

## Original Article

# Dietary Habits and Age at Menarche in Relation to Body Weight Among Preparatory School Girls in Alexandria

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## Abstract

**Background:** Overweight and obesity are a public health crisis among adolescents worldwide. Adolescence is a crucial period for learning and adopting healthy eating and lifestyle habits that persist into adulthood. Obesity in childhood is linked to early menarche which places the adolescent girl in high risk of developing metabolic diseases as Type 2 DM and cardiovascular diseases and hormone related cancer as breast and endometrial cancer.

**Objective(s):** The aim of this study was to assess the prevalence of overweight and obesity in preparatory school girls in Alexandria and to examine their relation to dietary habits and age at menarche.

**Methods:** A cross sectional study was conducted. A total of 730 preparatory school girls from 4 governmental schools were chosen using stratified random sampling. A self-administered questionnaire was used to collect demographic data, dietary habits, physical activity status and menstrual history. Anthropometric measurements were taken (weight, height, waist circumference, BMI) and percentiles were compared to CDC growth charts.

**Results:** In the present study, the prevalence of overweight in preparatory school girls was 14.7%, while that of obesity was 34.7% according to CDC charts. The prevalence of abdominal obesity was 24.7%. The prevalence of overweight/obesity was lower in girls whose mothers were working. Almost half (47.9 %) of girls who scored poor in the dietary habits questionnaire were obese, compared to 38% who had normal body weight. Dietary habits that were associated with obesity were eating meals away from home and consuming 2-3 loafs of “balady” bread daily. As for the age at menarche 51.9% of those who started menstruating before the age of 12 years were obese compared to 35.5% of girls who started menses after the age of 12 and this was statistically significant ( $p=0.004$ ). Age at menarche was negatively correlated with BMI.

**Conclusion and recommendations:** About one third of preparatory governmental school girls were obese. This was negatively associated with the age at menarche. Dietary habits that were significantly associated with overweight/obesity included eating away from home and increased consumption of bread. These habits should be the targets for school based nutrition education campaigns.

**Keywords:** Dietary Habits, Menarche, Preparatory School Girls, Egypt

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**Suggested Citations:** Emara RH, Mehanna AA, Ashour AD, Koura MR, Shatat HZ. Dietary habits and age at menarche in relation to body weight among preparatory school girls in Alexandria. JHIPH. 2018;48(1):9-17.

## INTRODUCTION

Obesity rates have been rising among children and adolescents in the past 30 years.<sup>(1)</sup> The prevalence of overweight and obesity among adolescents in Arab countries ranged from 18% to 44%.<sup>(2)</sup> According to Egypt's

Demographic Health Survey 2014 , the percentage of girls aged 15-19 years in Egypt who were overweight was 33.6% while the percentage of those who were obese was 8.7%.<sup>(3)</sup> Many factors contribute to obesity; genetic, metabolic, behavioral and environmental factors. All these factors cause an imbalance in the energy balance

equation where energy intake exceeds energy expenditure.<sup>(4)</sup>

Unhealthy eating habits are very common in adolescence. The period of adolescence is marked by many physiologic, psychological and cognitive transformations. Along with these changes their need for independence and peer acceptance, increased mobility, greater time spent at school have a direct effect on the nutrient needs and dietary behaviors of adolescents.<sup>(5, 6)</sup> Dietary habits that significantly contributes to occurrence of obesity are: increased consumption of food away from home<sup>(7)</sup>, large portion sizes,<sup>(8)</sup> excessive consumption of sugar-sweetened beverages<sup>(9, 10)</sup>, frequency of meals and snacks<sup>(11)</sup> and low fruits and vegetables consumption.<sup>(12)</sup> Sedentary behaviors that are common among adolescents are increased television watching, computer use and video game playing and decreased participation in sports.<sup>(13)</sup>

Adolescence is a high-risk period for weight gain due to the interplay between hormonal and metabolic changes with eating and activity behaviors.<sup>(14)</sup> Excess weight gain during this transitional period predisposes an adolescent girl at increased risk of being an overweight/obese adult. As adolescence is a time of developmental plasticity in which lifelong habits can become established, lifestyle interventions during this period may have a significant influence on lifelong health teenagers.<sup>(15)</sup>

Menarche is an important characteristic in the female sexual development. It is also considered as an indicator of quality of life of a population. Over the last 150 years, the age at which puberty begins has been decreasing, primarily because of improved health and nutrition.<sup>(16)</sup> The average age at menarche ranges from 12–15 years among different populations. Many factors affect the age of onset of menarche including diet patterns, socioeconomic status, geographical location and environmental conditions.<sup>(17)</sup> High BMI in childhood has been linked to the risk of early onset of puberty and menarche.<sup>(18)</sup> Also Obese adolescents are prone to polycystic ovary syndrome (PCOS); the hirsutism, persistent acne, and menstrual disorders associated with PCOS have a very distressing effect in adolescent girls<sup>(19)</sup> in addition PCOs predisposes them to metabolic syndrome later in life.<sup>(20)</sup>

Early menarche is known to be a risk factor for disease, for example, obesity, metabolic syndrome, cardiovascular disease and breast cancer.<sup>(21, 22)</sup> Early menarche causes premature closure of the epiphyseal plates, and thus women who experience menarche at an early age are known to have a shorter adult height.<sup>(23)</sup> In

addition, early menarche poses higher risks of hormone related cancer such as breast cancer and endometrial cancer due to increased exposure to estrogen.<sup>(24, 25)</sup> Moreover, early menarche acts as a risk factor for metabolic syndrome, diabetes, and cardiovascular problems, and even increases the mortality rate from ischemic heart disease and stroke.<sup>(26, 27)</sup>

There is a shortage of data on adolescents' nutritional status in developing countries to guide the formulation of policies and programs needed. The aim of the current study was to estimate the prevalence of overweight and obesity among governmental preparatory school girls in Alexandria and their relation to dietary habits and age at menarche.

## METHODS

**Type of study and sampling:** A cross sectional study was conducted. A representative sample of governmental preparatory school girls was selected by stratified random sampling method by taking 4 districts out of 8 randomly (East, West, El-Gomrok and El-Amreyah districts). One school was chosen randomly from each district and two classes were chosen from each grade randomly. To calculate the sample size, Epi Info was used for a population of 100,000 and an estimated rate of under-nutrition of  $1.5 \pm 1\%$  and an estimated rate of over-nutrition of  $27.2 \pm 4\%$ . It was found that the minimum required sample size at 95% confidence level was 565 students. The sample size was upgraded to a total of 730 students. The ethical committee of the High Institute of Public Health approved the study. Administrative approval of Ministry of Education was obtained. A verbal consent was acquired from all girls that participated.

**Data collection tools:** i- a pre-designed self-administered questionnaire was used to collect data about: age in years, parents' education and occupation, menstrual history, age at menarche, physical activity and dietary habits. Dietary habits questions included 25 questions about different habits as number of meals and type of main meal, breakfast skipping, consumption of foods outside home, frequency of snacking, consumption of fried foods, consumption of sweets and number of spoons of sugar added to beverages, fruits and vegetable consumption and number of bread loafs consumed daily and the portion size of starchy foods (rice, pasta, potatoes). Each question had a choice of three answers, some were categorized according to the frequency of consumption of foods or doing a certain dietary habit into: "0-2 per week" as rarely, "3-4 per week" as often,

and "5–7 per week" as always. In these questions the poor habit scored 1 point, the fair habit scored 2 points and the good habit scored 3 points, the total score of dietary habit questions were added up and the total habit score was categorized into poor (from 25 points to 41), fair (from 42 points to 57) and good (from 58 points to 75).

ii- Anthropometric measurements were taken according to procedures of Jelliffe et al.,<sup>(28)</sup>: Weight was measured using spring scales and recorded to the nearest 0.5. Height was measured via measuring ruler while the girl was standing erect. Body mass index (BMI) was calculated as the weight (kg) divided by the square height in (m<sup>2</sup>). BMI of girls was categorized using The Body Mass Index (BMI)-for-age CDC charts, BMI-for-age at or above the 95th percentile as obese and between the 85th and 95th percentile as overweight, between 5th and 85th percentile as normal and below 5th percentile as under nutrition.<sup>(29)</sup> Waist circumference (WC) was measured at the midway between last rib and iliac crest using non-stretchable tape. Using the CDC charts,<sup>(30)</sup> waist circumference above the 90th percentile was considered abdominal obesity.

#### Statistical Analysis

Data management was conducted using the Statistical Package for Social Science (SPSS) version "17" software (Chicago, Illinois, US). Data was presented using frequency, percentages, the mean and standard deviation (SD). For all analyses, p value < 0.05 was used to detect statistically significant difference. Data were analyzed using Chi squared test for categorical data and Pearson correlation coefficient for linear regression.

#### Ethical Considerations

This study was conducted according to the guidelines laid down for medical research involving human subjects and was approved by the ethics committee of the High Institute of Public Health, Alexandria University, Egypt. All measurements were taken in full privacy and the collected data were kept confidential. All participants were informed about the objective of the study and they had the right to accept or refuse to participate in the study, then their oral consent was obtained.

## RESULTS

The present study was conducted on 730 preparatory school girls, their age ranged from 12-17 years and the mean age was 13.7 ± 0.8 years. The age at menarche ranged from 7-16 years and the mean age at menarche was 12.3 ± 0.9 years. Collectively half of the girls were overweight and obese (14.7% & 34.7% respectively). No cases of under-nutrition were detected. About one quarter (24.7%) of the sample had abdominal obesity (Table 1). Table 2 shows that mothers' education, fathers' education

and fathers' occupation didn't show a significant relation with the body weight of preparatory school girls. While, girls whose mothers worked had a significantly lesser percentage of obesity (31%) than girls whose mothers were housewives (35.7%).

**Table (1): Distribution of preparatory school girls by BMI, waist circumference and age at menarche**

	Preparatory school girls	
	No.	%
<b>Age (years)</b>		
mean±SD	13.7±0.8	
Min-max	11.7-17.2	
<b>Age at menarche: mean ±</b>		
mean±SD	12.3±0.9	
Min-max	7.0-16.0	
<b>BMI for age</b>		
normal	370	50.7
overweight	107	14.7
obese	253	34.7
<b>Waist Circumference percentile</b>		
Normal	550	75.3
Abdominal obesity	180	24.7

Table (3) illustrates that the majority (88.6%) of the studied girls scored fair in the dietary habits questionnaire. Almost half (47.9%) of girls who scored poor in the dietary habits questionnaire were obese, compared to 38% who had normal BMI. This difference between groups was statistically significant (p<0.05). The results also showed that 78.2% of the sample practiced walking for 30 min/day five times per week. In addition, 79.3% of the sample their screen viewing time was more than two hours. However, no significant association between overweight/ obesity and sedentary life style could be detected.

Table (4) shows that neither number of meals taken by girls nor the type of essential meal was associated with obesity. Almost two thirds (63.6%) of girls skipped eating breakfast, 37.8% of girls who skipped breakfast were obese and 14.7% of them were overweight, although this difference was not statistically significant. Only one quarter of the adolescent girls always snacked in between meals, but this was not significantly associated with obesity. Only 31.2% of girls who always snacked were obese and 12.4% of them were overweight compared to 56.5% of them who were of normal weight. In the present study, half of the girls often ate meals away from home, which was significantly associated with obesity (p<0.05), 42.1% who always ate meals away from home were obese and 13.5% of them were overweight. More than half (55.8%) of girls added >3 spoons of sugar daily, but the results were paradoxical; 53.3% of those who consumed >3 spoons of sugar were of normal weight, 12.5% of those were overweight and 34.2% were obese and this was statistically significant. Concerning daily bread loafs consumption 42.5% of those who consumed two loafs of "balady" bread were obese and

10.5% of those were overweight compared to only 46.9% of those who were of normal weight.

Table (5) illustrates that 45.8% of girls reported irregular menstruation, about 35% of the girls with irregular menses were obese and 14.7% of them were overweight, however no significant relation between irregular menses and weight

could be detected. About 51.9% of those who started menstruating before the age of 12 years were obese compared to 35.5% of the girls who started menstruating after the age of 12 and this was statistically significant ( $p=0.004$ ). A weak significant negative correlation was found between the age at menarche and BMI (Table 6).

**Table (2): Distribution of preparatory school girls by body weight and socio-economic status**

Socio-economic factors	Body weight of preparatory school girls								Test of significance
	Normal (n= 370)		Overweight (n= 107)		Obese (n= 253)		Total (n= 730)		
	No.	%	No.	%	No.	%	No.	%	
<b>Father educational level</b>									
illiterate	33	49.3	11	16.4	23	34.3	67	9.2	$X^2 = 3.785$ $P= 0.876$
read and write	85	51.2	18	10.8	63	38.0	166	22.7	
primary or preparatory	96	51.6	30	16.1	60	32.3	186	25.5	
secondary	97	50.8	27	14.1	67	35.1	191	26.2	
university	59	49.2	21	17.5	40	33.3	120	16.4	
<b>Father occupation</b>									
not working	27	69.2	5	12.8	7	17.9	39	5.3	$X^2 = 9.660$ $P=0.140$
working	299	49.9	88	14.7	212	35.4	599	82.1	
retired	27	55.1	5	16.3	7	28.6	49	6.7	
dead	17	39.5	6	14.0	20	46.5	43	5.9	
<b>Mother education</b>									
illiterate	60	52.2	16	13.9	39	33.9	115	15.8	$X^2 = 4.324$ $P= 0.827$
read and write	57	50.9	14	12.5	41	36.6	112	15.3	
primary or preparatory	99	54.1	23	12.6	61	33.3	183	25.1	
secondary	96	45.9	37	17.7	76	36.4	209	28.6	
university	58	52.3	17	15.3	36	32.4	111	15.2	
<b>Mother occupation</b>									
not working (housewife)	293	51.3	74	13.0	204	35.7	571	78.2	$X^2 = 14.191$ $P= 0.03^*$
working	72	50.7	26	18.3	44	31.0	142	19.5	
retired	1	14.3	3	42.9	3	42.9	7	1.0	
dead	4	40.0	4	40.0	2	20.0	10	1.4	

**Table (3): Distribution of preparatory school girls by body weight and lifestyle**

Lifestyle habits		Body weight of preparatory school girls								Test of significance
		Normal (n= 370)		Overweight (n= 107)		Obese (n= 253)		Total (n= 730)		
		No.	%	No.	%	No.	%	No.	%	
Diet score	Poor	27	38.0	10	14.1	34	47.9	71	9.7	$X^2 = 9.864$ $P= 0.043^*$
	Fair	331	52.2	93	14.4	214	33.4	647	88.6	
	Good	5	41.7	4	33.3	3	25.0	12	1.6	
Walking 30 min/day, five times a week	No	78	49.1	29	18.2	52	32.7	159	21.8	$X^2 = 2.109$ $P= 0.348$
	Yes	292	51.1	78	13.7	201	35.2	571	78.2	
Screen viewing > 2 hours/day	No	82	54.3	18	11.9	51	33.8	151	20.7	$X^2 = 1.508$ $P= 0.470$
	Yes	288	49.7	89	15.4	202	34.9	579	79.3	

**Table (4): Distribution of preparatory school girls by dietary habits**

Dietary habit		Body weight of preparatory school girls								Test of significance
		Normal (n= 370)		Overweight (n= 107)		Obese (n= 253)		Total (n=730)		
		No.	%	No.	%	No.	%	No.	%	
Number of essential meals /day	one meal	36	53.7	10	14.9	21	31.3	67	9.1	X <sup>2</sup> =0 .710 P= 0.950
	two meals	173	51.2	47	13.9	118	34.9	338	46.2	
	three meals	161	49.5	50	15.4	114	35.1	328	44.7	
Type of essential meal	Dinner	36	53.7	9	13.4	22	32.8	67	9.2	X <sup>2</sup> = 1.956 P=0.744
	Breakfast	43	53.8	8	10.0	29	36.3	80	10.9	
Having breakfast before school /week	rarely	222	47.8	68	14.7	174	37.5	464	63.6	X <sup>2</sup> = 6.435 P= 0 .169
	often	107	56.0	25	13.1	59	30.9	191	26.2	
	always	41	54.7	14	18.7	20	26.7	75	10.2	
Snacking between meals /week	always	105	56.5	23	12.4	58	31.2	186	25.5	X <sup>2</sup> = 5.739 P= 0.220
	often	193	48.4	67	16.8	139	34.8	399	54.6	
	rarely	72	49.7	17	11.7	56	38.6	145	19.9	
Meals outside home/week	always	56	44.4	17	13.5	53	42.1	126	17.3	x <sup>2</sup> = 12.515 p= 0.014*
	often	190	52.5	42	11.6	130	35.9	362	49.6	
Snacking in front of TV or during studying /week	rarely	124	51.2	48	19.8	70	28.9	242	33.1	X <sup>2</sup> = 0.980 P= 0.913
	always	124	52.1	31	13.0	83	34.9	238	32.6	
	often	179	49.4	56	15.5	127	35.1	362	49.6	
Eating fried food/week	rarely	67	51.5	20	15.4	43	33.1	130	17.8	X <sup>2</sup> = 6.990 P= 0.136
	always	204	51.3	59	14.8	135	33.9	398	54.5	
Number of sugar spoons / day	often	145	49.5	38	13.0	110	37.5	293	40.1	X <sup>2</sup> = 9.552 P= 0.049*
	rarely	21	53.8	10	25.6	8	20.5	39	5.3	
	≥ 3 spoons	217	53.3	51	12.5	139	34.2	407	55.8	
Fresh vegetables / week	2 spoons	126	50.6	43	17.3	80	32.1	249	34.1	X <sup>2</sup> = 3.981 P= 0 .409
	1 spoon	27	36.5	13	17.6	34	45.9	74	10.1	
	twice or less	196	51.3	52	13.6	134	35.1	382	52.3	
Fresh fruits / week	3-4 times	110	50.0	40	18.2	70	31.8	220	30.1	X <sup>2</sup> = 7.133 P= 0.129
	≥5 times	64	50.0	15	11.7	49	38.3	128	17.5	
	twice or less	155	52.5	44	14.9	96	32.5	295	40.4	
Sweets / week	3-4 times	128	49.0	30	11.5	103	39.5	261	35.7	X <sup>2</sup> = 3.789 P= 0.435
	≥5 times	87	50.0	33	19.0	54	31.0	174	23.9	
	≥ 3 times	160	51.6	40	12.9	110	35.5	310	42.5	
Bread loaf / day	twice	118	52.4	38	16.9	69	30.7	225	30.8	X <sup>2</sup> = 16.353 P= 0 .003*
	once	92	47.2	29	14.9	74	37.9	195	26.7	
	≥ 3	140	52.6	49	18.4	77	28.9	266	36.5	
Bread loaf / day	2	138	46.9	31	10.5	125	42.5	294	40.2	X <sup>2</sup> = 16.353 P= 0 .003*
	≤ 1	92	54.1	27	15.9	51	30.0	170	23.3	

**Table (5): The menstrual status and age at menarche of preparatory school girls in relation to their body weight**

Menstrual status		Body Weight of Preparatory School Girls								Test of significance
		Normal (n= 281)		Overweight (n= 91)		Obese (n= 224)		Total (n=596)		
		No.	%	No.	%	No.	%	No.	%	
Regular menstruation	No	138	50.5	40	14.7	95	34.8	273	45.8	$X^2 = 2.402$ P= 0.301
	Yes	143	44.3	51	15.8	129	39.9	323	54.2	
Age at menarche	<12	23	29.9	14	18.2	40	51.9	77	12.9	$X^2 = 10.944$ P= 0.004*
	>12	258	49.7	77	14.8	184	35.5	519	87.1	

**Table (6): Correlation between the age at menarche and BMI and waist circumference among preparatory school girls**

Age at menarche	Waist circumference		BMI	
	r	p	r	p
	-0.043	0.291	-0.126**	0.002

(r): Pearson correlation coefficient

## DISCUSSION

In the present study, the prevalence of overweight in preparatory school girls was 14.7%, while that of obesity was 34.7% according to CDC charts. Data from the nationally representative survey carried by EDHS in 2014 revealed that the percentage of girls aged 15-19 years in Egypt who were overweight was 33.6%, while the percentage of those who were obese was 8.7%.<sup>(3)</sup> Our results are somewhat different than results of other studies that reported a higher prevalence of overweight than obesity. In a study done in Saudi Arabia which was conducted on 19,317 healthy children and adolescents the prevalence of overweight in girls aged 13-18 years was 20.4% and the prevalence of obesity was 4.7%.<sup>(31)</sup> In 2007, a multicenter study<sup>(32)</sup> compared the prevalence of overweight and obesity in 3 Arab countries Kuwait, Lebanon and Egypt, which revealed that the prevalence of overweight was 34.4% and obesity was 13.5 % on a sample of 340 girls 10-19 years old from Cairo and its rural surroundings which is the reciprocal of our results. In Sharkia, a study conducted in 2015 in urban areas on 900 students aged 12-15 of them 468 were females, showed that 19.9% of girls were overweight compared to 10.9% who were obese.<sup>(33)</sup> The disparity of our results might be

attributed to the fact that the studied sample included only governmental schools from urban areas.

The present study showed that the prevalence of abdominal obesity among preparatory school girls was 24.7%. This prevalence is higher than that found by a study conducted in Tabriz -Iran on a sample of 985 girls (14 to 17 years old), in this study 13.2% of girls had abdominal obesity.<sup>(34)</sup> Our results are comparable to a study which was conducted in three major cities in Saudi Arabia: Al-Khobar, Jeddah, and Riyadh. The prevalence of abdominal obesity in females was found to be 30.3%.<sup>(35)</sup> In another comparable study conducted in Alexandria to investigate the relationship between blood pressure and different body composition measures in Egyptian school adolescents, the prevalence of abdominal obesity in female adolescents was 31.9%.<sup>(36)</sup>

Concerning parents' education and occupation the study revealed that mother occupation was related to obesity in girls. The results were in parallel with the study conducted on 154 Egyptian children of both sexes aged 5-18 years where the maternal occupation had a significant effect on their childhood obesity, as obesity was more common among housewives (22.8%) than among working mothers,<sup>(37)</sup> Similarly a study conducted on 711 school

children in Suhag between 6 - 14 years revealed that obesity was significantly more prevalent (25%) among children whose mothers finished primary level of education only were obese compared to 10.5% of those finished faculty, and that obesity is more common among children whose mothers are working which is not in accordance to our results.<sup>(38)</sup>

In the present study, dietary habits that are associated with obesity were eating meals away from home and consuming 2-3 loafs of "balady" bread daily, a high percentage of girls who skipped breakfast had overweight/obesity although no significant relation could be detected. The relationship between skipping breakfast and BMI has been extensively investigated. In a study on 423 Jordanian adolescents (185 of them were females) to examine their eating habits, it was found that 55% of females skip breakfast, and there was a significant negative correlation between participant's BMI and eating breakfast.<sup>(39)</sup> In another study of a cohort of 113 457 children in Hong Kong who were followed for 2 years , it was found that at baseline 5.3% of the boys and 5.2% of the girls skipped breakfast . Breakfast skippers had a significantly higher BMI than eaters at baseline, and they experienced a greater increase in BMI compared to breakfast eaters at 2 years follow up which was statistically significant.<sup>(40)</sup>

Consumption of foods prepared outside the home has steadily grown in the last 40 years, it increased from one-sixth to almost one-third of an individual's daily dietary intake, causing an increase in total calorie and fat intake. Our results were in parallel with a study conducted in Brazil on 5266 adolescents (2593 boys and 2673 girls) to identify at-home and away-from-home dietary patterns.<sup>(41)</sup> In a given day, 47.9% of adolescents reported eating out and the mean away-from-home consumption of baked and deep-fried snacks, soft drinks, sandwiches, pizza, and desserts was greater than 30% and was positively associated with BMI z-scores. Our results were in accordance with the study conducted in Sharkia<sup>(33)</sup> which found that 24.2 % of those who reported frequent fast food consumption were obese and 27.2% of them were overweight. In a school-based study of over 20,000 adolescents in grades 7–12 in the United States who were followed until the age of 21 showed that greater fast food consumption and breakfast skipping during adolescence and increases in breakfast skipping from adolescence to early adulthood were associated with increased weight gain during this transition.<sup>(42)</sup>

Our results showed that the total daily sugar intake was not associated with obesity, this might be explained by the underreporting of obese adolescents to the consumption of high calorie foods. This concurs with the cross sectional study conducted on 22 non-obese and 21 obese adolescents where both groups underreported energy intake and consumption of calories from chips and soda was similar among non-obese and obese adolescents.<sup>(43)</sup> On the other hand our results didn't agree with the cohort study of more than 10000 boys and girls aged from 9-14 that found that Consumption of sugar-added beverages was associated with small BMI gains during the corresponding year.<sup>(44)</sup>

Declining age at menarche has been documented worldwide. Factors that have been associated with early age at menarche include genetic, environmental and most importantly the obesity epidemic in children. In the present study, early menarche age before the age of 12 years was significantly related to obesity (table 5). Also, there is a significant negative correlation between the age at menarche and BMI (table 6). This is in agreement with the study conducted in Soul where body fat percentage and BMI were higher in the early menarche girls age (8-12 years) than the late-menarche girls (>12 years).<sup>(45)</sup> Another study conducted in Nigeria on 470 adolescent girls found that The mean age at menarche was  $12.80 \pm 1.22$  years and subjects who had attained menarche in early adolescence had significantly higher BMI at 10, 12 and 13 years respectively.<sup>(46)</sup> Another study conducted on 1,273 female high school students in Kuwait found that the mean age at menarche was 12.41 years. Age at menarche was inversely and significantly associated with overweight and obesity.<sup>(47)</sup>

## CONCLUSION AND RECOMMENDATIONS

In conclusion, about one third of preparatory governmental school girls were obese. This was negatively associated with the age at menarche. Dietary habits that were significantly associated with overweight/obesity included eating away from home and increased consumption of bread. These habits should be the targets for school based nutrition education campaigns.

**Conflict of Interest:** None to declare.

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