RESEARCH ARTICLE

ASSESSMENT OF THE LEVELS OFCARDIOPULMONARY RESUSCITATION (CPR) AMONG MEDICAL STUDENTS IN NORTHERN SAUDI ARABIA

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Manuscript Info

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Abstract

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Background: Cardiopulmonary resuscitation is a lifesaving maneuver if provided at the right time and it can improve the mortality rate in medical emergencies. The accurate knowledge regarding CPR is an essential and integral part to deliver an adequate and successful resuscitation in such cases. This study aims to assess the knowledge among undergraduate medical students in CPR at the Northern Region Universities of Saudi Arabia.

Methods: This is a cross-sectional study assessing CPRknowledge among medical students. The data was carried out on 731 medical students (231 fourth year, 285 fifth year and 215 sixth year medical students) from different colleges in the northern Saudi area by an online self-administered questionnaire that aimed to evaluate their knowledge regarding basic life support (BLS) and CPR techniques in neonates, children, and adults.

Results: The data showed the mean knowledge scores of CPR among medical students according to university are represents as follows; University of Tabuk (50.5%), University of Hail (47%), Al Jouf University (45%), and Northern border university (43%). The mean knowledge scores of CPR among medical students according to academic year are represents as follows; fourth year (45.5%), fifth-year (47.6%), and sixth year (45.3%).

Conclusions: The level of BLS awareness among medical students is generally poor. The introduction of regular BLS courses into the undergraduate curriculum is a must to increase the level of knowledge among these future physicians. A shorter training period as well as recurrent and regular refreshing courses are also recommended.

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Introduction:-

Basic life support (BLS) refers to maintaining an airway and supporting breathing and circulation without using any equipment . However, this term encompasses more than cardiopulmonary resuscitation (CPR) such as defibrillation with an automated external defibrillator (AED), recognizing the signs of sudden cardiac arrest, heart attack, stroke, and foreign-body airway obstruction, basic first aid, and even child CPR BLS is most likely to be given to healthcare

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providers meanwhile CPR certification programs are more geared toward the general public and healthcare providers.

Cardiopulmonary resuscitation (CPR) is a combination of chest compressions and breaths that provides critical blood flow and oxygen to the heart and brain. It is held in some critical situations most likely sudden cardiac arrest which accounts for approximately half of all cardiovascular deathsIf CPR is started within three to five (3-5) minutes of collapse, it will have a great impact on mortality and morbidity. Unfortunately, bystander CPR is provided to only 15% to 30% of sudden cardiac arrest victims. Some of the factors that affect survival include the response time of trained emergency providers, the initial presenting cardiac rhythm, whether the sudden cardiac arrest was witnessed, and whether the victim received effective bystander CPR. CPR training for all healthcare professionals has been recommended since the inception of formal CPR guidelines more than 40 years agoAlso, the Royal College of Physicians has stated that advanced life support (ALS) should be taught in the undergraduate course.

Several studies have assessed the levels of BLS awareness among medical students in different countries However, similar data on the northern medical student in the Kingdom Of Saudi Arabia are lacking. Therefore The purpose of this study was to address and assess the level of knowledge of the basic aspects of CPR practice among medical students from several colleges in Saudi Arabia.

Materials and Methods:-

This cross-sectional study was conducted at Hail University. The sample was both females and males from different colleges in the Northern region of Saudi Arabia. The Universities that were selected in the present study were as follow: Hail University, Tabuk University, Al Jouf University, and Northern border University. The sample size was 731 participants, consisting of fourth, fifth, and sixth-year medical students. The study was carried out by a previously used and validated questionnaire [9,2,3], and it was modified according to the study objectives. An online questionnaire was divided into two parts. The first part was general and demographic questions which included gender, Institute (University), academic year. The second one was about the theoretical knowledge of CPR. In this section, we asked about the general concept of CPR, steps, maneuvers, how to conduct a CPR in different age groups and what to expect if it was handled by an expert than it was disturbed to the previously listed colleges.

Data Analysis :

Data were analyzed using the software Statistical Package for Social Science (SPSS Inc. Released 2009, PASW Statistics for Windows, version 16.0: SPSS Inc., Chicago, Illinois, USA). Those who answered ≥ 50% (11/22) of the total knowledge points were considered to have an acceptable level of knowledge, a chi-square statistical test was used for statistical significance (P-value). A P value > 0.05 was considered statistically significant.

Ethical considerations:

The study proposal was approved by the Research Ethics Committee of Hail University, and participants were informed of the details and aims of the study before consenting to participation.

Results:-

Participants:

A total of 731 participants who are from northern region universities in Saudi Arabia were included in the statistical analysis of which 52.5% were males and 47.5% were females. The participants were distributed among the academic years as follows: 231 were in their 4th year, 285 in their 5th year, 215 in their 6th year. Thus, it should be noted the participants were 187 (25.6%) from the University of Hail, 136 (18.6%) from the University of Tabuk, 247 (33.8%) from Al Jouf University, 161 (22%) from Northern Border University (Fig.1).

Figure 1: Distribution of Northern Region Universities in Saudi Arabia
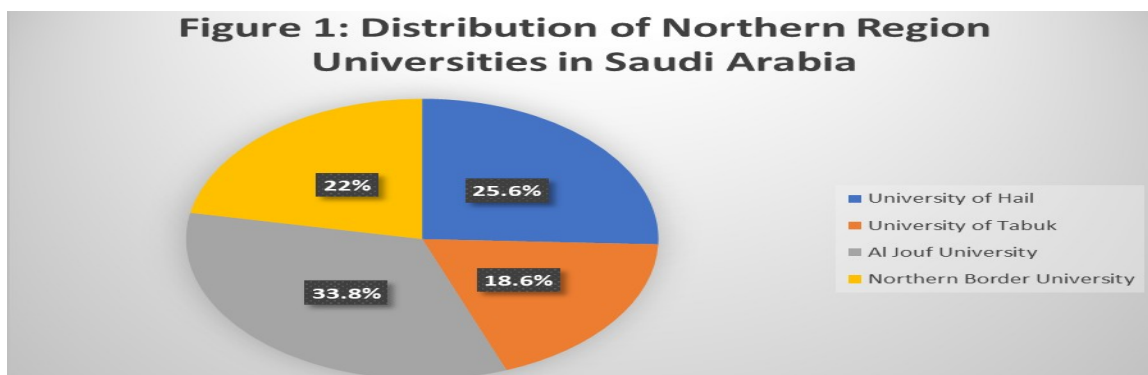
Knowledge:
In our study, 63.1% of the respondents were trained in CPR. Otherwise, 36.9% of respondents had no previous CPR training. More than 338 (46.5%) of the participating medical students answered the questionnaire correctly.Figure 2 demonstrates the percentages of the responses that have got the right answers to questions assessing CPR knowledge. Moreover, two-thirds of northern universities' medical students had inadequate knowledge of CPR, scoring less than 50% on the questionnaire. The CPR knowledge among medical students in Northern universities of Saudi Arabia represents as follows; University of Tabuk (50.5%), University of Hail (47%), Al Jouf University (45%), and Northern border university (43%). Accordingly, the University of Tabuk had the highest score in knowledge about CPR compared to other universities.However, the results showed that there were no statistically significant differences between the medical students in these universities. The defect was mostly apparent for all four universities in the questions assessing infant's and children's specific CPR knowledge. For instance, only 14.77% of average medical students were able to identify the depth of compressions in children. Besides, some students have shown lower rates of knowledge for questions covering the location and depth of compressions in neonates, infants, and children. In a similar case, an average of 26.27% of the students has a previous knowledge in the current order of the updated CPR intervention which is a very low percent. Generally, All four university students who had previous knowledge or CPR training course have better knowledge than others, scoring significantly better on average (P<0.01) (Table1).

The mean CPR knowledge among medical students in academic years represents as follows; fourth year (45.5%), fifth-year (47.6%), and sixth year (45.3%).

Generally, fifth-year students had the best knowledge compared to fourth and sixth-year students, scoring significantly better on average (p < 0.001) (Table 2, Fig. 3) with females achieving significantly higher scores than males (Table 3, Fig.4).
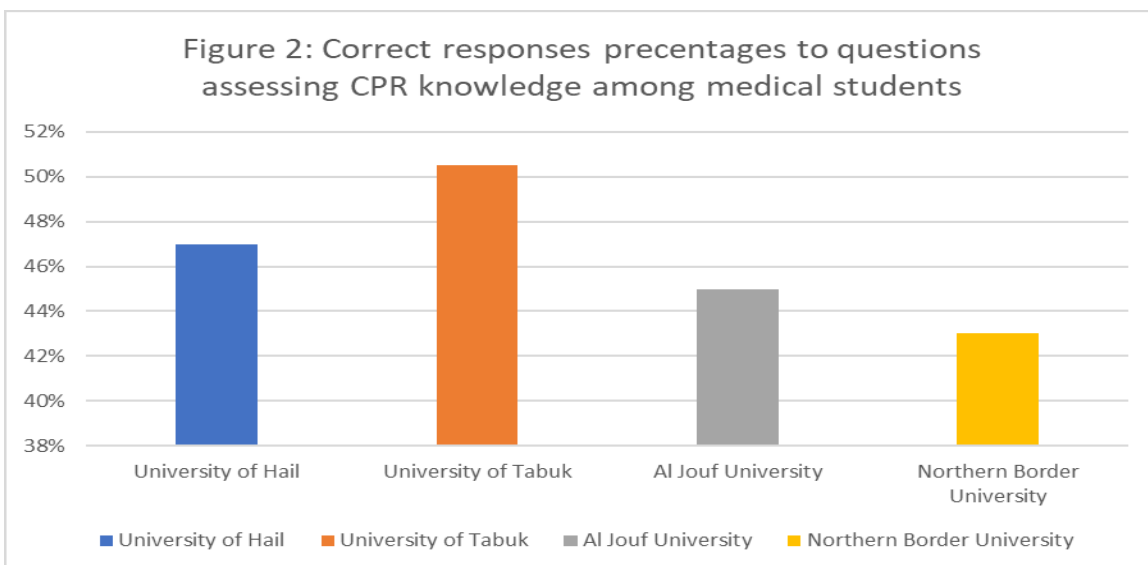

Figure 2: Correct responses precentages to questions assessing CPR knowledge among medical students

Table 1:- Comparisons of correct responses to questions assessing CPR knowledge among medical students according to university.
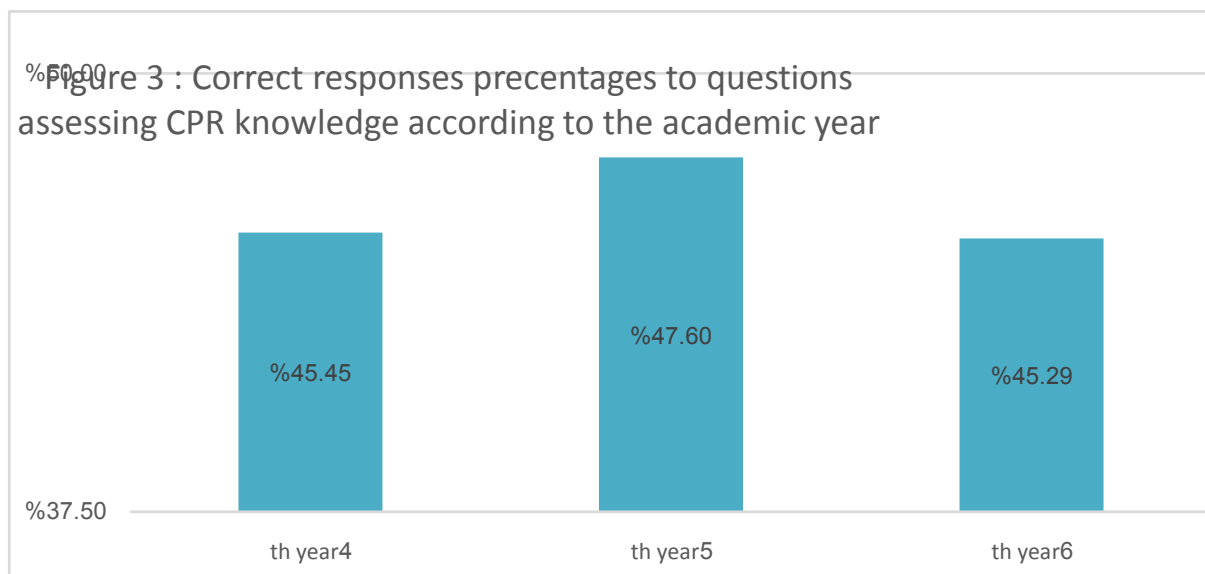
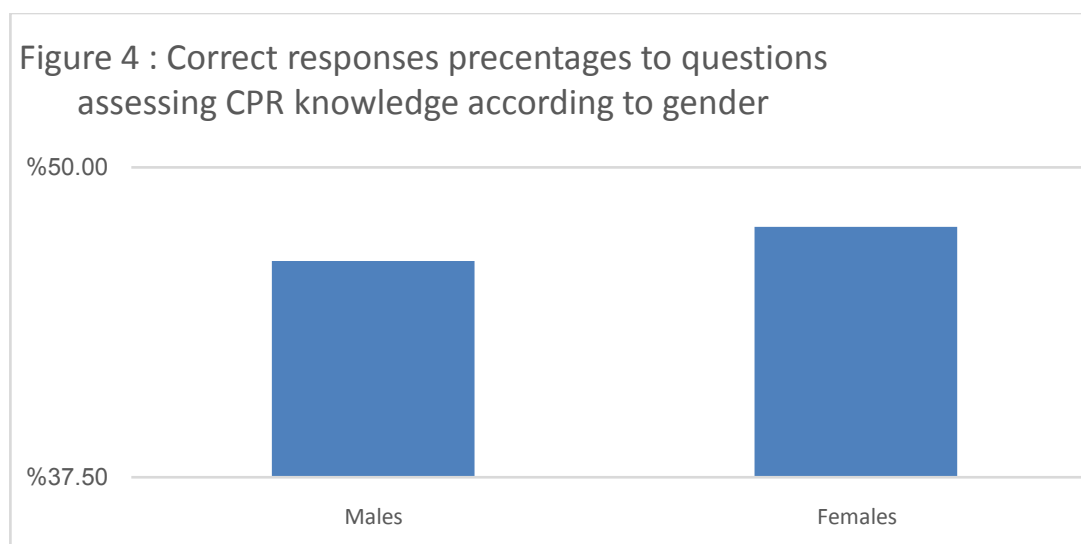| Question/knowledge area assessed	University of Hail (#%)	University of Tabuk (#%)	Al Jouf University (#%)	Northern Border University (#%)
The abbreviation of "BLS".	170 (90.9%)	118 (86.8%)	193 (78.1%)	122 (75.8%)
Response to Cardiac arrest on the road	129 (69.0%)	87 (64.0%)	108 (43.7%)	89 (55.3%)
Location of chest compression in adults	115 (61.5%)	79 (58.1%)	117 (47.4%)	85 (52.8%)
Location of chest compression in infants	78 (41.7%)	67 (49.3%)	57 (23.1%)	73 (45.3%)
Rescue breathing in infants	69 (36.9%)	54 (39.7%)	94 (38.1%)	66 (41.0%)
Depth of compression in adults	105 (56.1%)	82 (60.3%)	86 (34.8%)	83 (51.6%)
Depth of compression in children	32 (17.1%)	24 (17.6%)	34 (13.8%)	17 (10.6%)
Depth of compression in neonates	75 (40.1%)	50 (36.8%)	83 (33.6%)	54 (33.5%)
Rate of chest compression in adults and children	71 (38.0%)	45 (33.1%)	62 (25.1%)	59 (36.6%)
The current order of updated CPR intervention for all ages except newborns	59 (31.6%)	30 (22.1%)	81 (32.8%)	30 (18.6%)
Recommended universal compression to ventilation ratio	104 (55.6%)	88 (64.7%)	126 (51.0%)	107 (66.5%)
CPR attempted inside a hospital rather than outside	112 (59.9%)	112 (82.4%)	180 (72.9%)	101 (62.7%)
Window of effectiveness for CPR from onset of arrest	61 (32.6%)	48 (35.3%)	95 (38.5%)	46 (28.6%)
Artificial respirations > CPR in respiratory arrest	70 (37.4%)	71 (52.2%)	128 (51.8%)	55 (34.2%)
Most people who receive CPR survive	76 (40.6%)	60 (44.1%)	129 (52.2%)	65 (40.4%)
Reversible and irreversible brain damage	102 (54.5%)	80 (58.8%)	153 (61.9%)	74 (46.0%)
Blood flow cessation for > 10 h and cell death	82 (43.9%)	65 (47.8%)	136 (55.1%)	69 (42.9%)
CPR optimum period	93 (49.7%)	86 (63.2%)	141 (57.1%)	69 (42.9%)
Ambulatory compression-only CPR	41 (21.9%)	29 (21.3%)	50 (20.2%)	45 (28.0%)
Survival rate after defibrillation	96 (51.3%)	72 (52.9%)	132 (53.4%)	67 (41.6%)
CPR provider status	106 (56.7%)	95 (69.9%)	171 (69.2%)	79 (49.1%)

Table 2:- Comparisons of correct responses to questions assessing CPR knowledge among medical students according to the academic year.

Question/knowledge area assessed	Fourth-year	Fifth-year	Sixth year
The abbreviation of "BLS".	182 (78.8%)	235 (82.5%)	186 (86.5%)
Response to Cardiac arrest on the road	136 (58.9%)	153 (53.7%)	124 (57.7%)
Location of chest compression in adults	127 (55.0%)	150 (52.6%)	119 (55.3%)
Location of chest compression in infants	78 (33.8%)	117 (41.1%)	80 (37.2%)
Rescue breathing in infants	81 (35.1%)	110 (38.6%)	92 (42.8%)
Depth of compression in adults	106 (45.9%)	143 (50.2%)	107 (49.8%)
Depth of compression in children	34 (14.7%)	44 (15.4%)	29 (13.5%)
Depth of compression in neonates	88 (38.1%)	101 (35.4%)	73 (34.0%)
Rate of chest compression in adults and children	71 (30.7%)	83 (29.1%)	83 (38.6%)
The current order of updated CPR intervention for all ages except newborns	74 (32.0%)	78 (27.4%)	48 (22.3%)
Recommended universal compression to ventilation ratio	131 (56.7%)	174 (61.1%)	120 (55.8%)
CPR attempted inside a hospital rather than outside	149 (64.5%)	205 (71.9%)	151 (70.2%)
Window of effectiveness for CPR from onset of arrest	82 (35.5%)	109 (38.2%)	59 (27.4%)
Artificial respirations > CPR in respiratory arrest	106 (45.9%)	133 (46.7%)	85 (39.5%)
Most people who receive CPR survive	108 (46.8%)	140 (49.1%)	82 (38.1%)
Reversible and irreversible brain damage	125 (54.1%)	169 (59.3%)	115 (53.5%)
Blood flow cessation for > 10 h and cell death	105 (45.5%)	154 (54.0%)	93 (43.3%)
CPR optimum period	122 (52.8%)	149 (52.3%)	118 (54.9%)
Ambulatory compression-only CPR	51 (22.1%)	62 (21.8%)	52 (24.2%)
Survival rate after defibrillation	118 (51.1%)	155 (54.4%)	94 (43.7%)
CPR provider status	131 (56.7%)	185 (64.9%)	135 (62.8%)

Question/knowledge area assessed	Males	Females
The abbreviation of "BLS".	315 (52.2%)	288 (47.8%)
Response to Cardiac arrest on the road	206 (49.9%)	207 (50.1%)
Location of chest compression in adults	198 (50.0%)	198 (50.0%)
Location of chest compression in infants	130 (47.3%)	145 (52.7%)
Rescue breathing in infants	160 (56.5%)	123 (43.5%)
Depth of compression in adults	171 (48.0%)	185 (52.0%)
Depth of compression in children	48 (44.9%)	59 (55.1%)
Depth of compression in neonates	121 (46.2%)	141 (53.8%)
Rate of chest compression in adults and children	116 (48.9%)	121 (51.1%)
The current order of updated CPR intervention for all ages except newborns	126 (63.0%)	74 (37.0%)
Recommended universal compression to ventilation ratio	217 (51.1%)	208 (48.9%)
CPR attempted inside a hospital rather than outside	273 (54.1%)	232 (45.9%)
The window of effectiveness for CPR from the onset of arrest	143 (57.2%)	107 (42.8%)
Artificial respirations > CPR in respiratory arrest	168 (51.9%)	156 (48.1%)
Most people who receive CPR survive	167 (50.6%)	163 (49.4%)
Reversible and irreversible brain damage	205 (50.1%)	204 (49.9%)
Blood flow cessation for > 10 h and cell death	182 (51.7%)	170 (48.3%)
CPR optimum period	208 (53.5%)	181 (46.5%)
Ambulatory compression-only CPR	89 (53.9%)	76 (46.1%)
The survival rate after defibrillation	192 (52.3%)	175 (47.7%)
CPR provider status	245 (54.3%)	206 (45.7%)

Table 3:- Comparisons of correct responses to questions assessing CPR knowledge among medical students according to gender.

Figure 3 : Correct responses precentages to questions assessing CPR knowledge according to the academic year

%50.00

%45.45 — th year4

%47.60 — th year5

%45.29 — th year6

%37.50

Figure 4 : Correct responses precentages to questions assessing CPR knowledge according to gender

Discussion:-

Cardiac arrest If not treated immediately will eventually lead to death, immediate CPR can increase the chances of survival after cardiac arrest. CPR is an easy and effective procedure that permits almost anyone to sustain life within the first critical minutes after cardiac and respiratory arrest. Each individual in the community, especially the medical staff including medical students, should have adequate knowledge and training in providing CPR maneuvers.

This study aims to assess medical student's previous theoretical knowledge of cardiopulmonary resuscitation, besides, to compare their knowledge according to their academic year and university. The study was conducted in a representative sample from four different medical schools from the northern region of Saudi Arabia.

surprisingly, the study shows an overall inadequate level of CPR knowledge among medical students where most of them (63.1%) previously enrolled in the BLS course irrespective of their academic year or university. Furthermore, most of the students (82.5%) knows what the BLS abbreviation stands for, but only (56.5%) of them answered correctly to the question about their first response to someone unresponsive which is looking for safety. The knowledge deficit can put the life of the victim and rescuer in danger which makes knowledge the first and most important step in conducting efficient CPR.

Our study showed that more than one-third of the students failed to identify the proper site for chest compression in adults and most of them (62.4%) in infants which is a very high percent that can predispose the victim to dangerous complications such as, rib-fractures. Also, only (48.7%) students were able to identify the proper depth of chest compression in adults compared to (14.6%) in children, and (35.8%) in infants which will decrease the efficacy of the conducted CPR. Surprisingly, students were able to know how to give rescue breathing in infants are only (38.7%), these findings indicate that the deficiency in knowledge is more in pediatric CPR than adult CPR.

Students answered correctly to the Rate of chest compression in adults and Children during CPR were no more than (32.4%), and (27.3%) of students know the current order of updated CPR intervention for all ages except newborns. More than one-third of the students didn't know the recommended universal compression to ventilation ratio.

These findings may be a result of insufficient CPR educational sessions in these universities in addition to poor exposure to cardiac and respiratory arrest cases during medical student's current curriculum.

In our study, students of the University of Tabuk had the highest knowledge regarding CPR (50.5%), while students of the northern border university knowledge score was the lowest among universities selected in this study (43%). In another study conducted in the northern region of Saudi Arabia show similar results, Tabuk university students had the highest knowledge [10]. This might be due to more research done in the Tabuk university field for the same topic [11]. Despite being one of the most important skills that every medical student should acquire before their

graduation, lack of knowledge, insufficient training, and inadequate practice of CPR have been documented among medical students in several studies among different countries [2,9,12,13,14]. Previous studies suggest continuous CPR program training to enhance students' knowledge with time to time testing and reassessment [12,9,13].

In addition, this study results show a significantly higher mean knowledge score relating to CPR among fifth-year medical students (47.6%) followed by fourth (45.5%), and sixth years (45.3%). In contrast to the study done in Sri Lanka indicated that final year medical students had better knowledge than other clinical years [12]. Despite these results, the emergency medicine module is a part of the sixth year curriculum in Al Jouf and Tabouk medical schools. This shows that current CPR education in these universities is inadequate and needs major improvements.

There was a significant difference among the two genders in their mean knowledge scores with females achieving higher scores similar to a previous study [13]. In contrast to other studies proved that there was no statistical difference between the two genders [12]. indicating the importance of males to develop more knowledge about CPR.

This study recommends an Introduction of regular BLS courses with a certificate of completion into the undergraduate curriculum as a pre-graduation requirement to enhance the level of knowledge about BLS among medical students. In addition to the enrollment of medical students in the management of CPR patients under the supervision of emergency medicine specialist during their emergency medicine module as in the previous study done in Northwest Ethiopia found that anesthesia students' knowledge of CPR was higher than other students due to their frequent enrollment in the management of CPR patients [14].

Limitations:-
Practical skills of CPR couldn't be assessed in this study due to the questionnaire design to evaluate theoretical knowledge of CRP thus necessitate the need for future studies assessing CPR practical skills among medical students. Awareness of CPR among some medical students especially seniors could not be assessed as they did not respond to the questionnairedue to their busy schedule.

Conclusion:-
Introduction of CPR courses into the undergraduate curriculum and workshops on a regular basis is a must to increase the level of knowledge about CPR and keep them up to date, also we advise to increase the hospital visits during the Emergency Medicine module so that the students will have enough exposure to critical cases who need resuscitation. Involving the final year students in performing adequate CPR on their own to patients under the supervision of a specialist will not only improve their skills but will enhance their memory and knowledge of these life-saving skills.

Acknowledgment:-

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