

Obesity and Health-Related Quality of Life among Adolescents

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Abstract: The aim of this study was to measure the prevalence of overweight and obesity among adolescent schoolchildren, and to investigate its effect on health-related quality of life (HR-QOL). It is hypothesized that overweight/ obesity is an independent predictor of a lower HR-QOL score. The study was conducted in preparatory and secondary schools in Port Said city on 898 schoolchildren selected by stratified cluster random sampling. Data were collected using a designed a self-administered questionnaire form including a validated HR-QOL scale translated into Arabic and pilot-tested. Body mass index was measured. The response rate was 95.2%. The results showed a 11.5% prevalence of obesity and 21.5% overweight, significantly higher in secondary level, compared to preparatory ($p < 0.001$). The total QoL score was 68.7 ± 12.1 ; it showed statistically significant decreasing trends from normal to obese, through overweight in all QoL domains except having positive feelings. Significantly more girls in the overweight and obese categories had their menarche ($p = 0.002$), and the intensity of menstrual pain was significantly higher in overweight and obese girls ($p = 0.02$). Multivariate analysis identified participant's age, female gender, number of diseases or symptoms and BMI as independent statistically significant negative predictors of QoL score, while good perception of health and higher level of father education were positive predictors. Therefore, health care providers, schoolteachers and parents should deploy more efforts in implementing Intervention programs aimed at prevention and treatment of overweight/obesity in schools

[Amal Ahmed Khalil Morsy, Nagat Salah Shalaby, and Mona Abdel Sabour. **Obesity and Health-Related Quality of Life among Adolescents.** *Journal of American Science.* 2012; 8(4): 539-545]. (ISSN: 1545-1003). <http://www.americanscience.org>. 71

Keywords: adolescent, health, Obesity, quality of life

1. Introduction

Obesity has been defined as the condition of excess body fat to the extent that health is impaired⁽¹⁾. Childhood overweight is defined as a body mass index (BMI) greater than or equal to the sex-and-age-specific 95th percentile, while a BMI greater than or equal to the 85th but less than 95th percentiles is classified as "at risk for overweight"⁽²⁾.

Obesity is a strong risk factor for serious diseases as diabetes and heart diseases. It is also a risk factor for certain cancers and is associated with depression and other medical conditions. Additionally, it may reduce the life expectancy. Hence, the variety of long term illnesses resulting from obesity may have potentially catastrophic economic impact on the future health care systems.^(3,4)

The precise etiology of childhood overweight remains poorly understood. Fundamentally, overweight is a consequence of an imbalance in energy intake relative to expenditure. Certain changes in the environment may have affected the energy balance of children. These involve changes in the food market e.g. increased soda consumption, larger portion sizes, and high calorie foods and beverages; more barriers to physical exercise; changes in parenting roles with busier parents and children spending longer time watching TV and playing computer games. Such environmental changes enhance the significant role

genetics play in susceptible individuals.⁽⁵⁾ Further, one of the most important public health concerns is that obese children are at risk of becoming obese adults.⁽⁶⁾

The prevalence of childhood and adolescent overweight and obesity has increased substantially in the past 2 decades.^(7,8) A high body mass index during childhood is associated with undesirable lipid levels, insulin levels, and blood pressure.^(9,10) In addition to suffering adverse physical consequences, overweight children experience lower self-esteem as compared to normal weight peers. This leads to increased rates of psychological disorders, with associated stigmatization and discrimination, and higher rates of tobacco use.⁽¹¹⁾ Although many studies addressed the relation between obesity and QoL, the results are still controversial, which indicates a need for further research in this area.⁽¹²⁾

The prevalence of obesity among adolescents varies by time and place. Therefore, there is a need to update information regarding the magnitude of this problem in our community. Additionally, the impact of overweight and obesity on adolescents' health are deemed important to investigate.

2. Methods and material:

Aim of the study

The study aim is to:

1. Assess prevalence of overweight and obesity among adolescent schoolchildren,
2. Investigate its effect on health-related quality of life (HR-QOL). It is hypothesized that overweight/ obesity is an independent predictor of a lower HR-QOL score.

Design:

Design and setting: The study was conducted in eight schools in Port Said city using a cross-sectional analytic research design. It included four preparatory and four secondary schools, equally for boys and girls.

Setting:

The study was conducted in eight schools in Port Said city. It included four preparatory and four secondary schools, equally for boys and girls.

Sample:

This comprised schoolchildren from preparatory and secondary grades selected by stratified cluster random sampling. Port Said schools were classified into four strata according to gender (boys/girls) and educational phase (preparatory/secondary). Two schools were randomly selected from each of the four strata, for a total sample of eight schools. Within the selected schools, classes constituted the clusters. Two or three clusters were randomly selected from each selected school to fulfill the required sample size. The sample size was calculated to estimate a prevalence rate of obesity of 11.2%,⁽¹³⁾ with 3% absolute precision, a design effect 2, at 95% level of confidence. After correction for a dropout rate of about 10%, the required sample size was 944 schoolchildren. This was equally divided among the eight schools. This sample size was large enough for multivariate analysis to test the study hypothesis.

Data collection tools:

The researchers designed a self-administered questionnaire form for data collection. It comprised three parts. The first part was for adolescent's biosocial data as age, gender, grade, birth order. It also included questions about parents' education, job, and family income. The second part was for assessment of student's physical health; it also included questions about menstrual history for girls. The third part consisted of HR-QOL scale translated into Arabic.⁽¹⁴⁾ The scale covers QoL areas related to negative impact of obesity, satisfaction with own life, positive feelings, and the effect of obesity on daily life activities (DLA). The tool items are checked on a 6-point Likert scale ranging from "very satisfied" to "very dissatisfied." These were scored from 6 to 1, respectively. The scoring was reversed for negative items, so that a higher score reflects higher QoL. The scores of the items of each domain were summed up and converted to a percent score.

Pilot study:

The developed tool was reviewed by a panel of experts in nursing and medicine. Then, a pilot study was carried out on a sample of adolescents from other schools to test the clarity and reliability of the tool and feasibility of the study. The tool reliability was tested through assessing its internal consistency, and proved to be high (Cronbach alpha coefficient 0.81). Needed modifications were done in the form of re-phrasing of some items. The pilot subjects were not included in the main study sample.

Fieldwork: the required official steps were taken to get the approval of carrying out the study from the local Directorate of Education. Letters of agreement were issued to the headmasters of selected schools from the Directorate to conduct the study, and asking for cooperation with the researchers. Meetings were held with individual headmasters, where the researchers explained the purpose of the study. Parents' consents were obtained before any student participated in the study.

The researchers met with students in classrooms, explained to them the purpose of the study, and distributed the questionnaire forms to be completed. After completion of the form, each student's weight and height were measured using standardized methods⁽¹⁵⁾. Body mass index was estimated by dividing the weight in kilograms by height in squared meters; BMI below 18.5 means underweight, BMI <25.0 was considered as normal weight, 25.0-<30.0 as overweight, and 30.0+ as obesity⁽¹⁶⁾.

Ethical considerations:

Letters were addressed through schools to the parents of students explaining the study goal and procedures, and the rights to refuse or withdraw at any time. Confidentiality of the data was ensured and the collection tools were anonymous. Professional advice was provided to any affected student whenever needed. The field work was carried out from November 2010 to May 2011.

Data analysis:

Data entry and statistical analysis were done using SPSS 14.0 statistical software packages. The non-parametric Kruskal-Wallis test was used for multiple group comparisons of quantitative data as normal distribution could not be assumed. Categorical variables were compared using chi-square test. Whenever the expected values in one or more of the cells in a 2x2 tables was less than 5, Fisher exact test was used instead. In order to identify the independent predictors of QoL scores, multiple stepwise backward regression analysis was used, after testing for linearity, normality, and homoscedasticity, and analysis of variance for the full regression models was done.

Statistical significance was considered at p-value <0.05.

3. Results

The study included 898 adolescent school-children, with a response rate 95.2%. Slightly more than half of the sample (52.4%) from preparatory grades (Table 1). Their mean age was 14.7 ± 1.7 years, with slightly more boys (53.1%). The majority of their parents had intermediate or university education, and about half of the mothers (50.6%) were housewives.

More than half of the participants had chronic diseases or symptoms as shown in Table 2. However, the majority perceived their health as fair (34.9%) or good (45.7%). Meanwhile, 3.9% of them considered it poor.

Concerning obesity, Table 3 indicates a total prevalence of 11.5%, and 21.5% overweight. It is noticed that the prevalence of overweight and obesity are significantly higher in secondary level, compared to preparatory ($p < 0.001$).

Table 4 shows wide ranges of QoL scores in its various domains. The highest mean score was related to feeling satisfaction with own health (72.6 ± 14.2), whereas the lowest was related to having positive feelings (60.3 ± 22.9). The total QoL score was 68.7 ± 12.1 .

As for relation between the QoL and the grades of obesity, Table 5 demonstrates decreasing trends in the mean scores from normal to obese, through overweight. These trends were statistically significant except for the domain of having positive feelings ($p = 0.41$). Additionally, the feeling of negative impact of obesity on the daily life activities was similar in normal and overweight, but significantly lower in the obese.

Table 6 describes the relation between obesity and menstrual history among girls. It shows that significantly more girls in the overweight and obese categories had their menarche ($p = 0.002$). Also, the intensity of menstrual pain in overweight and obese girls was significantly higher, compared to those with normal weight ($p = 0.02$).

Multivariate analysis (Table 7) identified that participant's age, female gender, number of diseases or symptoms and BMI were independent statistically significant negative predictors of the total score of QoL. On the other hand, the good perception of health, and higher level of father education were positive predictors of this score. The model explains 35% of the variation in the QoL score, as indicated by its r-square value.

Table 1. Socio-demographic characteristics of students in the study sample (n=898)

	Frequency	Percent
Age (years):		
<16	553	61.6
16+	345	38.4
Range	11-21	
Mean \pm SD	14.7 ± 1.7	
Sex:		
Boys	477	53.1
Girls	421	46.9
Academic level:		
Preparatory	471	52.4
Secondary	427	47.6
Birth order:		
1	367	40.9
2-4	513	57.1
5+	18	2.0
Mother education:		
Illiterate	38	4.2
Basic	58	6.5
Intermediate	310	34.5
University	492	54.8
Mother job status:		
Housewife	454	50.6
Working	444	49.4
Father education:		
Illiterate	44	4.9
Basic	66	7.3
Intermediate	264	29.4
University	524	58.4
Father job status:		
Unemployed	46	5.1
Working	852	94.9

Table 2. Medical history and perception of health among students in the study sample (n=898)

	Frequency	Percent
Chronic diseases / symptoms (pain, insomnia, depression, etc.)	483	53.8
No. of problems/symptoms:		
Range	0-10	
Mean±SD	1.2±1.5	
Perception of general health:		
Poor	35	3.9
Fair	313	34.9
Good	410	45.7
Excellent	140	15.6

Table 3. Prevalence of obesity among students in the study sample (n=898)

	Obesity						X ² Test	p-value
	Normal		Overweight		Obese			
	No.	%	No.	%	No.	%		
Academic level:								
Preparatory	342	72.6	86	18.3	43	9.1	13.65	0.001*
Secondary	261	61.1	106	24.8	60	14.1		
Total	603	67.1	192	21.4	103	11.5		

(*) Statistically significant at $p < 0.05$ **Table 4. Quality of health measured among students in the study sample (n=898)**

	QoL domains	QoL scores
Feel obesity has a negative impact on QOL		
Range		29.2±100.0
Mean±SD		72.4±12.1
Feel satisfied with own life		
Range		20.0-100.0
Mean±SD		72.6±14.2
Have positive feelings		
Range		20.0-100.0
Mean±SD		60.3±22.9
Feel obesity has a negative impact on daily life activities (DLA)		
Range		0.0-100.0
Mean±SD		69.5±22.6
Total quality of life:		
Range		29.1-96.4
Mean±SD		68.7±12.1

Table 5. Relation between the scores of quality of health measured among students in the study sample and the grades of obesity

	Obesity			Kruskal Wallis Test	p-value
	Normal	Overweight	Obese		
Feel obesity has a negative impact on QOL					
Range	36.9-100	29.2-96.9	38.5-92.3	62.43	<0.001*
Mean±SD	74.5±11.5	69.6±12.3	64.9±11.6		
Median	75.40	70.80	66.20		
Feel satisfied with own life					
Range	20.0-100	20.0-100	24.0-100	20.92	<0.001*
Mean±SD	73.9±13.9	71.4±15.0	67.6±12.6		
Median	74.0	74.0	70.0		
Have positive feelings					
Range	20.0-100	20.0-100	20.0-100	1.79	0.41
Mean±SD	61.0±22.8	59.7±23.3	57.7±22.5		
Median	60.0	60.0	60.0		
Feel obesity has a negative impact on DLA					
Range	0.0-100	0.0-100	0.0-100	8.86	0.01*
Mean±SD	70.1±22.8	70.2±21.7	64.3±22.8		
Median	75.0	75.0	62.5		
Total quality of life:					
Range	35.2-96.4	32.3-91.9	29.1-89.0	12.79	<0.001*
Mean±SD	69.9±11.8	67.7±12.4	63.6±11.7		
Median	71.0	68.6	64.9		

(*) Statistically significant at $p < 0.05$

Table 6. Relation between female students' grades of obesity and their menstrual history

	Obesity						X ² Test	p-value
	Normal		Overweight		Obese			
	No.	%	No.	%	No.	%		
Menarche:								
No	37	13.9	3	3.0	2	3.8		
Yes	230	86.1	98	97.0	51	96.2	12.27	0.002*
Menarche age (mean± SD)	10.9±4.5		11.9±2.4		11.7±2.5		H=2.85	0.24
Period (days):								
Range	1-15		1-9		3-8			
Mean±SD	5.4±1.8		5.4±1.3		5.2±1.1		H=0.85	0.66
Cycle (days):								
Range	14-90		15-90		21-45			
Mean±SD	30.9±9		31.8±12.1		29.3±4.8		H=5.49	0.06
No. of pads/day (mean± SD)	3.1±1.3		3±1.3		3.4±1.2		H=4.25	0.12
Have pre-menstrual pain	215	93.5	86	87.8	45	88.2	3.52	0.17
Intensity of pre-menstrual pain (mean±SD, max=5)	2.5±3.5		2.9±3.7		2.8±3.5		H=3.71	0.16
Intensity of menstrual pain (mean±SD, max=5):	2.2±3.3		2.9±3.7		2.4±3.2		H=7.80	0.02*
Menses:								
Regular	138	60.0	69	70.4	35	68.6		
Irregular	92	40.0	29	29.6	16	31.4	3.81	0.15
Have menstrual problems	48	20.9	23	23.5	11	21.6	0.27	0.87
Use medications for menstrual symptoms	97	42.2	40	40.8	17	33.3	1.35	0.51
Think menstrual problems are due to obesity	22	9.6	9	9.2	8	15.7	1.87	0.39

(* Statistically significant at $p < 0.05$ (H) Kruskal Wallis test

Table 7. Best fitting multiple linear regression model for the total score of QOL

	Unstandardized Coefficients		Standardized Coefficients	t-test	p-value	95% Confidence Interval for B	
	B	Std. Error				Lower	Upper
	Constant	80.48				3.85	
No. of symptoms	-2.74	.24	-.34	11.564	<0.001	-3.20	-2.27
General health (reference: poor)	3.93	.46	.25	8.510	<0.001	3.03	4.84
Age	-.94	.20	-.13	4.753	<0.001	-1.33	-.55
Sex (reference: male)	-3.43	.68	-.14	5.066	<0.001	-4.76	-2.10
Father education (reference: illiterate)	.73	.35	.06	2.096	.036	.05	1.41
BMI	-.13	.06	-.06	2.008	.045	-.25	-.01

r-square=0.35

Model ANOVA: $F=80.35$, $p < 0.001$

Variables excluded by model: birth order, grade, mother education

4. Discussion

Obesity is one of the most common chronic disorders in childhood and its prevalence continues to increase rapidly. The present study demonstrated high percentages of overweight and obese among adolescent preparatory and secondary schoolchildren. The rates were higher in older age (secondary level), indicating an increasing trend with age. The finding is in line with Wang and Beydoun⁽¹⁷⁾ who mentioned an increase in childhood obesity across all age groups, and more than tripling between the ages of 6 and 19 years.

According to the results of the current study, overweight and obese adolescents had significantly lower scores of QoL. This was evident in all domains, and in the total score. This is further supported by the results of multivariate analysis, which identified BMI as an independent negative predictor of the score of QoL, in addition to the number of diseases or symptoms, and the feeling of poor health. The findings can be attributed to both the physical and psychological effects of obesity on the life of the adolescent. The finding is in agreement with Lofrano-Prado et al⁽¹⁸⁾ who have even demonstrated a positive effect of a

lifestyle program to reduce weight on the QoL of obese Brazilian adolescents. Moreover, Chang et al⁽¹⁹⁾ reported significant improvements in HR-QoL scores of morbid obese that had a bariatric surgery for obesity.

The difference in QoL scores between normal, overweight, and obese adolescents was more striking regarding the impact of obesity on the daily life activities, where obese subjects had a very low score, compared to normal and overweight. This is quite expected given the negative effect of obesity on physical fitness, in addition to its association with arthralgia and other physical symptoms.

These results are in agreement with Wilson et al⁽²⁰⁾ who showed that overweight and obesity contributed to activity limitation among adolescents, with chronic pain. Moreover, Swallen et al⁽²¹⁾ found that adolescents who were either overweight or obese were significantly more likely to report poor general health than adolescents with normal BMI. Additionally, they report one or more functional limitations. On the same line, Schwimmer et al⁽²²⁾ found that obese children and adolescents had lower health-related QoL scores compared to those with normal weight.

The negative impact of overweight/obesity on the QoL of adolescents is certainly not only related to their physical burden, but also may be due to psychological effects. This might be explained by the effect of overweight and obesity on body image, which is of particular importance at this stage of life when adolescents start to develop their identity and try to be attractive to others, especially for girls. Also, the associated feeling of stigma and exposure to negative comments from peers add to the psychological burdens⁽²³⁾. This explains the decreasing trend of QoL scores related to feeling satisfied with own life with increasing grade of obesity.

The present study has also demonstrated that significantly more overweight and obese girls had their menarche, compared to normal weight ones. This might be explained by increased sex hormones in body fat. The finding is in congruence with previous studies that reported earlier menarche among obese girls^(24,25).

Moreover, the intensity of menstrual pain among the present study girls was significantly higher among the overweight and obese ones. This might be attributed to the higher psychological stress associated with obesity, which might add to their suffering. In fact, the perception of pain is markedly influenced by the psychological status of the individual⁽²⁶⁾. From another perspective, there might be an underlying pathological element such as the polycystic ovary syndrome, which is closely related to obesity, and constitutes a major concern with the increasing trends of childhood obesity⁽²⁷⁾.

In addition to BMI, as independent predictor of a lower QoL score, other variables had their impact on this score. Adolescent's increasing age and female

gender seem to be negative predictors of the QoL score. The sex difference is quite plausible given the importance adolescent girls give to their body shape, which might be disturbed by overweight and obesity, with subsequent negative impact on their QoL score. In agreement with this, Kuan et al. ⁽²⁸⁾ found that Malaysian adolescent girls were more concerned about body weight and shape, compared to males. They diet more frequently, had self-induced vomiting, and used laxatives and exercise for weight loss. A similar gender-based difference in QoL was reported by Muhwezi et al ⁽²⁹⁾ in a Uganda study. Furthermore, Goldfield et al ⁽³⁰⁾ found stronger associations between higher BMI and body dissatisfaction among females.

Conclusions

The study concludes that overweight/obesity constitute a problem of high prevalence among adolescent schoolchildren, and is increasing with age. A higher BMI independently predicts lower health-related QoL scores.

Given the magnitude of the problem, its serious sequels, and its preventability at this age, health care providers, as well as schoolteachers and parents should exert more efforts in combating obesity. Intervention programs aimed at prevention (lifestyle change) and treatment (weight reduction) must be implemented in schools with the concerted efforts of all these three partners. National programs need to be developed to foster a healthy environment for children and adolescents with restriction of youth-targeted television advertising of foods of low nutritional value, and promotion of regular physical activity. Future research should aim at evaluating the effectiveness of the different intervention approaches.

Acknowledgements:

We gratefully acknowledge Rehab Hani (Assistant lecture in pediatric department) and Azza Fathy (Assistant lecture in pediatric department) for participation in collecting data. We thank also students who participated in the study. Additionally, we thanks administrations of schools for kind permission to conduct the study in their institution

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