

Association of Depression and Anxiety Disorders with Weight Status among Egyptian School Children: Giza Governorate

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Abstract: **Background:** The prevalence of childhood obesity is rapidly increasing, and many obese children suffer from emotional and behavioral problems. **The aim** of this study was to explore the relationship between nutritional obesity and psychosocial behavior among school –children in their natural setting. ; and to examine whether social backgrounds play a role in this relationship. Target population was third; fourth and fifth grade primary school children (n=861; mean age 10 ± 0.72) attending 3 public elementary schools at Dokki District; in Giza Governorate. **Measurements:** Weight status was assessed through measurements of Body Mass Index percentiles (BAP) for age & sex using World Health Organization Growth Standards. Familial backgrounds & academic school achievements of the children were recorded from school files. Data on anxiety and depressive symptoms of children was assessed using standardized methods. **Results:** 23.5% of boys and 18.7% of girls showed signs of depression; whereas anxiety was prevalent among 54% of boys and 52% of girls. Calculation of odds ratio (OR) showed that depression and anxiety is higher in low school achievers in girls ($p < 0.05$) and boys ($p < 0.01$). In a multiple regression model; depression was predicted by anxiety, age and academic achievements ($R^2 = 0.53$; $P \leq 0.001$). Anxiety was predicted by BAP and birth order ($R^2 = 0.38$; $P \leq 0.003$). **Conclusion:** Obesity affects psychosocial adjustment of children raising the importance of early detection and prevention of obesity in the form of nutritional and health awareness programs and training of school health personnel.

[Zeinab M Monir^a; Abla G Khalifa^a & Manal Mansour. Association of Depression and Anxiety Disorders with Weight Status among Egyptian School Children: Giza Governorate. Journal of American Science 2010;6(12):1364-1373]. (ISSN: 1545-1003). <http://www.americanscience.org>.

Key words: Obesity - Children - Depression -Anxiety - Academic Performance.

Introduction:

The prevalence of childhood obesity has been rapidly increasing during the past two decades (1). Recent estimates suggest that 6.6% and 14% of Egyptian children are overweight and obese respectively. (2, 3) Some of the most commonly reported and striking consequences of pediatric obesity are psychosocial (4). Today's culture ascribes a negative stereotype to obese people. There is a common belief that the overweight children are unhappy with their weight and experience most psychosocial distresses, particularly depressive symptoms (5). However, existing information on this relationship comes almost exclusively from clinical samples, wherein obese children seeking treatment demonstrate increased psychopathology and social problems compared with their non obese peers. (6)

Comparisons of clinical sample of obese children with non clinical samples of non obese children make it difficult to determine the independent effects of obesity regardless of clinical status on psychological factors. One notable exception to this design confound is the research conducted by Braet et al, (7) who found that a clinical group of obese children scored higher on parent-bases reports of psychopathology, including both behavioral and emotional problems, compared with a non-clinical group of obese children. Additional convergent evidence from a clinical sample includes findings that decreases in percentage of overweight during obesity treatment predict improvements in children's psychological functioning (8). Studies involving 9-years-old subject found that the heaviest children expressed the most discontent, having low body

esteem, a desire of thinness, and higher levels of dietary restraint(9).

Increased risk for depression in obese children presenting for treatment had been reported (10) whereas, Erickson et al, (5) had found a modest relation between obesity in primary school children and depression only in girls. The adult's clinical literature has also linked obesity with psychopathology in general and depression in particular(11).

In Egypt, though the school-age years of life are universally accepted to be of profound importance to the emotional and cognitive and social development; yet less psychiatric intervention occurs in this period from the school health system. The current study has attempted to assess anxiety and depression in primary school age children and in relation to family characteristics and school achievement. Relationship to weight status was as well considered.

Assessing psychological status (depression and trait anxiety) as correlates of weight-related distress in a young, , non-treatment-seeking cohort of children across a wide range of weight provides the opportunity to examine the associations between psychological characteristics and weight-related psychological distress (12). Gaining an understanding of the relationship between childhood obesity and psychological distress is important to identify what it is about obesity that may make children unhappy, early identify targets for intervention, and help clinicians identify those children in need of treatment and the types of treatments that may prove successful.

To address these issues, the present study assessed anxiety and depressive symptoms as an index of psychological distress; and their association to weight status; in a sample of elementary school boys and girls in their natural setting. Based on the existing literatures with adolescents and adults samples, the study hypothesized that obesity and psychological distress would be associated and that this would be influenced by the family backgrounds.

Subjects and Methods:

Subjects:

This study was conducted during school year 2008-2009 in three elementary schools in urban

Giza Governorate, Egypt. After gaining the approval of local educational authorities; a passive consent procedure was used. Parents were informed of the study in writing. Classrooms surveys and physical measures were completed during regular school hours by trained pediatricians. A total of 436 boys and 435 girls (age ranged 9.5-10.5 years) completed the study protocol.

Methods:

Every child was subjected to a thorough clinical examination (chest, heart, abdominal and neurological examination). Children having congenital anomalies or chronic diseases were excluded from the study as we aim to assess anxiety and depression prevalence in apparently healthy normal primary school children. Age of the children was recorded from birth certificates that were already present in school files.

A-Body Mass Index:

Children's weight was measured in kilograms using a standardized portable scale. Weight was measured twice to the nearest 0.1.Kg without shoes or outer clothing and the mean was used in the analysis: Height was measured in meters by a direct reading using stadiometer. Height was measured twice to the nearest centimeter and the mean of the two measures was used in the analysis. Children Body Mass Index (BMI, calculated as weight in kilograms divided by the square of height in meters) was then calculated from measures of height and weight as a measure of obesity. BMI is the preferred measure of children adiposity for epidemiological and clinical studies (13).

BMI percentile for age (BAP) and BMI for age Z scores (BAZ) were calculated using the Anthro Plus program of the computer. (14, 15)

B- Anxiety and Depression Assessment:

Depressive Symptoms:

The Arabic Children's Depression Inventory (ACDI) derived from kovacs (16) and kazdin, (17) and constructed for Egyptian children by Abdel Khalek, (18) was used. It comprises seven factors that cover the symptoms of juvenile depression; it contains 27 items in which the children have to respond by themselves through three alternatives i.e. rarely, sometimes and often. The ACDI was found to be correlated to the Arabic version; El-Tayeb (19) of the kovacs's Children's Depression Inventory (CDI)

and to the Hopelessness scale for children (16) in its Arabic form of Dowidar (20)

2- Personality Assessment Sheet for Assessment of Anxiety:

The anxiety sheet is derived from State-Trait-Anxiety Inventory (STAI) and validated by Abdel khalek (21). It contains 23 items in which the children have to respond by themselves through three alternatives, i.e. rarely; Sometimes; and often.

C-Academic achievement:

School achievement was recorded from the school files of midterm and terms examinations .Sum of Arabic Language and Mathematics Subjects were taken as an indicator of academic achievements.

D-Social Backgrounds:

Social evaluation has been made using father and mother education with scores 1, 2, 3, 4, denoting illiterate, primary school, high school and university education added to the child's birth order and the family number we gave 1st born score 3, 2nd and 3rd born score 2 more than 3rd born was given score 1, also, family number 4 was given score 3, family number-5 given score 2 and more than 5 was given score 1; social score was stratified as low social ≤ 7 ; middle social 8-9 and high social 10-12 to be used for the multivariate statistics.

E-Statistical Analysis:

Univariate statistics for data description was used. Bivariate statistics using χ^2 test and Pearson's correlation to assess the strength of relation of BMI and psychological distress (depression and anxiety) was applied. We used the multivariate analyses to examine independent and interactive associations of BMI and social status with each of anxiety and depressive symptoms. BMI and social status were stratified to examine the independent and interactive associations of BMI and social status with depressive symptom. SPSS program of PC (version 13) was used.

Results:

Table 1, a shows parental education of studied children: 68% of the mothers were illiterate or only

read and write; 27.5% had preparatory or high school education whereas only 4.2% of the mothers were university graduated, moreover 55.9% of the fathers were illiterate or can read write and 34.8% reached to high school education and only 9% were university graduated. No significant difference between boys and girls was shown using χ^2 test. **Table 1, b** shows that 32.1% of the children were first born child; 23.1% were second born; 18.1% were third born and the rest were fourth or more born children. Most of the children came from big families more than or equal four siblings.

Table 2 shows the weight status of boys and girls as measured by percentile BMI/age. 11% & 11.79 of boys and girls were thin; 13.7% & 12.26% of boys and girls were overweight and 7.8% and 8.01% were obese. There was no significant difference among boys and girls as regard weight status distribution.

Table 3 shows that 7.5 % of girls with low school achievement had depression scores < 44 , while 2.3% of girls with high school achievement had depression scores < 44 ; and the difference was significant ($\chi^2 = 4.06$, $p = 0.05$). The same results were found among boys; where 12% of low achievers in comparison to 31% of good achievers had depression scores < 44 ; and the difference was significant ($\chi^2 = 6.19$, $p = 0.017$).

Table 4 shows that 19% and 11% of high achievers boys and girls had anxiety scores < 35 ; while 7% of boys and 8% of girls who are high achievers had anxiety scores > 35 . The difference was significant ($\chi^2 = 6.89$, $p < 0.05$ for girls & $\chi^2 = 3.9$, $p < 0.05$ for boys).

Table 5 shows that depression scores of girls was affected by both mother's and father's education ($\chi^2 = 4.3$, $P = 0.03$ & $\chi^2 = 8.1$, $P = 0.01$ respectively), and family number ($\chi^2 = 5.8$, $P = 0.01$); while birth order was the only factor that affected depression scores of boys ($\chi^2 = 4.9$, $P = 0.05$).

Table 6 shows that anxiety scores of girls was affected by maternal education

($\chi^2 = 3.18$, $P = 0.05$). Social backgrounds of boys have no relation with anxiety scores of boys ($P > 0.05$ for all parameters).

Factors affecting anxiety and depression Scores were assessed using simple correlation. **Table 7** shows that academic achievement was negatively statistically correlated with both anxiety and depression scores (Pearson's correlation coefficient

$r = -0.238$; $p \leq 0.000$ for anxiety and $r = -0.272$; $p \leq 0.000$ for depression). While age; BMI/age; and height /age showed positive correlations with both anxiety and depression. Anxiety scores showed significant positive correlation with depression; ($r = 0.741$; $p \leq 0.000$).

Three models were applied using multiple regression analysis for prediction of factors affecting depression scores (dependent variable).

Table 8 shows that anxiety was the independent factor affecting depression in the first model with $R^2=0.516$; $p \leq 0.0001$. This means that 51.6% of depression states are associated with anxiety. In the second model, anxiety and age was the main predictors of depression ($R^2 = 0.481$; $p \leq 0.0001$). This means that 48% of anxiety states are associated with depression. The third model shows that anxiety, age and academic achievement predicted depression ($R^2=0.532$; $P \leq 0.0001$). This means that 53.2% of depression cases could be predicted by anxiety, age and academic achievement; using the equation:

Depression = 0.7 anxiety +1.2 age + 2.2 academic achievement.

Table 9 shows that BMI –Z scores and Birth order was the main predictors for anxiety ($p \leq 0.03$); in this model 3.8% of the change in anxiety could be explained by BMI-Z scores and birth order. This means that anxiety is associated with weight status.

Discussion:

Application of ACDI and STAI on elementary school children of Giza Governorate showed that 23.5% of boys and 18.7% of girls had depressive symptoms. While 54, 1% of boys and 52% of girls reported anxiety disorders; with highly significant correlations of depression to anxiety. This finding agrees with Faith et al (22). Despite the common belief that overweight children are less happy than average weight peers, data on the relationship between obesity and depressive symptoms from a population based sample of young Egyptian children were lacking.

In a study on third grade students attending schools in Northern California, Erickson et al (5) found a modest association between depressive symptoms and body mass index for girls; but not for boys. Girls depressive symptoms were strongly associated with overweight concerns. Other epidemiological studies have not found an association between depressive symptoms and obesity in population based samples of female adolescents and young women (23), however some

studies have found increased social, educational and psychological correlates of weight status in adolescents (24) as well.

Siegel et al (25) contributed poor health over time to overweight and depressed mood in young women. On the contrary, Neumark, (26) pointed to revaluation of psychosocial concerns among overweight adolescents. In addition to these, Ford et al (27) found that among low and increased self reported BMI, significantly impaired physical functioning rather than mental functioning were noticed.

Previous studies have suggested that gender differences in clinical depressive syndromes do not emerge until puberty; and women are twice as likely to be depressed as men. Our data suggest that gender differences may emerge in childhood. It has been hypothesized that socioeconomic conditions of the family is one of the risk factors that affect depression in girls and boys. As we conclude from our study that parental education, birth order and family size affects depression in girls. While father education and birth order and family size are the factors that affect depression in boys (11 & 22).

In this Study, there was significant negative correlations between academic achievements and each of anxiety and depression scores. Rashed et al (28) reported same results among primary school children in Alexandria Governorate. Vey et al (29); proved that school difficulties could be used in children as a substituted criterion of DSM –III criterion for major depression.

Birth order showed significant relation with depression among boys, whereas depression among girls was correlated with all social parameters (father and mother's education; family number and birth order. This finding reflects the social behavior of the community where most girls stay at home after school; and so her mood is affected by the family circumstances. On the contrary boys are free to stay outdoors. In this study the overall prevalence of anxiety and depression among boys is high; this could be attributed to other factors other than family backgrounds. Nilzon reported significant association of anxiety and depression with social status; but he found no sex differences (30).

In the multivariate analysis we were able to assess the independent and interactive relationships of BMI and sociodemographic status with levels of depression and anxiety. We found that BMI as well

as social status were associated with depressive symptoms in both girls and boys; after controlling for social status in a time and controlling for BMI in another time, although this study is limited in its cross-sectional design, these results suggest that anxiety and depression is affected by both obesity and social backgrounds.

In Conclusion; Obesity affects psychosocial adjustment of children raising the importance of early detection and prevention of obesity in the form of nutritional and health awareness programs and training of school health personnel for early detection of psychological disorders among children.

Table (1): Sociodemographic Backgrounds of Boys and Girls

a) Parental education.

	Mother education		Father education	
	Girls N (%)	Boys N (%)	Girls N (%)	Boys N (%)
Illiterate/read and write	294 (69)	294 (67.5)	228 (53.5)	256 (58.3)
High school	115 (27.2)	122 (27.9)	159 (37.6)	140 (32.0)
University	16 (3.8)	20 (4.6)	38 (8.9)	40 (9.7)

No significant difference using χ^2 test

b) Birth order and Family number.

Birth* order (p<0.01)	Girls N (%)	Boys N (%)	Family* Number (p<0.01)	Girls N (%)	Boys N (%)
1st	153 (36.2)	122 (27.9)	3	10 (2.3)	2 (0.5)
2nd	88 (20.7)	112 (25.6)	4	66 (15.5)	4 (0.9)
3rd	72 (16.9)	84 (19.2)	5	152 (53.7)	6 (0.4)
≥4th	112 (26.2)	118 (27)	> 6	197 (46.5)	426 (98.1)

*: significant differences using χ^2 test

Table (2) : Weight Status in Boys & Girls According to BMI/Age Percentiles (BAP)

Weight Status* (BMI percentile/age &sex)	Boys N (%)	Girls N (%)
Lean ($\leq 3^{\text{rd}}$ Percentile)	47(11.0)	50 (11.79)
Average (15^{th} - $\leq 85^{\text{th}}$ Percentile)	295(67.6)	288 (67.92)
Overweight ($>85^{\text{th}}$ - $\leq 95^{\text{th}}$ Percentile)	60(13.6)	52 (12.26)
Obese ($> 95^{\text{th}}$ Percentile)	34(7.8)	35 (8.01)
Total N	436	425

*: No significant difference between boys & girls using χ^2 test**Table (3) : Depression Scores according to School Achievement among Boys & Girls**

Depression scores	School Achievement			OR	RR	χ^2 (p)
	$\leq 50\%$ %	50-<70% %	$\geq 70\%$ %			
Girls:						
<40	7.5	19.0	23.1	4.626	3.652	4.06 (0.05)
≥ 40	92.5	81.0	76.9			
Boys:						
<40	12.4	33.5	30.2	6.631	5.739	6.19 (.017)
≥ 40	87.6	66.5	69.8			

OR: Odds Ratio

RR: relative Risk

 χ^2 : Chi squared test

P : level of significance

Table (4): Anxiety Scores according to School Achievement among Boys & Girls

Anxiety scores	School Achievement			OR	RR	χ^2 (p)
	$\leq 50\%$ %	50-<70% %	$\geq 70\%$ %			
Girls:						
<35	7.9	17.0	11.7	2.192	1.139	6.89
≥ 35	92.1	83.0	88.3			(0.05)
Boys:						
<35	7.4	26.9	18.2	3.337	2.206	3.93
≥ 35	82.6	73.1	81.8			(0.05)

OR: Odds Ratio

RR: relative Risk

 χ^2 : Chi squared test

P : level of significance

Table (5) : Social Parameters according to Depression Scores among Boys & Girls

	Depression score Boys		χ^2 (P)	OR	RR	Depression score girls		χ^2 (P)	OR	RR
	≤ 43 %	≥ 44 %				≤ 43 %	≥ 44 %			
<u>Father education</u>										
Illiterate	17.4	36.7	22	.221	.219	15.0	43.6	8.2	8.0	4.45
Primary	13.1	24.4	(.64)			14.7	17.4	(0.01)		
High	3.3	5.6				3.2	6.1			
<u>Mother education</u>										
Illiterate	23.5	45.5	1.14	1.09	.06	48.2	48.2	4.26	4.2	4.31
Primary	8.5	18.8	(.79)			6.5	16.5	(.03)		
High	1.9	1.9				2.3	2.3			
<u>Birth Order</u>										
1 st born	10.3	25.8	4.96	4.8	.099	11.0	17.0	3.44	3.4	3.03
2 nd born	9.9	10.8	(.05)			9.6	16.0	(.5)		
≥ 3	13.6	29.6				12.4	34.0			
<u>Family number</u>										
≤ 4	5.2	12.7	3.98	4.04	.437	7.8	9.6	5.58	5.7	5.53
4-6	20.7	31.0	(.13)			19.7	37.7	(.01)		
> 6	18.0	22.5				5.5	19.7			
Total n	33.6	66.4				3.3	6.7			

OR: Odds Ratio

RR: relative Risk

 χ^2 : Chi squared test

P : level of significance

Table (6) : Social Parameters according to Anxiety Scores among Boys & Girls

	Anxiety score Boys		χ^2 (P)	OR	RR	Anxiety score girls		χ^2 (P)	OR	RR
	≤ 38 (%)	≥ 39 (%)				≤ 38 (%)	≥ 39 (%)			
<u>Father education</u>										
Illiterate	11.3	42.3	2.4 (.13)	2.3	2.2	10.1	48.6	2.8 (0.01)	8.5	2.1
Primary	9.8	27.7				8.7	23.4			
High	3.3	5.6				2.3	6.9			
<u>Mother education</u>										
Illiterate	16.4	52.6	.77 (.5)	.70	.31	11.9	55.5	3.1 (.05)	3.1	2.9
Primary	6.6	20.7				7.8	20.2			
High	1.4	2.3				1.4	3.2			
<u>Birth Order</u>										
1 st born	9.4	26.6	.53 (.5)	.65	.43	6.9	21.1	2.01 (.05)	2.1	1.6
2 nd born	5.6	15.0				6.4	19.3			
≥ 3	9.4	33.8				7.8	38.5			
<u>Family number</u>										
≤ 4	3.8	14.1	1.76 (.4)	1.7	1.3	4.1	13.3	.45 (.5)	.45	.43
4-6	14.6	37.0				12.4	45.0			
> 6	6.1	24.4				4.6	20.6			
Total n	24.4	75.6				21.1	78.9			

OR: Odds Ratio

RR: relative Risk

 χ^2 : Chi squared test

P: level of significance

Table(7) : Factors Affecting Anxiety And Depression Scores

	Anxiety		Depression	
	<i>r</i>	<i>p</i>	<i>r</i>	<i>p</i>
Academic Achievement	-0.238	0.000	-0.272	0.000
Age	0.144	0.003	0.215	0.000
HAZ	0.116	0.001	0.100	0.038
BAZ	0.147	0.002	0.148	0.002
Anxiety	-	-	0.741	0.000
Depression	0.741	0.000	-	-

r: Pearson's correlation coefficient*p*: level of significance

HAZ: height/age Z scores

BAZ: Body Mass Index/age Z scores

Table (8): Multiple Regression Analysis Using Depression as a Dependent Variable.

Model	Standardized Coefficients		
	β	t	p
(1) -Constant -Anxiety	0.718	7.837 19.614	0.000 0.000
(2) -Constant -Anxiety - age	0.701 0.108	0.539 19.109 2.934	0.590 0.000 0.004
(3) -Constant -Anxiety -Age - Academic Achievement	0.676 0.100 0.099	1.541 18.177 2.751 -2.655	0.124 0.000 0.006 0.008

P: level of significance

Table (9) : Multiple Regression Analysis Using Anxiety as a Dependent Variable.

Model	Standardized Coefficients		
	β	t	P
(1) -Constant -BAZ	0.129	77.03	0.000 0.002
(2) -Constant -BAZ - Birth order	1.44 0.125	48.62 3.03 2.63	0.000 0.003 0.009

P: level of significance

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11/28/2010