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RESEARCH ARTICLE

Depression: A Co-Morbidity of Obesity in Pakistani Adolescents.

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Abstract

Background:- Obesity leads to co-morbidities has been established by studies. However obesity also leads to depression is little studied. This research was conducted to find out the association of obesity with depression in children.

Methods:- A cross-sectional descriptive study was conducted at four private sector schools of Karachi. A questionnaire to evaluate psychological state in children was prepared using criteria DSM-IV (Diagnostic and Statistical Manual of Mental disorders 4th edition). A total of four hundred and forty three students, randomly selected from grade 6 to grade 10 participated. Their height and weight was measured and BMI calculated. A two-way ANOVA test with statistical significance taken as $p < 0.05$, was applied to determine the relationship between our covariates.

Results:- 24.83% students were underweight, 53.72% had normal BMI, 21.67% children were overweight and 2.03% were obese. Children who were either overweight or obese had more desire to eat and higher frequency of hunger ($p < 0.01$). The confidence level and concentration on daily activities of overweight and obese children was significantly higher ($p < 0.01$) as compared to lean students. According to bivariate Pearson Correlation test the ability to concentrate and confidence level showed negative correlation with both desire to eat and feeling of hunger. Higher desire to eat in overweight and obese children decreased sleeping hours while feeling of hunger did not affect sleeping pattern.

Conclusion:- Obesity is associated with symptoms of depression. Adopting healthy dietary routine and a physically active life is necessary to reduce the prevalence of obesity thus decreasing depression and its adverse outcome.

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Introduction:-

Obesity is emerging as a grave health issue in developed and underdeveloped nation today (Rokholm et al, 2010; Waters et al, 2011). The toll of obese population has risen to epidemic figures posing hazardous health risks and psychological consequences (de Wit L et al, 2010; Luppino et al, 2010) not only to adults but also to adolescents and children globally.

In the year 2013, worldwide, 42 million children (under the age of five) were overweight and amongst which 31

million belonged to developing countries (<http://www.who.int/dietphysicalactivity/childhood/en/>). Similarly, another survey reports that among children and adolescents of developing countries there is a rise in percentage of overweight and obese individuals including both boys and girls. According to this survey, in 2013, the prevalence of overweight and obesity increased from 8.1% to 12.9% for boys and from 8.4% to 13.4% for girls (Ng M et al 2013). A systemic review by (Stella K. Muthuri et al 2014) also provides evidence of increasing trend of overweight and obesity among school-aged children and youth of Sub-Saharan Africa. Hence, obesity, once confined to the adult population has now also spread to the younger generation.

Research advancements in the field of bariatric has led to the evidence of strong association of obesity with hypertension(GroberGratz D et al 2013; Assadi F 2012), diabetes mellitus (Brufani C et al 2013),stroke, dyslipidemia, precocious puberty(Russel D L et al 2001), musculoskeletal problems (Krul M et al 2009)etc. hence a decrease in life expectancy therefore obesity being one of the major global risk for mortality accounting for about 5% deaths worldwide(Preston SH et al 2011). However, childhood obesity is rather worrisome because it is associated not only with early onset of such metabolic disorders and systemic diseases but an obese child also suffers from hyperventilation, is at a greater risk to fractures in comparison to his normal colleague and has to bear psychological effects like depression (Carotenuto M et al 2012) as one of the many side effects of this condition. Moreover the spike in the rate of obese individuals increases the burden on the economy of the country. Therefore, it is the need of the hour to sort out the solution to this critical problem.

Different studies carried out worldwide have shown variable degree of association between obesity and depression particularly in western countries. But research from Bangladesh (Asghar S et al 2010) suggested finding which were in contrast to that found in European societies. It concluded that overweight and obesity has no correlation with depression. However since episodes of depression and frequent mood changes may affect quality of life to a certain extent and also the social behavior of an individual therefore efforts must be made and researches must be conducted to establish the fact and prove the co morbidity. Hence, the aim of our study is to find out whether obesity depression exists in a co morbid state in school-aged children.

The study has following two objectives:

1. To determine the percentage of obesity depression co-morbid state in school going children of Karachi.
2. To evaluate the effect of age, gender and BMI on psychological state of school going children in Karachi.

Methods:-

This observational study involves human subject which is according to the ethics laid down by World medical Association (WMA). A cross-sectional descriptive study was conducted over a period of 6 months at four different private sector schools of Karachi. The schools were selected by categorizing the city into four zones namely; Karachi (East, South, North and Central) and one school from each of the four zones was selected. Permission was taken from the administration of every school to conduct a questionnaire based collection of data at their campus. A questionnaire to evaluate psychological state and depression in children and adolescent was prepared in consultation with a qualified psychiatrist using criteria DSM-IV (Diagnostic and Statistical Manual of Mental disorders 4th edition). Participants were briefed about the purpose of the research, questionnaire on depression was explained to them and verbal consent obtained. Each participant answered the questions by recalling their emotional state in the past two weeks. The questionnaire comprised of two sections. Section-1 required the participant to fill in the demographic data and section-2 consisted of 8 questions designed to evaluate the level of depression. The questions were mainly about appetite, concentration on daily activities, confidence level, effect on sleeping hours, desire to eat and the frequency of feeling hungry. A total of 443 students, randomly selected from grade 6 to grade 10 participated in our study. Both boys and girls from age 10-17 years were included. An anthropometric measurement of each student was taken as follows: body weight measured in light clothing and the students were asked to take off their shoes while their weight and height was measured. Body weight, using a weighing machine was recorded. Body height was measured in erect posture, using an inch tape with measurements taken nearest to 0.1cm. Children and adolescents were categorized as underweight, overweight and obese by converting their weight and height into BMI (Body Mass Index). BMI was calculated by weight (Kg) divided by height squared (m²). As cut off value for BMI varies from region to region so modified BMI criteria for Asian population was used. All the collected data was entered into statistical analysis software (SPSS version 18.0.) and relationship between our covariates was determined by applying a two-way ANOVA test with statistical significance taken as $p < 0.05$.

Results:-

Four hundred and forty three school going children participated in the study with ages ranging from 10 to 17 years. The sample was classified according to the BMI in four groups as underweight (≤ 17 kg/m²), normal (17.1-22.9 kg/m²), overweight (23-29.9 kg/m²) and obese (>29.9 kg/m²). Two way A-NOVA was applied taking body weight and gender as the factors effecting variables of the study.

The descriptive statistics are shown in table 1.

Table 1: Descriptive statistics of data

Results are shown as means \pm S.D

Variable	Underweight (≤ 17 kg/m ²)		Normal (17.1-22.9kg/m ²)		Overweight (23-29.9 kg/m ²)		Obese (>29.9 kg/m ²)	
	Male N=48	Female N=52	Male N=110	Female N=128	Male N=59	Female N=37	Male N=3	
Age	13.29 ± 1.16	12.57 ± 1.70	12.86 ± 1.49	13.65* ± 1.63	12.97 ± 1.45	12.49 ± 1.50	11 ± 0	13 ± 1.67
For the last one month how you rate your desire to eat?	4.06 ± 2.46	4.35 ± 2.76	3.85 ± 2.41	4.23 ± 2.35	6.92* ± 2.22	7.43* ± 1.65	7* ± 1.73	6.17* ± 1.72
For the last one month how many times you felt hungry?	3.71 ± 1.52	3.33 ± 1.59	3.36 ± 1.86	3.39 ± 1.82	5.17* ± 1.94	5.54* ± 1.77	8.67* ± 1.52	4.83* ± 2.78
How is your sleep?	2.04 ± 0.58	2 ± 0.65	2 ± 0.46	1.92 ± 0.55	2 ± 0.80	2.22 ± 0.82	3 ± 0	1.83 ± 0.98
Are you able to concentrate on daily activities?	1 ± 0	1 ± 0	2.35 ± 0.81	2.52 ± 0.78	1.58 ± 0.49	1.62 ± 0.49	1 ± 0	1 ± 0
Has your appetite changed?	2.31 ± 0.87	2.290 ± 0.8	2.3 ± 0.87	2.21 ± 0.88	2.07 ± 0.90	2.22 ± 0.91	1.67 ± 0.57	1.83 ± 0.75
How is your level of confidence these days?	1 ± 0	1 ± 0	2.24 ± 0.78	2.3 ± 0.76	1.61 ± 0.49	1.68 ± 0.53	1 ± 0	1 ± 0
How do you feel these days?	2.27 ± 0.93	2.38 ± 1.05	2.49 ± 0.95	2.63 ± 1.02	2.53 ± 1.43	2.24 ± 1.3	1 ± 0	3.17 ± 2.04

*p<0.05

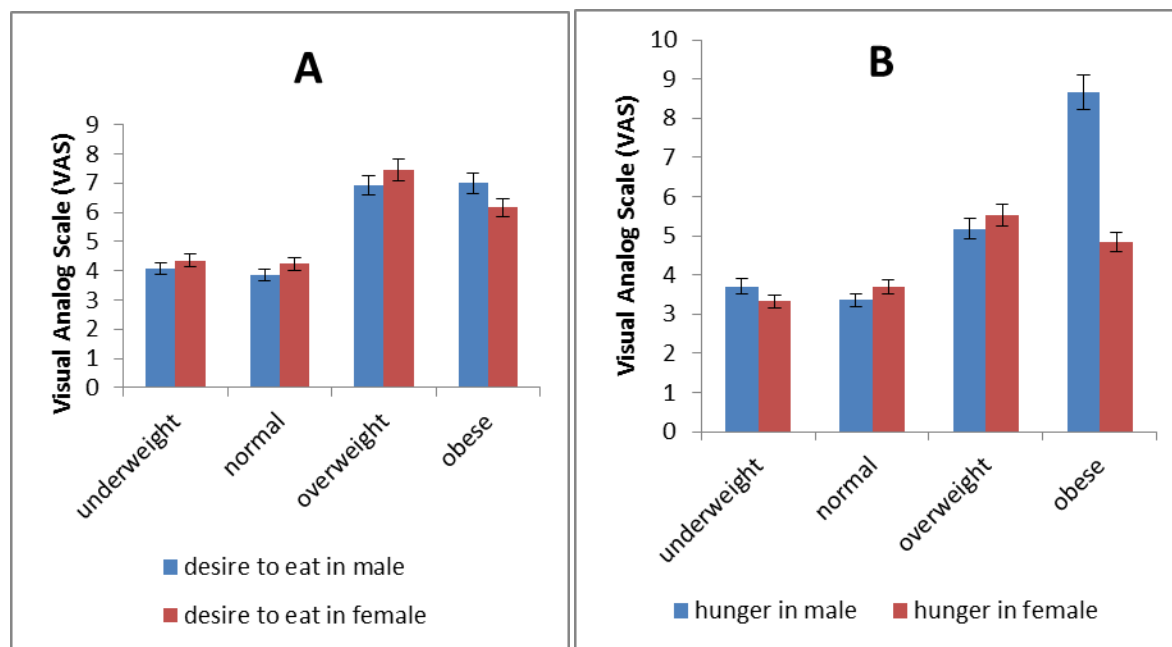
The analysis showed that ages of girls bearing normal weight were significantly higher than overweight girls ($p=0.04$). Children with BMI above with normal range reported significantly desire to eat ($df=3$, $-F=42.34$; $p<0.01$). It was also observed that the frequency of hunger was significantly higher in obese and overweight students than lean students. ($df=3$, $-F=28.13$; $p<0.01$)

Also higher BMI affected the level of confidence i.e they had lower level of confidence as compared to underweight or lean individuals ($df=3$, $-F=138.17$; $p<0.01$) It was evident that there was a significant level of difference among the children in the level of concentration they had on their daily activities when their weight was more than the normal range appropriate for their height ($df=3$, $-F=109.583$; $p<0.01$)

Tuckeys test was applied as post hoc test to analyze the effect of body weight on different variables. It was found that overweight and obese children of both genders had significant ($P<0.05$) desire to eat and they felt significantly ($p<0.05$) hungry as compared to underweight and normal weight children.

Figure 1-A

Figure 1-B



The sleep pattern of the children not found significantly affected by body weight.

The concentration on daily activities were found to be significantly effected ($p < 0.05$) by increasing weight gain. The post hoc also showed that the confidence level in class was significantly decreased ($p < 0.05$).

Figure 2-A

Figure 2-B

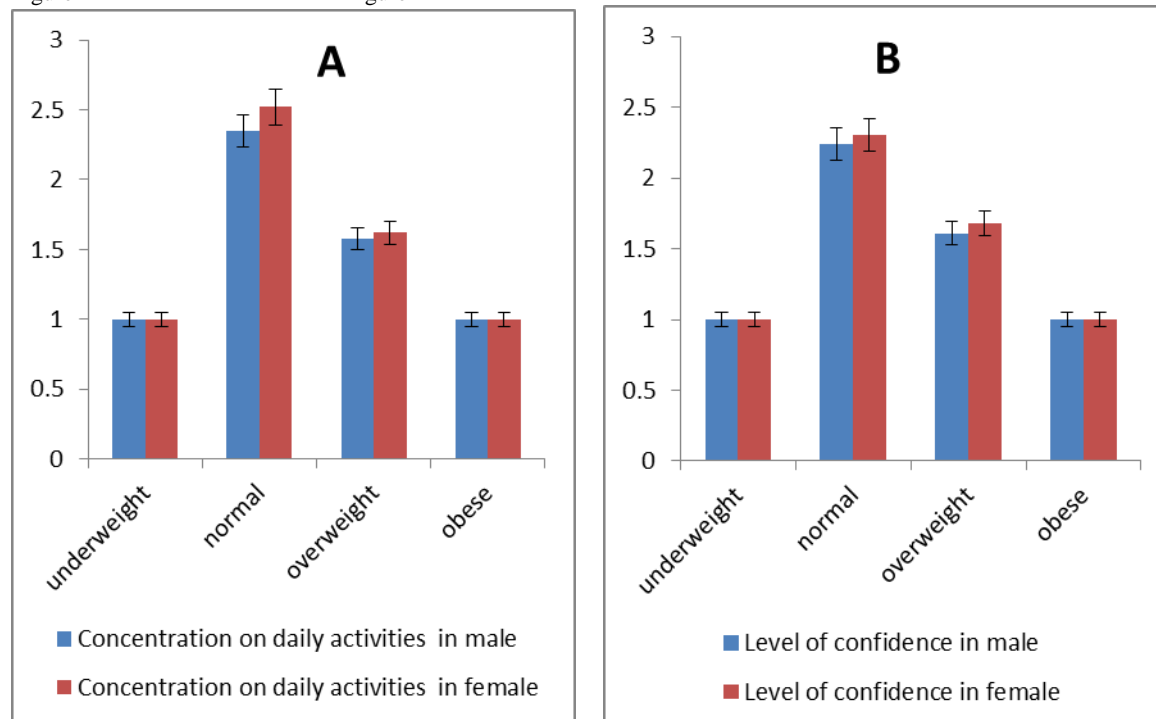


Table 2: Correlation of Symptoms of Depression with Eating Habits

Eating Habits	Symptoms Of Depression		
	N=443		
	Sleeping pattern	Ability to concentrate	Level of confidence
Desire to eat	0.16(0.025)*	-0.14(0.02)*	-0.11(0.012)*
Feeling of hunger	0.07(0.0049)	-0.017(0.03)*	-0.11(0.012)*

Results are shown as r^2 values, * $p < 0.05$

Bivariate Pearson Correlation test was applied to evaluate the probable relation of symptoms of depression with eating and sleep behavior of school going children. The ability to concentrate and level of confidence showed significant negative correlation with both “desire to eat “ and “feeling of hunger “ (Table2) while sleep pattern positively affected only the “desire to eat “ significantly while “the feeling of hunger” correlation with sleeping pattern was insignificant.

Discussion:-

Depression is characterized by multiple symptoms which mainly affect emotional state and routine activities of an individual. These include low mood and self-esteem, loss of interest in pleasurable activities, decreased appetite, sleep and concentration (Moore, M., & Carr, A 2013)

Depression was once considered as a problem of adult population is now regarded as a common condition in youth as well. Its prevalence is low in childhood and gradually increases throughout adolescence(Costello E J et al 2011) which could be explained by hormonal changes associated with puberty, cognitive maturation, coping up with the social circumstances and variable metabolic status of the body(Patton et al 2007).

Depressive psychological states affect eating pattern and behavior in both ways i.e. some people start eating more resulting into bulimia nervosa while other exhibit anorexia nervosa with very little eating habits. Researchers have shown that most people start eating more in depression. Hence, association between depression and obesity is well known(Dockary S et al 2009; Cortese S et al 2009) with a slight pronounced effect in females as also seen in our study (Hyde JS et al 2008 ; Blaine B 2008)

Our study analyzed the effect of BMI and gender on depressive status of the school going children of adolescent age group. According to the results 23.07% of the school going children had higher than normal BMI. They also exhibit significantly higher desire to eat and feel hungrier, hence put on weight. The pattern of increase in desire to eat and hunger was similar in both the gender. This might be because day to day stressors affect Hypothalamic Pituitary Adrenal (HPA) axis resulting in increased circulating cortisol (Pervaindou et al 2013) which increases the ingestion of comfort food mainly constituting carbohydrate and fried food. As depression leads to decreased physical activity because of low mood (Motl RW et al 2004) therefore during stress due to dysregulated HPA-axis people tend to eat more which may lead to obesity. However, a slight less desire to eat (Figure 1-A) and significantly less hunger (Figure 1-B) in obese girls was observed which may be due to self-consciousness and cosmetic reasons leading to forced dieting(Johnson CC et al 2008). Another suggested explanation of this result could be because of expression of more leptin in obese individuals (Lu-X-Y 2007) due to higher adipose tissue mass and since female s have higher adipose tissue as compared to males so they might be less hungry.

It was evident that body weight and symptoms of depression did not vary much with age although slight high ages of children in normal BMI group was observed. This is in contrast with the study conducted by Jugesh Chhatwalin India (Chhatwal J 2004) according to which prevalence of obesity decreased significantly with age, from 18.5% at 9 years to 7.6% at 14 years, rising at 15 years to 12.1%. The incidence of depression, notably in girls, rises sharply after puberty and, by the end of adolescence, the 1 year prevalence rate exceeds 4% (Thapar A et al 2012) This might be because of simple random sampling technique.

Present study showed that sleeping pattern was disturbed (decreased) in individuals who had also higher desire to eat. This finding is similar to a cross sectional study of 383 youths between the ages of 11-16 years was conducted using objective activity monitoring (wrist accelerometer). It indicated that overweight youths experienced less total sleep time than non-obese youths, although there were no significant differences between the groups in measures of sleep disturbance (Siversten B et al 2014) Relationship between sleep and obesity may be mediated at least in part

by insulin resistance. In a study of obese children, insulin resistance was associated with shorter sleep duration by polysomnography (Flint J et al 2007)

Our study shows that the level of confidence and concentration on daily activities was found to be lower in those students who had higher desire to eat and felt hungrier. This could be explained by prevalence of low self-esteem (Eisenberg et al 2003), feeling of guilt and depressed mood (Pesa JA et al 2000) in people who are suffering from depression. These feelings act as psychological stress and increase the appetite due to dysregulated Hypothalamic Pituitary Adrenal (HPA) axis. (Avanci J et al 2012)

Conclusion:-

The results represent the association of depression with obesity in school going children of Karachi. Most of the overweight to obese children suffer from depression symptoms recorded by criteria DSM-IV. The cross sectional nature of study did not prove the predictive criteria of depression towards weight gain but since the adverse health consequences and co-morbidities are associated with obesity like cardiovascular diseases, diabetes etc. and pessimistic thought process leading to suicidal attempts in depressive individuals therefore it strongly merits further studies on the subject and planning preventive measures to be taken to address the problem which might include awareness campaigns on adopting healthy eating habits and life styles.

Abbreviations:-

BMI- Body Mass Index

DSM-Diagnostic and Statistical Manual of Mental disorders

HPA-Hypothalamic Pituitary Adrenal

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