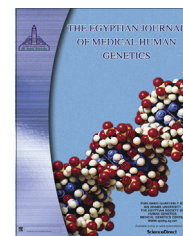




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ORIGINAL ARTICLE

Health related quality of life and psychological problems in Egyptian children with simple obesity in relation to body mass index

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KEYWORDS

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Abstract *Background:* Obesity in childhood or adolescence could affect quality of life (QOL). There is little existing information about the health-related quality of life (HRQOL) of obese children and adolescents.

Objective: To assess HRQOL and psychiatric co-morbidities in obese children and adolescents; and their relationship to body mass index (BMI).

Methods: Fifty obese children and adolescents were compared to 50 healthy age-, sex- and pubertal stage-matched non obese children and adolescents serving as controls. They were assessed by child self-report and parent proxy report using a pediatric HRQOL inventory scale, also, Children Anxiety Scale and Children Depression Inventory (CDI) were assessed.

Results: Obese children had total HRQOL score: 69.1 ± 8.4 versus 81.1 ± 7.8 respectively, $p < 0.001$ and their parents had total score: 62.9 ± 9.5 versus 74.9 ± 7.2 respectively, $p < 0.001$. Obese children reported lower health-related QOL scores in all domains than controls. BMI standard deviation score (SDS) correlated negatively with total score and all domains in child self report and parent proxy report. Anxiety (mild: 8%, moderate: 38%, severe: 54%) and depression (mild: 18%, moderate: 24%, severe: 58%) were pre-existing or diagnosed in all obese children with significant positive correlations between BMISDS and each of anxiety ($r = 0.81$, $p < 0.01$) and CDI scores ($r = 0.78$, $p = 0.01$). BMI (OR: 5.72, 95%CI: 2.57–5.9) and waist circumference (OR:2.27, 95%CI:1.99–5.31) SDSs were independent risk factors affecting the total QOL score.

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Conclusions: Obese children and adolescents have lower health-related QOL that correlated negatively with BMI, also they are more susceptible to anxiety and depression symptoms than non obese children.

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1. Introduction

Overweight and obesity rates continue to increase among the pediatric population, as well as in adults [1–5]. Statistics from the Centre for Disease Control and Prevention (CDC) show that 11.3% of children and adolescents aged 2–19 are at or above the 97th percentile of BMI-for-age growth charts, 16.3% are at or above the 95th percentile, and 31.9% are at or above the 85th percentile [6,7]. By these definitions, nearly one third of individuals between the age of 2 and 19 years are either overweight or obese [6].

Due to an increase in the prevalence of childhood and adolescent overweight and obesity in the past 2 decades, concerns about the physical and psychosocial consequences of childhood obesity were raised. Obesity is associated with numerous physical problems, such as hypertension, coronary arteriosclerosis, elevated cholesterol, type 2 diabetes, joint problems, stroke, and certain types of cancers [1]. Psychologically, it is associated with several problems, such as lower self-concept, negative self-evaluation, decreased self-image, anxiety and depression [2]. While aspects of self-esteem may predict psychological adjustment, including depressive symptoms [3], health-related QOL is a more comprehensive and multidimensional construct, and includes physical [8], emotional, social, and school functioning [4]. Although pediatricians believe that being overweight in childhood or adolescence affects future QOL, there is little existing information about the health-related QOL of obese children and adolescents [5].

With this background, we attempted to assess the health related QOL and psychiatric co-morbidities (anxiety and depression) in obese children and adolescents; and their relation to BMI.

2. Subjects and methods

2.1. Study population

This cross sectional case-control study was conducted on 50 obese children and adolescents (28 males and 22 females) who were randomly collected from the Pediatrics' Obesity Clinic, Children's hospital, Ain Shams University during the period from July 2010 to June 2011. Their mean age was 10.2 ± 2.6 years (range: 7–16.5 years). Obesity (BMI SDS $> +2$) was defined according to the reference ranges of Cole, 2002 [9]. Obese patients due to genetic syndromes, endocrinal diseases or psychiatric disorders were excluded from the study.

Obese patients were compared to 50 healthy age-, sex- and pubertal stage-matched non obese children and adolescents (33 males and 17 females) serving as controls. Their mean age was 11.4 ± 3.7 years (range: 7–17 years). They were recruited from the Pediatrics' Outpatient Clinic of the same hospital.

The work has been carried out in accordance with the code of Ethics of the World Medical Association (Declaration of

Helsinki) for experiments involving humans. All subjects were informed of the aim and methods of the study and signed a written consent.

2.2. Methods

All participants were subjected to:

- History and clinical examination: laying stress on age, sex, developmental history, therapeutic history, duration of obesity.
- Anthropometric measurements: weight and height were measured together with calculation of height standard deviation score (SDS) according to the norms of Tanner et al., 1966 [10]. BMI was calculated using the formula: weight (kg)/height² (meters) together with calculation of BMISDS using the reference ranges of Cole, 2002 [9].
- Waist circumference was measured using a non-elastic tape with the subject in a standing position. The abdominal circumference midway between the lowest rib and the top of the iliac crest at the end of expiration was measured to obtain the waist circumference. Waist circumference SDS was calculated according to the reference ranges of Hatipoglu et al., 2008 [11].
- HRQOL assessment using the 23-item PedsQL™ Generic Core Scales: patients and their parents were asked to fill in The PedsQL Inventory [4]. It is a 23-item Scale that consists of 4 Core Scales [physical functioning (8 items), emotional functioning (5 items), social functioning (5 items) and school functioning (5 items)] and 3 summary scores [(total score (23 items), physical health summary score (8 items) and psychosocial health summary score (15 items)]. Scales are standardized, and scores range from 0 to 100, with higher scores representing better QOL. To obtain a total score, the items are reverse-scored and transformed to a 0–100 scale (0 = 100, 1 = 75, 2 = 50, 3 = 25, 4 = 0). The 3-point Likert scale is scored 0 = 100, 2 = 50, and 4 = 0. The Physical Health Summary Score (8 items) is the same as the Physical Functioning Subscale. The Psychosocial Health Summary Score (15 items) is a mean score (computed as the sum of the items divided by the number of items answered in the Emotional, Social, and School Functioning Subscales). Scale scores are computed as the sum of the items divided by the number of items answered.
- Screening for anxiety using Children Anxiety Scale [12]. It consists of 53 questions answered by Yes (score 1) or No (score 0) and the total score range is 0–53. A children anxiety score of < 18 was classified as mild anxiety, 19–28 as moderate and > 29 as severe anxiety.
- Screening for depressive symptoms using the CDI [13] which is a self-rating scale widely used to assess depressive symptomatology in children and adolescents. It consists of 27 Likert-like items, with scores ranging from 0 to 2,

and yields total scores from 0 to 54, with higher scores reflecting greater symptomatology. A score of 0–9 was considered normal, 9–14 (male) and 9–16 (female) was classified as mild depression, 14–18 (male) and 16–22 (female) was classified as moderate depression and > 18 (male) and > 22 (female) was classified as severe depression.

2.3. Statistical analysis

IBM SPSS statistics (V. 19.0, IBM Corp., USA, 2010) was used for data analysis. Data were expressed as mean \pm SD for quantitative parametric measures and both number and percentage for categorized data. Student's *t* test was used for comparison between two independent mean groups for parametric data, Wilcoxon Rank Sum test for comparison between two independent groups for non-parametric data, and Analysis of Variance (ANOVA) for comparison between more than 2 patient groups for parametric data. Also, comparison between more than 2 patient groups for non-parametric data was done using Kruskal–Wallis test. Ranked Spearman correlation test was used to study the possible association between each two variables among each group for non-parametric data. Chi-Square test was used to study the association between each 2 variables or comparison between 2 independent groups as regards the categorized data. A *p* value of < 0.05 was considered significant.

3. Results

The mean duration of obesity among studied cases was 4.30 ± 0.55 years (0.61–7.71 years). All anthropometric measurements and waist circumference SDS were significantly higher in obese children than controls (Table 1).

Obese children and adolescents reported significantly lower health-related QOL (child self report and parent proxy report) in all domains compared to healthy children and adolescents ($p < 0.01$, Table 2).

Regarding the relation between weight status and QOL in child self report, BMISDS correlated negatively with each of total score ($r = -0.77$, $p = 0.02$), physical health score ($r = -0.71$, $p = 0.02$, Fig. 1), psychosocial health score ($r = -0.90$, $p < 0.001$); emotional ($r = -0.88$, $p < 0.01$), social ($r = -0.92$, $p < 0.001$) and school ($r = 0.83$, $p < 0.01$) functioning. For the relation between weight status and QOL in parent proxy report, similarly, BMISDS correlated negatively with each of total score ($r = -0.72$,

$p = 0.01$), physical health score ($r = -0.77$, $p = 0.02$), psychosocial health score ($r = -0.80$, $p < 0.01$); emotional ($r = -0.89$, $p < 0.01$), social ($r = -0.82$, $p < 0.01$) and school ($r = 0.93$, $p < 0.001$) functioning.

Moreover, the duration of obesity correlated negatively with each of total score ($r = -0.82$, $p < 0.01$), physical health score ($r = -0.87$, $p = 0.01$), psychosocial health score ($r = -0.83$, $p < 0.01$, Fig. 2); emotional ($r = -0.79$, $p = 0.01$, Fig. 3), social ($r = -0.72$, $p = 0.02$) and school ($r = 0.83$, $p < 0.01$) functioning of studied obese children.

By multivariate analysis, BMI (OR: 5.72, 95%CI: 2.57–5.9) and waist circumference (OR: 2.27, 95%CI: 1.99–5.31) SDSs were the only significant independent risk factors affecting the total QOL score which means that HRQOL score is affected more as the degree of obesity (reflected by BMI and waist circumference SDSs) increases.

Anxiety and depression were either pre-existing or subsequently diagnosed in all our obese children and adolescents, which was significantly higher than non obese ones ($p < 0.01$). Moreover, severe degrees of anxiety and depression were encountered in obese children ($p < 0.01$, Tables 3 and 4). In addition, there were significant positive correlations between BMISDS and each of anxiety ($r = 0.81$, $p < 0.01$) and CDI scores ($r = 0.78$, $p = 0.01$).

When relating the degree of anxiety to HRQOL scores in obese children and adolescents, there were significant negative correlations between anxiety score and each of total ($r = -0.81$, $p = 0.01$), physical ($r = -0.79$, $p = 0.021$) and psychosocial ($r = -0.83$, $p = 0.01$) scores. Similarly, CDI score correlated negatively with each of total ($r = -0.71$, $p = 0.03$), physical ($r = -0.72$, $p = 0.02$) and psychosocial ($r = -0.89$, $p < 0.01$) scores. In addition, the total scale score in the child self report of obese children was significantly lower as severity of anxiety (mild: 76.44 ± 4.21 , moderate: 71.55 ± 2.31 , severe: 66.10 ± 3.66 , $p = 0.041$) and depression (mild: 74.81 ± 6.3 , moderate: 70.11 ± 2.2 , severe: 65.33 ± 1.56 , $p = 0.032$) increased.

4. Discussion

Obesity is one of the most stigmatizing and least socially acceptable conditions in childhood [5]. Although overweight and obesity are associated with many severe medical consequences even at a young age, the most common short-term consequences of pediatric obesity are psychosocial in nature. Because pediatric obesity can lead to such problems, efforts to examine HRQOL in overweight and obese youths have

Table 1 Statistical comparison of anthropometric measures between studied cases and controls.

	Obese (<i>n</i> = 50)		Non obese (<i>n</i> = 50)		<i>p</i>
	Mean \pm SD	Range	Mean \pm SD	Range	
Age (years)	10.2 \pm 2.7	(7–16.4)	11.4 \pm 3.7	(7–17)	0.061
Height SDS	+0.5 \pm +0.7	(–1.18 to 3.7)	–0.2 \pm 1.1	(–1.8 to 1.28)	0.024*
BMI (kg/m ²)	31.5 \pm 4.6	(25.2–48.2)	19.2 \pm 2.2	(15.9–21.67)	0.001**
BMISDS	+3.5 \pm 0.5	(+2.5 to 4.5)	+0.6 \pm 0.3	(+0.07 to 1.36)	0.001**
Waist circumference SDS	+4.5 \pm 1.5	(+2.3–7.9)	+1.05 \pm 0.4	(+0.01–1.2)	0**

BMI, body mass index; SDS, standard deviation score.

* $p < 0.05$ significant.

** $p < 0.01$.

Table 2 Statistical comparison of HRQOL scores among obese children and controls.

	Obese ($n = 50$) Mean \pm SD	Non obese ($n = 50$) Mean \pm SD	t	p
<i>Child self report</i>				
Total scale score	69.1 \pm 8.4	81.1 \pm 7.8	7.4	<0.001**
Physical health	68.4 \pm 12.2	82.9 \pm 8.6	6.9	0.01**
Psychosocial health	69.5 \pm 8.3	80.1 \pm 8.5	6.3	0.01*
Emotional functioning	65.4 \pm 10.3	78.5 \pm 10.9	6.2	0.020*
Social functioning	70.8 \pm 9.8	82.3 \pm 9.8	5.9	0.021*
School functioning	72.4 \pm 9.8	79.9 \pm 9.4	3.9	0.040*
<i>Parent proxy report</i>				
Total scale score	62.9 \pm 9.5	74.9 \pm 7.2	7.1	<0.001**
Physical health	61.7 \pm 13.1	76.9 \pm 7.1	7.2	0.021*
Psychosocial health	63.6 \pm 9.5	73.9 \pm 8.5	5.7	0.020*
Emotional functioning	62.4 \pm 11.9	71 \pm 11.1	3.7	0.01*
Social functioning	64.6 \pm 11.1	76.9 \pm 9.5	5.9	0.01*
School functioning	64.2 \pm 10.8	73.9 \pm 10.3	4.5	0.020*

HRQOL, health related quality of life.

* $p < 0.05$.

** $p < 0.01$.

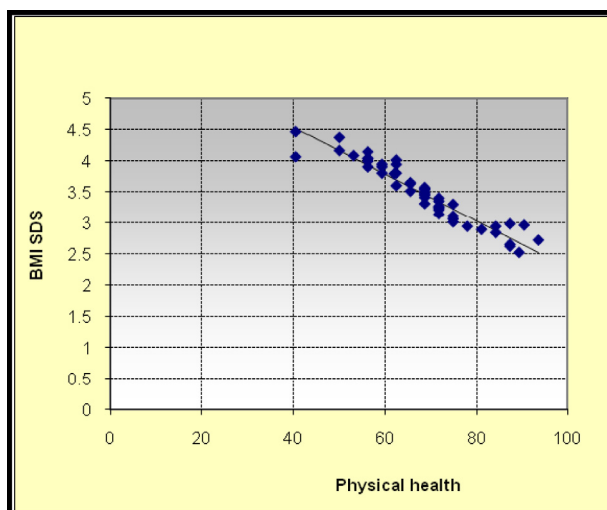


Figure 1 Regression analysis showing the correlation between BMISDS and physical health scores among obese patients.

increased. The multidimensional concept of HRQOL expands the view on health beyond somatic indicators to include the patients' subjective perspective on the physical, psychological, social, and functional aspects of health [4].

Children and adolescents in our study reported significant impairment not only in total scale score, but also in all domains—physical, psychosocial, emotional, social, and school functioning—in comparison to non obese children and adolescents with BMI and waist circumference SDSs being significant independent factors affecting the total QOL score. Thus, the likelihood of an obese child or adolescent having impaired HRQOL was significantly greater than a healthy child or adolescent, which decreases as the degree of obesity increases suggesting that the day-to-day life of obese youth is globally impacted by this condition.

Studies on obese adults most consistently showed decreased physical functioning [15]. Similarly, obese children in our study

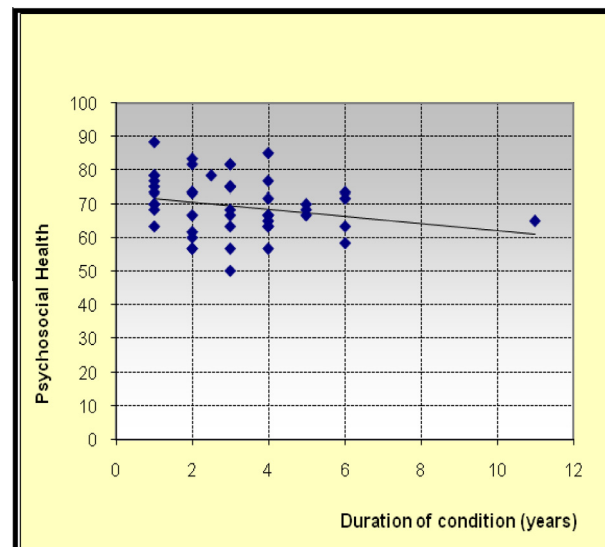


Figure 2 Regression analysis showing the correlation between duration of obesity and psychosocial health scores in obese patients.

were more likely than non obese children to have impaired physical functioning. Furthermore, Fontaine et al. [14] reported that physical functioning decreased with increasing weight among British adults. We also observed that the BMISDS score among obese children and adolescents was inversely correlated with physical functioning which was confirmed by Schwimmer et al. 2003 [15]. Also, our results are in agreement with Swallen et al. 2005 [16] who found that physical functioning decreased as BMI moved away from normal limits, and found a statistically significant relationship between BMI and general and physical health. This supports the idea that the diminished ability to move with increasing weight leads to a decrease in caloric expenditure with the potential consequence of a further mismatch in energy balance leading to additional weight gain [14].

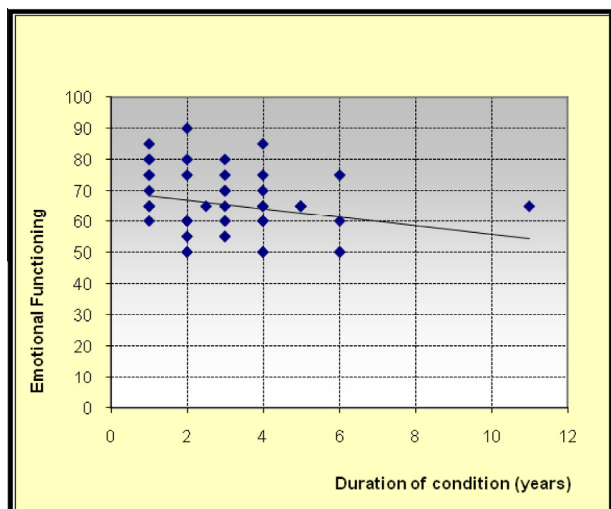


Figure 3 Regression analysis showing the correlation between duration of obesity and emotional functioning scores in obese patients.

Table 3 Statistical comparison of anxiety score grades between cases and controls.

Degree of anxiety	Obese <i>n</i> (%)	Non obese <i>n</i> (%)	X2	<i>p</i>
Mild	4(8%)	44(88%)		
Moderate	19(38%)	6(12%)	67.09	0**
Severe	27(54%)	0(0%)		

Pearson Chi-Square test.
** *p* < 0.01 highly significant.

Table 4 Statistical comparison of CDI score grades between cases and controls.

Degree of depression	Obese <i>n</i> (%)	Non obese <i>n</i> (%)	X2	<i>P</i>
Normal	0(0%)	31(62%)		
Mild	9(18%)	13(26%)	62.72	0**
Moderate	12(24%)	6(12%)		
Severe	29(58%)	0(0%)		

Pearson Chi-Square test.
** *p* < 0.01 highly significant.

Body image dissatisfaction has been described as the most consistent psychosocial consequence of obesity [17]. Certain changes seem to be responsible for impairment in specific dimensions of psychosocial functioning. For instance, patients with abdominal obesity felt more ashamed of body changes and had more problems with dressing, social and spare-time activities [18]. This was confirmed in our study by the finding of waist circumference SDS as an independent risk factor affecting the HRQOL total score in our obese patients. Compared with normal-weight individuals, obese persons overestimate or distort body size more, and are more dissatisfied and preoccupied with their physical appearance. This was highlighted in the current study by the significant negative

correlation between BMISDS and psychosocial functioning. Friedlander et al. 2003 [19] reported that higher BMI scores were associated with lower Psychosocial Health Summary scores, but not Physical Health Summary scores. They suggested that obesity in children is more closely associated with perceived limitations in psychological health rather than in physical health. Based on the content of the questions used to assess psychological health, it can be inferred that children with higher BMIs are more likely than normal weight children to be perceived by their parents as having feelings of anxiety and depression, of exhibiting aggressive or immature behavior, as having role limitations in their schoolwork and social activities, and as having low self-esteem. Previous results were confirmed in the current study by the presence of lower social and school functioning scores in our patients' self report and their parents' proxy report. Moreover, severe degrees of anxiety and depression were encountered in our obese children with significant positive correlations between BMISDS and each of anxiety and CDI scores.

On the other hand, Rizi et al. 2010 [20] assessed the HRQOL in a clinical sample of obese children and adolescents aged between 5 and 16 years and demonstrated that the degree of obesity was not related to the degree of psychosocial functioning. They explained this by the fact that once an individual becomes obese, it does not matter how obese he is. This was not the case in the current study since not only the total scale score, but also in all domains—physical, psychosocial, emotional, social, and school functioning—demonstrated a significant negative correlation with the duration of obesity.

All obese children in our study had significant higher anxiety score with more severe degrees being encountered than controls. This is in agreement with Vila et al. [21], who found that the most frequent disorders in obese children were anxiety disorders. In contrast, Wadden et al. [22] did not find an association between weight and clinical depression or trait anxiety in his mixed gender and ethnic sample.

Also, our study revealed an increased prevalence of depression among obese children since all obese children showed significant higher depression score with more severe degrees encountered than controls. This is in agreement with Lofrano-Prado et al. [2], who reported that obese adolescents had a higher incidence of mental health problems, such as depression, anxiety, low QOL than non-obese adolescents, suggesting that this condition has a global impact on their daily life. In contrast, Zeller and Modi [23] found that only 11% of their obese sample reported depressive symptoms in the clinical range based on a conservative criterion, which is consistent with a 10% prevalence rate of depressive symptoms in a community sample. Recognizing that this is not a formal psychiatric diagnosis and merely an endorsement of symptoms, these data suggest that only some obese youth who seek weight management treatment are experiencing clinically elevated internalizing symptoms.

The relationship between obesity and depression/anxiety could be due to several plausible mechanisms. First, elevated depressive or anxious symptoms could exacerbate the likelihood of weight gain over time [24]. For example, depression or anxiety could affect diet or activity levels that could lead to elevations in sedentary behavior, increase in emotional eating, and decrease in exercise. Second, psychiatric medication use may affect weight directly or indirectly, as in practice of eating in the absence of hunger (i.e., an increase in reported

psychological hunger) and may contribute to this complicated relationship [25]. Third, depression, anxiety, and weight could be influenced by additional social and biological risk factors; there may be different types of depression and anxiety among overweight children and adolescents that influence their eating behavior and physical activity levels. This was highlighted in the current study by the clear negative correlations between QOL scores and each of anxiety and CDI scores in our obese patients. Additionally, preliminary data provide evidence that hormonal factors, including adolescents' menstrual cycles, may shed light on mood fluctuations [26].

In conclusion, even in the absence of co-morbid disease, obese children and adolescents reported impaired HRQOL. It is critical for physicians, parents, and teachers to be aware of the risk for impaired QOL in these children and adolescents. We propose that studies of targeted interventions to treat obesity in children and adolescents should include an assessment of HRQOL before, during, and after the intervention. Such clinical trials would provide the opportunity to evaluate the comprehensive effects of an intervention, not just on weight status, but also on the HRQOL of those children and adolescents. Also, long-term multidisciplinary lifestyle therapy to decrease symptoms of depression, anxiety and body image dissatisfaction; is essential to improve QOL in obese children.

Conflict of interest

The authors declare no conflict of interest. There is no financial and personal relationship with other people or organizations that could inappropriately influence their work.

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