

Prevalence of Obesity and Overweight among Primary Schools Children in Qena, Egypt

Amira M.M. Hamed¹, Alaa-Eldin A. Hassan¹, Mohammed Mahmoud Sayed Younis¹, Al-Mostafa Mohammed Kamal^{*2}

¹Faculty of Medicine, Department of Pediatrics, Al-Azhar University, Assuit branch, Egypt

²Qeft Teaching Hospital, Ministry of Health, Qena, Egypt

*Corresponding author: Al-Mostafa Mohammed Kamal, Email: almostafa.kamal99@gmail.com, Mobile: (+20) 122 602 0554

ABSTRACT

Background: Obesity is a significant public health concern affecting more than half a billion people worldwide giving rise to a range of health problems. This is due to its various and serious health hazards on one side and its preventable nature on the other side. **Objective:** This study aimed at identification of prevalence of overweight and obesity and its risk factors among children between 6 - 12 years of age in Qena, Egypt.

Methods and populations: A cross sectional study was conducted on 1000 students were chosen randomly from all grades of primary schools (6 -12 years) in the period from January, 2019 to June, 2019.

Results: The overall prevalence of obesity and overweight was 13.9% and 16.2% respectively. Girls were more obese than boys, (OR= 7.26, 95% CI: 4.6-10.19). Current study revealed that 71.2% of the obese and 66.7 of overweight children were from urban areas (OR= 0.172, 95 % CI: 0.115- 0.257) and 38.5% of the overweight children and 97.2% of the obese children had an obese parent (OR = 134.4, 95% CI: 47.06 - 372.6). There was a statistical significant association between prevalence of overweight and obesity in school children and education of the mother (OR = 10.2, 95% CI: 6.2- 16.6).

Conclusion: About one out of seven of 6-12 year-old-children in Qena city were obese. Locality of residence, gender, guardian education, obese guardian, feeding formula in early life, bad dietary habit (fast food consumption and missed breakfast) and lack of physical activity were likely to be the predictors of this alarming issue.

Key words: Childhood, Overweight, Obesity.

INTRODUCTION

Obesity is a significant public health concern affecting more than half a billion people worldwide ⁽¹⁾. In 2018, more than 1.9 billion were overweight and 600 million were obese. 39% of children and adolescents less than 18 years were overweight in 2018 and 13% were obese. More than 41 million children under the age of 5 years were overweight or obese in 2018. In Egypt, the estimated prevalence of overweight increased from 4% in 1990 to 7% in 2011 and is expected to increase ⁽²⁾. In Port Said city the overall prevalence of overweight and obesity in governmental pupils (6–12 years old) was 17.7 % and 13.5% respectively ⁽³⁾. In Cairo, the overweight and obesity prevalence was 11% and 3.8 % respectively ⁽⁴⁾. In Alexandria the overall prevalence of overweight and obesity in governmental pupils (6–12 years old) is 16.8 and 9% respectively ⁽⁵⁾. In El-Sharkia, overall prevalence of overweight and obesity showed 20% for overweight and 10.7% for obesity ⁽⁶⁾. In Assuit city, the overall prevalence of overweight and obesity among primary school children aged from 6 to 11 years was 11.24% and 12.28% respectively ⁽⁷⁾. Obesity is often defined simply as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired ⁽⁸⁾.

The BMI-for age percentile has been used as a reliable and accurate estimate for body fatness in children and adolescents. BMI-for age \geq 85% percentile is considered overweight. BMI-for age \geq 95%, percentile is considered obese ⁽⁹⁾. Skinfold thickness is useful for describing subcutaneous body fat distribution

or "fat patterning" ⁽¹⁰⁾. Obese children and adolescents have been shown to be more likely to skip breakfast and consume a few large meals per day than their leaner counterparts who are more likely to consume smaller frequent meals ⁽¹¹⁾. Most of children who miss breakfast will easy to weight gain. Conversely, breakfast consumption is an important factor to determine the quality of diet and energy intake that affect school children health status ⁽¹²⁾.

Reported associations of food groups with childhood obesity include low intake of fruits and vegetables, high intake of fast foods and sweets and high intake of sugar-sweetened beverages such as soft drinks ⁽¹³⁾. Snacks tend to be higher in energy density and fat content than meals and high snack consumption has been associated with high intake of fat and sugar ⁽¹⁴⁾. Increasing body weight increases mortality because of coronary heart diseases risk. The risk of developing DM and some types of cancers increase with obesity ⁽¹⁵⁾. Parents must be more aware of the role they can play in preventing obesity in their children ⁽¹⁶⁾. The earliest school-based obesity interventions are based on the program that was conducted during school hours. This program consisted of intensive exercise and nutrition education program delivered over a 5-6 month period ⁽¹⁷⁾.

AIM OF THE WORK

This study aimed at identification of prevalence of overweight and obesity and its risk factors among children between 6 - 12 years of age in Qena, Egypt.

PATIENTS AND METHODS

Study Design and Setting: This cross-sectional school-based study was conducted in four primary schools in Qena city. 1000 students were chosen randomly. It was conducted through a period of six months from January, 2019 to June, 2019.

Sample Size: The sample size was calculated using the EPI-INFO 2002 software (Centers for Disease Control and Prevention (CDC), Atlanta, Georgia, USA; on the basis of a prevalence rate of 13.3% for obesity among primary school children ⁽³⁾. With a precision of 3%, a confidence level of 95%, and an error of 0.05, a minimum sample of 450 students were required. This sample was increased to 1000 for proper representation of different age groups in the selected schools.

Sampling Technique and Procedures: Stratified and clustered random sampling technique was employed to select study subjects. Stratification was based on grades and location of the school. 250 students from each school, in Qena city, 40 students from the first 5 grades and 50 students from 6th grade. 4 schools were enrolled in this study. As regards the gender all the selected primary and preparatory schools included both girls and boys. All students aged between 6 to 12 years were included, while students less than 6 years or more than 12 years were excluded. Also children with chronic illness as well as those on corticosteroid therapy or growth hormone replacement therapy were excluded.

Data Collection Procedure: After agreement of the head of educational directorate of Qena governorate on conducting this research, data were collected from January, 2019 to June, 2019. In the first visit to each school, the researcher invited children to participate in the study, sampled them and gave them consent letter for their parents that included basic information about aim of the study, the planned physical examination of the study participants and the questionnaire. This visit took place a day before the second visit in which data were collected. On arrival of the second visit, consent letters from the parents were collected from the children and those who were allowed to participate in the research were gathered in class for anthropometric measurements, then they were given the questionnaire and were asked to take it home to be filled by their parents and give it back to the researcher on the next day.

Instrument of the Study

Questionnaire: A semi-structured, self-administered questionnaire was used. The questionnaire had two sections; the first section that was filled in the school by the researcher included personal informations: age, grade, gender, school name in addition to anthropometric measurements. The second section, which is a reliable questionnaire was

filled by one of the parents. This section concerned about the suggested risk factors of overweight and obesity including maternal education and job, maternal or parental obesity (documented by the mother herself), birth weight of the child and type of feeding during infancy (whether breast, formula feeding or both). Data about the current dietary habits of the child were also collected including frequency of eating fast food, frequency of drinking sugary fruit juice daily, frequency of eating fresh vegetables and fruits in addition to information about the weekly practice of physical exercises.

Anthropometric Measurements:

The study groups were examined for anthropometric measurements using similar techniques for obese and non-obese students by two well-trained persons (male for boys and female for girls) under supervision of the investigator. Body weight (in kilograms) was measured by a standardized balanced digital scale to the nearest 0.5. Height (in centimeters) was measured by a standardized fixed stadiometer fixed vertically on the wall. BMI for- age and sex percentiles are one of the most reliable, known and useful anthropometric measurements for the assessment of obesity in children and adolescents ⁽¹⁸⁾. BMI was estimated by dividing the weight in kg on square of height in meter. The results were applied separately for every student and classified by plotting BMI against standard percentile Egyptian curves for each age and sex into: underweight, normal weight, overweight and obese ⁽¹⁹⁾. Underweight: less than the 5th percentile, normal weight: 5th percentile to less than the 85th percentile, overweight: 85th to less than the 95th percentile and obese: 95th percentile or greater.

Ethical Consideration: The study protocol was approved by ethical committee of the Faculty of Medicine, Al-Azhar University – Assuit branch. A prior consent for the study was taken from the school administration. At the time of the study the parents of each participant were informed about the study protocol and a written consent was obtained to their child's participation and confidentiality was assured.

Statistical Analysis

Statistical analysis was done by compatible computer using software SPSS version 20 for windows. Frequencies, descriptive statistics, correlation, X² test, t-test and regression analysis were done along with the respective odds ratios for obesity with their 95% (CIs). Chi-square test and fisher exact test was used to compare between categorical variables while for comparing between continuous variables, we used Independent-Samples T test and ANOVA. The probability of less than 0.05 was used as cut off point for all significant tests.

RESULTS

Table (1): Socio-demographic characteristics and nutritional status among studied children

Variable	Normal weight (n=699) No %	Overweight (n=162) No %	Obese (n=139) No %	P value
Age:				0.87
6-	125 (17.9%)	22 (13.6%)	20 (14.4%)	
7-	114 (16.3%)	28 (17.3%)	25 (17.9%)	
8-	120 (17.2%)	25 (15.4%)	22 (15.8%)	
9-	117 (16.7%)	27 (16.7%)	23 (16.6%)	
10- 11-	116 (16.6%) 107 (15.3%)	28 (17.3%) 32 (19.8%)	23 (16.6%) 26 (18.7%)	
Gender:				0.016
Boys Girls	285 (40.8%) 414 (59.2%)	70 (43.2%) 92 (56.8%)	62 (44.6%) 77 (55.4%)	
Residence:				0.001
Rural Urban	490 (70.1%) 209 (29.9%)	54 (33.3%) 108 (66.7%)	40 (28.8%) 99 (71.2%)	
Education of the mother:				0.001
High	450 (64.3%)	40 (24.7%)	21 (15.1%)	
Preparatory Primary	150 (21.5%) 99 (14.2%)	98 (60.5%) 24 (14.8%)	70 (50.4%) 48 (34.5%)	
Job of the mother:				0.112
House wife Working mother	260 (37.2%) 439 (62.8%)	50 (30.9%) 112 (69.1%)	45 (32.4%) 94 (67.6%)	
Obesity among parents:				0.001
No obesity	430 (61.5%)	7 (4.3%)	4 (2.8%)	
Father only	110 (15.7%)	30 (18.5%)	20 (14.4%)	
Mother only	90 (12.9%)	45 (27.8%)	30 (21.6%)	
Both parents	69 (9.9%)	80 (49.4%)	85 (61.2%)	

Table (1) shows significant relationship between developing of Obesity and (Residence, parental obesity, and maternal education).

Table (2): Nutritional status, feeding in early life and dietary habits among studied children

Variable	Normal weight (n=699) No %	Overweight (n=162) No %	Obese (n=139) No %	P value
Feeding in early life:				0.001
Breast feeding	620 (88.7%)	42 (25.9%)	22 (15.8%)	
Formula feeding Both breast and formula feeding	39 (5.6%) 40 (5.7%)	62 (38.3%) 58 (35.8%)	50 (36%) 67 (48.2%)	
Weekly Fast food consumption:				0.000
Yes No	97 (13.9%) 602 (86.2%)	92 (56.8%) 70 (43.2%)	73 (52.5%) 66 (47.5%)	
Breakfast intake:				0.001
Yes No	480 (68.7%) 219 (31.3%)	75 (46.3%) 87 (53.7%)	50 (36%) 89 (64%)	
Weekly Fresh vegetables & fruits consumption:				0.001
Once	144 (20.6%)	110 (67.9%)	90 (64.7%)	
Twice	135 (19.3%)	32 (19.8%)	34 (24.5%)	
More than twice	420 (60.1%)	20 (12.3%)	15 (10.8%)	

Table (2) shows significant relationship between developing of Obesity and (feeding in early life, fast food intake, fresh fruits and vegetables intake and breakfast intake).

Table (3): Nutritional status, physical activity and daily habits among studied children

Variable	Normal weight (n=699) No %	Overweight (n=162) No %	Obese (n=139) No %	P value
Transportation to school:				
Walking	550 (78.7%)	8 (4.9%)	9 (6.5%)	0.047
Bicycle	65 (9.1%)	4 (2.5%)	5 (3.5%)	
General transportation	55 (7.9%)	12 (7.4%)	10 (7.2%)	
Taxi or car	29 (4.1%)	138 (85.2%)	115 (82.7%)	
Performing physical activity: Yes	574 (82.1%)	55 (34%)	31 (22.3%)	0.0001
No	125 (17.9%)	107 (66%)	108 (77.7%)	
TV watching hours: <one hour	99 (14.2%)	29 (17.9%)	14 (10%)	0.111
1-2 hours	200 (28.6%)	56 (34.6%)	45 (32.4%)	
>2 hours	400 (57.2%)	77 (47.5%)	80 (57.6%)	
Playing video games daily: Yes	249 (35.6%)	52(32.1%)	59 (42.4%)	0.116
No	450 (64.4%)	110 (67.9%)	80 (57.6%)	
Daily sleeping hours: <10 hours	79 (11.3%)	22 (13.6%)	19 (13.6%)	0.001
10-12hours	250 (35.8%)	60 (37%)	50 (36%)	
>12 hours	370 (52.9%)	80 (94.4%)	70 (50.4%)	

Table (3) shows significant relationship between developing of Obesity and physical inactivity.

Table (4) Odd ratio (95 % CI) for some risk factors among obese children

Characters	Obese children (n = 139) N (%)	P value	Odd ratio (95 % C I)
Weekly fresh vegetables and fruits intake	Once 90 (64.7%) Twice 34 (24.5%) More than twice 15 (10.8%)	0.000	0.08(.04-0.15)
Residence	Rural 40 (28.8) Urban 99 (71.2)	0.001	0.172 (0.115-0.257)
Mother education	High 21 (15.1) Preparatory 70 (50.4) Primary 48 (34.5)	0.001	10.2 (6.2-16.6)
Parental obesity	No 4 (2.8) Father 20 (14.4) Mother 30 (21.6) Both 85 (61.2)	0.001	132.4 (47.06-372.6)
Feeding	Breast 22 (15.8) Formula 50 (36) Both 67 (48.2)	0.001	47.2 (26.48-84.1)
Fast food consumption	Yes 73 (52.5) No 66 (47.5)	0.000	6.86 (4.6-10.19)
Breakfast intake	Yes 50 (36) No 99 (64)	0.001	0.26 (0.17-0.37)
Physical activities	Yes 31 (22.3) No 108 (77.7)	0.0001	0.06 (0.04-0.09)

Table (4) shows summary of significant risk factors of Obesity in this study and their odd ratio (95%CI).

DISCUSSION

In our study, among 1000 students we found that girls represented 58.3% (583) and 58.4 % of the participants were from urban. Our study revealed that the overall prevalence of obesity and overweight among children from 6 – 11 years of age was 13.9% and 16.2% respectively. In Port Said city the overall prevalence of overweight and obesity among governmental primary school children was 17.7 % and 13.5% respectively ⁽³⁾. In Sohage, **Hadhood et al.** ⁽²⁰⁾ reported that out of 711 studied children, 117(16.5%) were overweight and 104 (14.6%) were obese. Residing in urban area, having an obese parent or both of them, low level of maternal education, being on feeding formula during early life and lack of fresh vegetables and fruits in diets were significant risk factors for overweight and obesity in the studied children (P value < 0.05).

In Assuit city, the overall prevalence of obesity among primary school children was 12.28% ⁽⁷⁾. In Alexandria, overall prevalence of obesity among school children was 9% ⁽⁵⁾. In El-Sharkia, overall prevalence of obesity was 10.7% ⁽⁶⁾. In Cairo, the obesity prevalence was 22 %. These variations might be partially attributed to the difference in the standard curves used for defining obesity and overweight. The overall obesity prevalence in El- Mania was 24.4% ⁽²¹⁾.

In Jordon, a study was done on 2131 Jordanian children aged 6–12 years found that 19.4% were overweight and 5.5% were obese ⁽²²⁾. Difference in prevalence of obesity and overweight between Egyptian and Arabian children could be explained by genetic and dietary variation in addition to differences in socio economic status between Qena governorate and these countries. In the United States, study in 2009-2010, revealed that the prevalence of obesity in children and adolescents was 16.9% ⁽²³⁾. In our study, we found that girls were more obese than boys, p value < 0.05, (OR= 7.26, 95% CI: 4.6-10.19). This could be due to reduced activity levels of girls in the school or out of the school. Some of this sex difference could be due to adiposity related to hormonal changes at menarche ⁽²⁴⁾.

Ghazali et al. ⁽²⁵⁾ reported that prevalence of obesity between urban and rural children was not significantly different (7.2 vs.7.0%). Difference in obesity rates between genders was not significant (8.9% vs. 5.3%). However, among girls, there was a weakly significant difference in urban-rural obesity rates. Urban girls were less likely to be overweight or obese compared to their rural counterparts (OR=0.57 and OR=0.35 for overweight/obese and obese respectively). This difference is not observed between urban and rural boys. **Bahbah et al.** ⁽²⁶⁾ in Menoufia reported that the prevalence of obesity among female children was 11.9%, which is higher than male children 7.8%. We found that 71.2% of the obese children were from urban areas (P value = 0.001), (OR= 0.172, 95 %

CI: 0.115- 0.257). This result agrees with results of **El-Shafie et al.** ⁽⁵⁾ who studied the prevalence of overweight and obesity in primary school children living in Alexandria governorate and found that the prevalence of overweight and obesity among urban children was 18.4 and 10.1% respectively, which was higher than among rural children which represented 12.1 and 5.6%, respectively.

Badawi et al. ⁽³⁾ showed a strong positive correlation between child BMI and mother's and father's BMI (p value <0.001). In our study, there was a significant association between the prevalence of overweight and obesity in school children and education of the mother, where mothers of 34.5 % of obese children finished only the primary level of education compared to 15.1% of mothers of obese children with higher education (P value < 0.05), (OR = 10.2, 95% CI: 6.2- 16.6). **Talat and El Shahat** ⁽⁶⁾ in Urban Sharkia Governorate, Egypt concluded that the prevalence of overweight and obesity was high in children whose parent level of education was low. These results disagree with the study done in El-Mania by **Hassan et al.** ⁽²²⁾, which showed that the higher the level of parents' education, the higher the prevalence of overweight and obesity. In the present study, 41.1% of overweight children and 33.1% of obese children received feeding formula compared to 6.1% and 3.2% of overweight and obese children respectively were breast fed (P value <0.05) (OR = 47.2 , 95 % CI: 26-84.1). This significant association was also reported by several previous studies which reported the protective role of breast feeding against childhood overweight and obesity. Breastfeeding has been reported as being a potentially protective factor against weight gain in childhood, which is important because overweight children are at risk of becoming overweight adults.

It also agree with the study done by **Hassan et al.** ⁽²⁷⁾ among a sample of Egyptian Children, which showed that the prevalence of overweight and obesity in primary school children was 10.7 and 21.3% respectively in urban children, which was higher than in rural children 12.5 and 12.5% respectively. It also agrees with the study done by **Bahbah et al.** ⁽²⁶⁾ in Menoufia, which revealed that the prevalence of overweight and obesity was 18.3% and 15% respectively, which was higher than that showed among rural children, which was 7.1% and 4.8% respectively with a significant difference. This difference could be attributed to both dietary variations (absence of fast food restaurants, plenty of fresh fruits and vegetables nearby) and increased physical activity in rural areas as means of transportation are uncommon and children usually walk to schools. We found significant association between obesity among one or both parents and prevalence of obesity and overweight among children (p value=0.001), (OR = 134.4, 95% CI: 47.06 - 372.6). As 92.7% of the overweight children and

97.2% of the obese children had an obese parent or both parents were obese. In addition, **Badawi et al.** ⁽³⁾ in Port Said city, Egypt showed the significant association (p value <0.001) between nutrition during lactation period and BMI, where 36.5% and 22.3% of formula-fed children were obese and overweight respectively compared with 5.7% and 18.1% of breast-fed children. Another study was conducted in Menoufia, Egypt by **Farahat et al.** ⁽²⁸⁾ who reported that 41% of normal children aged 4–6 years were breast-fed compared to 28% of overweight children. Additionally, they found that 38% of normal children were bottle-fed, compared to 50% of overweight children (P < 0.05).

Concerning fast food consumption, our study found a very highly significant association between fast food consumption and obesity (P= 0.001), as the majority of the obese students (52.5%) and of the overweight students (56.8%) used to consume fast food compared to 13.9% of the non-obese students (OR = 6.86, 95 % CI: 4.6 -10.19). These results agree with the results of **Badawi et al.** ⁽³⁾ in Port Said city, Egypt describing that faulty dietary habits as having more fast food, candy, chocolates, sugary Juices and carbonated beverage led to a higher BMI (p value <0.001) and also agree with results of study published in 2006 by **Malik et al.** ⁽²⁹⁾, which showed that fast food consumption was highly associated with obesity in adolescent school students.

Frequency of consumption of fresh fruits and vegetables was a significant risk factor that was detected where 43.2% of the obese children ate fresh fruits or vegetables once compared to only 10.8% of those who ate them twice daily with very high statistically significant difference (P value = 0.0001). There are many clear benefits to fruit and vegetable consumption, from childhood onwards in enriching the fiber and micronutrient content of the diet while reducing its energy density. Our results agree with **Badawi et al.** ⁽³⁾ in Port Said city, Egypt who showed that having more fresh fruits and vegetables had lower BMI measures (P value < 0.001). Our results also agree with **Epstein et al.** ⁽³⁰⁾ in New York State who suggested that increasing fresh vegetables intake is important for childhood obesity prevention and also agree with a study done by **Heo et al.** ⁽³¹⁾ in US that found an inverse association between body mass index (BMI) and fruits & fresh vegetables intake in children.

Physical inactivity may contribute to the development of obesity in the community and a decline in physical activity means that those who are susceptible to weight gain will be at risk of becoming obese. Our study showed that there was a very highly statistical significant inverse relationship between physical activity and obesity (P = 0.001), as 77.7 % of the obese students did not practice physical activity, (OR = 0.06, 95 % CI: 0.04-0.09). This finding is in agreement with **Ortega et al.** ⁽³²⁾ who studied energy

intake and expenditure in obese and non-obese Swedish children & adolescents and found that physical activity level was significantly higher among the non-obese children ⁽³²⁾.

CONCLUSION

About one out of seven of 6-12 year-old-children in Qena city were obese. Locality of residence, gender, guardian education, obese guardian, feeding formula in early life, bad dietary habits (fast food consumption and missed breakfast) and lack of physical activity were likely to be the predictors of this alarming issue. Societal and public health efforts are needed in order to reduce the burden of disease associated with obesity.

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