

# Prevalence of factors leading to obesity among school children (aged 15–18 years) in Giza governorate, Egypt

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## Objective

The aim of this study was to determine the prevalence of obesity and the factors leading to it among adolescents in Giza governorate.

## Participants and methods

A cross-sectional study was conducted among 1021 adolescents (between 15 and 18 years of age) of both sexes. They were recruited from different schools of Giza governorate, Egypt, through convenience sampling. The 'Obesity Questionnaire Survey Sheet' was administered to the selected students and they were assessed for height, weight, and body composition using InBody120. The frequencies and percentages were reported for categorical variables.

## Results

The results revealed that 58% of the adolescents had normal BMI, whereas 36.5% were overweight and obese. It is also interesting to find out that 78.1% had high percent body fat and 69.5% had peripheral obesity. Furthermore, 77.9% of students had trunk obesity. As regards fast food consumption, 79% of adolescents consumed it occasionally. It is also interesting that 40.4% of participants had positive family history. In addition, 54.9% of students never participated in any physical activity.

## Conclusion

Our study concluded that the major risk factor for obesity in 15–18-year-old adolescents is lack of physical activity. However, consumption of fast food is also increasing in this age group. Furthermore, genetic predisposition cannot be ignored.

## Keywords:

adolescents, obesity, physical activity, prevalence

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## Introduction

Childhood obesity is a serious health problem that has adverse and long-lasting consequences for individuals, families, and communities. The magnitude of the problem has increased significantly over the last three decades and, despite some indications of a plateau in this growth, the numbers remain stubbornly high. Efforts to prevent childhood obesity, to date, have focused largely on school-aged children, with relatively little attention to children under the age of 5 years. However, there is a growing awareness that efforts to prevent childhood obesity must begin before children ever enter the school system [1].

Obesity refers to excess body fat; however, the exact meaning of excess has not been defined. Obesity most often is regarded as an excess percentage of body weight that is fat, but no widely accepted diagnostic definitions or cutoff points are available for children. For an understanding of developmental patterns, mean body fat percentages (%BF) [derived from bioelectrical impedance analyses (BIAs)] are

available in American children above 12 years of age [2], and percentile curves have been published for British children between 5 and 18 years of age [3].

In children, the assessment of weight status is much more complex. This is because children are growing and the growth patterns (and hence the BMI) of children differs with age. The pattern of growth is dependent upon the sex of the child as the growth pattern for boys is very different from the growth pattern for girls [4].

According to the recommendation of the WHO, population BMI (Table 1) greater than 25 is considered as overweight, whereas BMI greater than 30 is taken as obese [6].

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**Table 1 Classification of body mass index percentile according to Klein *et al.* [5]**

Underweight	<5 percentile
Normal weight	5–84 percentile
Overweight	85–94 percentile
Obese	>95 percentile
Severe obesity	>99 percentile

BIA, which determines total body water (TBW) by measuring electrical impedance and resistance associated with passage of an alternating current through the body, provides body composition estimates with minimal compliance considerations. Estimates of fat-free mass (FFM) may be derived from TBW measures by assuming a fixed FFM hydration value. Fat mass and %BF can then be determined if body mass is measured [7].

Body composition data are frequently collected in clinics, sports medicine, nutrition, and other health-related fields. Although Dual-energy X-ray absorptiometry (DEXA) and underwater weighing can provide accurate results, these methods are often inaccessible to the general population and potentially expensive. The devices chosen for estimating %BF should be both valid and reliable. We have examined the validity and reliability of different body composition analyzers in children and adults. We sought to establish whether differences in the devices were sensitive to age and sex. The data of previous studies suggest that the InBody underestimate %BF in young men and women [8]. It is possible that arm length may influence body fat calculations by means of bioelectrical impedance [9,10]. Moreover, segmental BIA, such as the InBody, has great potential to accurately assess total and appendicular body composition estimates [11]. In adults, we determined that %BF between the DEXA and InBody only differed in men between 36 and 50 years of age. In addition, in young girls, there was a significant difference in %BF compared with underwater weighing.

Obese children need a thorough medical evaluation by a pediatrician or a family physician to consider the possibility of a physical cause. In the absence of a physical disorder, the only way to lose weight is to reduce the number of calories being eaten and to increase the level of physical activity. Lasting weight loss can only occur when there is self-motivation. As obesity often affects more than one family member, making healthy eating and regular exercise a family activity can improve the chances of successful weight control for the child or adolescent [12].

Obesity is hard to reverse once established [13]. The risk for childhood overweight will continue into adolescence and adulthood. Having a huge burden of obesity in the people in near future will be difficult to tackle. Timely preventive measures in children and adolescents will be a sound and effective way of dealing with the problem of obesity. School is the place where children spend half of the day; therefore, teaching about the changes in lifestyle and including regular physical activity in the curriculum can be one of the methods of intervention that produces benefits. Family environment and parental characteristics such as parental working status, sibling, person living in the child room, etc. must be considered in designing the strategies and intervention, as it has a strong influence on childhood obesity [14].

Thus, the purpose of this study was to determine the prevalence of obesity and analyze the factors leading to obesity among secondary school children in Giza governorate.

## Participants and methods

### Participants

The sample included 1021 students representing 0.11% of the 8952 students in Giza governorate. Students of both sexes were selected through the convenience sampling technique from school-going adolescents aged 15–18 years studying in different schools in Giza governorate, Arab Republic of Egypt.

The following participants were selected:

- (1) Students from governmental school selected randomly from different areas of Giza governorate.
- (2) Students from urban and rural areas.
- (3) Students between 15 and 18 years of age.
- (4) Both sexes.
- (5) All students willing to participate in this study.

### Materials

- (1) The questionnaire sheet: children were asked about routine activities, type of diet they are taking, number of meals per day, type of exercises they do, about physical activity in their schools, and engagement in any sports activity. They were further asked about family history of obesity and their perceptions as regards the risk factors for obesity [15].
- (2) The InBody120 (13850 Cemtos Corporate Dr., Unit C, Cerritos, CA, USA) is a very fast

measurement tool (in <20 s) and is portable with compact size and light weight. Data are transferred through Bluetooth made by BioSpace Company (Gangnam-gu, Seoul, Korea) and calibrated with a manual weight scale. Sensor was calibrated using a JAC Machine. The results were as follows:

- (a) Body composition analysis: body weight is the sum of TBW, protein, minerals, and body fat mass.
- (b) Muscle-fat analysis: the longer the skeletal muscle mass (SMM) bar is compared with the body fat mass bar, the stronger the body.
- (c) Obesity analysis: BMI is an index used to determine obesity using height and weight.
- (d) Segmental lean analysis: it evaluates whether the muscles are adequately developed in the body.
- (e) Body composition history: to track the history of the body compositional change, and take the InBody test periodically to monitor one's progress.
- (f) InBody score: this score shows the evaluation of body composition, which includes muscle, fat, and water in the body.
- (g) Weight control: it determines how the body measures up to the recommended weight, muscle mass, and body fat mass for a good balance.

#### *Research parameters*

Various nutritional outputs are provided, such as basal metabolic rate, waist-hip ratio, visceral fat level, and obesity degree (Adaptations are themselves works protected by copyright. So in order to publish this adaptation, authorization must be obtained both from the owner of the copyright in the original work and from the owner of copyright in the translation or adaptation).

#### **Procedures**

The study was conducted among school-going adolescents between 15 and 18 years of age studying in different regions of Giza (Al Ahram Commercial Boys School, El Horreya Boys School, Abna El Andalos Private School, El Omrania Girls Institute, Ahmed Kemal Experimental School, NINMS Nursing School, and Ahmed Orabi Girls School).

A total of 1021 students were selected through the convenience sampling technique.

Duration of the study was 6 months, from January 2015 to June 2015.

Data were collected by taking permission from the head of the selected schools and from selected students.

We explained the objectives of the study to the selected students. A self-administered questionnaire was given to the students. The questionnaire assessed routine activities, diet, number of meals per day, type of exercises, physical activity in their schools, and engagement in any sports activity. They were further asked about family history of obesity and their perceptions as regards the risk factors of obesity.

On the day of data collection, all those students who were selected to participate in the study and presented were assessed for height and weight measurement, % BF's, percent of body water, percent of body muscles, basal metabolic rate, and fat distributions' in body using the body fat analyzer scale InBody120.

This study was approved by the Ethical Committee of the Faculty of Physical Therapy, Cairo University.

#### **Statistical analysis**

Descriptive statistics were described for variables in the form of mean±SD and percentages and frequencies. Data management and statistical analysis were performed using statistical package for the social sciences (SPSS, version 21; SPSS Inc., Chicago, Illinois, USA).

Numerical data were summarized using mean±SD and ranges. Categorical data were summarized as percentages. Comparisons between the two groups were made using the *t*-test. For categorical variables, differences were analyzed with the  $\chi^2$ -test. Adjustments of *P* value were made using the Bonferroni method for multiple testing. Stepwise logistic regression was carried out to give adjusted odds ratio (OR) and measure magnitude of the effect of different factors on obesity. Two-tail tests were performed with *P* value less than 0.05 considered significant.

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#### **Results**

This cross-sectional study was carried out to determine the prevalence of obesity, distributions of body fat in school children, and analyze the factors leading to obesity among secondary school children in Giza governorate, Egypt.

As shown in Table 2, the baseline data included age, sex, and height. As regards age, the mean±SD for study participants was 16.3±1.9 years, with a range of 15–18 years. As regards height, the mean±SD for study

**Table 2 Demographic characteristics of the studied participants**

Demographic characteristics	
Age (years)	
Mean±SD	16.3±1.9
Range	15–18
Sex [N (%)]	
Male	495 (48.5)
Female	526 (51.5)
Height (cm)	
Mean±SD	165.0±8.7
Range	135–189

participants was 165.0±8.7 years, with a range of 135–189 years. As regards sex, the number of male participants was 495 (48.5%) and the number of female participants was 526 (51.5%).

The number of normal, overweight and obese, and underweight participants were 292 (58.8%), 373 (36.5%), and 56 (5.5%), respectively. As regards TBW, the number of participants with normal, high, and low TBW was 648 (63.5%), 144 (14.1%), and 229 (22.4%), respectively. As regards SMM, the number of participants with normal, high, and low SMM was 572 (56%), 196 (19.2%), and 253 (24.8%), respectively. As regards BMI, the number of normal, underweight, overweight, mildly obese, moderately obese, and morbidly obese participants was 615 (60.2%), 64 (6.3%), 192 (18.8%), 76 (7.4%), 63 (6.2%), and 11 (1.1%), respectively. As regards %BF, the number of participants with normal, high, and low %BF was 332 (32.5%), 677(66.3%), and 12 (1.2%), respectively, as shown in Table 3.

Table 4 shows the number of participants within the study group and their percentage with respect to waist–hip ratio, peripheral obesity, and trunkal obesity. As regards waist–hip ratio, the number of participants with normal, high and obese, and low waist–hip ratio was 543 (53.2%), 443 (43.4%), and 35 (3.4%), respectively. The number of participants with obesity and those without peripheral obesity was 710 (69.5%) and 311 (30.5%), respectively. The number of participants with and those without trunkal obesity was 795 (77.9%) and 226 (22.1%), respectively.

It was observed that 40.4% of the adolescents had a positive family history of obesity, whereas 59.6% did not have obesity in their family. Further, 1.8% of the adolescents had a history of diabetes mellitus disease, 10.4% had allergic diseases, 8.5% had rheumatic disease, and 31.6% had others risk factors of obesity, such as hormonal or menstrual disturbance; however, 47.7% did not have any history of disease risk factors (Table 5).

**Table 3 The number of participants and their percentage for weight classification and body composition parameters**

Parameters	N (%)
Weight classifications	
Normal	592 (58.0)
Overweight and obese	373 (36.5)
Underweight	56 (5.5)
Total body water	
Low	229 (22.4)
Normal	648 (63.5)
High	144 (14.1)
SMM	
High	196 (19.2)
Low	253 (24.8)
Normal	572 (56.0)
BMI	
Underweight	64 (6.3)
Normal weight	615 (60.2)
Overweight	192 (18.8)
Mild obesity	76 (7.4)
Moderate obesity	63 (6.2)
Morbid obesity	11 (1.1)
%BF	
High	677 (66.3)
Low	12 (1.2)
Normal	332 (32.5)

%BF, percentage body fat; SMM, skeletal muscle mass.

**Table 4 The number and percentage of participants according to obesity distribution**

Obesity distribution	N (%)
Waist–hip ratio	
High	443 (43.4)
Low	35 (3.4)
Normal	543 (53.2)
Peripheral obesity	
No	311 (30.5)
Yes	710 (69.5)
Trunkal obesity	
No	226 (22.1)
Yes	795 (77.9)

When children were asked about the number of meals they take in a day, 54.5% reported that they take meals one or two times, 40.8% affirmed that they take three or four meals a day, and only 0.7% were eating more than five meals a day. As regards the preferred food, 40.7% preferred juice and fruits, 14% vegetables, 27% carbohydrates, 8.1% fried and fatty food, and 21.8% preferred sweets. As regards fast food consumption, 23.3% of the adolescents stated that they consumed fast food 5 times or more/week, 13.7% stated that they consumed fast food 3–4 times/week, 41.2% gave positive response for having fast food 1–2 times/week, and only 20.9% responded in negation. As regards soda consumption, 23.5% of the adolescents stated that they consume soda 8 times or more/week,

**Table 5 The number of participants and their percentage according to the family history and history of disease risk for obesity parameters**

Parameters	N (%)
Family history of obesity	
Father	46 (4.8)
Mother	203 (21.2)
Both	45 (4.7)
None	571 (59.6)
History of disease	
Diabetes mellitus	18 (1.9)
Allergy	99 (10.4)
Rheumatic disease	82 (8.6)
Others	304 (31.7)
None	518 (47.8)

11.4% stated that they consume 4–7 times/week, and 37% gave positive response for having soda 1–4 times/week, and only 27.2% responded with none (Table 6).

As regards the number of times participants engaged in sport activity in school, we found that 52.5% of participants were not engaged in sport activities, 27.8% engaged 1–2 times/week, 7.9% engaged 3–4 times/week, and nearly 10.4% engaged 5 times or more/week. When asked about the frequency of active play (play or exercise enough to sweat and/or breath hard), 7.2% of students reported a high rate of active play 5 times or more/week, 5.7% of students reported active play 3–4 times/week, 29.1% of students reported active play 1–2 times/week, and nearly 54.9% of students did not actively play. As regards TV watching habits, 23.3% claimed to spend more than 5 h, 30.2% spent 3–4 h, 26.3% spent 1–2 h, and 16.9% spent an hour or less. However, 10.8% do not watch TV at all (Table 7).

Our findings revealed that there were significant differences between the obese and nonobese (normal) groups in the following variables: the number of times per week one plays or exercises enough to make one sweat and breathe hard for 20 or more minutes; the number of times one takes part in sports activities in school; the number of hours one sits and watches TV or videos on an average school day; the number of times in a week one eats fast food; and the number of meals one eats in a day (Table 8).

However, there were no significant differences between the two groups in the following variables: family history of obesity ( $P=0.608$ ), the number of times the student takes part in sport activities in school ( $P=0.152$ ), and history of disease ( $P=0.667$ ).

**Table 6 The number of participants and their percentage according to the parameters of eating behavior**

Parameters	N (%)
Number of meals per day	
One or two	522 (54.5)
Three or four	391 (40.8)
More than 5	7 (0.7)
Food preferred	
Juice and fruits	390 (40.7)
Vegetables	134 (14)
Carbohydrates	258 (27)
Sweets	209 (21.8)
Fried and fatty food	78 (8.1)
How many times a week do you eat fast food?	
None	200 (20.9)
1–2	395 (41.2)
3–4	131 (13.7)
>5	223 (23.3)
How many sodas per week do you drink?	
None	261 (27.2)
1–4	354 (37)
>4–7	109 (11.4)
≥8	225 (23.5)

**Table 7 The number of participants and the percentage, the parameters of physical activity and sedentary behavior**

Parameters	N (%)
How many times do you participate in sports in school?	
None	503 (52.5)
1–2	266 (27.8)
3–4	76 (7.9)
>5	100 (10.4)
How many times per week do you play or exercise enough to make you sweat and breathe hard for 20 or more minutes?	
None	526 (54.9)
1–2	279 (29.1)
3–4	55 (5.7)
>5	69 (7.2)
How many hours do you sit and watch TV or videos on an average school day?	
None	103 (10.8)
<1 h	162 (16.9)
1–2	252 (26.3)
3–4	289 (30.2)
>5	176 (18.4)

To measure the independent effect of different covariates on obesity risk, factors that had a significance level less than 0.10 were selected to enter into a stepwise logistic regression analysis. These included number of meals in a day, the number of times in a week one plays or exercises enough to make one sweat and breathe hard for 20 or more minutes, the number of hours one sits and watches TV or videos on an average school day, the number of times in a week one eats fast food, and the number of sodas consumed per week. The regression coefficient showed the effect of each variable after

**Table 8 Comparison between normal and obese participants according to their answer in Obesity Questionnaire Survey Sheet parameters**

Questions	Answer	Obese ( <i>n</i> =150) [ <i>N</i> (%)]	Normal ( <i>n</i> =816) [ <i>N</i> (%)]	<i>P</i> value
Family history	Yes	46 (15.6)	248 (84.4)	0.608
	No	81 (14.3)	484 (85.7)	
History of disease	Yes	66 (13.4)	426 (86.6)	0.667
	No	67 (14.4)	399 (85.6)	
Number of meals per day	One or two	89 (17.0)	433 (83.0)	0.002
	Three or four	36 (9.2)	355 (90.8)	
	More than 5	2 (28.6)	5 (71.4)	
Food preferred	Juice and fruits	46 (13.5)	294 (86.5)	0.225
	Vegetables	15 (17.0)	73 (83.0)	
	Carbohydrates	29 (14.4)	173 (85.6)	
	Sweets	28 (15.7)	150 (84.3)	
	Fried and fatty food	7 (10.3)	61 (89.7)	
How many times do you participate in sports in school?	All	2 (3.6)	53 (96.4)	0.152
	None	75 (15.2)	417 (84.8)	
	1–2	30 (11.5)	231 (88.5)	
	3–4	8 (10.3)	70 (89.7)	
	>5	20 (19.4)	83 (80.6)	
How many times per week do you play or exercise enough to make you sweat and breathe hard for 20 or more minutes?	None	66 (12.9)	446 (87.1)	<0.001
	1–2	48 (17.7)	223 (82.3)	
	3–4	0 (0.0)	51 (100.0)	
	>5	3 (3.8)	75 (96.2)	
	None	6 (7.1)	79 (92.9)	
How many hours do you sit and watch TV or videos on an average school day?	<1	30 (18.5)	132 (81.5)	<0.001
	1–2	17 (7.1)	223 (92.9)	
	3–4	60 (20.8)	229 (79.2)	
	>5	20 (11.0)	162 (89.0)	
	None	26 (13.4)	168 (86.6)	
How many times in a week do you eat fast food?	1–2	59 (15.2)	330 (84.8)	0.007
	3–4	26 (19.0)	111 (81.0)	
	>5	16 (7.2)	207 (92.8)	
	None	55 (21.1)	206 (78.9)	
How many sodas per week do you drink?	1–4	39 (11.0)	315 (89.0)	0.001
	>4–7	9 (8.3)	100 (91.7)	
	≥8	30 (13.3)	195 (86.7)	
	None	55 (21.1)	206 (78.9)	

controlling the effect of other variables in the model (Table 9).

Multivariate analysis for number of meals per day revealed that it was a risk factor for being obese, and that it was significantly higher in participants taking more than 5 meals/day (OR=5.9,  $P=0.091$ ).

However, the risk for obesity was lower among participants who took 3–4 meals/day than one or two meals/day (OR=0.3,  $P<0.001$ ).

The risk for obesity was higher in students who did not play or exercise enough to make them sweat and breathe hard for 20 or more minutes, compared with those who did 1–2 and 3–4 times/week (OR=4.9,

$P=0.011$ ; OR=5.9,  $P=0.005$ ; and OR=0.3,  $P=0.997$ , respectively).

Similarly, the risk for obesity was higher among students who watched TV or videos for a longer time on an average school day [ $<1$  h: OR=3.0,  $P=0.065$ ; 1–2 h: OR=1.8,  $P=0.343$ ; 3–4 h: OR=6.5,  $P=0.001$ ; and  $>5$  h: OR=2.6 (0.8–8.4),  $P=0.099$ ].

Likewise, the risk for obesity was higher in students who consumed fast food more frequently in a week (never consumed,  $P=0.001$ ; 1–2 times/week: OR=2.5,  $P=0.005$ ; 3–4 times/week: OR=3.2,  $P=0.002$ ; and more than 5 times/week: OR=0.9,  $P=0.884$ ). The number of times soda was drunk per week was not a risk factor for obesity (none:  $P=0.001$ ;

**Table 9** Multivariate analysis to determine factors affecting obesity

	<i>B</i>	SE	<i>P</i> value	OR
Number of meals per day				
One or two	–	–	<0.001	–
Three or four	–1.1	0.3	<0.001	0.3
More than 5	1.8	1.1	0.091	5.9
How many times per week do you play or exercise enough to make you sweat and breathe hard for 20 or more minutes?				
None	–	–	0.051	–
1–2	1.6	0.6	0.011	4.9
3–4	1.8	0.6	0.005	5.9
>5	–17.4	52.735	0.997	0.3
How many hours do you sit and watch TV or videos on an average school day?				
None	–	–	<0.001	–
<1 h	1.1	0.6	0.065	3.0
1–2	0.6	0.6	0.343	1.8
3–4	1.9	0.6	0.001	6.5
>5	1.0	0.6	0.099	2.6
How many times a week do you eat fast food?				
None	–	–	<0.001	–
1–2	0.9	0.3	0.005	2.5
3–4	1.2	0.4	0.002	3.2
>5	–0.1	0.4	0.884	0.9
How many sodas per week do you drink?				
None	–	–	<0.001	–
1–4	–1.0	0.3	<0.001	0.4
>4–7	–1.1	0.4	0.009	0.3
≥8	–1.2	0.3	<0.001	0.3
Constant	–4.1	0.8	<0.001	0.0

*B*, regression coefficients; OR, odds ratio; SE, standard error of the coefficient.  $P \leq 0.05$  is considered significant.

1–4 times: OR=0.4,  $P=0.001$ ; 4–7 times: OR=0.3,  $P=0.009$ ; and >8 times: OR=0.3,  $P=0.001$ ).

## Discussion

This study was conducted to estimate the prevalence of obesity among adolescents in the governmental secondary schools in Giza governorate, using a well-constructed self-administrated questionnaire. It is a cross-sectional study that was conducted on students between 15 and 18 years of age with a total number of 1021 students during the academic year 2015 using the convenience sampling technique, using the BMI and the international cutoff points for definition of overweight, and obesity [16].

It is well known that obesity and overweight are associated with many risk factors such as improper dietary patterns, family history, physical inactivity and sedentary lifestyle, lack of exercise, watching television or prolonged seated work, etc. This study revealed that the overall prevalence of obesity was 33.5%, 192 (18.8%) were found to be overweight and 150 (14.7%) were obese. The high prevalence of overweight and

obesity in the study was an important finding of our study, which clearly shows that the childhood obesity epidemic is becoming evident in our country, and this suggests that Egypt is in a state of increasing childhood overweight and obesity similar to other different countries because of lifestyle changes.

As described in the literature, sex is a demographic factor associated with the prevalence of obesity. This trend was confirmed in our study. Indeed, a statistically significant difference was observed as regards sex. Thus, female participants were significantly more obese than male participants. This difference was also found in several investigations in Tunisia [17], Ghana [18], and South Africa [19]. This could be related to the influence of cultural factors. Indeed, female obesity is seen as a sign of wealth and beauty in the African cultural context. This feature of the prevalence of overweight and obesity was confirmed in our study.

The prevalence of obesity in our study is higher than that found in Congo (8.6%) in 2004, Nigeria (8.8%) [20,21], Mauritius (10%) [22], and Algeria (9%). This is consistent with the prevalence found by Abubakari and Bhopal in their meta-analysis. It is two times higher than that in Eritrea (3.3%) and half of the prevalence rate found in Cameroon (18%) in 2004 [23]. A study in southern Morocco has reported a prevalence higher than our findings, 30% for overweight and 49% for obesity [24]. The prevalence of obesity in the Democratic Republic of Congo (5.7%) [25] is lower than that in our findings. The dietary patterns specific to each country could explain the disparity in the prevalence rates of obesity. There is an increasing prevalence of obesity not only in industrialized countries but also in developing countries [26,27]. This is the case of Tanzania, in which the prevalence of obesity increased from 3.6% in 1995 to 9.1% in 2004 [28].

Pubertal development in the participants we studied was associated with the characteristic sex-specific changes in body composition; gains in fat mass were greater in girls, whereas gains in FFM were greater in boys [29].

Our research showed that 79% of adolescents consumed fast food occasionally. A similar study conducted in Karachi in 2008 showed that 80% of adolescents consumed fast food [30]. Our research also revealed that adolescents lack physical training, and that 52.5% participants did not engage in physical activity in schools, 54.9% of students did not participate in active play (play or exercise enough to

sweat and/or breath hard), and more than 80% of students spent more than an hour per day watching TV or playing video game. It is well understood that the major reason for putting on weight is high-caloric intake and low output, which is reflected in our society as obese and overweight adolescents [31]. This study provides evidence that, nowadays, adolescents are consuming high-caloric diets (fast food) and have less physical activity, indicating the lifestyle conversion into a sedentary one. Sedentary pattern of lifestyle promotes leisure activities that are unhealthy, such as using computer excessively, playing video games, and watching different TV programs.

Moreover, the frequency of performing vigorous physical activity was statistically associated with the occurrence of overweight and obesity. Respondents who performed vigorous physical activity less frequently were more likely to report overweight and obesity compared with those who performed vigorous physical exercise frequently; this is also supported by similar studies [5,32].

TV advertisements attract adolescents to consume candies, snack food, and sweetened breakfast cereals that are rich in calories and fats and lower in fiber and nutrients, hence, influencing adolescents and promoting an unhealthy diet pattern. It is also interesting that 40.4% of our study population had a positive family history. Hereditary constitutes a major role, as shown in several studies. For example, it was shown that obesity risk increases by 5–40% when parents were obese. Similarly, there is a 75% chance that a child will be overweight if both parents were obese, and a 20–50% chance if only single parent is obese [33].

## Conclusion

Our study concluded that the major risk factor for obesity in 15–18-year-old adolescents is lack of physical activity. It is also important to see that the consumption of fast food is increasing in this age group, which may be due to the enormous advertisement of fast food stuffs. Another reason is the preference of relaxed/sedentary lifestyle, which is causing this problem in this population.

## Recommendations

Efforts should be made to educate parents about the hazards of obesity during childhood. Moreover, it is important to encourage adolescents to participate in physical activities and to follow diet control, especially for fat, refined sugar, and sport drink.

Regulating authorities should stress on the presence of nutrition labels on fast food packing. Further, such regulatory bodies should provide continuous medical education to general practitioners, nurses, and specialist to update their knowledge about the magnitude of the problem, the risk factors and complications, preventive measures, and proper management. Finally, healthcare services should be available to all to prevent the occurrence of related complications.

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## Conflicts of interest

There are no conflicts of interest.

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