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# Prevalence of overweight and obesity among preparatory school adolescents in Urban Sharkia Governorate, Egypt

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### KEYWORDS

Prevalence;  
Obesity;  
Body mass index and life style**Abstract** *Background:* Obesity has become an important public health problem in children and adolescent because of the rapid increase in its prevalence rate and its severe co-morbidities.*Objectives:* To estimate the prevalence of overweight and obesity among preparatory school adolescent in urban Sharkia Governorate, aged from 12 to 15 years and to explore the associated risk factors.*Methods:* A cross-sectional study was carried out at Sharkia Governorate during academic year 2014–2015 (from October 2014 to 30th of May 2015). All the children were subjected to a prepared questionnaire that included questions related to socio-demographic characteristics, life style (physical activity and eating habits) and anthropometric measurements including height, weight and body mass index.*Results:* Nine hundred students participated in this study. The prevalence of overweight and obesity was 20% and 10.7% respectively. The highest rate of overweight was at the age of 13–14 years (grade 2) while the highest rate of obesity at the age of 14–15 years (grade 3). Risk factors of obesity were low parent education level, skipping breakfast, snack taking, fast food consumption, > 2 h per day of television watching, eating while watching television and low level of physical activity.*Conclusion:* This study found a relatively high prevalence of overweight and obesity among adolescents aged 12–15 years in urban Sharkia Governorate. Risk factors of overweight and obesity were low level of parent education, faulty feeding habits and physical inactivity.© 2015 The Authors. Production and hosting by Elsevier B.V. on behalf of The Egyptian Pediatric Association. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

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### Introduction

Obesity is a disease of multiple and complex causes leading to accumulation of large amounts of body fat due to an imbalance between energy intake and output. Usually, it is measured as excessive weight for a given height, using the body mass

index (BMI): Weight in kilograms (kg) over height squared ( $m^2$ ).<sup>1</sup> In the clinical setting, obesity is typically evaluated by measuring BMI, waist and hip circumference, and body fat measurement.<sup>2</sup> The prevalence of childhood overweight and obesity has increased over the past twenty years in both the developing and developed countries.<sup>3</sup> Available studies in Eastern Mediterranean countries indicate that obesity has reached an alarming level among both children and adults. Consequently, the incidence of severe co-morbidities such as hypertension, cancer, dyslipidemia, coronary heart diseases, and type 2 Diabetes Mellitus is also very high and represents more than 50% of the total causes of death. So obesity has become an important public health problem in children and adolescents.<sup>4</sup> Unsatisfactory data on the prevalence of overweight and obesity among adolescents in urban Sharkia Governorate are available. The knowledge on the prevalence of overweight and obesity and its determinants can help implement population-based preventive measures.

### Objective

The aim of the present study was to estimate the prevalence of overweight and obesity among preparatory school adolescents in urban Sharkia Governorate and to explore the associated risk factors.

### Subjects and methods

#### *Study design*

A cross-sectional study was conducted on a sample of students who attended general (governmental) preparatory school during the academic year 2014–2015 (from October 2014 to May 2015) in urban Sharkia Governorate. The sampling frame included the listed governmental schools given by Educational Directorate of Sharkia Governorate.

#### *Study population and sampling*

A multistage random sampling technique was used to select a sample. In this type of sampling we combined more than one sampling technique. First, Zagazig city was randomly selected from 12 cities in Sharkia Governorate. Then all general preparatory schools (48 schools) in Zagazig city were listed and 6 schools were selected using table of random numbers. Inside each school, pupils were chosen out of different school grade strata by selecting the students sitting in the middle three desks from each row of all classes of the whole school.

#### *Sample size*

The size of preparatory student population with age ranging from 12 to 15 years is about 32,400 students and the previous estimated prevalence of overweight and obesity was 26%.<sup>5</sup> By using EPI-Info version 6 statistical packages, the sample size was estimated to be 900 students.

#### *Inclusion and exclusion criteria*

Students aged between 12 and 15 years were included, while students less than 12 or more than 15 year of age were

excluded. Children with chronic illness as well as those on corticosteroid therapy or growth hormone replacement therapy and children with chromosomal disorders were excluded.

#### *Data collection procedure*

Permission was obtained from heads of educational directorates. Then the researcher visited the chosen schools to inform them about the survey. All the classes from the first to the third grade in each selected school were included in the study. Systematic randomization was used to select the sample where the students in the middle three desks from each row in each class were chosen to give them the consent form (which was approved by the Regional Ethics Committee). After having got the agreement consent from the headmasters and the students, data were collected by the following tools.

#### *A-Questionnaire*

The contents of the prepared questionnaire were explained to the students before handling. The included questionnaires were

- (A) Socio-demographic characteristics as age, grade, gender, birth date, school name, residence, parents' educational level [illiterate, read and writing (elementary), school (up to high school), university], father occupation [unskilled workers, skilled workers, semi-professional, professional], mother occupation [working or not working], family size and numbers of house rooms.
- (B) Feeding pattern data included the frequency of breakfast intake in a week, number of meals, eating snacks and fast food consumption.
- (C) Life style factors included:
  - (1) Hours of television watching and computer/video games were recorded for each day of a typical week and divided into three time categories, such as no television watching,  $\leq 2$  h per day,  $> 2$  h per day.
  - (2) Eating while television watching.
  - (3) A questionnaire on physical activity was developed by asking the participants to recall the number of hours per week if they had participated in any structured physical activity or team sport in the last six months. The participants were also asked about the time spent in commuting between home and school. Physical activity were divided into three time categories, such as no physical activity (less than 10 min per day), sometimes (10–30 min per day) and frequent (more than 30 min per day).

#### *B-Anthropometric measurements*

The researcher personally took different anthropometric measurements at the examination room assisted by the schools' doctors and nurses who were given a course of training for anthropometric measurements organized by the investigation team to avoid any potential bias in the study. All measurements were taken using the same type of apparatus and followed the same procedures recommended by Cameron.<sup>6</sup>

*Height* was measured to the nearest 1 cm while the students stood straight on the stadiometer barefoot and the head aligned so that the auditory canal and lower rim of the orbit were in a horizontal plane.

Weight was measured to the nearest 0.5 kg using digital scales while the students wore a light school uniform and were barefoot.

*Body mass index:* it was calculated by dividing weight in kg by square height in meters.

#### Outcome definitions

By plotting BMI against percentile curves of the standard Egyptian growth charts instructed by the faculty of medicine Cairo University and National Re-search Center<sup>7</sup>, overweight was defined as BMI more than 85th and less than 95th percentile for age and sex while obesity was defined as BMI more than 95th percentile for age and sex compared to.

#### Statistical analysis

Data were checked, entered and statistically analyzed by SPSS (Statistical Package for Social Sciences version 15, Chicago, IL, USA). Data were expressed as mean  $\pm$  standard deviation for quantitative variables or number and percentage for categorical variables. Data were compared using Student's *t*-test for 2 groups and ANOVA test for more than 2 groups. Multivariate logistic regression analysis was done to estimate the effect of each variable on overweight and obesity. For all tests, a *p* values less than 0.05 were considered statistically significant.

#### Results

Our study included 900 students at preparatory schools in urban Sharkia Governorate (432 males and 468 females). We found that 20% of the studied participants (180 students) were overweight, 10.7% (96 students) were obese and 69.3% (624 students) represent normal and underweight adolescents. Overweight represent 20.1% in males (87 out of 432 male) compared to 19.9% in females (93 out of 468 females) while obesity represent 10.4% in males (45 out of 432 male) compared to 10.9% in females (51 out of 468 females).

According to the age of the studied students (school grades), the highest rate of overweight was among the second grade students aged 13–14 years (21.5%) while the highest rate of obesity were among the third grade students aged 14–15 years (11.8%). There was no relation between obesity and age of the studied participants ( $p > 0.05$ ). Several variables were tested to determine their effect on BMI (Tables 1 and 2). Our data showed that illiterate fathers and mothers, frequently eating snacks, frequently fast food consumption, watching TV  $> 2$  h, missing breakfast eating, frequently eating while watching TV and physical inactivity lead to higher BMI. Multivariate logistic regression analysis was done to show the risk of these variables as shown in Table 3.

#### Discussion

Obesity is an increasing phenomenon.<sup>8</sup> Overweight and obesity in adolescence are associated with hypertension, dyslipidemia, high cholesterol and impaired glucose metabolism that have an impact on the physical health and can lead to an increase in the risk of early illness and death in later life.<sup>9</sup>

Our study revealed that the prevalence of overweight and obesity among preparatory school adolescents in urban

Sharkia Governorate was 20% and 10.7% respectively. Overweight and obesity represent 20.1% and 10.4% respectively in males. This is higher than national level, as overweight and obesity was recorded to be 11.5% and 6.5% respectively. While overweight and obesity represent 19.9% and 10.9% respectively in females. This is also higher than the national level, as overweight and obesity was recorded to be 15.2% and 7.7% respectively.<sup>10</sup> These higher rates could be explained by low educational level of parents, unhealthy dietary behaviors with high caloric intake particularly snacks and fast food and life style of the participants. The prevalence of overweight and obesity in our study rate is nearly similar to that founded by Al Saeed et al.,<sup>11</sup> who revealed that the prevalence of overweight and obesity was 20% and 11% respectively. At the same time the prevalence of obesity was less than figures recorded by Bin Zaal et al.,<sup>12</sup> in Dubai who revealed that the prevalence of obesity was 20.5% and by a study made in Kuwait showed that the prevalence of overweight and obesity among male children aged 10–14 years was 29.3% and 14.9% respectively while in female children 10–14 years the prevalence of overweight and obesity was 32.1% and 14.2% respectively.<sup>13</sup>

But this prevalence was higher than that reported in similar studies in UK and Brazil (8.7% and 4%) respectively.<sup>14</sup>

Our study showed a significant association between obesity and *parents' education* as the highest prevalence of obesity was among students with low educated parents as they are responsible for food selection for their children as well as their life style activities. This agrees with several studies carried out in the developed countries which explain this association by the belief of low educated parents that overweight children are healthier than normal weight children. So they prefer high calories food which causes obesity in their children.<sup>15,16</sup> While most studies carried out in developing countries revealed that the highest prevalence of obesity was among students with high educated parents due to parental style with low energy expenditure.<sup>14,17</sup>

In the present study, there was a significant association between obesity and *fathers' occupation* since the highest prevalence of obesity was among students of unskilled workers fathers while the lowest percentage was among students of professional fathers. This runs with several Turkish and Australian studies which showed that fathers' socioeconomic status has an impact on the stable household habits, dietary values and physical activity.<sup>13,18</sup> In this study, there was no significant association between obesity and *working status of the mother* as obesity occurs due to unhealthy eating habits and sedentary life style rather than working status of the mother. This goes parallel with Güven et al.<sup>15</sup> But other studies in developing countries revealed a significant association between obesity and working status of the mother as the child is more likely to be overweight if his mother works more hours per week during childhood which impede young children's access to healthy foods and physical activity.<sup>16,19</sup>

The present study sheds light on the dietary behavior and lifestyle of the general preparatory school students. *Skipping breakfast* is associated with overweight/obesity in children and adolescents.<sup>12,20</sup> Our study showed a significant association between skipping breakfast and overweight as well as obesity. This could be explained as skipping breakfast leads to eating energy-dense, less-nutritious snacks and fast foods later during the school hours to compensate this lost meal. In the

**Table 1** Distribution of overweight and obesity according to father's and mother's education in the studied sample.

	Level of education	Normal N = 624		Overweight N = 180		Obese N = 96		X <sup>2</sup>	P
		No	%	No	%	No	%		
Father's education	Illiterate	48	34.8	54	39.1	36	26.1	125.1	0.00**
	Read and writing	108	60	42	23.3	30	16.7		
	School (up to high school)	264	80	48	14.5	18	5.5		
	University	204	80.9	36	14.3	12	4.8		
Mother's education	Illiterate	72	44.4	48	29.6	42	26	165.6	0.00**
	Read and writing	84	46.7	72	40	24	13.3		
	School (up to high school)	222	84.1	24	9.1	18	6.8		
	University	246	83.7	36	12.2	12	4.1		

It shows that the students of illiterate fathers and mothers had the highest incidence of obesity while the students of university fathers and mothers had the lowest incidence of obesity. The relation between the level of father's & mother's education and obesity was founded to be significant ( $p < 0.001$ ).

\* is significant P.

\*\* is highly significant P.

**Table 2** Dietary habits and life style factors associated with overweight and obesity in the studied school adolescents.

		Normal		Overweight		Obese		X <sup>2</sup>	P
		No	%	No	%	No	%		
Breakfast eating	No	78	44.8	48	27.6	48	27.6	84.6	0.00**
	Sometimes	336	73.7	90	19.7	30	6.6		
	Frequent	210	77.8	42	15.5	18	6.7		
Number of meals	< 3	216	75	42	14.6	30	10.4	8.2	0.01*
	≥ 3	408	66.7	138	22.5	66	10.8		
Snacks	No	234	79.6	48	16.3	12	4.1	79.5	0.00**
	Sometimes	276	74.2	48	12.9	48	12.9		
	Frequent	114	48.7	84	35.9	36	15.4		
Fast food consumption	Sometimes	300	72.5	84	20.3	30	7.2	70.5	0.00**
	Frequent	96	48.5	54	27.3	48	24.2		
	No	228	79.2	42	14.6	18	6.2		
Hours of TV watching	≤ 2 h	396	77.6	90	17.7	24	4.7	69.7	0.00**
	> 2 h	180	54.5	84	25.5	66	20		
	No	48	80	6	10	6	10		
Eating while TV watching	No	180	73.2	54	22	12	4.8	142.9	0.00**
	Sometimes	372	77.5	84	17.5	24	5		
	Frequent	72	41.4	42	24.1	60	34.5		
Exercise	Frequent	234	81.3	42	14.6	12	4.1	145.6	0.00**
	Sometimes	312	76.5	72	17.5	24	6		
	No	78	38.2	66	32.3	60	29.4		

It shows that there was a significant association between obesity and breakfast skipping ( $p = 0.00$ ), number of meals as overweight associated more with meal > 3 ( $P = 0.01$ ), who eats snacks frequently ( $p = 0.00$ ) and who eat fast food frequently ( $p = 0.00$ ). Also there was a significant association between obesity and who watch TV > 2 h ( $p = 0.00$ ), who frequently eat while watching TV ( $p = 0.001$ ) and who did not do exercise ( $p = 0.00$ ). There was a significant association between normal weight and who watch TV ≤ 2 h ( $p = 0.01$ ), who sometimes eat while watching TV ( $p = 0.025$ ).

\* is significant P.

\*\* is highly significant P.

current study, there was no significant association between obesity and number of meals since it is not important the number of meals as the amount and the content of the meals. This agrees with Güven et al.,<sup>15</sup> study which revealed that the obese adolescents choose energy dense food.

This study showed a significant association between obesity and *snack intake* due to its high fat and sugar content. This

runs with several studies which found a significant relation between BMI and eating snack.<sup>12,21</sup> Also we revealed a significant association between obesity and *frequent fast food consumption* due to its high fat and calories. This agrees with the study conducted by Jerffey et al.,<sup>22</sup> who found a significant relation between BMI and fast food. Similar results were obtained by other researchers.<sup>12</sup>

**Table 3** Multivariate logistic regression analysis for the independent predictor for obesity among the studied students.

Predictor variable	Adjusted OR	P	95% confidence
Illiterate father education	1.45	0.04*	0.87–5.9
Illiterate mother's education	2.46	0.036*	1.2–4.69
Missing breakfast eating	3.36	0.006*	2.1–17.6
> 3 Meals	1.1	0.08	0.8–14.25
Frequent eating snacks	1.70	0.002*	1.08–45.2
Frequent fast food consumption	1.51	0.012*	1.14–48.7
> 2 h of TV watching	1.36	0.048*	0.45–6.8
Frequent eating while TV watching	9.36	0.00**	4.3–14.6
Practice no physical exercise	1.70	0.002*	1.3–4.7

\* is significant P.

\*\* is highly significant P.

In the current study, there was a significant association between obesity and hours of *television (TV) viewing* as TV watching decreases energy expenditure by spending less time on performing physical activity and increases their consumption of obesogenic foods during watching. This is in agreement with the study conducted by Munakata et al.,<sup>23</sup> who demonstrated a significant relation between BMI and TV watching in Japan. Our studies showed a significant association between obesity and *eating while watching TV*, which is consistent with multiple studies.<sup>24,25</sup> On the other hand, Bin Zaal et al.,<sup>12</sup> did not find a significant association between obesity and consuming meals while watching TV as the fat content of the foods was more important than the amount of food consumed during TV watching.

Our study revealed a significant association between *physical activity* and fewer incidences of overweight and obesity as walking to the school and performing some physical exercises at the school time lead to an increased energy expenditure. This agrees with previous studies.<sup>26,27</sup> On the other hand, some studies did not find a significant association between obesity and physical activity.<sup>18</sup>

### Conclusion

The prevalence of overweight and obesity among adolescents aged 12–15 years in urban Sharkia Governorate was relatively high. Low level of parent education, breakfast skipping, snack taking, fast food consumption, television watching more than two hours per day, eating while watching television and finally physical inactivity showed a strong association with a higher BMI in the students.

### Key messages

Provide education programs to the parents about healthy balanced diet and healthy active life style to their children. Promote intake of fruits and vegetables and restrict the intake of energy dense food. Limit time of TV watching to less than two hours per day. School should provide healthy school meals, playground equipment and promote physical activity.

### Conflict of interest

The authors declare that there are no conflict of interests.

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