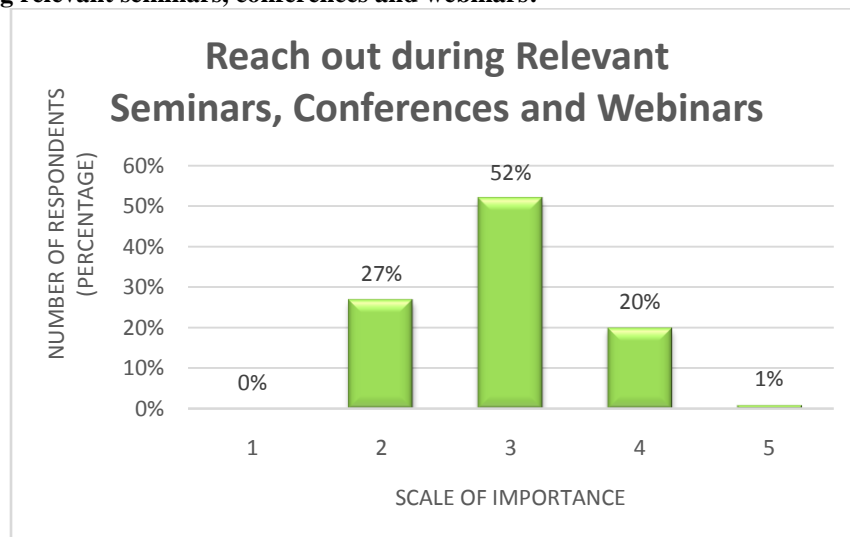
**Fig p:-** Print and electronic advertisements.

**Discussion:-**

It is observed that print and electronic advertisements do not hold much value now-a-days. It can be confirmed by the figure shown above depicting 67% respondents finding it unnecessary with 20% finding it not important and 13% responding to it as neutral.

No respondent considers this to be an important or very important factor while selecting their future employers.

**Reach-out during relevant seminars, conferences and webinars:-**



**Fig q:-**Reach-out during relevant seminars, conferences and webinars.

**Discussion:-**

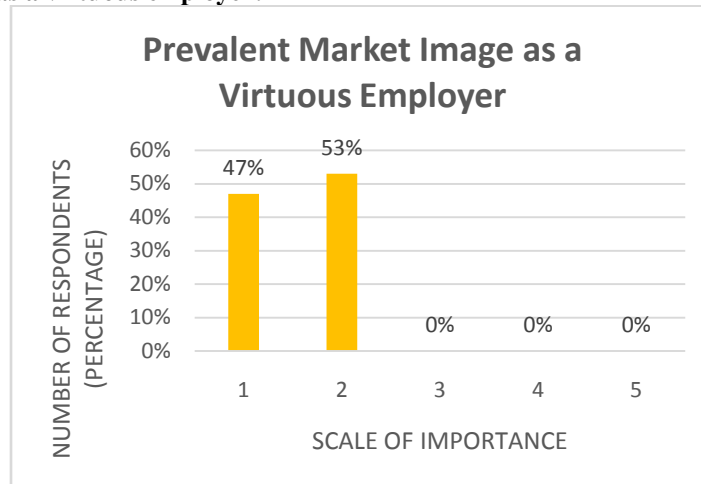
The above figure states that 52% of the respondents find this factor to be a neutral influencer with 27% finding it important.

20% of the respondents do not find it important and 1% find it as an unnecessary parameter.

No respondent finds it to be a very important factor.



**Prevalent market image as a virtuous employer:-**

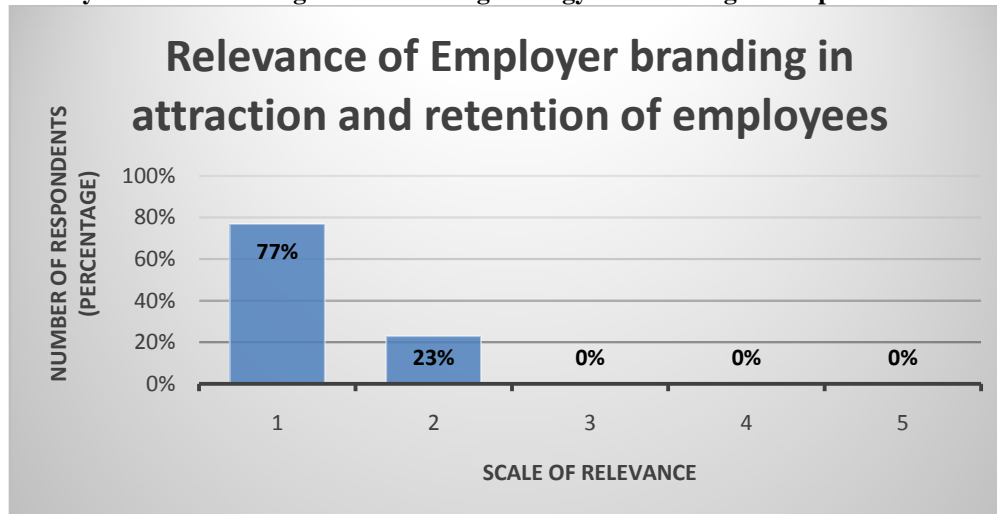


**Fig r:-** Prevalent market image as a virtuous employer.

**Discussion:-**

All respondents find it important for their selected employer to have a prevalent market image as a virtuous employer with 53% finding it important and 47% finding it a very important factor.

**How relevant do you feel is branding and advertising strategy in attracting better potential recruits?**



**Fig 4:-**Relevance of employer branding in attraction and retention of employees

**Discussion:-**

Majority of the respondents feel that employer branding plays a major role in attracting and retaining employees in an organization.

It can be observed from the figure that 77% of the respondents find employer branding very relevant for attracting and retaining employees with 23% finding it an important factor.

**Are there any specific parameters that would motivate you to select a particular organization over the others?**

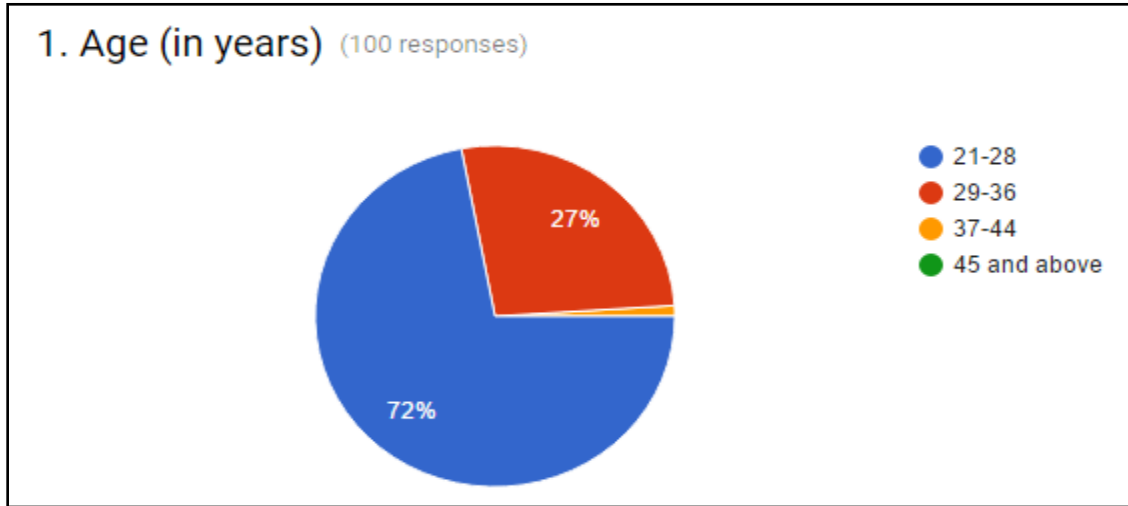
Majority of the respondents look into organization’s social media presence and word-of-mouth (through ex-employees) before selecting a particular organization over others.

Job specific training sponsored by the company augments the inclination towards a future employer. Career management seems to have an influence on the perceived quality of employment experience. Working conditions

influence the entire working experience increasing overall satisfaction of employees. Other specific parameters being stable growth and remuneration prospects offered by the organization, transparency in leadership decision making and open culture of the organization. Thus, these are the factors which play a dominant role while a prospective employee makes decisions about his/her future employment.

### Part 2:- Employee Questionnaire

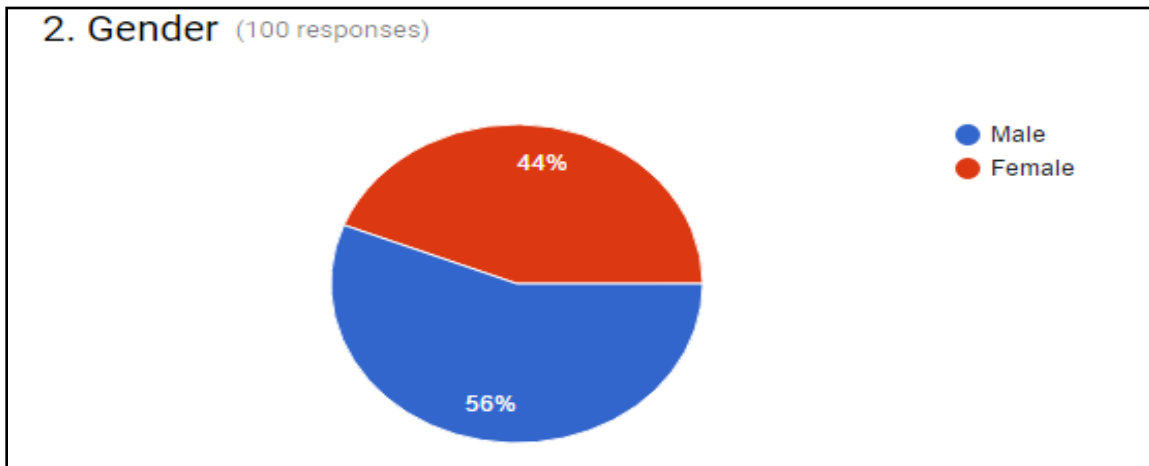
Age:-



**Fig 1:-**Age of the Respondents

As evident in the graph above, 72% of the respondents belonged to the age bracket of 21-28 years. The intention was to capture the responses of freshers/young professionals working in the IT sector. On the other hand, 27% of the respondents belonged to the age bracket of 29-36 years which constitutes the middle management layer of the respective organizations.

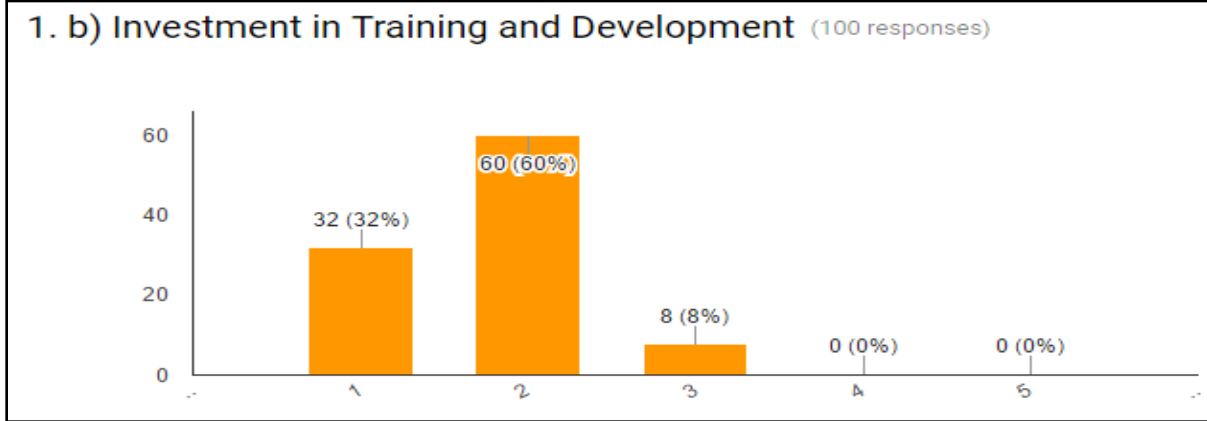
Gender:-



**Fig 2:-** Gender of the Respondents.

The above male to female ratio is reflective of the general diversity ratio observed in the organizations which have been considered. While this ratio was once dominated by the male counterparts, it can be seen from the above figure that there is a definite alteration in the conventional trends and thus today the female professionals are as much part of the private sector jobs as their male colleagues.

The prominent parameters which came out from the study include:-  
**Investment in training and development**



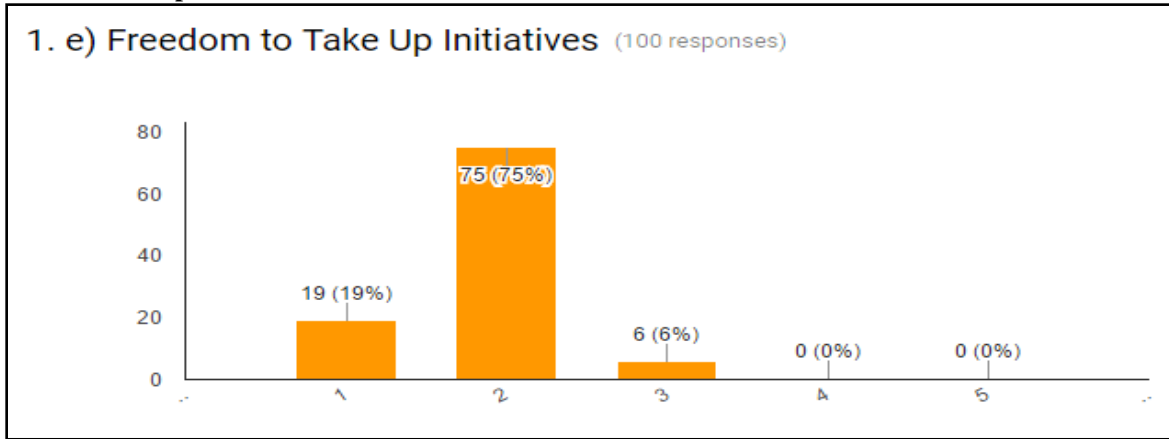
Note: X axis is to measure the scale of importance while percentage of respondents has been assimilated in Y Axis

Fig a:- Investment in training and development

**Discussion:-**

Majority of the respondents (60%) were satisfied with the current exposure to requisite Training and Development programs and thus considered it as one of the prime parameters to be considered while evaluating the internal brand image of an employer.

**Freedom to take up initiatives:-**



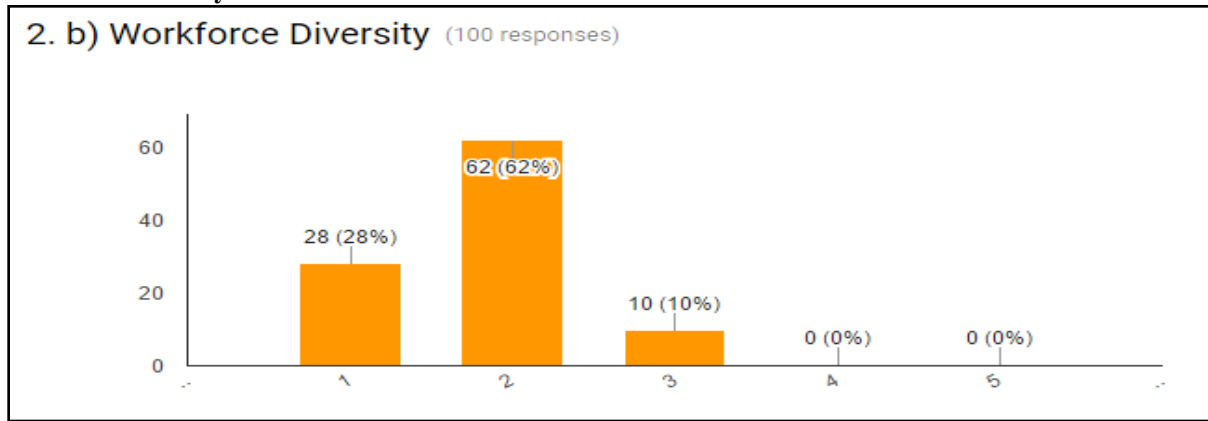
Note: X axis is to measure the scale of importance while percentage of respondents has been assimilated in Y Axis

Fig b:- Freedom to take up initiatives.

**Discussion:-**

Majority of the Respondents (75%) rated Freedom to take up initiative as a very high parameter towards satisfaction in their respective employment. This is clearly indicative of how autonomy at workplace can play a prime role in retaining employees in an organization.

**Workforce diversity:-**



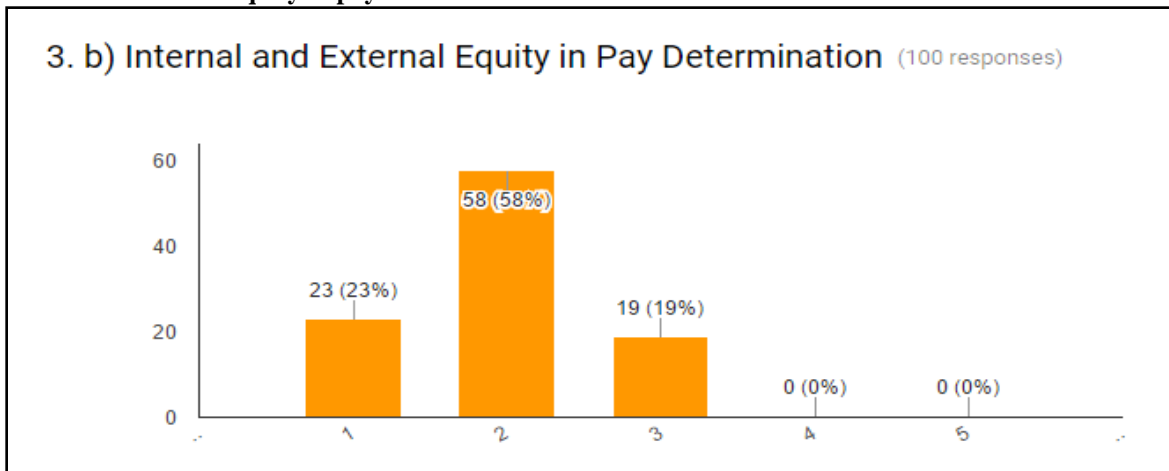
**Note:** X axis is to measure the scale of importance while percentage of respondents has been assimilated in Y Axis

**Fig c:-**Workforce diversity.

**Discussion:-**

Majority of the respondents (62%) were of the opinion that workforce diversity definitely helps the organization in establishing a renowned brand image. Diversity at workplace shows that the organization is open to versatility in its talent pool and is cognizant towards the importance of maintaining a healthy balance in the male – female ratio.

**Internal and external equity in pay determination:-**



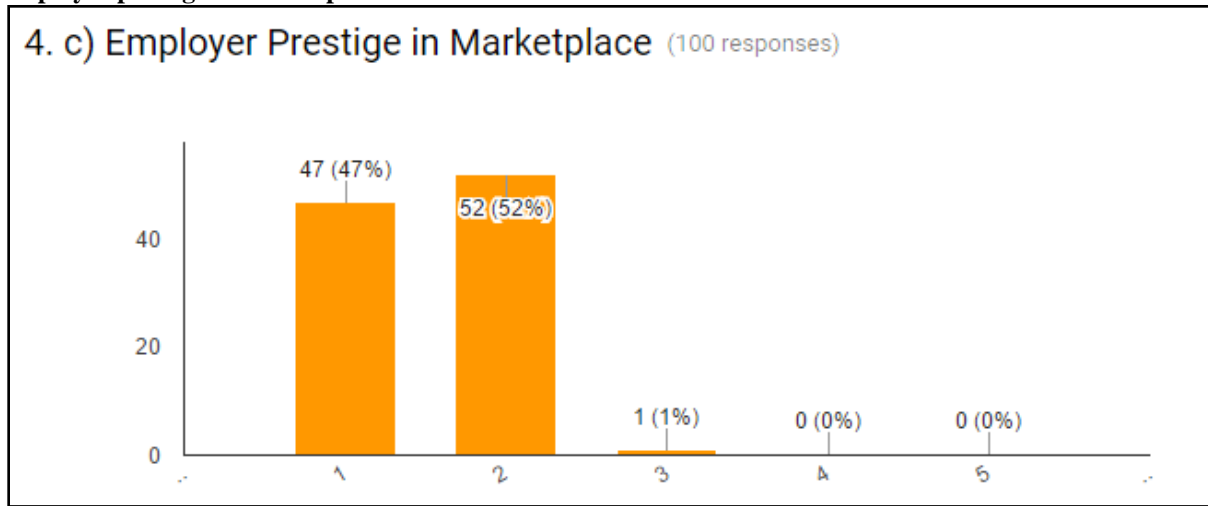
**Note:** X axis is to measure the scale of importance while percentage of respondents has been assimilated in Y Axis

**Fig d:-**Internal and external equity in pay determination

**Discussion:-**

Majority of the respondents (58%) were satisfied with the kind of time and investment their respective organizations were making towards maintaining internal and external equity during pay-outs. Ensuring that the salary/increments/yearly bonus are marked to market, is extremely important in today’s competitive business environment. This ensures that the respective firm does not lose out on its critical talent. Benchmarking salaries also helps in attracting the best-in-class talent when it comes to recruitment.

**Employer prestige in marketplace:-**



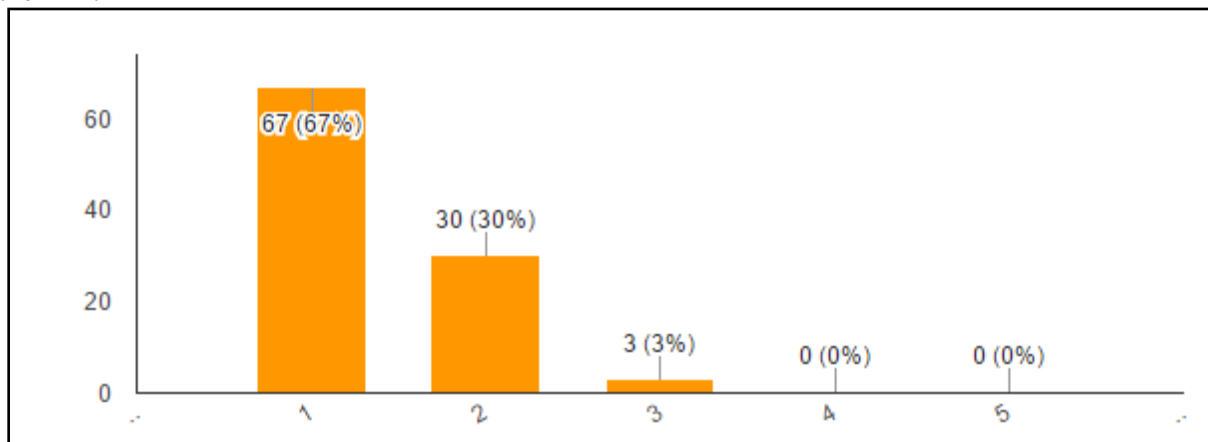
**Note:** X axis is to measure the scale of importance while percentage of respondents has been assimilated in Y Axis

**Fig e:-** Employer prestige in marketplace.

**Discussion:-**

The above figure is clearly indicative of the fact that a significant portion of the respondents were extremely satisfied in regards to the prestige of their organization in the IT industry. This evident inclination brings out the fact that an established and well-known brand in the market place is a definite plus point when it comes to attraction and retention of employees.

**How relevant do you feel is strategic employer branding towards ensuring enhanced retention levels within the firm?**



**Note:** X axis is to measure the scale of importance while percentage of respondents has been assimilated in Y Axis

**Fig 3:-**Relevance of strategic employer branding towards ensuring enhanced retention levels.

**Discussion:-**

67% of the respondents felt that employer branding is extremely important in attracting and retaining employees in an organisation. Further, 30% of the respondents were of similar opinion. The results seen above are in definite alignment with the primary objective of the entire research which is being conducted.

**Are there any specific parameters that would motivate you to stay loyal towards your current job?****Discussion:-**

Certain concrete parameters which came out through this particular question include: higher education facilitation, work life balance, brand name/market standing of the organization, opportunities to handle diversified portfolio, transparency in leadership decision making, progressive culture (at par with market dynamics), variability in routine job - more exposure, benefits to cater for diversity at workplace, opportunities to upscale skill-sets and access to versatile profiles within the organization.

The above factors are essentially responsible for preferring one organization over the other. Successful incorporation of the above factors also result in differentiating a virtuous employer from other several employers in the marketplace.

**Hypothesis Validation:-**

The employee questionnaire consisted of certain relevant variables which reinforce the entire employment experience thereby *positively influencing* the retention levels within a firm. A total of seventeen such variables were considered and Factor Analysis was done on them (using the SPSS tool) in order to club these variables under broader factors. The intention has been to define certain relevant factors which would have a direct implication on retention levels within a firm.

Under factor analysis, we do not make any categorical distinction between a dependent and an independent variable. Infact the relationship between each of the independent variables are studied to be able to classify them under common heads based on certain commonalities which may exist. Thus, a set of procedures are conducted to examine the relationship between a set of interdependent variables with a broader objective of data reduction and summarization.

In this context, factor analysis would help us to determine the underlying factors which according to the employees have a crucial role to play while establishing a renowned employer brand.

Before we delve into the results of the factor analysis which was conducted, it is important to highlight the steps which were followed to do the same.

First and foremost the objective behind conducting the analysis was set, which in our case is to try and point out certain relevant variables which according to employees of certain renowned IT giants are required to ensure that they stay loyal to their respective organizations. Further, the KMO and Bartlett's test of Sphericity helps us to understand if the variables are adequately correlated with each other and whether or not Factor Analysis is relevant in the given situation. A value greater than 0.5 and significance level equivalent to 0.00 indicates that it is acceptable to process with Factor Analysis for further examination. Further, Varimax method of rotation is selected and the requisite procedure is executed.

The variables that were considered as part of the employee survey are as follows –

1. Concern towards Employees
2. Investment in Training and Development
3. Job/Role Rotation Frequency
4. Openness in Organization Culture
5. Freedom to take-up Initiatives
6. Variation in Routine Work
7. Workforce Diversity
8. Work as per Pre-determined Schedule
9. Relevance of Academic Degree
10. Salary Hikes
11. Internal and External Equity in Pay Determination
12. Management Contribution towards Employees' Career Planning
13. Opportunities for International Work Assignments
14. Size of Organization
15. Stress – Free Work Environment

16. Employer Prestige in Marketplace  
 17. Scope for Creativity in Work Assigned

The 100 employees who were surveyed across versatile roles/profiles were asked to rate these variables in terms of their relevance towards creating the image of a virtuous employer. The ratings were given on a scale of 1 to 5 varying from Very Relevant to Irrelevant. These were then entered in SPSS to conduct Factor analysis. The result of the same is as follows –

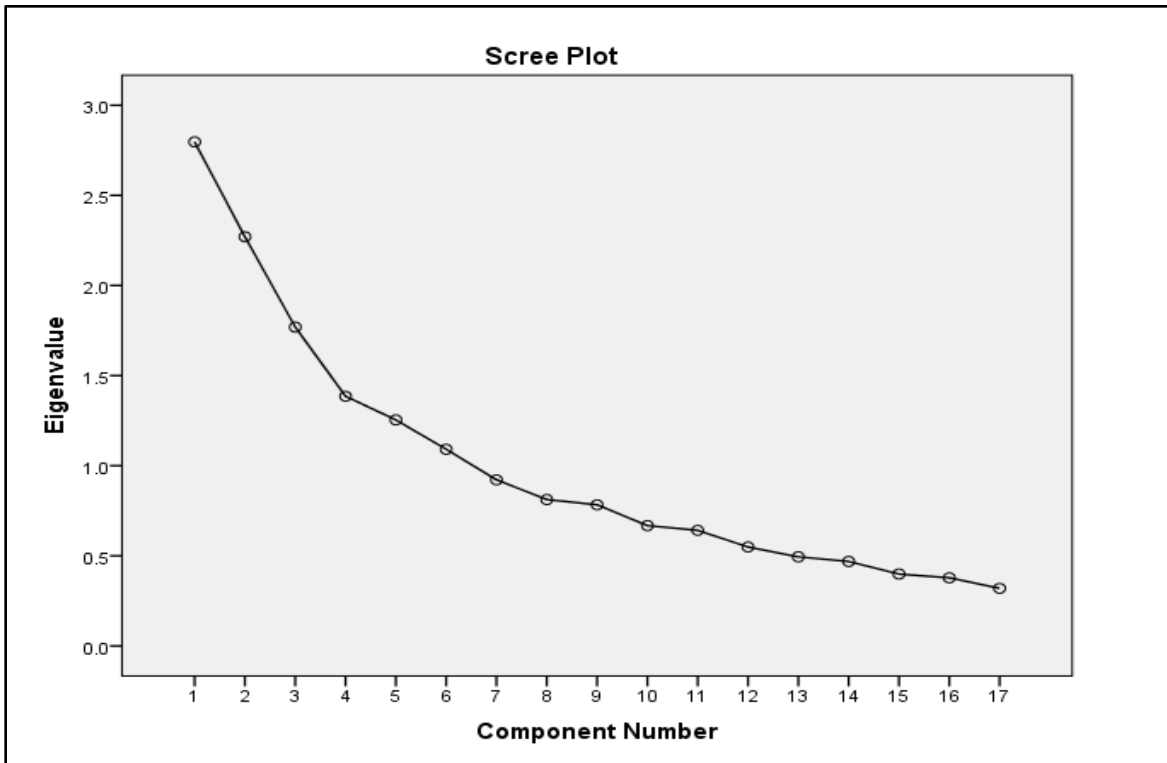
<b>Factor Analysis</b>		
<b>KMO and Bartlett's Test</b>		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.620
Bartlett's Test of Sphericity	Approx. Chi-Square	316.365
	df	136
	Sig.	.000

<b>Communalities</b>		
	Initial	Extraction
ConcernTowardsEmployees	1.000	.420
InvestmentInTrainingAndDevelopment	1.000	.644
JobRoleRotationFrequency	1.000	.643
OpennessInOrganizationCulture	1.000	.661
FreedomToTakeUpInitiatives	1.000	.637
VariationInRoutineWork	1.000	.491
WorkforceDiversity	1.000	.624
WorkAsPerPreDeterminedSchedule	1.000	.746
RelevanceOfAcademicDegree	1.000	.684
SalaryHikes	1.000	.698
InternalAndExternalEquityInPayDetermination	1.000	.470
ManagementContributionTowardsEmployeesCareerPlanning	1.000	.472
OpportunityForInternationalWorkAssignment	1.000	.607
SizeOfOrganization	1.000	.630
StressFreeWorkEnvironment	1.000	.670
EmployerPrestigeInMarketplace	1.000	.636
ScopeForCreativityInWorkAssigned	1.000	.832

Extraction Method: Principal Component Analysis.

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.797	16.450	16.450	2.797	16.450	16.450	2.216	13.035	13.035
2	2.270	13.356	29.806	2.270	13.356	29.806	2.157	12.690	25.725
3	1.769	10.405	40.211	1.769	10.405	40.211	1.642	9.658	35.383
4	1.385	8.147	48.358	1.385	8.147	48.358	1.635	9.618	45.000
5	1.254	7.377	55.735	1.254	7.377	55.735	1.552	9.131	54.132
6	1.091	6.419	62.154	1.091	6.419	62.154	1.364	8.022	62.154
7	.922	5.422	67.576						
8	.812	4.777	72.353						
9	.783	4.607	76.960						
10	.667	3.926	80.886						
11	.641	3.772	84.658						
12	.549	3.230	87.888						
13	.494	2.908	90.796						
14	.469	2.756	93.552						
15	.399	2.346	95.898						
16	.378	2.223	98.120						
17	.320	1.880	100.000						

Extraction Method: Principal Component Analysis.





	Component					
	1	2	3	4	5	6
ConcernTowardsEmployees	.041	.296	.561	.099	.006	.079
InvestmentInTrainingAndDevelopment	.676	-.016	.277	.040	-.059	.323
JobRoleRotationFrequency	.304	.126	.346	.641	-.034	.052
OpennessInOrganizationCulture	-.167	-.054	.715	.224	.233	-.123
FreedomToTakeUpInitiatives	.449	-.179	.583	-.067	-.183	.160
VariationInRoutineWork	.656	.092	-.085	-.063	-.192	.063
WorkforceDiversity	-.023	-.023	.209	-.123	.653	-.370
WorkAsPerPreDeterminedSchedule	-.015	.205	-.044	.079	.818	.163
RelevanceOfAcademicDegree	-.294	.125	-.320	.613	.037	.321
SalaryHikes	.115	-.065	.191	.784	-.003	-.169
InternalAndExternalEquityInPayDetermination	.455	.359	.159	.209	.193	-.167
ManagementContributionTowardsEmployeesCareerPlanning	.385	.514	.000	.111	.180	.126
OpportunityForInternationalWorkAssignment	-.232	.659	.177	-.142	.224	-.131
SizeOfOrganization	-.018	.772	-.094	.089	.124	.035
StressFreeWorkEnvironment	-.696	.228	.104	-.236	-.187	.177
EmployerPrestigeInMarketplace	.043	.687	.085	-.007	-.393	.016
ScopeForCreativityInWorkAssigned	.095	-.011	.065	-.037	-.019	.904

### Inferences:-

A 'KMO' (Kaiser-Meyer-Olkin measure of sampling adequacy) value of 0.620 indicates that Factor Analysis is the relevant process to be conducted. Once it has been established that Factor Analysis is appropriate in the context, we move on to choose the various approaches within it. In this case, we selected the Principal Component Analysis method, in which the total variance spanning the data set is considered. The factors thus derived are termed as Principal Components. The next table is the 'Community' table which indicates the magnitude of variance each variable shares with all other variables considered. The next important outcome is the 'Total Variance Explained' table. The 'Initial Eigen Values' / or simply Eigen Values given in the table are values that give us the variance explained by each factor. The variance attributed to each factor is in decreasing order of magnitude (as seen in the table).

Under this approach, only factors with values greater than one are considered for further study while others are left out. Thus, the total factors in our case are 6. Also, it is to be noted that a Cumulative Variance % between 60 and 70 is considered to be appropriate (which is 62.15 in our case).

The next diagram is commonly called as the 'Scree Plot'. This is a plot of the calculated Eigen Values against the number of factors which have been extracted. The shape of this plot is significantly used when it comes to determining the actual factors to be considered. There is an evident break in this plot with an initial sharp slope of factors with Eigen value greater than one which is subsequently followed by a sprawling set of other factors. This gradual trailing off is referred to as the Scree and it has been proven that the point at which this Scree begins denotes the actual number of factors. However, it is to be kept in mind that the factors so determined are invariably one or more than the ones determined by the Eigen Value table. In our result, the point at which the trailing off begins is 8 (2 more than the factors which we got from the previous table). One of the most significant output of this exercise is the 'Component Matrix' table. However, the initial or the 'Un-rotated Factor Matrix' as it is termed may not be the most reliable output to be independently taken into account. This is because the initial solution generally witnesses a correlation between a single factor and many associated variables. Such results if obtained are difficult to interpret.

Thus, in order to simplify things, the 'Rotated Component Matrix' is taken into consideration which essentially rotates the original solution to ensure that the factors have significant loadings with only the relevant variables. Thus, using the results of the Rotated Component Matrix Table, we would place certain associated variables under the same umbrella. In order to do this, the researchers will have to predetermine a certain cut-off across components. For the study under consideration, the benchmark which has been set is 0.65. Thus, all variables with a score above 0.65 (under a given component) would be clubbed under a common factor heading. The relevant factors and their subsequent variable/s thus identified include –

**Factor 1:-**

- Investment in Training and Development
- Variation in Routine Work

**Factor 2:-**

- Opportunities for International Work Assignments
- Size of Organization
- Employer Prestige in Marketplace

**Factor 3:-**

- Openness in Organization Culture

**Factor 4:-**

- Salary Hikes

**Factor 5:-**

- Workforce Diversity
- Work as per Pre-determined Schedule

**Factor 6:-**

- Scope for Creativity in Work Assigned

The 17 variables initially considered have been thus reduced to 10 relevant variables which span across 6 factors. The factors so framed are based on the opinion of the employees working in IT companies. The results thus signify the important variables that have a key role to play in placing a given employer brand at a superior position as against its counterparts.

The factors identified above can now be assigned suitable heads based on the initial literature review conducted.

**Factor 1 – Variability in Job Setting and Overall Development/Empowerment**

**Factor 2 – Organizational Reputation and Flexibility**

**Factor 3 – Work Environment**

**Factor 4 – Compensation and Career Progression**

**Factor 5 – Workforce Assortment and Streamlined Job Activities**

**Factor 6 – Requisite Autonomy at Workplace**

Apart from the above set of variables, an additional question was also asked to collect opinion regarding the positive impact of strategic employer branding initiatives in regards to retention levels within a firm. The rating was collected on a Likert Scale ranging from 'Very Relevant' to 'Extremely Irrelevant'. The results were as follows –

Rating	Number of Responses (out of 100)	Percentage of Responses (%)
1 – Very Relevant	67	67
2 – Relevant	30	30
3 – Neutral	3	3
4 – Irrelevant	0	0
5 – Extremely Irrelevant	0	0

The derivations from the factor analysis and the above result evidently support the pre-determined hypothesis which states that – ‘Strategic Employer Branding reinforces the entire employment experience thereby positively *influencing* the retention levels within a firm’. The identified set of factors further help us point out the specific branding initiatives which have critical role to play in the mentioned arena.

The second set of questions were for students from premium management institutes in the city of Pune. The student questionnaire consisted of certain relevant variables which reinforce the fact that branding and advertising activities executed as part of the recruitment experience *positively impact* the candidate pool; thereby leading to better potential recruits. A total of eighteen such variables were considered and Factor Analysis was done on them (using the SPSS tool) in order to club these variables under broader factors. The intention has been to define certain relevant factors which if catered to, would result in definite attraction towards the latent employer. The variables that were considered as part of the employee survey are as follows –

1. Concern towards Employees
2. Investment in Training and Development
3. Job/Role Rotation Frequency
4. Openness in Organization Culture
5. Freedom to take-up Initiatives
6. Salary Hikes
7. Internal and External Equity in Pay Determination
8. Management Contribution towards Employees’ Career Planning
9. Opportunities for International Work Assignments
10. Size of Organization
11. Stress – Free Work Environment
12. Employer Prestige in Marketplace
13. Scope for Creativity in Work Assigned
14. Social Media Presence (Networking through Facebook, Twitter, LinkedIn)
15. Word-of-Mouth Reputation through Ex-Employees
16. Print and Electronic Advertisements
17. Reach-out during Relevant Seminars, Conferences and Webinars
18. Prevalent Market Image as a Virtuous Employer

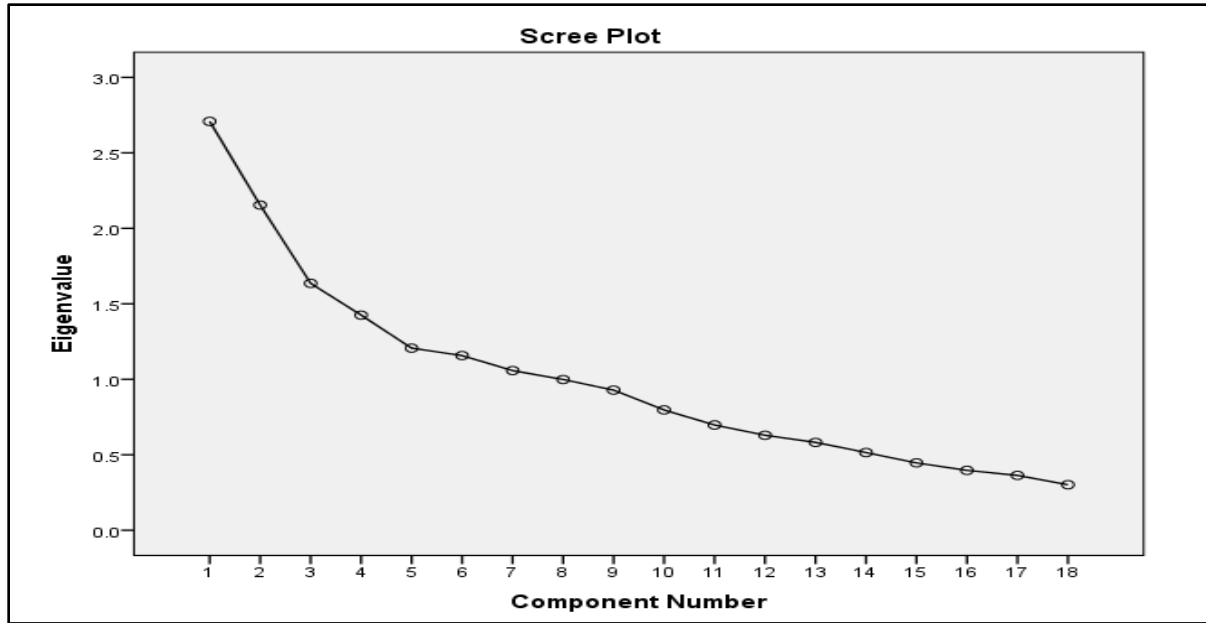
The 100 students who were surveyed belonged to versatile academic backgrounds and were asked to rate these variables in terms of their relevance towards creating the image of a virtuous employer. The ratings were given on a scale of 1 to 5 varying from Very Relevant to Irrelevant. These were then entered in SPSS to conduct Factor analysis. The result of the same is as follows-

→ Factor Analysis		
KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.579
Bartlett's Test of Sphericity	Approx. Chi-Square	301.730
	df	153
	Sig.	.000

Total Variance Explained									
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.708	15.046	15.046	2.708	15.046	15.046	2.123	11.792	11.792
2	2.154	11.967	27.013	2.154	11.967	27.013	2.101	11.673	23.464
3	1.636	9.088	36.100	1.636	9.088	36.100	1.672	9.287	32.752
4	1.425	7.917	44.018	1.425	7.917	44.018	1.457	8.094	40.846
5	1.206	6.701	50.719	1.206	6.701	50.719	1.360	7.557	48.403
6	1.157	6.428	57.147	1.157	6.428	57.147	1.341	7.452	55.855
7	1.058	5.877	63.024	1.058	5.877	63.024	1.291	7.170	63.024
8	.998	5.547	68.571						
9	.929	5.159	73.730						
10	.797	4.428	78.158						
11	.697	3.874	82.032						
12	.629	3.496	85.528						
13	.582	3.233	88.761						
14	.515	2.861	91.622						
15	.446	2.479	94.101						
16	.397	2.204	96.306						
17	.363	2.019	98.325						
18	.302	1.675	100.000						

Extraction Method: Principal Component Analysis.

Rotated Component Matrix <sup>a</sup>							
	Component						
	1	2	3	4	5	6	7
ConcernTowardsEmployees	.309	-.012	.269	.440	-.051	-.451	-.096
InvestmentInTrainingAndDevelopment	.016	.475	.649	.014	.074	.009	.026
JobRoleRotationFrequency	.112	.544	.216	.364	-.132	-.144	-.239
OpennessInOrganizationCulture	-.020	.072	-.104	.881	.060	.070	.006
FreedomToTakeUpInitiatives	-.246	.238	.497	.372	-.360	-.050	.168
SalaryHikes	-.051	.468	-.056	.234	.041	-.430	-.383
InternalAndExternalEquityInPayDetermination	.348	.638	-.019	.055	-.189	.129	-.147
ManagementContributionTowardsEmployeesCareerPlanning	.448	.425	.115	.043	-.041	.026	.307
OpportunityForInternationalWorkAssignment	.659	-.073	-.353	.293	-.033	.120	.200
SizeOfOrganization	.813	.068	-.023	-.071	.070	.083	-.173
StressFreeWorkEnvironment	.296	-.719	-.051	.070	-.157	.047	-.110
EmployerPrestigeInMarketplace	.621	-.063	.255	-.080	-.132	-.299	.143
ScopeForCreativityInWorkAssigned	.087	-.082	.697	-.102	.035	.109	.104
SocialMediaPresence	.085	-.012	.190	.084	-.113	.845	-.060
WOMReputationThroughExEmployees	-.203	.007	.326	.190	.258	.243	-.099
PrintAndElectronicAdvertisements	.029	-.039	.099	-.001	.047	-.039	.859



ReachOutDuringRelevant SeminarsConferencesWebinars	-.052	-.198	.128	-.002	.782	-.078	-.074
PrevalentMarketImageAsAVirtuousEmployer	.012	.363	-.095	.028	.648	-.034	.250

Extraction Method: Principal Component Analysis.  
 Rotation Method: Varimax with Kaiser Normalization.  
 a. Rotation converged in 10 iterations.

**Inferences:-**

A ‘KMO’ (Kaiser-Meyer-Olkin measure of sampling adequacy) value of 0.579 indicates that Factor Analysis is the relevant process to be conducted. The next important outcome is the ‘Total Variance Explained’ table. The ‘Initial Eigen Values’ / or simply Eigen Values given in the table are values that give us the variance explained by each factor. The variance attributed to each factor is in decreasing order of magnitude (as seen in the table). This is because the initial factors would be more dominant than the consequent trailing ones. Under this approach, only factors with values greater than one are considered for further study while others are left out. Thus, the total factors in our case are 7. Also, it is to be noted that a Cumulative Variance % between 60 and 70 is considered to be appropriate (which is 63.02 in our case).

The next diagram is commonly called as the ‘Scree Plot’. This is a plot of the calculated Eigen Values against the number of factors which have been extracted. There is an evident break in this plot with an initial sharp slope of factors with Eigen value greater than one which is subsequently followed by a sprawling set of other factors. In our result, the point at which the trailing off begins is 9 (1 more than the factors which we got from the previous table). One of the most significant output of this exercise is the ‘Rotated Component Matrix’ which essentially rotates the original solution to ensure that the factors have significant loadings with only the relevant variables. Thus, using the results of the Rotated Component Matrix Table, we would place certain associated variables under the same umbrella. In order to do this, the researchers will have to predetermine a certain cut-off across components. For the study under consideration (student data), the benchmark which has been set is 0.6. Thus, all variables with a score above 0.63 (under a given component) would be clubbed under a common factor heading. The relevant factors and their subsequent variable/s thus identified include –

**Factor 1:-**

- Size of Organization

**Factor 2:-**

- Internal and External Equity in Pay Determination

**Factor 3:-**

- Investment in Training and Development
- Scope for Creativity in Work Assigned

**Factor 4:-**

- Openness in Organization Culture

**Factor 5:-**

- Reach-out during Relevant Seminars, Conferences and Webinars
- Prevalent Market Image as a Virtuous Employer

**Factor 6:-**

- Social Media Presence

**Factor 7:-**

- Print and Electronic Advertisements

The 18 variables initially considered have been thus reduced to 9 relevant variables which span across 7 factors. The factors so framed are based on the opinion of the students currently studying in management institutes in the city of Pune. The results thus signify the important variables that have a key role to play in placing a probable employer brand at a superior position as against its competitors.

The factors identified above can now be assigned suitable heads based on the initial literature review conducted.

**Factor 1 – Organizational Reputation****Factor 2 – Compensation and Career Progression****Factor 3 – Requisite Autonomy at Workplace and Overall Development/Empowerment****Factor 4 – Work Environment****Factor 5 – Promotional Initiatives by a Firm and Righteousness of Potential Employer****Factor 6 – Brand Endorsement in Virtual World****Factor 7 – Extensive Marketing Strategies to Attract Future Incumbents**

Apart from the above set of variables, an additional question was also asked to collect opinion regarding the critical role that enhanced recruitment experience plays in attracting a better talent pool. The rating was collected on a Likert Scale ranging from ‘Very Relevant’ to ‘Extremely Irrelevant’. The results were as follows –

Rating	Number of Responses (out of 100)	Percentage of Responses (%)
1 – Very Relevant	77	77
2 – Relevant	23	23
3 – Neutral	0	0
4 – Irrelevant	0	0
5 – Extremely Irrelevant	0	0

The derivations from the factor analysis and the above result evidently support the pre-determined hypothesis which states that – ‘Branding and advertising activities executed as part of the recruitment experience *positively impact* the candidate pool; thereby leading to better potential recruits’. The identified set of factors further help us point out the specific branding initiatives which have critical role to play in the mentioned arena.

**Significance of the Outcome:-**

Organisations have profusely used marketing and branding practices to stimulate product/service brand loyalty in customers. Building up on similar lines, firms today are intensifying this activity to further distinguish themselves as against their counterparts, thereby making them desirable employers in the eyes of their current and/or plausible workforce. Through this dissertation, we attempted to highlight the need for IT organisations to strategically align their HR function, most specifically functions like recruitment, learning and development, and marketing/communication, in order to build the image of a an *admired employer* thereby resulting in enhanced attraction and retention levels.

The researchers have tried to point out that if managers at the planning and execution level in IT organizations try to focus their energies on the identified set of factors, it would definitely facilitate them to uplift the stature of their respective organizations. Finally, this synergic initiative would aid the firms to be branded with the title of 'Employer of Choice', subsequently elevating their financial standing as well.

### **Conclusion and Recommendations:-**

At a broader level, firms have been seen to realise the significance of building a strategic employer brand. This understanding has been proven by the fact that organizations today are expending a substantial amount to expand the realm of employer branding. The intention is crystal clear; invest in attracting the best talent pool in the industry, employ streamlined initiatives to retain them and consequently ensure that there is economic value add out of the entire exercise. Further, successfully attracting the best minds in the industry gives the firm an evident edge over its competitors.

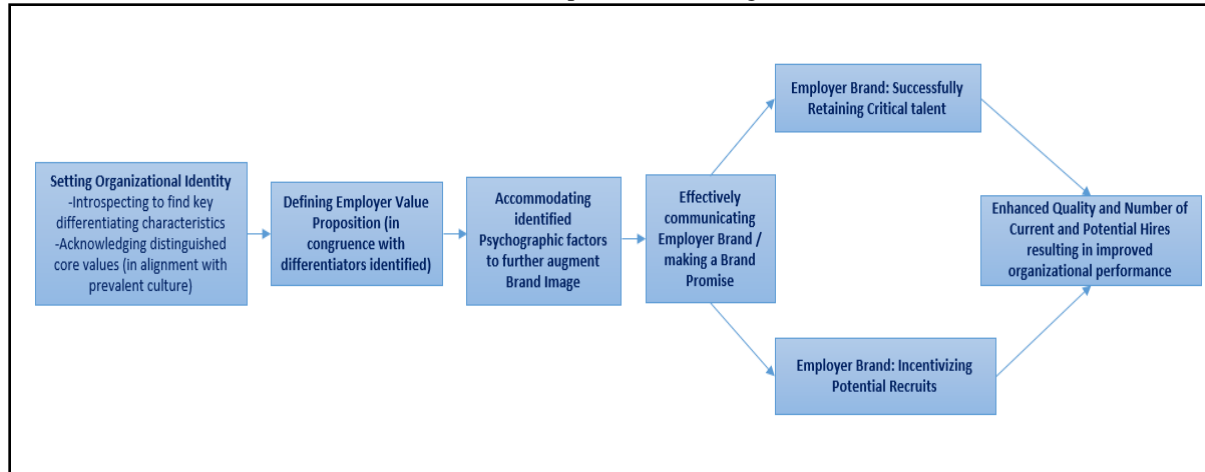
At an individualistic level, the benefits of employer branding are again manifold. Potential recruits rely on their personal perceptions about a brand or the generic word of mouth while evaluating the pros and cons of being associated with a potential employer. There are off course certain other evident benefits of establishing an Employee Value Proposition. The first and foremost being the ability to curb the total time taken to fill in a position. Since an established brand automatically attracts decent quality talent, the ensued time required for advertising and related search activities is cut down by a great extent. The next important dimension is that of the cost per hire. A targeted brand promise helps in enticing the right talent pool, thereby plummeting the need for employee referral. As recruitment related expenditures are done within a certain pre-determined amount of budget, the reduced cost per hire turns out to be significantly beneficial. Further, during adverse trade cycles, such as a situation of recession, an appealing employer brand warrants that the current workforce is retained, thereby contributing towards financial stability. Finally, since the umbrella of employer branding also entails eminent learning and development initiatives, it is consequently ensured that the overall 'quality of hire' is enriched; thereby guaranteeing better client servicing by the organization.

Another point to be noted here is that since bulk of the operational costs (65%-70%) comprise of human resource related expenditure, curbing it down would inevitably make sure that the business is profitable. It is thus imperative to understand that even peripheral improvement in attraction and retention levels would facilitate long term sustainability of the firm.

In this study, we tried to capture the perceived importance of varied psychographic factors. To do the same, a sample of both employed and unemployed (seeking job opportunities) personal was taken. Each of these individuals were asked to rate each of the variables considered, in regards to their relative importance, on a multi-rating scale. Further, through exploratory factor analysis (principal component method), the significant dimensions in regards to employer attractiveness and employee retention, were brought to light.

Factors such as Variability in Job Setting, Overall Development/Empowerment, Organizational Reputation, Flexibility, Compensation and Career Progression emerged to be dominant factors across the sample size considered. This is reflective of the fact that the workforce of today demands autonomy at workplace and adequate space to be creative in their daily tasks and responsibilities. Further, corporate image and prestige in marketplace was observed to be a substantial determining factor for an employee's decision regarding pursuance of any employment. Also, a significant number of respondents were seen to be in agreement with the stated hypothesis, thereby certifying the relevance of the research conducted. These results therefore have pertinent managerial implications and can be thought provoking as far as human resource management is concerned. Hence, comprehending the versatile preferences of impending job hunters, would enable the line managers to be proactive in their approach and ensure that productive employment messages are adequately conveyed, as and when required.

The above discussions can be illustrated with the help of the following framework –



Finally, it needs to be acknowledged that the study had certain **limitations**. The research sample consisted of two broad segments - employees working in four renowned IT Corporates and job seekers who were currently pursuing a management degree across five celebrated institutes, in the city of Pune. Thus, it is suggested that further study in this regard should be inclusive of an even more representative sample so that generalizations about a set of population could be made. Also, the research scope could be enhanced beyond the variables: attraction, retention and could include relevant dimensions such as employee satisfaction. Furthermore, the statistical means used could be expanded to incorporate a confirmatory factor analysis.

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#### Glossary:-

1. **Employer Brand** – In this context, the term means becoming 'the employer of choice' by promoting unique benefits as part of the employment experience, subsequently enhancing the value proposition for existing and potential employees.
2. **Employer Attractiveness** is defined as the envisioned benefits that a potential employee sees in working for a specific organization. The objective is to enable the firm to gain a competitive edge in the labour market.
3. **Retention**, in this background, encompasses those employees who are willing to stay in an organization for a period greater than two years because they trust the employees they work for and take conceit in the work they do.



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### RESEARCH ARTICLE

#### KFU STUDENT'S KNOWLEDGE AND ATTITUDE ABOUT CIGARETTE SMOKING CESSATION.

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Cigarette smoking, cessation, knowledge, anti-smoking campaigns, King Faisal University

#### Abstract

Purpose of the Study: determine the knowledge of King Faisal University students about cigarette smoking cessation options of male students, by King Faisal University, Saudi Arabia. A random sample of 300 students from 5 different colleges at the university answered a self-administered questionnaire based on a modified and translated research questionnaire by Lisa Hope titled "Smoking Cessation Knowledge and Clinical Cessation Techniques Among Medicine Residents". 62% of smokers knew about counseling option, while 83% of non-smokers knew about it. 58% and 65.8% from smokers and non-smokers, respectively, knew about nicotine replacement therapy. 18% of smokers and non-smokers knew about Prozac and Bupropion. The study showed lack of anti-smoking campaign exposure, 44.6% of participants have not seen any anti-smoking campaign in the past year.

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#### Introduction:-

Smoking is a major worldwide public health problem and one of the main preventable cause of morbidity and mortality. <sup>i</sup>Smoking related disease will kill one in 10 adults globally by 2030, if current trends continue, smoking will kill one in 6 people worldwide. <sup>ii</sup>Smoking currently kills five million people a year worldwide and, according to estimates, will probably kill eight million people a year between now and 2030 and one billion over the course of the 21st century. Although many of the adverse health effect of tobacco occur later in life, smoking has health implication for young people. <sup>iii</sup>According to studies conducted in Saudi Arabia the prevalence of smoking ranges from 2.5-52% (median 17%), and among young adults ranges from 2.4-37% (median 13.5%). <sup>iv</sup>21.6% (n=1382) is the prevalence of cigarette smoking among male students of King Faisal University (KFU).

Many cigarette smokers find it difficult to quit smoking despite being aware of its hazards. Frequent failed attempts are reported globally. However, there are many success stories around the world. With the help of anti-smoking centers there is higher possibility of succeeding in quitting. This study aims to determine the knowledge of KFU Students and attitude about cigarette smoking cessation options and compare the knowledge among smokers and non-smokers.

**Method:-**

The number of KFU students in 2013 is 31,849 . Because of huge number of KFU students and limited time we had decided to take only 20% out of total student number from five collages. We estimated that our sample size is 300 students. Our research method is cross sectional and it compares the knowledge between smokers and non-smokers about their knowledge and attitudes about cigarette smoking cessation. We have chosen this method because it is not expensive, fast and easy to do, and the limited time we had.

We have read some researches to know the appropriate questions to use them in our questionnaire. After that we have discussed to took most of our question from "Smoking Cessation Knowledge and Clinical Cessation Techniques Among Medicine Residents" research done by Lisa Hope. By modifying the questionnaire from the research by Lisa Hope to a more simplified form and added some questions we had made by ourselves. We had also to translate the questionnaire to Arabic to make sure our sample fully understand the questionnaire. The questionnaire contain both English and Arabic translation of it.

**Procedure:-**

Our procedure was as the following: first we had to take permission from the university administration to do our research on five collages . Then we took permission from students by writing on the first page of our questionnaire "The return of questionnaire will be considered as permission from the students to use the information in the research" . Also, we promised them to keep confidentiality of this information by writing " the confidentiality of information will be strictly maintained" .Then we did a pilot testing in ten students. After that, We fixed any problem in the questionnaire if there were any. finally we started distributing the questionnaire to the students from the five selected colleges "Medicine, Pharmacology, Engineering, Computer Science and Veterinary Medicine" .

**Material:-**

In material we are supposed to go to the students of the five selected colleges and introduce ourselves and our research .Then hand them questionnaire and ask him to fill and return it back. The questionnaire contains three sections. First section about Demographic information, the second section is about Tobacco use history and current behavior and the third and final section is about knowledge and attitudes .

**Gantt Chart (Timeline):-**

	19-21 <sup>th</sup> Nov	21-24 <sup>th</sup> Nov	24-28 <sup>th</sup> Nov	28 <sup>th</sup> Nov-15 <sup>th</sup> Dec	15 <sup>th</sup> Dec – 1 <sup>st</sup> Jan
Introduction Writing					
Questioner editing					
Data Collection					
Preparation of draft report					
Abstract + final draft					

**Statistical Analysis:-**

At the beginning we used SPSS 17 and we entered the student Data. Then we checked the data correctors. Finally we will use some graphs and tables.

**Results:-****Table 1:-** Demographic Distribution.

		College in which student is studying										Mean
		Computer Science		Medicine		Engineering		Clinical Pharmacy		Veterinarian Medicine		
		Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %	Count	Column N %	
The age in years	18	0	.0%	2	3.2%	0	.0%	0	.0%	8	14.0%	
	19	1	1.4%	9	14.3%	9	12.3%	0	.0%	11	19.3%	
	20	17	23.0%	10	15.9%	11	15.1%	1	3.0%	8	14.0%	
	21	33	44.6%	21	33.3%	24	32.9%	17	51.5%	11	19.3%	
	22	10	13.5%	13	20.6%	18	24.7%	11	33.3%	10	17.5%	
	23	7	9.5%	5	7.9%	8	11.0%	4	12.1%	6	10.5%	21.3
	24	4	5.4%	1	1.6%	2	2.7%	0	.0%	2	3.5%	
	25	2	2.7%	2	3.2%	1	1.4%	0	.0%	0	.0%	
	27	0	.0%	0	.0%	0	.0%	0	.0%	1	1.8%	
	<b>Total&amp;%</b>	<b>74</b>	<b>24.7%</b>	<b>63</b>	<b>21%</b>	<b>73</b>	<b>24.3%</b>	<b>33</b>	<b>11%</b>	<b>57</b>	<b>19%</b>	
The current year in the program	1 <sup>st</sup> Year	8	10.8%	4	6.3%	12	16.4%	0	.0%	25	43.9%	
	2 <sup>nd</sup> Year	22	29.7%	15	23.8%	18	24.7%	10	30.3%	8	14.0%	
	3 <sup>rd</sup> Year	20	27.0%	6	9.5%	16	21.9%	13	39.4%	11	19.3%	2.92
	4 <sup>th</sup> Year	12	16.2%	38	60.3%	15	20.5%	10	30.3%	7	12.3%	
	5 <sup>th</sup> Year	12	16.2%	0	.0%	9	12.3%	0	.0%	5	8.8%	
	6 <sup>th</sup> Year	0	.0%	0	.0%	3	4.1%	0	.0%	1	1.8%	

There were 74 (Computer Science) , 63 (Medicine) , 73 (Engineering) , 33 (Clinical Pharmacy) and 57 (Veterinarian Medicine) college students which makes up the 300 student sample size. The mean for age was 21.3 years and approximately 3<sup>rd</sup> year in their current program.

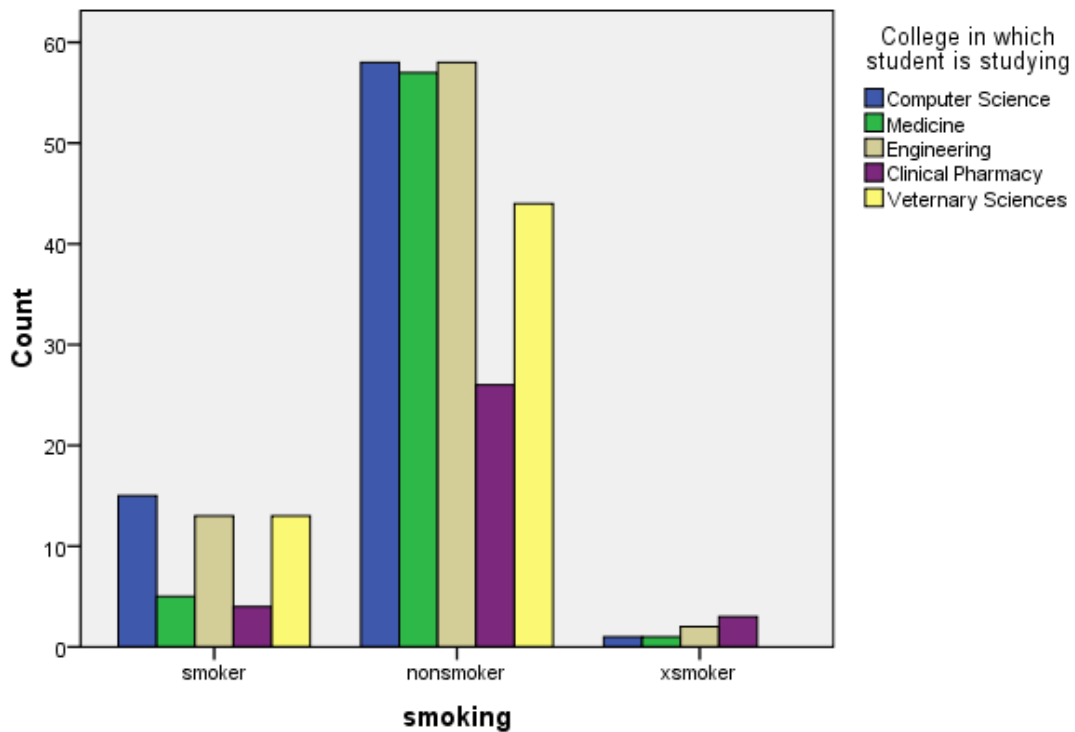
**Table 2:-** Comparison in between collage in number of smoker , nonsmoker and x-smoker.

Count		College in which student is studying					Total
		Computer Science	Medicine	Engineering	Clinical Pharmacy	Veterinary Sciences	
smoking	smoker	15	5	13	4	13	50
	nonsmoker	58	57	58	26	44	243
	xsmoker	1	1	2	3	0	7
<b>Total</b>		<b>74</b>	<b>63</b>	<b>73</b>	<b>33</b>	<b>57</b>	<b>300</b>

The sample contains 50 smokers , 243 non-smokers and 7 ex-smokers.

**Chart 1:-** Comparison in between collage in number of smoker , nonsmoker and x-smoker.

**Bar Chart**



**Table 3:-** Knowledge and attitude:

		smoking						P
		Smoker		Non-smoker		Ex-smoker		
		Count	Column %	Count	Column %	Count	Column %	
Smoker’s chances x2 if physician advises to quit ?	True	29	58.0%	187	77.0%	5	71.4%	.021
	False	21	42.0%	56	23.0%	2	28.6%	
Nicotine addictive-ness	True	27	54.0%	210	86.4%	6	85.7%	.000
	False	23	46.0%	33	13.6%	1	14.3%	
Anti-smoking Centre in Al-Hassa? (Counseling)	Yes	37	74.0%	152	62.6%	6	85.7%	.154
	No	13	26.0%	91	37.4%	1	14.3%	
(Nicotine replacement therapy)	Yes	31	62.0%	203	83.5%	6	85.7%	.002
	No	19	38.0%	40	16.5%	1	14.3%	
(Prozac pill)	Yes	29	58.0%	160	65.8%	3	42.9%	.287
	No	21	42.0%	83	34.2%	4	57.1%	
(Bupropion)	Yes	9	18.0%	44	18.1%	1	14.3%	.967
	No	41	82.0%	199	81.9%	6	85.7%	
	Yes	9	18.0%	46	18.9%	2	28.6%	.799
	No	41	82.0%	197	81.1%	5	71.4%	

**Table 4:-** Anti-smoking campaign exposure in the last 1 year.

Crosstab													
Count													
		How many anti-smoking campaign have you seen in the last 1 year?											Total
		0	1	2	3	4	5	6	9	10	14	20	
smoking	Smoker	23	8	7	6	1	3	0	0	1	0	1	50
	Non-smoker	109	62	37	10	8	11	2	2	1	1	0	243
	Ex-smoker	2	2	0	2	0	1	0	0	0	0	0	7
Total		134	72	44	18	9	15	2	2	2	1	1	300

134 have not seen any anti-smoking campaign , 72 have seen only once , 44 have seen 2 and 50 have seen more than 2 campaigns.

### Discussion:-

Our study showed that most of participants knew about counseling option in cigarette smoking cessation. However there were significant difference ( $P < 0.05$ ) between (smokers 62%) and (non-smokers 83%) . But participants were less knowledgeable about pharmacological smoking cessation options. Only 18 % from smokers and non-smokers knew about Bupropion and Prozac. Participants were mostly knowledgeable about nicotine replacement therapy more than any pharmacological cigarette smoking cessation option (58% smokers) and (65.8% non-smokers). There is no difference ( $P > 0.05$ ) in the knowledge of pharmacological cigarette smoking cessations options between smokers and non-smokers. Only 58% of smokers think their chances of quitting would be doubled if they were advised to quit smoking. Only 54% of smokers think that nicotine is as addictive as other drugs , while 86% of non-smokers think it's addictive .There is significant difference between smokers and non-smokers ( $P < 0.05$ ). However there are no hard evidence that nicotine is as addictive as drugs like cocaine , some researches say it's and some say its not . It's controversial between Scientists and can't be used as argument for poor knowledge. 134 out of 300 of participants, which makes up 1/3 of them, have not seen ANY anti-smoking campaign in the past year! And 2/3 of participants have not seen more than 1 campaign.

### Limitation:-

Our sample size is 300 students from only 5 selected colleges. The time was very limited, because of exams and other assignments. We didn't have enough time to gather and analyze more sample size and take sample from all over the university colleges. Also our questionnaire was taken from other research that was "Smoking Cessation Knowledge and Clinical Cessation Techniques Among Medicine Residents" research done by Lisa Hope and we tried our best to modify and translate the questionnaire to suite research purpose.

### Conclusion:-

There were some significance in difference between the knowledge in counseling between smokers and non-smokers . However pharmacological cigarette smoker cessations options showed no significant difference between smokers and non-smokers. There were lack of anti-smoking campaign and 2/3 of participants have not seen more than 1 anti-smoking campaign advertisement.

### Recommendations:-

1. Perform a larger scale study for conformation
2. Educate smokers through seminars about smoking cessation options that it can reduce the withdrawal symptoms.
3. Increase the numbers of anti-smoking campaigns.
4. Use modern communication to raise awareness about smoking cessations options.
5. Anti-smoking campaign advertisements must be in a place were any person can see whatever his social , economic and education state.
6. Inform doctors to recommend and educate patients about cigarette smoking options.

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### RESEARCH ARTICLE

#### ENERGY MANAGEMENT.

Gaikwad Karan Prabhakar and Devkar Sanchita Dattatray.

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#### Abstract

Energy consumes maximum cost in manufacturing so its management is important aspect which should be studied. Energy management deals with planning, organizing and implementation of energy resources to get maximum productivity. Energy management function should be integrated with organizational culture so as to attain cost effective utilization of resources. Energy conservation is an important part in eco-friendly production and defines ethics of organization towards environment. Energy audit process is carried out these days to study use and utilization of energy. Maintaining energy balance is principle which must be followed while managing energy. Technical and economic feasibility of energy should be studied while implementing projects so that cost effective utilization of resources can be possible. Global resource utilization can only be possible through managing and conserving energy reserves.

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#### Research Methodology:-

The data used for research is secondary data obtained from publications, reports, and surveys by government, private and international organizations. The research is Descriptive, Exploratory and explanatory in nature for study of various dimensions related to energy and its management.

#### Objectives:-

- To study national and global energy consumption
- To study role of energy management function in an organization
- To study energy conservation techniques and methods
- To study energy audit method
- To study energy balance and its importance
- To study importance of integrating energy management function with organizational culture for global energy conservation.
- To study economic and technical feasibility of energy in manufacturing and production management process.

#### Introduction:-

Energy management deals with planning and operation of energy production and energy consumption units. As conservation of energy is becoming a global issue of concern it is important need to integrate energy management function with organizational structure so that energy management techniques can be developed and implemented properly. The central task of energy management in an organization is to reduce costs for the provision of energy in buildings and facilities without compromising work processes. Energy prices fluctuate constantly which can significantly affect energy bills in an organization. Poor energy procurement decisions costs organization a high



loss. Organization can control and reduce energy costs by taking a proactive and efficient approach in buying energy. Even a change in energy can be a profitable and eco-friendly alternative.

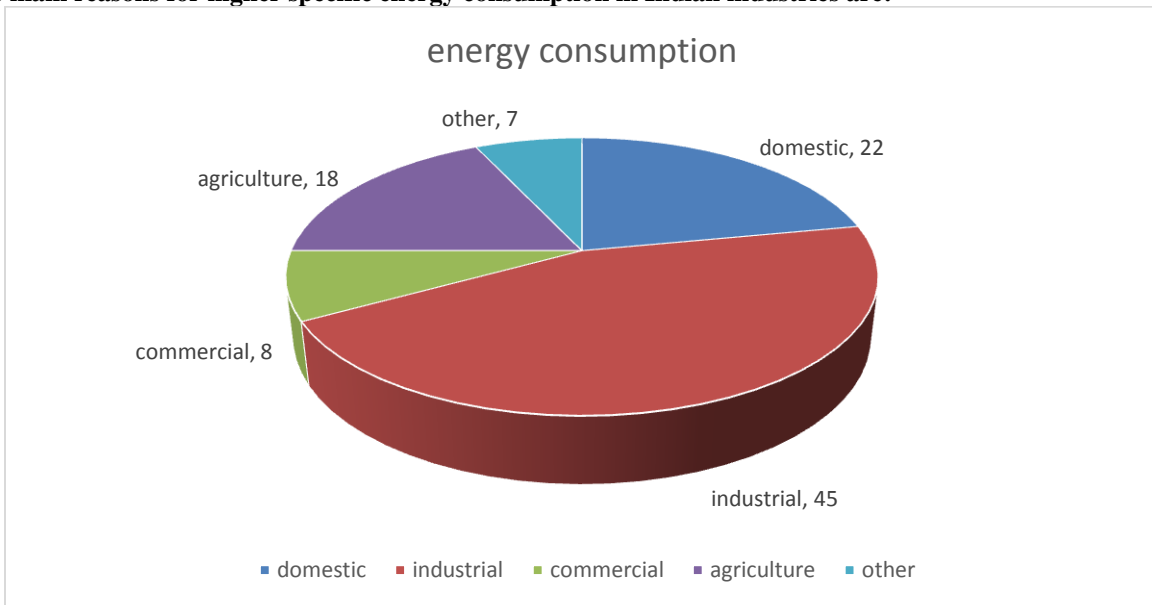
**Energy Consumption:-**

Sector wise Energy Consumption Pattern

Sectors	International Level	National Level	State Level
Industry	51.7%	29%	25%
Transport	26.6%	30%	0.6%
Domestic	13.9%	27%	49%
Commercial	7.8%	9%	17%
Others	0	5%	8.4%

(Source: World Energy Outlook 2014)

The main reasons for higher specific energy consumption in Indian industries are:



- Obsolete technology
- Lower capacity utilization
- Causal metering and monitoring of energy consumption
- Lower automation
- Raw material quality and poor handling
- Operating and maintenance practices
- Lack of knowledge/awareness among the employees

**Energy procurement:-**

**Eliminate Waste:-**

Ensure that energy is used at the highest possible efficiency.

**Maximize Efficiency:-**

Utilize the most appropriate technology to meet organizational needs. **Optimize Supply:** Purchase or supply energy at the lowest possible cost. Energy management practices may vary from simple maintenance and operational activities that ensure equipment and systems use energy efficiently and effectively, to capital intensive installation of new, more efficient technology.

**Energy audit:-**

Energy audit is an inspection, analysis and survey of energy flows energy for buildings, process or system. The audit process starts by collecting information about a facility’s operation and about its past record of utility bills. This data

is then analyzed to get a picture of how the facility uses and possibly wastes energy, as well as to help the auditor learn what areas to examine to reduce. In any industry the top most three expenses are on energy whether its energy, labour and material.

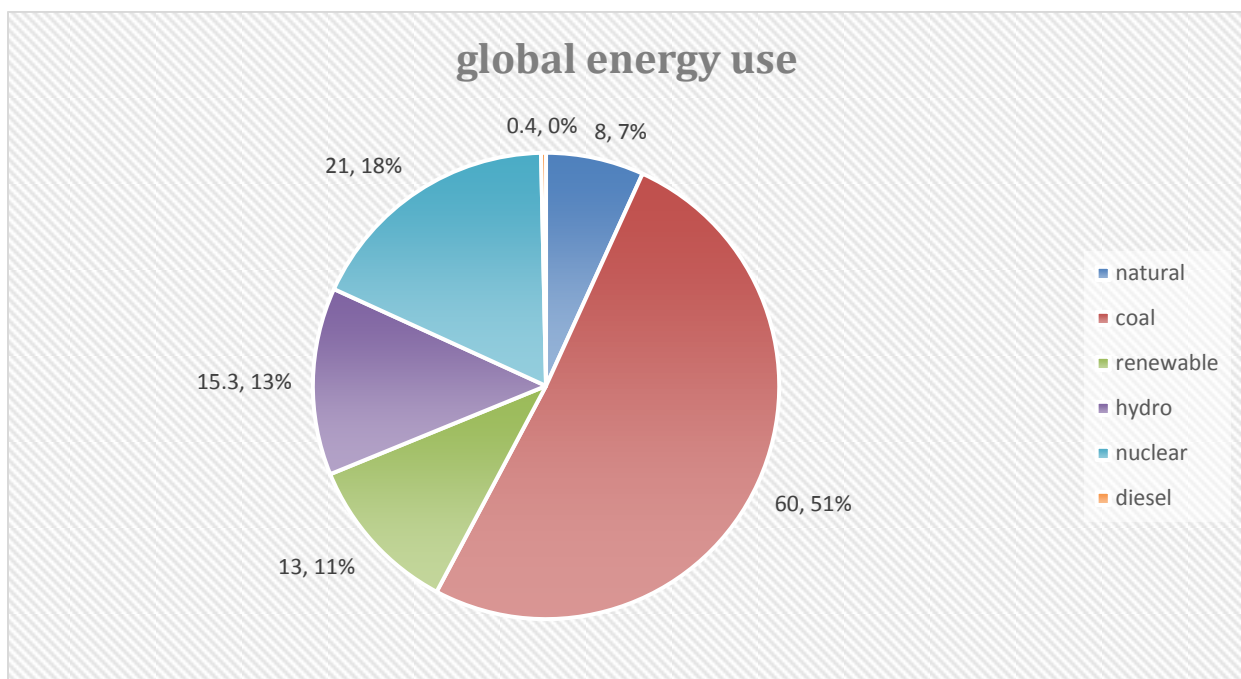
If one were to relate cost which can be manageable or potential cost of savings in each of the above components, energy would be invariably top ranker in cost and thus energy management function constitutes a strategic area for cost reduction. The energy audit would give a positive orientation towards cost reduction, preventive maintenance and quality control.

#### Dimensions of energy Audit:-

- **energy as a system** – to study natural role, laws and use of energy for its judicious use and energy resource utilisation.
- **Conversion**- It accounts for energy input, storage, conversion, waste, sales and consumption.
- **Statistics measurement**- measures instruments, calibration, measuring rate, and instrument management. This also includes the scope of energy report, frequency of submission, breakdown level, depth of analysis, etc.
- **indicators of energy consumptions**– it accounts for a company's energy consumption, but not its energy inputs.
- **Operating efficiency** – operating techniques and its efficiency in production process.
- **Energy consumption during manufacturing** - includes consumption per unit of output value, per unit of product, direct and indirect energy consumption and energy consumption per comparable unit product.
- **Energy cost indicators** - multiplies energy consumption by energy price.
- **Energy savings techniques and methods**- differentiates actual energy consumption and benchmark consumption. Setting energy usage standards and its implementing procedures.
- **Economic analysis of energy-saving projects** – makes a comparative analysis of energy economic costs for similar products and conditions. Analysis of energy feasibility of project.

#### Identification of Energy Conservation Opportunities:-

- **Fuel substitution:** Identifying the appropriate fuel for efficient energy conversion, finding substitutes for rare and costly fuels and energy sources.
- **Energy generation :** Identifying Efficiency opportunities in energy conversion equipment/utility such as captive power generation, steam generation in boilers, thermic fluid heating, optimal loading of DG sets, minimum excess air combustion with boilers/thermic fluid heating, optimizing existing efficiencies, efficient energy conversion equipment, biomass gasifiers, Cogeneration, high efficiency DG sets, etc.



- **Energy distribution and supply management:** Identifying Efficiency opportunities network such as transformers, cables, switchgears and power factor improvement in electrical systems and chilled water, cooling water, hot water, compressed air, Etc.
- **Energy usage by processes:** This is where the major opportunity for improvement and many of them are hidden. Process analysis is useful tool for process integration measures.
- **Technical and Economic feasibility**

**The technical feasibility should address the following issues:-**

1. Technology availability, space, skilled manpower, reliability, service etc
2. The impact of energy efficiency measure on safety, quality, production or process.
3. The maintenance requirements and spares availability

It is observed that 25% of energy cost can be saved if energy management techniques are applied in various manufacturing and production functions.

- Logistics: it is an important factor of energy consumption as transport of goods and products requires large consumption of fuels.
- Supply chain management: if proper supply chain management techniques are applied wastage of energy can be prevented.
- Production planning and control: planning organizing and directing energy resources towards cost effective production techniques.
- Material Management: adequate procurement and storage of material if implied properly can utilize energy and prevents its over use.

**Findings:-**

- Increasing energy consumption is felt throughout globe in recent years of industrialization.
- Energy management function is gaining popularity in organization due to its key task of cost reduction.
- Energy conservation is must for eco-friendly production and manufacturing process.
- Energy audit and energy inspection techniques are necessary for cost effective production.
- There should be integrating of energy management function with organizational culture for global energy conservation.
- The economic and technical feasibility plays important aspect of energy conservation and cost reduction in manufacturing and production industries.
- Energy balance: it studies amount of energy used by a site or unit, its supply and its utilization. It deals with how much amount of energy is supplied or used and how much should be supplied or consumed

**Conclusion:-**

Global energy scarcity is issue of concern that's why energy conservation and energy management has got prime important in many countries. For Cost effective production and manufacturing, energy management function should be implemented in organizational culture. Energy audit is an investigative and analytical part of energy management which is gaining popularity. Ethical standards should be implemented to control overall energy consumption in organization. Maintaining energy balance is must to utilize energy resources in standard and gain maximum profit. Technical and economic feasibility should be studied while implementing manufacturing techniques and production processes. Global resource utilization is possible only if energy reserves are managed properly.

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### RESEARCH ARTICLE

#### KNOWLEDGE AND ATTITUDE OF CARE GIVERS ABOUT MANAGING FEBRILE CHILD IN MADINA REGION.

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#### *Abstract*

**Introduction:** Fever is a very common and basic symptom in pediatric population. Parents reaction to fever might put their child under risk of chronic hepatic toxicity in case of inappropriate use of antipyretics. We aimed to evaluate knowledge and attitude of care givers in Madina region toward a febrile child to determine if there is a risk of chronic acetaminophen hepatic toxicity.

**Methodology:** A cross sectional study was conducted, questionnaire was used as a collecting tool (electronic and paper based) Pilot study and pre-test has been done to clarify any ambiguous question. Specific coding mechanism was set, data were analyzed using the Statistical Package for the Social Sciences (SPSS) program.

**Results:** The vast majority of parents know their children's weight and they know the exact definition of fever. However, their knowledge about antipyretics in different routes of administration, duration between different doses regardless of the route and their action in case of persistence of fever in terms of the use of cold compression, are not satisfactory for a symptom which is very common like fever.

**Conclusion and Recommendations:** Physicians and pharmacists must explain to parents the appropriate dosing method of over the counter antipyretics.

It is preferable that these medications are suspended based on physician's prescription. Otherwise, Preparations which might lead to chronic liver toxicity should be replaced by other safe medications.

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#### **Introduction:-**

Fever is a very common and basic symptom in pediatric population. Although it is a reflection of a good immune system to some extent, it might be a red flag for a serious condition.

Over counter antipyretics are common all over the world. However, reaction of care givers toward a child with fever are variable, their definition of fever is not necessarily clear specially with different measuring scale options. Doses and intervals in between might vary as well particularly if they use different routes of administration.

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Chronic liver toxicity in children whom are exposed to higher doses of acetaminophen is a significant health care issue that seems to be under investigated. We aimed to evaluate the current attitude of parents towards a febrile child. This is to highlight the importance of increasing the awareness of the society about the proper ways to control fever in children.

Acetaminophen doses of 10 to 15 mg/kg per dose given every 4 to 6 hours orally are generally safe and effective.

Ibuprofen (10 mg/kg per dose) is at least as effective as or more effective than, acetaminophen (15 mg/kg per dose) in lowering body temperature when either drug is used as a single or repetitive dose. <sup>(1)</sup>

There is no evidence to indicate a significant difference in the safety of standard doses of ibuprofen and acetaminophen in healthy children between 6 months and 12 years of age with fever.

However, Data are inadequate to support a specific recommendation for the use of ibuprofen for fever or pain in infants younger than 6 months. <sup>(1)</sup>

No consistent evidence has indicated that the use of an initial loading dose of acetaminophen by either the oral (30 mg/kg per dose) or rectal (40 mg/kg per dose) route improves antipyretic efficacy. <sup>(2)</sup>

Although hepatotoxicity with acetaminophen at recommended doses has been reported rarely, hepatotoxicity is most commonly seen in the setting of an acute overdose. However, there is a significant concern of acetaminophen-related hepatitis in chronic acetaminophen overdose. The most commonly reported scenarios are those of children receiving multiple supratherapeutic doses or frequent administration of appropriate single doses at intervals of less than 4 hours (ie, >15 mg/kg per dose or more than 90 mg/kg per day for several days ).

In 1 case series, half of the children with hepatotoxicity had received adult preparations of acetaminophen. <sup>(3,4)</sup> On the other hand, nephrotoxicity is reported in numerous case reports in children with fever who treated with ibuprofen. Thus, caution is encouraged when using ibuprofen in children with dehydration or with complex medical illnesses. <sup>(5,6)</sup>

Although there is some evidence that combination therapy may result in a lower body temperature for a greater period of time, there is no evidence that combination therapy results in overall improvement in other clinical outcomes.

The possibility that parents will either not receive or not understand dosing instructions, combined with the wide array of formulations that contain these drugs, increases the potential for inaccurate dosing or overdosing. Finally, this practice may only promote the fever phobia that already exists. <sup>(7,8)</sup>

## **Methods:-**

A cross sectional study was conducted in Madina Region, Saudi Arabia, on February-April 2016. We chose our sample using random sampling method. We excluded people living outside Madina region. We used the questionnaire as a collecting tool (electronic and paper based questionnaire). This questionnaire reached to our target group through social media as well as, in the public places and waiting areas of pediatric hospitals in Madina.

Before starting with our observation process, we explained the purpose of our study. Validity and reliability has been taken into account. Pilot study and pre-test has been done to clarify any ambiguous question.

Ambiguous questions were explained to parents who were interviewed in the waiting areas and a contact number of the research supervisor was added to the electronic form in order to answer any question parents might have.

First paper of the questionnaire was a consent form to accept the participation in the study.

The variables were the (age ,sex ,weight, level of parent's education and questions about how do parents deal with a febrile child).

By using specific coding mechanism we will collect the data suitable for analysis using the Statistical Package for the Social Sciences (SPSS) program.

Study was approved by the ethical committee at Taibah University.

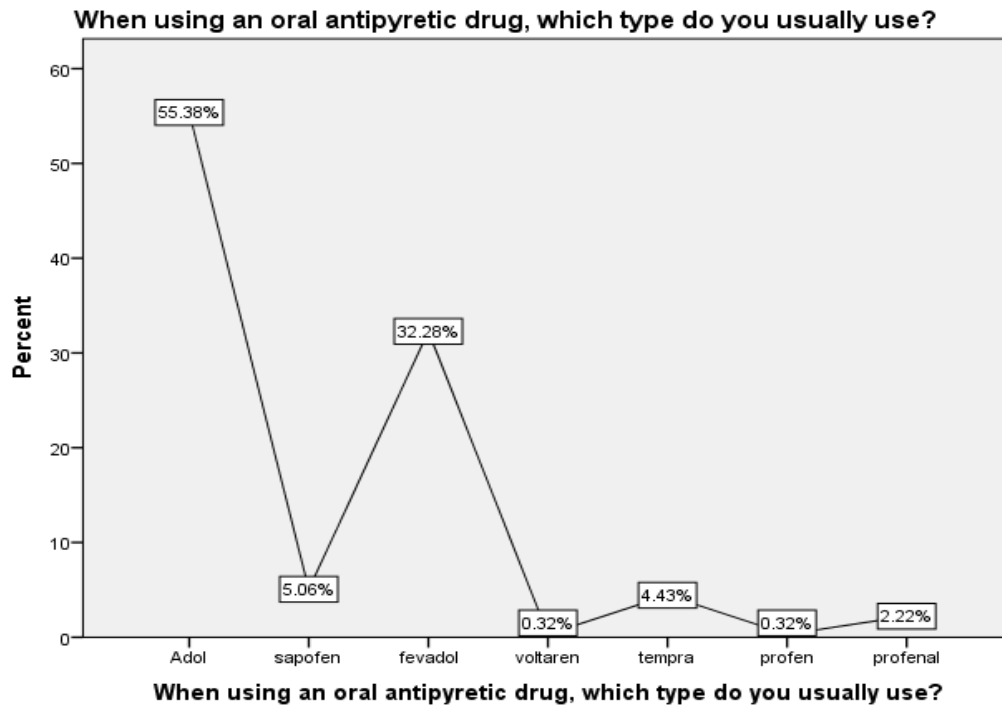
**Results:-**

**Table 1:-** Sociodemographic data. n (316).

Child's Age (mean)	4 years
Child's Sex: (%)	
Male	56.3
Female	43.7
Child's Risk Factors to Develop Hepatic Toxicity: (%)	
Obesity.	
Liver Disease	5.1
Type 1 Diabets Millitus	1.6
Family History of Liver Disease	4.4
	6.3

Parents who measure their children's temperature were (80.7 %), on the other hand (19.3 %) of them do not,(6.59% )of parents, measure their children's temperature by under the tongue measuring method, (56.98%) by armpit and (36.43%) by auricle.

(4.11%) consider 37 degrees centigrade as a fever, (28.48%) consider 37.5 degrees centigrade and (67.41)% consider the child febrile when his temperature reaches 38 degrees centigrade. (79.75%) give antipyretic orally first and (42.1 %) start with suppository antipyretic. (37.97%) seek medical advice when fever persists despite antipyretics, while (62.03%) they don't.



**Figure 1:-** Type of oral antipyretic using trade name.

Dose of antipyretic was determined in(57.59%) by the pediatrician,(17.41%) by the pharmacist and (25%)of parents determine it by themselves.(65.82%) of parents determine the dose based on the age of their children, (24.37%) determine it based on the weight and (9.81%) they determine it based on degree of the temperature. (13.9%) of parents don't know their children's weight.

In case of persistence of fever despite the use of oral antipyretics, (84%) of parents give their children anal suppository and (16%) add another type of oral antipyretic. (19.94%) of parents give the next dose of antipyretic after less than 4 hours from last dose and (80.08%) give them after more than 4 hours .

(79.1%) of children receive an antibiotic when the fever doesn't subside. While (20.9%) of children don't receive an antibiotic. (14.13%) of parents that give their children an antibiotic when the fever continues without prescription , while (85.87%) seek medical advice before giving an antibiotic.

(85.44%) of parents use cold compresses to reduce their children's body temperature, while (14.56%) they don't. (68.52%) in case of using cold compresses use a room temperature water . While (31.48%) use a cold water or ice.

### Discussion:-

The vast majority of parents know their children's weight and they know the exact definition of fever. However, their knowledge about antipyretics in different routes of administration, duration between different doses regardless of the route and their action in case of persistence of fever in terms of the use of cold compression, are not satisfactory for a symptom which is very common like fever.

Although most of the parents answered the question of who describe the medication appropriately, they answered the next question of based on what inappropriately. That might indicate either parents selected the ideal answer or physicians didn't explain the importance of prescribing antipyretics based on patient's weight.

The good thing that the majority who selected the option of antibiotics answered the next question of prescribe it appropriately.

The other good thing is that most of the children who are exposed to frequent inappropriate doses of antipyretics have in majority no risk factors of chronic liver disease but still chronic acetaminophen toxicity is a major concern.

### Conclusion and Recommendations:-

Physicians and pharmacists must explain to parents the appropriate dosing method of over the counter antipyretics.

It is preferable that these medications are suspended based on physician's prescription. Otherwise, Preparations which might lead to chronic liver toxicity should be replaced by other safe medications.

Education about actions when fever persists must be encouraged in every mean as the knowledge about dealing with febrile patient is less than the expected level.

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### RESEARCH ARTICLE

#### APLASTIC CRISIS CAUSED BY PARVOVIRUS B19 IN AN ADULT PATIENT WITH SICKLE-CELL DISEASE.

Mashaiel Al Hajri MD, Israa Alaithan MD, Mona Al Hammad MD and Wejdan Al Omran MD.

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#### Abstract

We describe a case of aplastic crisis caused by parvovirus B19 in an adult sickle-cell patient presenting with Fever, abdominal pain and headache. Reticulocytopenia in patients with Sickle-cell disease suggests B19 infection where Anti-B19 IgM and IgG were detected

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#### Introduction: -

Parvovirus B19 is a small single stranded DNA virus that infects and replicates in erythroid progenitor cells of the bone marrow and blood, leading to inhibition of erythropoiesis<sup>[1]</sup>. It causes aplastic crisis by inhibiting erythroid series formation through the pathogen's direct cytotoxic effect on erythroid burst and colony forming units. B19 commonly infects rapidly dividing cells such as bone marrow or developing fetal tissues<sup>[2]</sup>. It is now recognized as an important human pathogen causing transient aplastic crisis (TAC) in chronic hemolytic anemia patients. This clinical presentation is related to the tropism of the virus for bone marrow precursors, mainly erythroblasts<sup>[1]</sup>. During an acute infection, this results in a significant drop in hematocrit. In healthy individuals, RBC production returns in 10 to 14 days. However, in individuals with an increased RBC turnover, even a limited cessation of RBC production can lead to a clinically significant drop in hemoglobin and transient aplastic crisis (TAC)<sup>[3]</sup>. Severe anemia is most likely to occur in individuals with underlying hemolytic anemia (e.g. sickle cell disease, hereditary spherocytosis)<sup>[4]</sup>.

#### Case Report: -

A nineteen years old Saudi female from Al-Khobar and living there. Admitted to the KFHU through ER when she was complaining of abdominal pain and fever for 5 days duration.

The patient is a known case of sickle cell disease and G6PD deficiency since childhood. She was on folic acid 1 tablet/day. The patient gave history of recurrent attacks of Vaso-occlusive painful crisis (VOC) for more than 12 times per year since childhood, which decreased 1-2 attacks per year during the last 4 years. The attacks were precipitated by cold and stress and it were managed in the ER with analgesic and IV fluids. Also, she has a history of recurrent admission to the hospital 1-2 times per year. Last admission was one year back. There is no previous history of ICU admission. She had blood transfusion when she was 10 years old. No history of previous surgery.

Six days prior to the presentation, the patient started to have fever that was about 38.1C<sup>o</sup>, which associated with chills and headache. Also, the patient gave a history of watery diarrhea 3 to 4 times per day not associated with blood or mucus. There was no chest pain, shortness of breath, palpitations, sweating, or meningeal signs. She sought medical advice in a private hospital where blood investigations were done. She had been managed by Paracetamol and antibiotics where the fever subsided.



Three days later she started to have acute progressive continuous right hypochondrial pain not related to food or specific position, localized not radiating to other site. The pain was associated with nausea and vomiting moderate amount with no hematemesis or diarrhea. No history of similar symptoms in the family. She went to the ER where she was managed by IV fluid and analgesia.

At the day of presentation she came to the ER complaining of worsening of the abdominal pain not associated with nausea or vomiting.

### **Physical Examination: -**

Physical examination reveals a well-developed, alert, and oriented woman in pain. Her blood pressure was 110/70 mmHg, pulse 110 bpm, respiratory rate was 20 bpm and temperature was 37.7°C. The patient had pale conjunctiva without jaundice. Chest examination is normal EAE. Cardiac examination shows normal S1, S2 with grade III/VI systolic murmur at pulmonary area. Abdominal examination reveals soft and lax abdomen with mild tenderness in the right hypochondrial area and no hepatosplenomegaly.

Laboratory evaluation was performed on admission to the hospital. The patient's hemoglobin was 3.9 g/dL, the hematocrit was 11.1%, RBC was 1.2, platelet count was 148, reticulocyte 1.9%, and the leukocyte count was normal. Results of blood chemistry, urinalysis, chest radiography and abdominal ultrasound were normal.

### **Management:-**

On admission, the patient was treated with oral analgesics and IV fluids. After obtaining the blood cultures, IV antibiotic therapy was started. Also the patient is transfused with 3 units of packed RBC. Her hemoglobin increased to 8.3 g/dL. Acute parvovirus B19 infection is suspected and confirmed by B19-specific serology that reveals an IgM value of 86.27u/ml (positive value >11) and IgG of 21.93u/ml (positive value >11u/ml). The patient's pain and fever resolve by the 2<sup>nd</sup> day of admission. She had been discharged on 4<sup>th</sup> day of admission afebrile with no headache or pain on antibiotic.

### **Discussion: -**

Parvovirus B19 commonly infects rapidly dividing cells such as bone marrow or developing fetal tissues. Infection is most frequently found in the late winter or early spring. As parvovirus DNA has been found in respiratory secretions at the time of viremia, the most common route of transmission appears to be respiratory<sup>[5]</sup>.

Here we describe parvovirus infection in an adult with sickle cell anemia. After reviewing the literature and reported cases, we found that usually the infection occur during childhood or early adolescence. The peak incidence rates occur in 6 to 14-year-old<sup>[5]</sup>, but rarely during adulthood. Parvovirus infection causes transient aplastic crisis in patients with hemolytic anemia such as sickle cell anemia, hereditary spherocytosis and thalassemia. Clinical presentation may vary depending on the extent of the infection. Usually they present with severe symptomatic anemia secondary to the massive drop in hemoglobin level. Other presentation could be due to drop in leucocytes count or platelet count. In the case we described here the patient presented with vague symptoms such as abdominal pain, fatigue and symptomatic anemia. Upon laboratory investigations a drop on hemoglobin level with accompanying reticulocytopenia will raise the suspicion of parvovirus infection in those patients, other cell lineage might be affected too, inducing leucopenia or thrombocytopenia.

Serum IgM testing is recommended to diagnose acute viral infection in immunocompetent patients, with 89 percent sensitivity and 99 percent specificity. Elevated IgM antibodies will remain detectable for two to three months after acute infection. IgG testing is less useful because it only indicates previous infection and immunity<sup>[6]</sup>.

### **Conclusion:-**

Anemia with reticulocytopenia in patients with hemoglobinopathies and in immunocompromised hosts (e.g. patients with AIDS, transplant recipients) should alert the clinician to the possibility of parvovirus B19 infection. Tests are available to confirm the diagnosis. Management includes packed red cell transfusions and, in cases of immunocompromised patients, administration of intravenous immunoglobulin<sup>[7]</sup>.

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### RESEARCH ARTICLE

#### PANCREATIC CANCER IN THE YOUNG PRESENTING AS FEVER OF UNKNOWN ORIGIN

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#### Manuscript Info

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#### Abstract

Pancreatic cancer is a lethal disease, presenting in the old age. We describe a rare case of a young male patient presenting with fever of unknown origin and found to have pancreatic cancer. Upon review of literature, only one case was reported.

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#### Introduction: -

Pancreatic cancer is one of the most notorious diseases. It ranks as the 4<sup>th</sup> cause of cancer-related death. In the US, in 2009, an estimated 42,470 new patients were diagnosed with pancreatic cancer (21,050 men and 21,420 women), with 35,240 deaths from it (18,030 men and 17,210 women).<sup>[1]</sup> Between 2002 and 2006, the median age at diagnosis was 72 years and the median age at death was 73 years for cancer of the pancreas. The age-adjusted incidence rate in this period was 13.1 per 100,000 men and 10.4 per 100,000 women per year.<sup>[2],[3]</sup> In Saudi Arabia, pancreatic cancer represents 1.75% of all cancers with 1585 registered cases from 1994 to 2007 accounting 2.5% for males and 1.1% for females of all types of cancer and it is the fifth most prevalent gastrointestinal cancer among Saudis. The median age at diagnosis was 63-year-old ranging from 15-96 years. [4] The most recognizable risk factor for pancreatic cancer was cigarette smoking. Hereditary pancreatic cancer occurs in 5-10% of cases and it occurs at earlier age and usually associated with other syndromes like hereditary pancreatitis, Peutz-Jeghers syndrome, familial atypical multiple mole melanoma, familial breast cancer syndrome, and hereditary non-polyposis colorectal cancer syndrome.

Pancreatic adenocarcinoma is the most common pathological type and it's 80% located in the head of the pancreas. It usually presents with jaundice, abdominal pain, anorexia, cachexia, new onset diabetes mellitus and venous thromboembolism. Fever as the initial presentation is rare and scarcely described in literature. Therefore, we here report a case of pancreatic adenocarcinoma diagnosed in a young patient and presenting as fever at time of diagnosis.

#### Case Report: -

We report a case of a 29 year-old male who works as an office clerk in Ministry of Health, who presented to the ED of King Fahad University Hospital (KFUH) with history of fever (39°C), anorexia, weight loss of 7 Kg, RUQ abdominal pain and jaundice for 6 weeks. He denied history of diarrhea and arthralgia.

On physical examination, a young, malnourished gentleman lying in bed, conscious and alert, apparently looking jaundiced and pale. Temperature was 39° c at presentation with no chills. Abdominal examination revealed hepatomegaly (16 cm liver span), however, no splenomegaly or ascites.

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The patient has no significant past medical history except for cigarette smoking 1 pack/year for the past 10 years. No history of contact with febrile patient, alcohol consumption, blood transfusion, IV drug abuse or recent history of travel. There was only a brief exposure to cattle in a farm but no raw milk ingestion. No personal or family history of cancers.

Patient was extensively investigated. Laboratory work up results are summarized in Table 1.

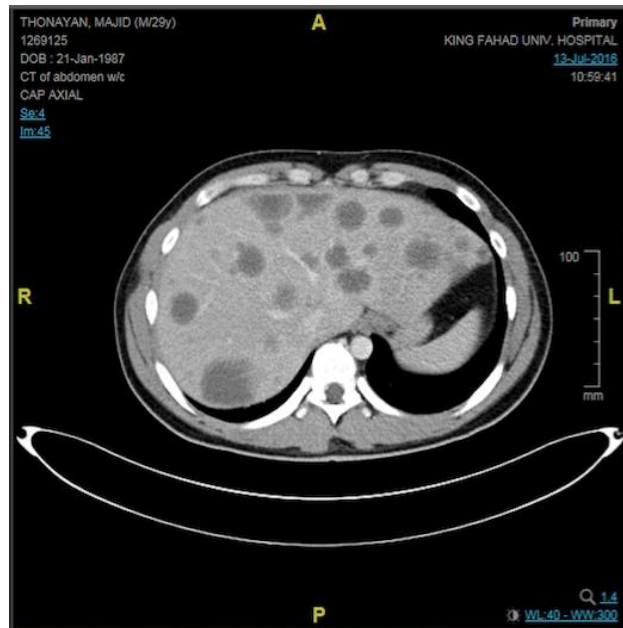
Test	Result
Complete Blood Count	Leukocytosis: $11.1 \times 10^3$ cells/mm <sup>3</sup> Neutrophilic predominance 79% Hemoglobin: 10.8 g/dL MCV: 80.6 fL
Liver function Test, Amylase and Lipase	Hyperbilirubinemia: Total bilirubin 5 mg/dL, direct bilirubin 4.3 mg/dL Albumin: 2 g/dL Lactate dehydrogenase: 1141 U/L Gamma-gultamyltransferase: 381 U/L Alkaline phosphatase: 334 U/L Aspartate aminotransferase: 83 U/L Alanine aminotransferase: 35 U/L Amylase: 27 U/L Lipase: 123 U/L
Septic work up	Repeated blood culture: no growth. Malaria smear, hepatitis profile, monospot test, EBV serology, HIV serology and echinococcus serology all were negative. Brucella serology was 1:320
Inflammatory markers	ESR: 120 h/mm CRP: 21.1 mg /L
Autoimmune markers	ANA, ANCA, RF,AMA and ASMA* all were negative.
Cancer markers	CA 19-9 : 2289 AFP and CEA not elevated
Random Blood Sugar	93 mg/dL

\* ANA: Antinuclear Antibody, ANCA: Antinuclear cytoplasmic antibody, RF: Rheumatoid factor, AMA: Antimitochondrial antibody and ASMA: Antismooth muscle antibody.

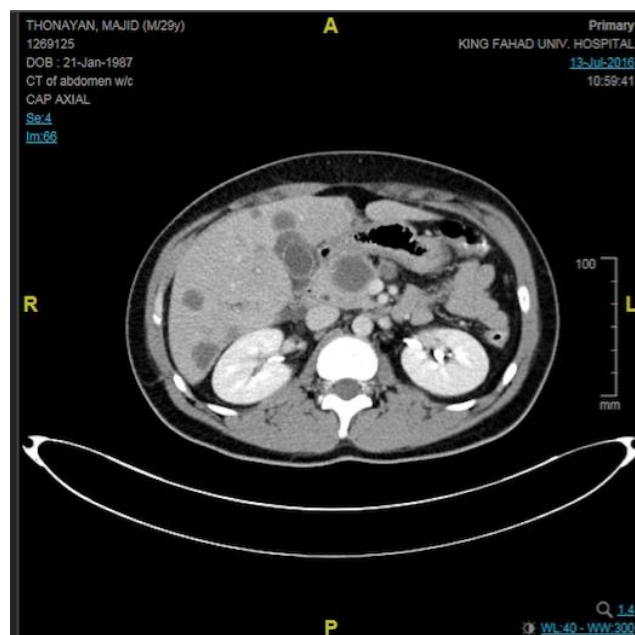
Abdominal ultrasonography revealed multiple hypoechoic lesions in the liver and hepatomegaly. Gallbladder, kidneys were normal and no free fluid collection in the abdomen (Figure 1). A computed topography (CT) scan with contrast was requested and revealed bilateral cervical lymphadenopathy, hepatomegaly and multiple hypodense lesions of variable size and density involving both right and left hepatic lobes (Figure 2). Also, a necrotic, cystic mass lesion was noted in the head of the pancreas, measuring 3x2.8x2.4 cm in its transverse, antero-posterior and cranio-caudal dimensions, there is adjacent necrotic lymph node in the pancreatic bed (Figure 3). No splenomegaly or ascites noted.



**Figure 1:-** US showing multiple hypoechoic lesions in the liver.



**Figure 2:-** CT scan showing multiple Hypodense lesions in the liver.



**Figure 3:-** CT scan showing mass in the pancreatic head.

The case was approached by a multidisciplinary team involving Infectious disease team and Gastroenterology team. Initial management plan was to start the patient on antibiotic regimen for brucellosis, Doxycycline and rifampicin were given for 6 weeks with no improvement of symptoms. A suspicion of malignancy leadthe team to carry out an ultrasound- guided liver biopsy and it revealed multiple metastatic clusters and cords of anaplastic malignant epithelial cells dispersed in a desmoplastic stroma. Extensive tumor necrosis was noted.

Oncology team was consulted and assessed the case. The treatment suggested was perusing palliative care with analgesia and chemotherapy in the form of gemcitabine and erlotinib, which is not available at our hospital. Patient was referred to a tertiary care hospital for perusing chemotherapy.

**Discussion: -**

Fever of unknown origin (FUO) is defined as temperature  $\geq 38.5^{\circ}\text{C}$  for  $\geq 3$  weeks in a healthy immunocompetent individual despite a 1-week extensive investigation. Infection accounts for the most cases of FUO, followed by neoplastic fever. Neoplastic fever is a common presentation of certain malignancies like hematological, colon and renal cancers. Neoplastic fever is noted especially in metastatic malignancies. [5] Therefore, we report our rare case of a young patient presenting with fever as the main presentation of pancreatic cancer.

There are multiple mechanisms to explain fever in setting of malignancy. Infection is the usual precipitant, however, neoplastic fever can be induced by the tumor related release of pro-inflammatory cytokines. Also, aggressive body immunological response mounted against tumor with leukocytosis add to the production of pyrogens.

Pancreatic cancer is a disease of the old population. Early onset pancreatic cancer (EOPC) is defined as pancreatic cancer in  $\leq 50$  years of age. Several risk factors have been linked to the susceptibility for developing pancreatic cancer at a younger age, among them, smoking and genetic factors were the key players. In a case control study conducted by Hassan MM et al., there was a 60% greater risk among the ever-smokers. [6]

EOPC usually presents as a poorly differentiated adenocarcinoma with distant metastases. In a retrospective analysis of consecutive cases of patients with EOPC, 61% had poorly differentiated pathology and 84% had metastatic unresectable disease at time of diagnosis. [7]

Pancreatic adenocarcinoma in the young carries a poor prognosis with average survival as short as 5 months unfortunately. The patient is offered a palliative care in the form of analgesia and chemotherapy.

**Conclusion: -**

We conclude that pancreatic adenocarcinoma can present in earlier age with smoking and genetic susceptibility being the most critical risk factors. In addition, we found that pancreatic adenocarcinoma can present with fever of unknown origin.

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### RESEARCH ARTICLE

#### EMBARKMENT OF QUANTITATIVE EASING AS POLICY.

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#### Abstract

In response to the financial crisis in 2008, the Federal Reserve implemented all possible monetary policies without significant success. The result was the presentation of the quantitative easing (QE) policy, which is a monetary policy where the Federal Reserve purchases mid-to long-term bonds and thus liquidates the market and increases money supply. This paper will illustrate how the quantitative easing benefitted the US economy to overcome the financial crisis. It will illustrate difficulties that QE has not solved like a strong increase in national debt along with US companies' hoarding large amounts of cash abroad, which has made the mission of recovery very difficult for the Federal Reserve. Lastly, it will look at potential solutions besides QE to stabilize the United States economy.

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#### Introduction:-

Quantitative Easing (QE) is a monetary policy where Federal Reserve purchases mid-to long-term bonds and thus liquidates the market and increases money supply (Lu, 2013). The cause behind QE is due to banks holding immense amounts of excess reserves. One reason banks retain large amounts of excess reserves is that there is a weak loan demand associated with regulatory uncertainty alongside a slow recovery of the economy. Another motive is the unprofitability to lend loans since interest rates are at or below cost of capital, which more likely will lead to a potential loss (Thornton, 2010).

One of the reasons QE occurred was that the previously implemented monetary policy of setting interest rates between 0-0.25percent did not lead to the anticipated relief in the market (Farley& Juvenal, Quantitative Easing: Lessons We've Learned, 2012). In addition, other measures were pursued with the same negative outcome. As a last resort, the Federal Reserve under Bernanke implemented the first quantitative easing measure on November 25<sup>th</sup>, 2008.

There were three main problems the QE was supposed to solve, 1) stop the economy from worsening, 2) stabilize various industries and markets in the United States, and 3) improve and create growth throughout the United States economy.

The decision to implement the quantitative easing was difficult since there wasn't much data on prior integrations and its success rate. One could only speculate the consequences but the Federal Reserve under Bernanke valued the risk of implementation lower than the alternative of not doing anything additionally. An indication of success can be found by assessing the United States unemployment rate from 2006 to 2014. As a reminder the crisis didn't start until late 2007 and the first quantitative easing wave was released late 2008.

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It can be observed that after 2010 the unemployment rate has consistently decreased and has reached 6.7 percent in March 2014. This indicates that the quantitative easing policy did benefit the economy by decreasing unemployment although it is not back to pre-crisis levels, it is moving in that direction.

Besides the unemployment rate decreasing, an improvement in the gross domestic product (GDP) has been observed. The GDP is a significant measure because it provides a good indication of the growth of a country. In 2008, the United States GDP depreciated 3.3 percent, which revealed the actual impact of the financial crisis, especially since the Federal Reserve anticipated growth of 2.4 percent (Silver, 2012). One of the reasons that this unfitting forecast occurred was that the economists of the Federal Reserve often overestimate forecasts to protect themselves and their names as economists (Silver, 2012). In addition, it is a very difficult job as an economist to forecast future growth based off economic statistics alone since there are so many variables they potentially have to account for. Although the forecast was falsely projected and the economy slid into a recession, it showed the positive impact QE had on the United States GDP. As observed in the unemployment and GDP, the financial crisis had its worst impact on the United States economy in 2009.

### Concerns In Qe:-

There have been multiple indications that the quantitative easing policy was a beneficial choice to prevail the impending crisis. Although this is true there are a variety of concerns for the future.

One of these concerns is inflation. The idea behind quantitative easing was to avoid deflation by buying mortgage based securities (Dabrowski, 2010). This did prevent deflation but buying mortgage based securities means that more money is put into circulation, which by definition should increase the inflation rate. Authorities feared that this increase in monetary flow could potentially cause a hyperinflation as experienced by Germany in 1919.

Another prevailing concern besides inflation is the fact that US companies are holding over \$1.5 trillion in cash abroad due to the high corporate taxes in the United States (Kaisaris, 2013). This has been a major setback to the US economy and the Federal Reserve since the economy would greatly benefit from this amount of cash flow. But US companies do not see any reason to lose 35% of their revenue through corporate taxes; therefore they leave their cash in foreign subsidiaries (Kaisaris, 2013). With that said, US businesses will maintain their cash back abroad unless the United States decreases its corporate tax rate to a more competitive rate as of 15-20 percent (Kaisaris, 2013).

Beside the concerns of inflation and foreign cash stacks, the United States should pay close attention to its rapidly increasing debt rate. Although the quantitative easing by the Federal Reserve has been effective in decreasing the unemployment rate as well as increasing the gross domestic product, it led to a high increase in expenditure by the Federal Reserve. It is shown how rapidly the Federal Reserve expenditure has grown since 2002. It prevailed that the Federal Reserve has increased their output from around \$850 billion in 2007 to \$4,100 billion in 2013; this is a substantial increase of over \$3 trillion in five years (Farley & Neely, Four Stories of Quantitative Easing, 2013). This expenditure can be directly correlated to the national debt of the United States, which has been increasing since the early 2000s but took a significant leap since 2009.

As we can see the National Debt has severely increased over the last decade and has surpassed the annual GDP. Currently the National Debt is 1.0153 times greater than the GDP of the United States, which could lead to tensions in the future if the budget doesn't get improved accordingly. In addition, it is seen that the GDP to debt ratio of the United States has rapidly worsened since the implementation of QE in 2008.

As we can see the Federal Reserve had to make a trade-off by improving the economy in the expense of heavily increasing debt. The QE policy is stated to stay in effect till 2015, but what will happen afterwards? This question is difficult to answer, but one thing seems certain to occur and that is uncertainty. If the United States does not continue to grow at the anticipated rates it will cause questions about the stability of the United States economy. It is also difficult to forecast how long the United States will need to figure out their debt and budget reduction. The US might lose its financial status of a safe haven and might be downgraded even further by rating institutes like Moody. With that said, research by Yangzi Lu has shown that there is a solution to reduce any potential uncertainty and benefit the US financially, which would be by developing and implementing a world currency (Lu, 2013).



### Alternatives To Qe:-

In this paper, there is a discussion on the effects of the quantitative easing implementation and described research that documents how QE has been beneficial in stabilising and improving the United States economy. One of the main issues with the accomplishment is the expenditure by the US government that had to be implemented to realize this task. The reason why this high expenditure has not affected the United States, as it has other countries like Greece, is that the United States uses its “sovereign currency as the international reserve currency” (Lu, 2013). Before the US dollar became the international reserve currency, precious metals were the international reserve currency. Due to the complex outreach of today’s world economy the possibility of returning to precious metals as the international reserve currency is not an option anymore, instead something new should be established that has no direct link to any sovereign country (Lu, 2013). This new establishment has been perceived as a World Currency. The advantages of it would include more certainty in the world economy, stabilization of the United States and no interference of politics involvement.

An increased amount of certainty could singlehandedly be worth the transition to a world currency. In today’s difficult economy, entities always look to the big countries like the United States, China or Germany for advice and more importantly financial support. But if a country like the United States is heavily struggling itself and needs all its resources for themselves, where should these other countries or the United States itself seek assistance? In the case of a world currency, countries could look for support from the world currency rather than be reliant on the larger nations. This improved environment would benefit investors since that would have the trust and certainty that every country was overseen and protected by an independent entity. A board of directors could lead this entity similarly to the International Monetary Fund.

There are several factors that could benefit the United States and the rest of the world from having a world currency; there are also factors that speak against an implementation. The most important factor being that the United States would lose their financial independence and leverage over every country linked to the US dollar. In addition, a more radical budget restructure would have to be enforced similar to what was seen in Greece, Ireland, and Island because the United States would not have their financial leverage anymore. Because this would be devastating to the United States and its economy, it is the main reasons why a world currency will not be enforced anytime soon.

### Conclusion:-

This paper tries to find out the reasoning behind the implementation of quantitative easing. It looked at the benefits it created with stopping the financial crisis from getting worse. The unemployment rate has been decreasing since the implementation along with the gross domestic product increasing. Although there were many benefits from QE there have been deficits as well, as the heavily increase of Federal Reserve expenditure that caused the national debt of the United States to surpass the gross domestic product. A potential solution of the dilemma would be to implement a world currency as the international reserve currency, relieving the US dollar from that role. Although this could be very beneficial for the United States and other countries, it will not be implemented any time soon since the United States would lose all its financial leverage. At this time the US cannot afford to lose that leverage since that would cause economy turmoil and lead right back into a recession.

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### RESEARCH ARTICLE

## COMPARISON OF EFFICACY OF INFUSIONS OF DEXMEDETOMIDINE VERSUS BUTORPHANOL AS SEDATIVE & ANALGESIC IN SHORT GENERAL ANAESTHESIA IN DAY CARE GYNAECOLOGICAL SURGERIES.

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##### Key words:-

Dexmedetomidine, butorphanol, day care, analgesia, Ramsay Sedation Score.

#### Abstract

**Background And Goals:** Development of selective alpha 2 adrenoceptor agonists may provide a new concept for the administration of perioperative anaesthesia & analgesia in day care surgeries. Goal of this study was to compare Inj.Dexmedetomidine&Inj.Butorphanol with respect to time required for onset & offset of sedation, quality of intraoperative as well as postoperative analgesia & the time required for post-operative recovery.

**Methods:** After obtaining permission from Institutional Ethical Committee (IEC), study was conducted in 40 patients of ASA I and II divided into 2 groups A & B by computer generated random number table. Patients, in group A received injDexmedetomidine 1 mcg/kg i.v and group B received inj.Butorphanol 10 mcg/kg i.v, in infusion over 10 minutes prior to induction. Induction was done with injPropofol i.v 2mg/kg & maintained with 33% O<sub>2</sub>, 66%N<sub>2</sub>O & 0.6-0.8% of isoflurane with patient breathing spontaneously. Throughout the surgery the sedation and analgesia was maintained with injDexmedetomidine 0.7 microgram/kg/hr infusion in group A and with injButorphanol 2 microgram/kg/hr in group B. Patients were evaluated in postoperative recovery room with help of Visual Analogue Scale (VAS) for pain, Ramsay Sedation Score & Standard Aldrete Score for recovery.

**Results:** Demographically, the two groups were similar. Requirement of inhalational anaesthetic agents was significantly reduced in the group A ( $p < 0.05$ ). VAS was significantly less (2.75  $\diamond$  0.44) in the group B after 90 min and earlier rescue analgesia was given in group A ( $p < 0.05$ ). Eye opening was earlier (45.5  $\diamond$  23.61) in group A and was highly significant ( $p < 0.001$ ). Postop recovery was significantly improved (9.8  $\diamond$  0.41) with dexmedetomidine group. **Conclusion:** Dexmedetomidine produces better sedation and analgesia without significant adverse effects and can be used as sole sedative and analgesic for day care surgery patients with better recovery.

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**Introduction:-**

Pain is “an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage.”<sup>[1]</sup>

Dexmedetomidine is the dextrorotatory *s*-enantiomer of medetomidine. It is a  $\alpha$ -2 agonist. Use of  $\alpha$ -2 adrenoceptor agonist is not new, it dates back to 1960's but it was approved in December 1999, as the most recent agent in this group and was introduced into clinical practice as a short-term sedative (<24 hours). The development of new, more selective  $\alpha$ -2-adrenoceptor agonists with improved side effect profiles may provide a new concept for the administration of perioperative anesthesia and analgesia.

Dexmedetomidine, mechanism of action is unique and differs from those of currently used sedative agents, including clonidine. By binding to the presynaptic alpha-2 adrenoceptor, it inhibits the release of norepinephrine, therefore, terminate the propagation of pain signals. Activation of the postsynaptic alpha-2 decrease sympathetic tone, with attenuation of the neuroendocrine and hemodynamic responses to anesthesia and surgery; reduce anesthetic and opioid requirements; and cause sedation and analgesia. They allow psychometric function to be preserved while letting the patient rest comfortably.

Butorphanol tartrate, (-) - 17 - (Cyclobutyl-methyl) morphinan-3, 14 - diol D- (-) -tartrate (1:1) (salt), is a synthetic intermediate acting opioid, agonist-antagonist of phenanthrene series. Butorphanol tartrate exhibits partial agonist-antagonist activity at  $\mu$  opioid receptor and agonist activity at the  $\kappa$  opioid receptor. It is five times more potent than morphine. An analgesic dose of butorphanol tartrate given by i.m, i.v or epidural route often produces marked sedation<sup>[2]</sup>. Butorphanol tartrate is a time tested analgesic used commonly in anaesthetic practice.

Dexmedetomidine has been recently added to the armamentarium of anaesthesiologists for intra-operative and post-operative analgesia<sup>[3]</sup>. In this study we have compared it with butorphanol tartrate when used in providing intra-operative and post-operative analgesia.

**Aims and Objectives:-**

1. To compare Dexmedetomidine with Butorphanol in short general anaesthesia- day care surgeries.
2. To see whether Dexmedetomidine and Butorphanol reduce the induction dose of propofol and volatile inhalational anaesthetics.
3. To compare the untoward effects of Dexmedetomidine and Butorphanol.
4. To compare the efficacy of Dexmedetomidine achieving intraoperative and postoperative analgesia with that produced by using Butorphanol.

**Materials & Method:-**

- Prior permission of institutional ethical committee was obtained to conduct the study.
- The study was conducted in 40 patients. In group A patients received Dexmedetomidine (n=20) & in group B patients received Butorphanol (n=20) .
- All patients were subjected to thorough pre-anesthetic evaluation and relevant laboratory investigation.

**Inclusion Criteria:-**

1. ASA grade I or II.
2. Age 18-60 years.
3. Availability of informed consent.
4. Patients undergoing elective short gynaecological procedures under short general anaesthesia.
5. Hemodynamically stable patients with all routine investigations within normal limits.

**Exclusion criteria:-**

1. Patients unwilling or hesitant to undergo the procedure under prescribed anaesthesia.
2. Patients with known hypersensitivity to opioids.
3. Patients addicted to opioids.
4. Patients with chronic obstructive pulmonary disease, bronchial asthma and or respiratory insufficiency.
5. Patients with head trauma and raised intracranial pressure due to any cause.
6. Patients suffering from psychiatric illnesses.

## 7. Emergency surgeries

### Method of randomisation:-

A statistician was consulted and with the help of computer generated table the randomization was done, adequacy of sample size and power of test was confirmed and then 40 patients were divided into 2 equal groups of 20 patients each ie. Group A and group B.

- Group A: Patients were given Inj.Dexmedetomidine 1mcg/kg body weight as loading dose and maintained on 0.7 mcg/kg body weight.
- Group B : Patients were given Inj.butraphanol 10mcg/kg body weight and maintained on 2 mcg/kg body weight

### Methodology:-

Anaesthetic plan was discussed and explained to all the patients a day prior to surgery. Patients were asked for any previous history of allergy to any anaesthetic given before or any kind of medication.

All patients were kept fasting overnight prior to scheduled day of operation.

In operation theatre, pre-operative vitals i.e. Pulse rate, BP, oxygen saturation were recorded. 20 gauge i.v cannula was placed in situ. All patients received inj.glycopyrolate 0.004 mg per kg body weight and injondansteron 0.1 g per kg body weight intravenously and inj.dexmedetomidine 1 microgram /kg body weight intravenously in infusion pump over 10 minutes prior to induction of GA in group A & inj.Butraphanol 10mcg/kg in infusion pump over 10 minutes body weight intravenously prior to induction of GA.

After medication patients in both the groups were analysed for sedation using Ramsay sedation scale & anxiety prior to induction.

**Table 1 - Ramsay scale for the assessment of the level of sedation**

LEVEL OF ACTIVITY	POINTS
Patient anxious, agitated or restless	1
Patient cooperative, orientated and tranquil	2
Patient responding only to verbal commands	3
Patient with brisk response to light glabella tap or loud auditory stimulus	4
Patient with sluggish response to light glabella tap or loud auditory stimulus	5
Patient with no response to light glabella tap or loud auditory stimulus	6

**Source: Arq. Bras. Cardiol. vol.93 no.6 São Paulo Dec. 2009.**

All the patients of group A were maintained on 0.7mcg/kg dexmedetomidine infusion and all the patients of group B were maintained on 2mcg/kg butarphanol infusion. Infusions were stopped 5 minutes prior to end of surgery.

Following preoxygenation induction of GA was done with inj. propofol 2 mg/kg body wt. After the loss of eyelash reflex / patient in apnea patients were ventilated via face mask till the patient regains the spontaneous ventilation. Anaesthesia was maintained with 33% oxygen, 66% nitrous oxide and isoflurane (0.5% to 0.8%), with the patient breathing spontaneously. In the recovery room patient were followed up for vitals, for pain using visual analog scale & standard Aldrete score<sup>[14]</sup> for recovery.

Table 2:- Vas.

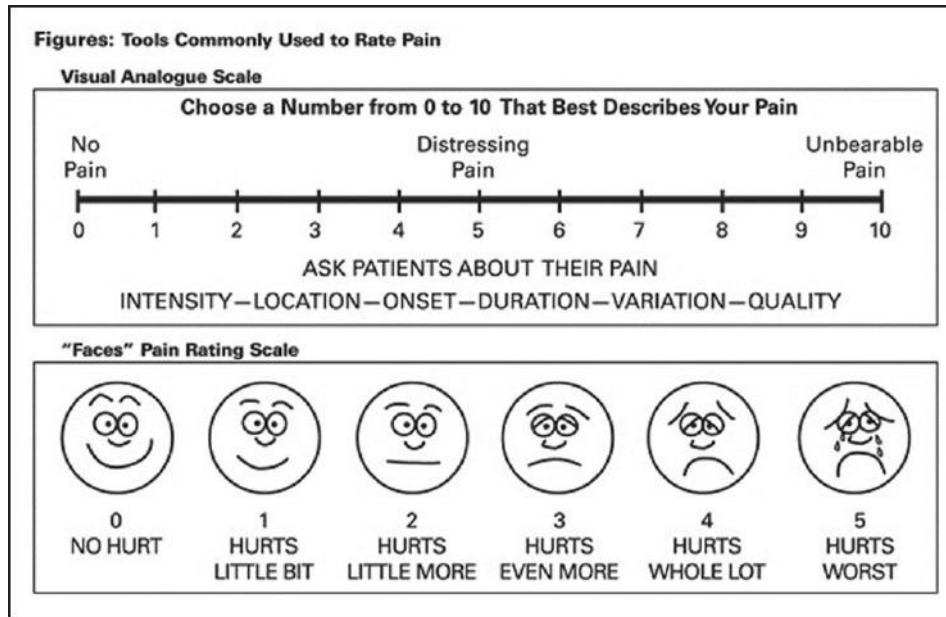


Table 3:-Standard Aldrete score.

Criteria	Points
<b>Vital signs</b>	
Within 20% of preoperative baseline	2
Within 20~40% of preoperative baseline	1
> 40% of preoperative baseline	0
<b>Activity level</b>	
Steady gait, no dizziness, at preoperative level	2
Requires assistance	1
Unable to ambulate	0
<b>Nausea and vomiting</b>	
Minimal, treated with oral medication	2
Moderate, treated with parenteral medication	1
Continues after repeated medication	0
<b>Pain: minimal or none, acceptable to patient, controlled with oral medication</b>	
Yes	2
No	1
<b>Surgical bleeding</b>	
Minimal: no dressing change required	2
Moderate: up to two dressing changes	1
Severe: three or more dressing changes	0

Source: Rev. bras. ter. intensiva vol.21 no.2 São Paulo Apr./June 2009

Along with this, vitals were monitored. (Pulse, BP, SPO<sub>2</sub> and RR). The patient were followed up until the VAS was more than or equal to 5.

Then the rescue analgesia will be given if required.

The time will be noted and patient will be released from the study.

Results in both groups will be tabulated and compared to draw the conclusion.

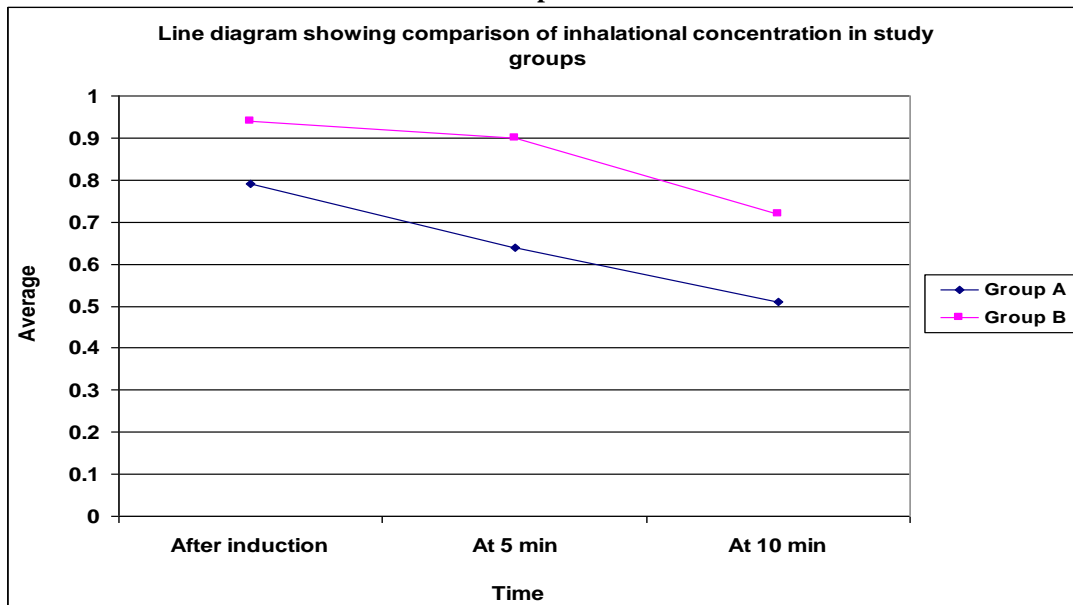
#### Parameters Recorded:-

1. Pre operative vitals
2. Base line vitals before premedication.
3. Vitals before induction.
4. Intra operative events (average).
5. Post operative vitals.
6. Duration of surgery
7. V.A.S score :
  - ❖ T<sub>0</sub> – at the time of premedication: drugs to be given.
  - ❖ T<sub>1</sub> – when patient wakes up/responds to verbal stimuli
  - ❖ T<sub>2</sub> – when patient starts complaining of pain with V.A.S > or equal to 5 (rescue analgesia to be given)
  - ❖ T<sub>1</sub>-T<sub>2</sub> = total duration of action
8. Ramsay sedation score.
9. Standard aldrete score for recovery.

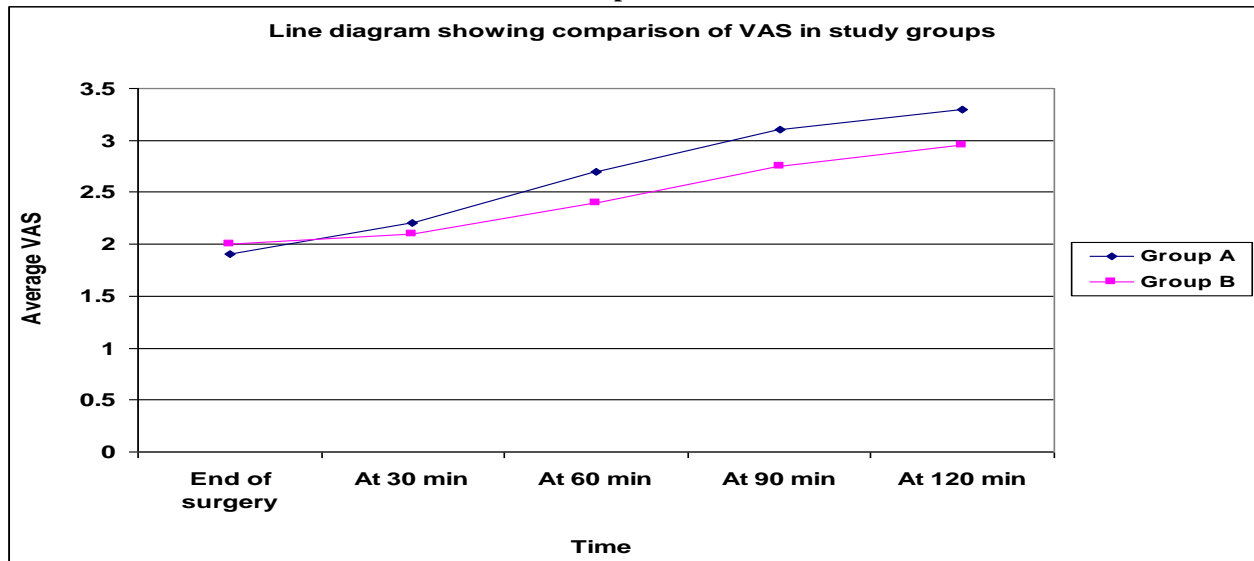
#### Results:-

There was no significant difference in pulse rate. There was significant fall in systolic ( $z = 2.55$ ) and diastolic ( $z = 2.04$ ) blood pressure in dexmedetomidine group after induction. ( $p < 0.05$ ). Requirement of inhalational anaesthetic agents was significantly reduced in the dexmedetomidine group ( $p < 0.05$ ) as compared to the butorphanol group (graph 1). VAS was significantly less ( $2.75 \diamond 0.44$ ) in the butorphanol group after 90 min and earlier rescue analgesia was given in dexmedetomidine group ( $p < 0.05$ ) (graph 2). Sedation score in both the groups was similar as assessed by Ramsay sedation score. Eye opening was earlier ( $45.5 \diamond 23.61$ ) in dexmedetomidine group as compared to the butorphanol group and was highly significant as  $p < 0.001$  (graph 3). Recovery was significantly improved ( $9.8 \diamond 0.41$ ) with dexmedetomidine group than butorphanol group and its  $p < 0.001$  as assessed by Standard Aldrete Score. (graph 4)

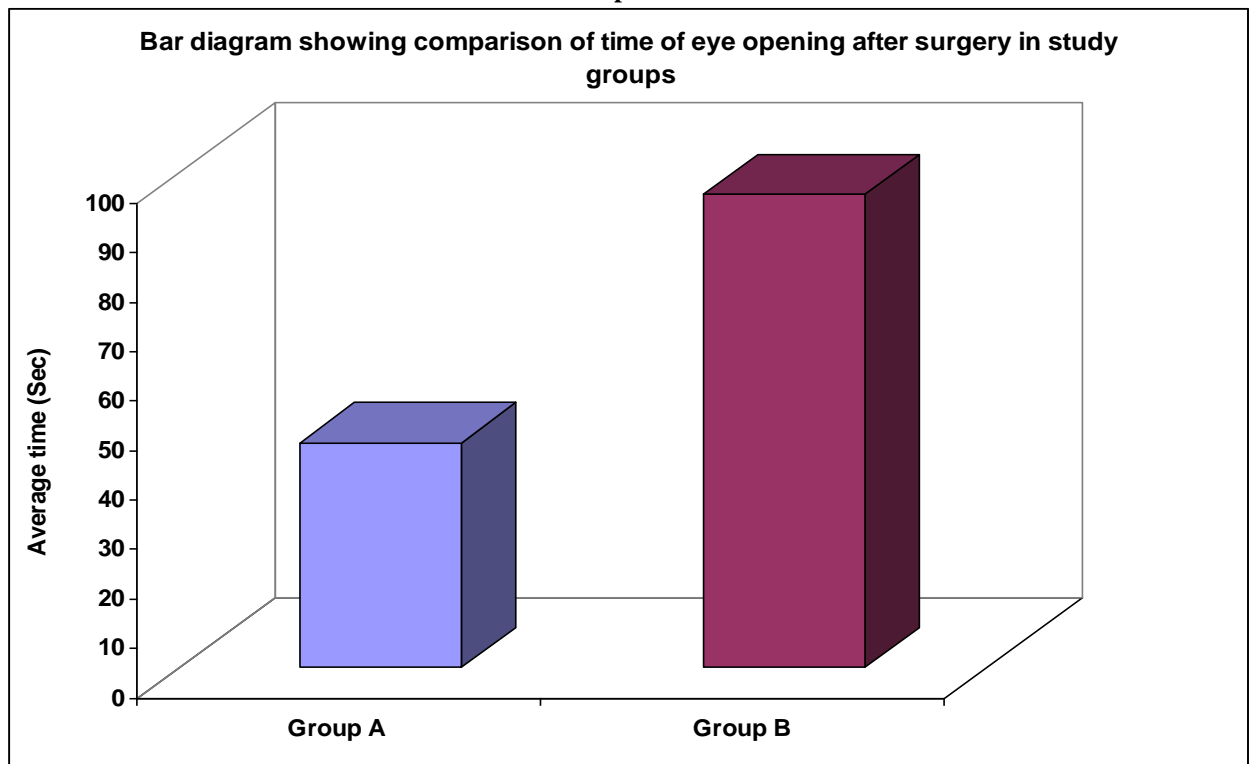
Graph 1:-



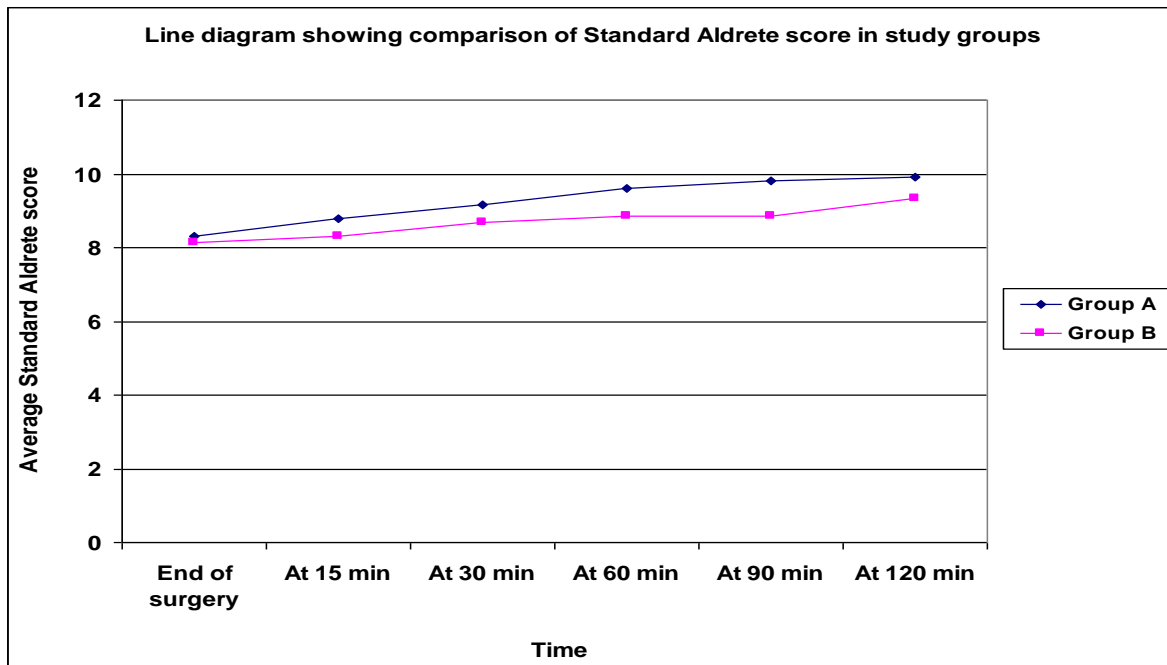
Graph 2:-



Graph 3:-



Graph 4:-



### Discussion:-

In the modern day hospitals, there is an established principle of ambulating the surgical patient as early as possible. Day care surgery has been defined by the Royal College of Surgeons as when the surgical day case patient is admitted for investigation or operation on a planned non-resident basis and who requires facilities for recovery. This definition excludes upper and lower GI endoscopies, outpatient procedures such as flexible cystoscopy, and minor superficial surgery under local anaesthetic, none of which require full day care facilities for recovery. It is important to mention that day care surgery is different from out-patient surgery in that the patients of day care surgery need some degree of post-operative observation for a few hours. All day care surgical patients essentially come early in the morning and after the surgery is over and the post-operative observation is uneventful, the patient is discharged home the same day.

The reduction in cost to both the patient and community, coupled with the advantages of Day Surgery for both patients and their relatives, have served to increase the demand for Day Surgery. The use of a Day surgery facility reduces the number of in-patient beds required. Shortened hospital stays and earlier mobilisation also reduces the risk of hospital-acquired infections and venous thromboembolism (VTE). The bulk of these patients come from specialties of ophthalmology and ENT, followed by Gynaecology and General Surgery. The other super-specialties only contribute a very small fraction<sup>4</sup>.

In last few years, a great enthusiasm has been shown toward the use of  $\alpha_2$  agonists in anaesthesia practice because it has been found to decrease serum catecholamine levels by upto 90%,<sup>5</sup> to blunt the haemodynamic response to laryngoscopy, tracheal intubation, pneumoperitoneum and extubation<sup>6</sup>, to provide sedation without respiratory depression and to decrease post-operative analgesic requirements<sup>7</sup>.

Whereas butorphanol is used as a pre-anaesthesia adjunct, narcotic analgesic for the relief of moderate to severe migraine, postoperative, or obstetric pain. Early studies suggested that butorphanol did not produce complete respiratory depressant effects and a 'plateau or ceiling effect' was observed<sup>8</sup>.

In 2003, Ard et al and Nelson et al suggested that Dexmedetomidine provides sedation, analgesia, and anxiolysis with minimal effect on respiratory function during the awake craniotomy similar to sedation during natural sleep.

In 2009, Wang F et al study found in a study that the butorphanol combined with intravenous morphine PCA in patients undergoing abdominal hysterectomy shows effective analgesia with sedation and fewer side effects. This



study also demonstrated that the butorphanol group had analgesia superior to the physiological saline control. The study found that there were no differences between urinary catheterization of more than 24 h, first time out of bed and time to discharge to home.

We choose butorphanol as drug of comparison with dexmedetomidine because the analgesic activity is 4-7 times that of morphine, 15-30 times that of pentazocine and has fewer side effects than other opioids and all of them can be reversed by naloxone. The safe dose of butorphanol that can be given intravenously is 20-40 µg/kg<sup>9</sup>. We have used 10 µg/kg of butorphanol in our study. The duration of analgesia after intravenous injection of 1 or 2 mg of Butorphanol lasts for 3-5 hours.

### **Conclusion:-**

Our study demonstrated that dexmedetomidine produces better sedation and analgesia without significant adverse effects compared to butorphanol. It can be used as sole sedative and analgesic for day care surgery patients. Patients also show better and faster recovery on usage of dexmedetomidine.

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**RESEARCH ARTICLE**

**TERRITORIAL DEVELOPMENT IN A PERIPHERAL AND DISADVANTAGED AREA.  
 SIERRA LEONE AT A TURNING POINT.**

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**Geography And Territorial (Under)-Development. A Brief Reflection On Sierra Leone – West Africa:-**

When we talk about development we have to consider a huge number of geographical factors, that are represented by specific and complex indicators, of both the human (social, cultural, economic) and the natural sphere. These elements analyse and describe the territorial performances of the local communities, especially their mutual relationship with the environment: structures, infrastructures and info-structures, as well as socio-economic activities, political life and the expressions of culture contribute to forge a unique geographical landscape, that intersects with those of other geo-systems.

For this reason, geography, thanks to its systemic and holistic approach, helps us in the recognition of the above mentioned experiences, that are both the result and the promoters of the territorial development in this current globalized dimension.

Globalization can be a challenge, but it becomes a risk if it is not sustainably governed. Thus, competitiveness seems to be a stimulating condition for the sustainable development: it doesn't exclusively foster the economic growth, but also the social and the cultural system and the ecological integrity, i.e. conditions like "conservation and development of human capital, social gender equality; reduction at all scales of economic, social and environmental segregation; decline in quantity and intensity of flows of materials, energy, transport; promotion of participatory subsidiary models based on cooperation and partnership" (Gemmiti, 2011, p. 47). In other words, competitiveness is sustainable if a territory supports (and sustain) market competition from the local enterprises (a mix of social, environmental, economic factors), promotes innovation and the know-how (tertiary education, scientific research, culture) thanks to investments from local or international stakeholders, who become actors of the territorial development. This happens when a territory is able to produce and maintain the maximum value added, as well as cooperation for both the social and the environmental quality, and is capable to interact with other territorial systems (Prezioso, 2006; Gaddoni, Pistocchi, 2013).

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Underdeveloped regions usually don't benefit from these conditions: they still lack positive policies to enhance phenomena of social fragmentation, of informal fragile economy, of widespread illiteracy, of illegal squatter settlements, of corruption, pollution, exploitation and mistreatment, and so on.

It is then necessary to evaluate several geographical aspects, that go from history to culture, from geopolitics to economy. New or old form of slavery, poverty, and dependency on rich economies are still indicated as the main aspects of underdevelopment (Alie, 1990; Latouche, 2007; Olivier de Sardan, 1995; Pistocchi, 2009; World Bank, 2009). Moreover, environmental problems like pollution, land- and water-grabbing, deforestation and desertification, mixed with the loss of local cultures, that are consequences of underdevelopment, in turn accentuate forms of territorial poverty.

Not different is the situation in Sierra Leone, a country that globally emerged from silence few decades ago, during a terrible "civil" war (1991-2001), which was caused by a complexity of reasons: the ambition of a group to control the domestic diamond sector, the anger of the people against the Government for the underdevelopment, the interest of international actors to control the region... That conflict, however, contributed to erode the socio-economic fabric of the local communities and worsened the dramatic condition of the infrastructural and economic sectors.

Although a period of attempts to raise from darkness, Sierra Leone is still one of the Heavily Indebted Poor Countries (and it is fully qualified for debt cancellation) and one of the lowest (181 on 188) for the Human Development Index (2015). The main causes of this condition can be attributed to a complicated system of political and economic aspects at both the national and the global scale. Sierra Leone is facing a sort of paradox, that is typical of underdeveloped countries: despite its poverty (illiteracy, diseases, civil revolutions, and economic dependency on foreign investments), it is rich of resources (underground, territorial, cultural), with a quite varied and abundant quantity of vegetables and fruits. Such a frailty must be attributed both to the past (transatlantic slave trade and colonialism) and to the present globalized economy.

### **Sierra Leone Between Local And Global Economies**

Sierra Leone is divided into four administrative regions, and more specifically in three provinces (*North*, with Makeni as capital city; *Eastern*, with Kenema as capital city, and *Southern*, with Bo as capital city) and the so called Western Area of Freetown, the capital.

The country is one of the 16 African states that are part of West Africa, according to the regionalization criteria adopted by the United Nations. Sierra Leone, and all the countries of the Region, that formerly belonged to the British, French and Portuguese Empires, have politically emancipated after WW II. These states, except Mauritania which came out in 2002, make up ECOWAS, namely the Economic Community Of West African States (CEDEAO in French, *Communauté Economique des Etats de l'Afrique de l'Ouest*), a regional economic grouping created May 28, 1975 in order to promote the integration of states in all the economic and productive fields, included infrastructures and energy, social and cultural issues. Its founding treaty was revised, integrated and reaffirmed in Cotonou (economic capital of Benin) in 1993; it asserts (art. 2) that ECOWAS is the only economic community in the region for economic integration and the attainment of the objectives of the community itself (Gamberoni, Pistocchi, 2013, pp. 230-231). Among the various initiatives, ECOWAS has been working in order to adopt a common currency, the ECO, by 2020<sup>1</sup>, notwithstanding, this appears quite difficult and problematic, primarily due to the different level of economic growth, to the diversity of the economies and to the drastic differences in size of the GDP of the countries that would adopt the ECO (e.g., Nigeria alone has a GDP of 260 billion dollars, compared to 75 billion the entire UEMOA). It is understandably a long and tortuous path, since it requires the fulfillment of a series of conditions and characteristics identified as key by WAMI (West Africa Monetary Institute). To do this, a stable and active domestic economy is necessary, to move funding and to promote projects, collaborations and globalization processes.

<sup>1</sup> The idea of adopting a single currency in West Africa by 2020 dates back to June 2007, when the Heads of State of the region's countries had signed a declaration called "Vision 2020". As in the past the Franc CFA (*Franc Colonies Françaises d'Afrique*) was pegged to French Franc, the ECO should be pegged to the Euro. According to the Liberian Toga McIntosh, current Vice-President of the ECOWAS Commission, the path to reach the single currency should provide for a first phase of integration between the Portuguese-speaking countries and those of the English language; then the full monetary integration between them and the French-speaking area UEMOA (*Union Economique et Monétaire Ouest Africaine*), in which the CFA Franc is already in force (<http://atlasweb.it/2013/09/12/africa-occidentale-entro-il-2020-arriva-leco-la-nuova-moneta-unica-579.html>).

India, Brazil but especially China are the new economic superpowers that are responsible of a quite controversial economic development: the combination «infrastructure in exchange for resources» sums up this sort of relationship. China, which is experiencing a fast process of economic growth and that it is lacking raw materials (especially energy) is “forced” to turn to Africa and buy or trade its resources by building in exchange large infrastructures (roads, hydroelectric dams, airports).

These are impressive works, which on the one hand improve the spatial performance of entire regions, and contribute to raise the quality of life of entire human groups: this could be an opportunity for the local development, even in a scenario of South-South partnership<sup>2</sup>; on the other hand, however, the local governments and the local communities lose any kind of control on these vast areas. Although in the short term these large investments and the impressive works by Chinese companies (there are 30 currently active in the territory of Sierra Leone) produce some benefits, in the long term the major Chinese projects do not contribute to build the foundations for a long-lasting, solid and resilient development, since it does not protect land resources, and do not promote local expertise, which, when they are not replaced by Chinese labor, are exploited in a working condition of subordination. That's why someone talks about «China's Silent Storm in Sierra Leone» (Datzberger, 2013).

This is what matters: «[...] looking at China as an infrastructural developer for Sierra Leone, they have made significant progress on the Freetown urban landscape from the multi-use national stadium to Youyi building (ministerial complex). Over the past decades; they have built bridges, power transmissions, a dam and some roads. More recently, the Chinese contractors finished constructing a new foreign ministry building, additional offices for parliament and the 100-bed China Sierra Leone Friendship Hospital at Jui, outside of Freetown. And President Ernest Koroma, early in July, 2013 signed a deal with Chinese Railway International Company to build a new airport and a railway amounting in the total of \$ 8 billion. Thus, China has significantly supported some level of economic growth for Sierra Leone» (<http://standardtimespress.org>).

But the newspaper article “The growing interest of China in Sierra Leone”, 27th August, 2016 (<http://standardtimespress.org>), complaint that China continues to ignore the level of corruption in this country and in particular in the high ministerial and government troops. This for a number of reasons such as opportunism and practicality: China, for its projects in Sierra Leone, use Chinese workers instead of local workforce and seems not interested in the internal political dynamics. Unfortunately, this *laissez-faire* attitude seems to worsen the fragile socio-political system, because it breaks down the sense of belonging and the civic participation of the locals, who better appreciate those new, quick, and efficient infrastructures.

### **Political power and the Shadow-State model**

This weakness is largely dependent on the so called «shadow-state», originated from a two-hundred-years period, when these territories have experienced a rapid political transition, from pre-colonial state (made of noble lineages and of a society divided into strict social classes) to colonial (dual, made of white settlers and blacks subjects) to the post-colonial era (the current one, of independent but non self-sufficient states). The colonial state completely reshaped societies, and transformed the form of aggregation and organization (law and economics), repositioning individuals or entire ethnic groups in new geographic spaces (provinces, administrative districts, municipalities) that had little or nothing to do with places and traditional territories (kingdoms, ethnicities). They thus created the political dichotomies and conceptual dyscrasia (common law vs. civil law, urban world vs. rural world, the center vs. periphery, leadership vs. mass of citizens, rich vs. poor) that form the basis of the serious problems related to underdevelopment. Such conditions cause on the one hand fragmentation and separation, on the other the contradictions of a democratic society (Turco, 2004), made of territorial systems in which the gap between town and country is still very strong, and in which the same urbanization is characterized by interstitial spaces and overwhelming informal economies (Gamberoni, Pistocchi, 2013, p. 97).

Sierra Leone is still struggling to emancipate. In the past, it «was the first centre of modern civilization in West Africa» (HIGSON 1961, p. 191). But at the dawn of the independence processes other countries like Nigeria and Ghana were beginning to take on a leading role in the regional economy. So, Sierra Leone needed «improved

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<sup>2</sup> This is legitimated by the FOCAC, the *Forum On China and Africa Cooperation*, established in 2000, which provides for bilateral economic agreements between the Beijing government and each partner African state. However, it seems to be an unequal exchange.

services (especially of education in the Protectorate<sup>3</sup>) and these cost money. This can be raised by loans from abroad or by increased production within the country. Loans can only be a temporary solution: increased production will require the combined efforts of the whole population. The national income could, however, be added to in the near future by the: 1) regulation of the diamond industry and prevention of illicit mining and selling of the stones; 2) rapid development of swamp rice production; 3) increase of iron ore and other mineral production; 4) development of plantation cultivation of bananas, citrus fruits and pineapples; 5) more scientific cultivation of oil palm, to ensure greater output and better quality. The economic problem of Sierra Leone is a serious one and must be solved as soon as possible in order to allow for the orderly and natural development of self-government» (Higson 1961, p. 191).

## A Contradictory Development

The following tables (table 1, 2, 4, 4) summarize some of the major geographical performances about Sierra Leone from the World Bank Development Index 2016.

**Table 1:** Demography of Sierra Leone

Population	Population density	Urban population	Population of the Capital City (census 2014)	Capital population density	Net migration 2010-2015
6,300,000	87 people per sq. km	40%	951,000	2,664 people per sq. km	- 21,000

**Table 2:** Socio-economic Aspects: Growth, Employment, Poverty

GDP per capita	GDP per capita growth rate	Annual GDP growth rate			People under the poverty line (2011)		Foreign Direct Investment
		1999-2000	2000-2009	2009-2014	Less than 3,1\$ a day	Less than 1,9\$ a day	
700 \$	+2.3%	-3%	+7.2%	+11%	80%	52.8%	690 million \$

**Table. 3:** Society and Quality of Life

Child mortality (0-5) (2015)	Maternal mortality (2015)	Fertility (15-19) (2014)	HIV Adults (15-49) infected (2014)	Youth literacy rate (15-24) (2005-2014)	Digital divide (2014)	
					New mobile subscriptions	Private use of Internet
120‰	13.6‰	120‰	1.4%	64%	+77%	2%

**Table 4:** Environment and pollution

Deforestation 2000-(2015)	Protected areas (2014)	Fresh water per capita (2014)	People with access to good sanitation facilities	CO <sub>2</sub> emissions (2011)
-0.28%	3.8%	25,334 m <sup>3</sup>	63%	0.9 millions of tons

Table 1 shows the total population of Freetown, the capital, and its population density (2,664 inhabitants / km against the country's average 87). This of most of the territories in rapid process of growth: the urban gigantism and the primacy of the capital city or a few other urban settlements than the rest of the territory. Big-primatial cities in underdeveloped or developing countries are still very controversial, because the relationship between the global and the local is negative. Often, unscrupulous businessmen choose the chaotic capital city of underdevelopment as a free territory, to hide their illegal activities. For these reasons, urbanization needs responses for the impacts it produces on the territory, the environment, the society and its economy. In particular, the main environmental problems are particularly concerned with water and energy waste, pollution and the resulting social ills: economic poverty and

<sup>3</sup> That book was edited in 1961, the same year of the Independence. "Protectorate" meant the inner areas: the author underlined the urgency to enhance education in the "peripheral" areas, namely those where people were still mainly living mainly with the primary sector subsistence activities.

social marginalization slow down and discourage political intervention and planning aimed at making sustainable the progressive urban growth.

However, this condition is not only typical of the poorest areas of the earth: cities such as Tokyo, New York, Paris, London, for example, can in some way be defined «primatial». But with one major difference: their level of urbanization determines the strengthening of the economic structure also of the suburbs, and urbanization enhances the entire territory; on the contrary, in underdeveloped regions or emerging economies, urbanization does not necessarily correspond to a better quality of life.

Freetown attracts a lot of people from the countryside and suburbs: it provides some excellent services (headquarters of banks, multinational corporations), but still lacks some basic services to citizens and cannot provide services for the suburbs and the surrounding countryside.

Surely, the country is in strong economic growth (tab. 2). Even EPA, the Environmental Protection Agency, confirms the positive development of Sierra Leone's economic performance, growth which, however, has taken place at a much lower rate than that of other countries in sub-Saharan Africa. «The poverty headcount has declined from 66.4 percent in 2003 to 52.9 percent in 2011. The overall reduction was led by strong growth in rural areas, where poverty declined from 78.7 percent in 2003 to 66.1 percent in 2011, yet this figure was overall still higher than urban poverty. Urban poverty declined from 46.9 percent in 2003 to 31.2 percent in 2011. This decline was despite an increase from 13.6 percent to 20.7 percent in the capital, Freetown. District level poverty analysis showed that by 2011 most districts had converged to poverty levels between 50 and 60 percent, with the exceptions being Freetown at 20.7 percent and levels above 70 percent in Moyamba and Tonkolili. Underlying this poverty reduction was an annualized 1.6 percent per capita increase in real household expenditure from 2003 to 2011» (EPA, 2014, p. 12).

Although the growth rate of per capita GDP is positive (+ 2.3%), this process is still unable to eradicate widespread and extreme poverty that emerges from the data for the percentage of people living under the absolute poverty line (52.8% of the population) in 2011.

What emerges from the economic indicators is also reflected in the social conditions (tab. 3): the gap between rich and poor is still wide, as well as between the services provided and the people's needs. Even health data are not entirely comforting, especially those related to maternity-care and child-care. In particular, child mortality 0-5 is dramatic: it means that health facilities and medicines, as well as physical and economic accessibility to medical care are not guaranteed.

Talking about environment (tab. 4), a reflection on wrong policies is required: although availability of fresh water is medium-high (25,334 m<sup>3</sup> compared to the world average of 5,925), sewage and water treatment systems are still poor, justifying the high percentage of some of the more frequent diseases (diarrhea, fever, cholera, malaria) due to the assumption or the presence of dirty or contaminated water.

Uncontrolled deforestation is decreasing, but an ecological approach for the preservation and the institution of protected areas don't seem to be a governmental priority. Indeed, in a vision of development and sustainability, it could be a successful policy for both the environment and the promotion of tourism that, in turn, could support the socio-economic sector. The level of dioxide emissions is very low. This is attributable not to policies<sup>4</sup> to prevent pollution and protect the environment, but, again, to an economic and industrial system underdeveloped.

This is a challenge: the country is constantly exposed to risks of instability and periodic events that slow down or block the path toward a stable development. For example, in the past two years Ebola caused many deaths, as well as socio-economic problems connected with farming and environmental health: the affected areas were quarantined and rural areas were left abandoned and remained uncultivated for months; children and the youths didn't go to school; any other activity was suspended.

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<sup>4</sup> In this current global scenario, the country has been trying to adapt its policies to the Millennium Goals.

## **Ebola And Intervention Policies: Victory Or Defeat?**

Ebola is an insidious disease because it is of easy infection and difficult to cure, which put a strain on not only some regions of West Africa (Guinea, Sierra Leone, Liberia), but the whole humanity: the disarming impotence in front of the spread of such a disease (without being able to stop it promptly) causes amazement, dismay, sense of failure.

Africa is living a strong and fast economic growth. However, the gap between wealth (little and poorly distributed) and poverty (and very widespread) is still marked.

For these reasons, the challenge of solving a health problem opens complex scenarios, since it is part of a broader field of study, which inevitably also involves the economic, political and social sphere. The disease in Africa is closely linked to the complex food- cultural- social- and economic- system.

A very low human development, a fragile health system and a large internal migration led to the spread of Ebola and to the collapse of the country. Besides these reasons we must not forget the archaic traditional rites around death and the dead, during which the corpse is exposed to people.

It is not for mere irony that Ebola has spread in the same areas affected by the drama of the blood-diamonds war and the child-soldiers. Those are vast border areas, passageways from one State to another, poor of institutional barriers and delimited by the so called «porous» borders: they divide two States, but only one ethnic region, that is inhabited by the same people. That ethnic group was divided during the colonial and post-colonial power, and suffered a sort of geographic *diaspora*. So, they now nourish a strong sense of belonging and live in continuous contact, ignoring the constraints imposed by international geopolitics. The state is unable to ensure an effective and active control: illegal trade, smugglers, terrorists, and diseases are not stuck by borders. For example, «while Nigeria's border problem is related to this colonial history, its porosity has been exacerbated by the failure of succeeding governments to properly administer these borders. As Okumu noted, «the high level of insecurity on African borders is largely due to the way they are administered and managed, and less to do with how colonialists drew them. In this respect, Nigerian borders are known for the limited presence of security and law enforcement officials. The few that are deployed are poorly trained, work with inadequate and obsolete equipment, and sometimes poorly remunerated. In addition, most border communities have for long been neglected by the government, making it difficult for government to leverage on their position to curtail illicit crossborder activities» (Onuoha, 2013, p. 4).

The most affected districts were those at the border with Liberia (Kailahun and, by geographical proximity, Kenema) and Guinea (Bombali and, by geographical proximity, Port Loko): those are the districts through which the main interregional roads pass from one country to another. Moreover, Makeni (Bombali District) is the capital of the whole Northern Region, and Kenema (Kenema District) is the capital of the Eastern Region, therefore, they are the most populated urban areas of those regions.

In the absence of adequate equipment and sanitary facilities, it was difficult to make a prompt diagnosis to prepare an effective contrast therapy. The symptoms of this disease, in fact, are generally high fever (more than 38°C), headache, muscle aches, vomit, diarrhea, abdominal pain, bleeding, that are very common to many other diseases (malaria, yellow fever...). Therefore, at the beginning of the outbreak of Ebola, people were not alarmed and behaved without precautions: many civilians helped doctors and nurses in hospitals and took care of their loved ones and so they have been infected too.

To avoid infection, while waiting for an international systematic intervention, it was made an ambiguous and controversial choice, the «quarantine»: whole areas of Sierra Leone, in particular the rural and less accessible, have been isolated, with the prohibition for the inhabitants to leave their houses, to go into the fields and to support each other.

The result was that entire plantations were abandoned, the countryside was invaded by wild-nature, and all the rural economy was destroyed: these safety and prevention strategies have caused hunger and malnutrition, have weakened the body and the immune system of people and have favored the emergence of other diseases.

The prices of everyday products such as rice, potatoes, and oil have increased by 30% (tab. 5). This has led to a surge in inflation, that grew up in a few days from 6.39 at 7.8%.

**Table 5:** Ebola impact on the production and sale of the main agricultural products and foodstuffs in Liberia, Sierra Leone and Guinea (FAOSTAT 2015, p. 4).

Country	Rice		Cassava		Corn	
	Reduction of production (tons)	Loss of production value (\$ USA)	Reduction of production (tons)	Loss of production value (\$ USA)	Reduction of production (tons)	Loss of production value (\$ USA)
Liberia	24,000	10,000,000	19,000	2,000,000	-	-
Sierra Leone	100,000	43,000,000	37,000	4,000,000	2,000	300,000
Guinea	55,000	23,000,000	4,000	400,000	24,000	4,000,000

Many foreign companies, such as *China Union*, the *Vale* and the *Marampa*, have drawn all their employees at home. These sudden closures led to the collapse of all commercial transactions and, consequently, the unemployment of many workers who worked in sectors linked with these big foreign companies.

The growth rate of GDP (2001-2014) was -29.67%. This data must precisely be imputed to the fact that for at least 169 days, half of the entire population of the country has lived without money. Schools and universities were closed: teachers and administrative staff did not receive salary, while students have lost a whole year of training and have delayed a year their entry into the world of work.

Ultimately this phenomenon, which has severely affected the socio-economic sector, has also damaged the tourism industry: data show that the number of tourists in a few months dropped by 50% or even 60%.

On 7<sup>th</sup> November 2015, Sierra Leone was declared Ebola-free, since, in accordance with safety procedures, no negative test for the Ebola virus was recorded in the previous 42 days. The population started to return to their daily lives and to their work activities. Yet, in late January 2016, new infection cases alerted the community. It took month to definitely proclaim Sierra Leone Ebola-free.

For now it seems that Ebola has claimed nearly 4,000 deaths in Sierra Leone, nearly 5,000 in Liberia and more than 2,500 in Guinea.

## Final Remarks

Sierra Leone is not yet a State democratically made; scholars even define it a failed state. A young country like Sierra Leone needs a strong political and administrative system, able to guarantee cohesion, in safeguarding and promoting the complex socio-cultural structure.

The cultural, political, economic identity of Sierra Leone, like that of any other territory, does not end within its territorial unit; on the contrary, it can be understood through a global vision of its political and economic dynamics.

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