

Obesity and Eating Habits among University Students in Alexandria, Egypt: A Cross Sectional Study

Doaa M Genena^{1,2,*}, Amany A Salama¹

¹Department of Nutrition, Faculty of Allied Medical Sciences, Pharos University, Alexandria, Egypt

²Medical Research Institute, University of Alexandria, Alexandria, Egypt

*Corresponding author: doaa.genena@alexu.edu.eg

Abstract The prevalence of obesity in Egypt among young adults is high, particularly among females. Eating habits display general trends over time, reflecting sociocultural trends in food availability and nutritional knowledge and goals; lifestyle changes toward unhealthy dietary patterns such as high fast food consumption are becoming trendy among young adults. The purpose of this study was to assess the prevalence of overweight and obesity in a sample of students from the University of Pharos, Alexandria, Egypt (PUA) and to examine their eating habits. A cross-sectional survey of 398 university students (males and females) aged 18-26 years, who were chosen randomly from Pharos University campus during the spring semester 2016-2017. Students were asked to fill out a self-reported questionnaire that included questions on their eating, drinking and smoking habits, their weight, and height. Body mass index (BMI) was used to assess students' weight status. The results showed that 28.9% of the students were overweight, 11.8 % were obese, while (55.8%) were of normal weight (49.6% of males compared to 59.1% of females), and 3.5% were underweight. Eating habits of the students showed that the majority (80%) was taking meals irregularly. Almost half of students (45.7%) reported eating two meals per day (44.4% of females as compared to 48.2% males). About 57.6% of female students reported eating breakfast daily or three to four times per week compared to 55.3% male students. Two third of the student were taking snacks daily or three to four times per week (68.1% female vs. 71.6% males, with a statistically significant difference between males and females ($p=0.034$). Male students tend to eat more fruits daily as compared to females (39.7% vs. 36.2% respectively). Smoking was not common among students. The study concluded that obesity and overweight were prevalent among PUA college students, irregular and infrequent meals together with low vegetables intake and frequent snacking were the most common unhealthy eating habits of the participants. In terms of eating patterns, significant differences were observed between the two genders with respect to frequent snacking by males.

Keywords: eating habits, university students, obesity, overweight, Egypt

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1. Introduction

Dietary habits of young adults are affected by the fast-food market. The traditional Mediterranean healthy food habits have been replaced by more westernized food habits, which are characterized by low intake of dietary fiber, vegetables, and fruit and high intake of foods rich in fat, sugar; and consequently, overweight and obesity are increased. [1] Because of the established health risks and substantial increases in prevalence, obesity has become a major global health challenge. Not only is obesity increasing, but no national success stories have been reported over the past three decades [2].

A person with a BMI of 25 or more is considered by the WHO to be overweight, while obesity is defined as having a BMI of 30 or more. Overweight and obesity are potent risk factors for cardiovascular diseases and diabetes and are major contributors to premature deaths. These metabolic disorders are dramatically increasing among

adults in the Eastern Mediterranean Region. Data for adults aged 15 years and older from 16 countries in the region show the highest levels of overweight and obesity in Egypt, Bahrain, Jordan, Kuwait, Saudi Arabia and United Arab Emirates [3].

The Egyptian society is a young society; according to the Central Agency for Public Mobilization and Statistics (CAPMAS) which announced that the population of Egypt has increased in the last 10 years from 72.8 million in 2006 to 90.1 million in 2016 and that total number of Egyptians (under 18) is about 33.3 million, representing 36.6% of the total population in mid-2016 [4].

College students represent the youthful age population of a community, and are prone to unhealthy eating habits and foods during their college years which might affect their wellbeing and increase the risk of obesity, diabetes and coronary heart disease; like fast food consumption, lower vegetable and/or fruit intake along with physical inactivity and increasing computer and Television viewing hours [5,6].

Dietary habits usually depend on lecture schedules attended by students and availability of food inside or in

the vicinity of the university campus. As a result of the expansion in the fast-food market and lack of appropriate food courts, students usually face meal skipping, inadequate variety of foods, and unhealthy snacking. [7] University population is divided into two categories, those who continue to live with their parent and those that are attending universities far from their usual residence that are forced to live away from home.

For both, the beginning of the university matches with more freedom and independence and is often the first time that young people assume the responsibility to choose and prepare foods. [8] Therefore, the aim of the current work was to assess the prevalence of overweight and obesity among college students in Alexandria Egypt and to examine their eating habits.

2. Methods and Subjects

Data collection took place in a single private university Pharos University, Alexandria, Egypt (PUA); with an undergraduate population of over twelve thousand undergraduate students. A convenience sample of 398 students (males and females) attending PUA, aged 18-26 years -who were chosen randomly-was included in the study during spring semester 2016-2017. A self-administered questionnaire titled 'Student Eating Habits' was developed based on previously validated questionnaires that had been used within the literature. [9] Ethical approval was received from the research ethics committee of PUA prior to data collection. Students were provided with an information sheet and consent form to fill before completing the self-report questionnaire. To ensure that the students could participate on a voluntary basis, students were informed that their participation was both voluntary and anonymous.

2.1. The Questionnaire Included Sections On

Demographic characteristics: Demographic information was collected on age, sex, ethnicity, self-reported height and weight (from which BMI was calculated), living arrangement and year of study.

Lifestyle related habits: including physical activity and TV watching hours per week and hours of sleep per night.

Eating habits: comprised questions regarding eating, drinking and smoking habits.

2.2. Statistical Analyses

Statistical analyses were performed using the Statistical Package for Social Sciences software SPSS 20.0 (IBM Corp. Armonk, NY). Data were analyzed using the Chi square test and Mann Whitney test for comparing between categories. All analyses were two-tailed, and 'p' values less than 0.05 were considered statistically significant.

3. Results

Characteristics of participating students are presented in Table 1. A total of 398 students (141 males and 257 females), with a mean age of 20.6 ± 1.59 years, participated in this study. The average weight and height were 70.46 ± 16.15 kg and 167.9 ± 10.41 cm, respectively. Mean BMI was 24.84 ± 4.35 .

Table 1. Characteristics of The Students

	Min. – Max.	Mean \pm SD.	Median
Age (years)	18.0 – 26.0	20.64 ± 1.59	21.0
Weight (kg)	37.0 – 142.0	70.46 ± 16.15	68.0
Height (cm)	141.0 – 196.0	167.91 ± 10.41	167.0
BMI	13.76 – 42.53	24.84 ± 4.35	24.22

The outcome of this study indicated that the prevalence of overweight and obesity was more common among male students compared to females; (33.3% and 14.2% vs. 26.5% and 10.5%, respectively); nevertheless, there was no significant difference between males and females. About half of the students (55.8%) were of normal weight (49.6% of male students compared to 59.1% of female students), while almost one third (28.9%) of the sample was overweight, 11.8 % was obese and 3.5% was underweight as indicated in Table 2.

Table 2. Distribution of the Students According to BMI

BMI	Sex				Total (n = 398)		Test of Sig.	p
	Male (n = 141)		Female (n = 257)		No.	%		
	No.	%	No.	%				
<18.5 (Underweight)	4	2.8	10	3.9	14	3.5	$\chi^2=$ 4.293	0.232
18.5 - 24.9 (Normal weight)	70	49.6	152	59.1	222	55.8		
25 - 29.9 (Over weight)	47	33.3	68	26.5	115	28.9		
≥ 30 (Obese)	20	14.2	27	10.5	47	11.8		
Min. – Max.	13.76 – 39.42		10.02 – 42.53		13.76 – 42.53		U= 16786.50	0.225
Mean \pm SD.	25.22 ± 4.60		24.63 ± 4.20		24.84 ± 4.35			

χ^2 , p: χ^2 and p values for Chi square test for comparing between the two categories
U, p: U and p values for Mann Whitney test for comparing between the two categories

Table 3. Students' Response to Questions Related to Their Lifestyle Practices Including Eating Habits, Meal Patterns, Fruits and Vegetables Intake, and Fried Food

Questions	Sex				Total (n = 398)		χ^2	p
	Male (n = 141)		Female (n = 257)		No.	%		
	No.	%	No.	%				
Do you take your meals regularly?								
Always regular	31	22.0	46	17.9	77	19.3	0.975	0.324
Irregular	110	78.0	211	82.1	321	80.7		
Do you take breakfast?								
Daily	56	39.7	112	43.6	168	42.2	0.618	0.892
Three or four times per week	22	15.6	36	14.0	58	14.6		
Once or twice per week	28	19.9	47	18.3	75	18.8		
Rarely	35	24.8	62	24.1	97	24.4		
How many times do you eat meals except snacks?								
One time	14	9.9	33	12.8	47	11.8	1.195	0.754
Two times	68	48.2	114	44.4	182	45.7		
Three times	37	26.2	73	28.4	110	27.6		
Four times	22	15.6	37	14.4	59	14.8		
How often do you take snacks apart from regular meals?								
Daily	75	53.2	101	39.3	176	44.2	8.642*	0.034*
Three or four times per week	26	18.4	74	28.8	100	25.1		
Once or twice per week	31	22.0	59	23.0	90	22.6		
Rarely	9	6.4	23	8.9	32	8.0		
How often do you eat green, red or yellow colored vegetables?								
Daily	44	31.2	56	21.8	100	25.1	4.695	0.196
Three or four times per week	27	19.1	58	22.6	85	21.4		
Once or twice per week	34	24.1	63	24.5	97	24.4		
Rarely	36	25.5	80	31.1	116	29.1		
How often do you eat fruits?								
Daily	56	39.7	93	36.2	149	37.4	3.362	0.339
Three or four times per week	21	14.9	57	22.2	78	19.6		
Once or twice per week	35	24.8	63	24.5	98	24.6		
Rarely	29	20.6	44	17.1	73	18.3		
How often do you eat fried food?								
Daily	54	38.3	90	35.0	144	36.2	1.284	0.733
Three or four times per week	32	22.7	64	24.9	96	24.1		
Once or twice per week	38	27.0	78	30.4	116	29.1		
Rarely	17	12.1	25	9.7	42	10.6		
How often do you eat with friends and family?								
Daily	41	29.1	91	35.4	132	33.2	2.076	0.557
Three or four times per week	38	27.0	69	26.8	107	26.9		
Once or twice per week	26	18.4	43	16.7	69	17.3		
Rarely	36	25.5	54	21.0	90	22.6		
How often do you drink soft drinks?								
Yes	102	72.3	186	72.4	288	72.4	0.0	0.994
No	39	27.7	71	27.6	110	27.6		

χ^2 , p: χ^2 and p values for Chi square test for comparing between the two categories

*: Statistically significant at $p \leq 0.05$.

Table 3 showed that most students; (80%) were taking meals irregularly. About 57.6% of female students reported eating breakfast daily or three to four times per week compared to 55.3% male students. Almost half of students (45.7%) reported eating two meals per day (44.4% of females as compared to 48.2% males). Two third of the student 69.3 % were taking snacks daily or three to four times per week (68.1% female vs. 71.6% males); with a statistically significant difference between males and females ($p=0.034$). More than two thirds of students (72.4%) reported the intake of soft drinks (males & females). The intake of colored vegetables and fruits was more in favor of fruits among students. A total of 46.5% of the students reported daily or 3-4 times per week intake of colored vegetables with no gender differences (44.4% females vs. 50.3% males) and 57% of students reported daily or 3-4 times per week intake of fruits. Male students tend to eat more fruits daily as compared to females (39.7% vs. 36.2% respectively). A total of 60.3% of the students reported daily or 3-4 times per week intake of fried foods with no gender differences (female 59.9% vs. males 61%). Eating daily with friends and family was common among students (60%) with no gender differences. Smoking was not common among students; 78.9% of students reported that they do not smoke, 2.5% were ex-smokers and 18.6% were current smokers.

About half of students (45.7%) reported eating two meals per day (4.4 % of them were underweight, 59.3 % were normal weight, 28.6 % were overweight, and 7.7 % were obese). Almost half of students 44.2 % were taking snacks daily (3.4 % of them were underweight, 56.3% were normal weight, 30.7 % were overweight, and 9.7% were obese), while 25.1% of students reported taking snacks 3-4 times per week (1% of them were underweight, 54% were normal weight, 33 % were overweight, and 12% were obese).

There was a correlation between body mass index of the students and breakfast intake, ($p=0.046$); 42.2% of student were taking breakfast daily (3.0 % of them were underweight, 47.6 % were normal weight, 35.1 % were overweight, and 14.3 % were obese) 14.6% of students were taking breakfast 3-4 times per week (5.2 % of them were underweight, 63.8 % were normal weight, 22.4 % were overweight, and 8.6 % were obese) as shown in Figure 1.

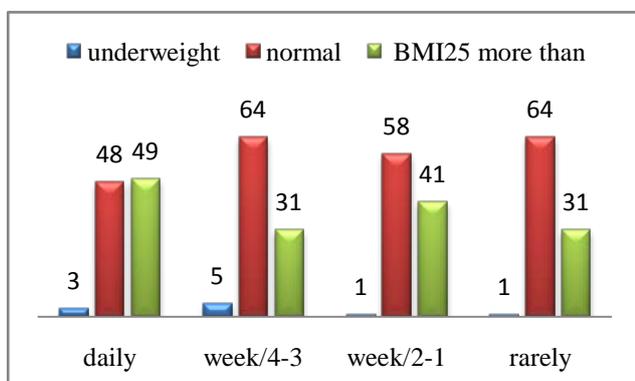


Figure 1. Correlations between BMI and breakfast intake

Regarding vegetables intake, 25.1% of the students reported daily intake of colored vegetables (3.0 % of them were underweight, 52.0% were normal weight, 32.0 %

were overweight, and 13.0 % were obese), while 21.4% reported 3-4 times per week intake (3.8 % of them were underweight, 60.3% were normal weight, 23.1 % were overweight, and 12.8 % were obese). As for reported fruit intake; 37.4% reported daily intake (4.0% of them were underweight, 50.3% were normal weight, 33.6 % were overweight, and 12.1 % were obese) and 19.6% reported 3-4 times per week intake (3.8% of them were underweight, 60.3% were normal weight, 23.1 % were overweight, and 12.8% were obese) as shown in Figure 2.

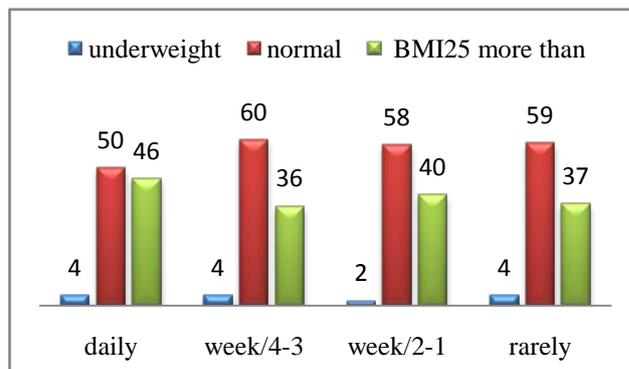


Figure 2. Correlations between BMI and fruits intake

Frequent intake of fried food was observed among the sample; with 36.2% reporting daily intake (4.2% of them were underweight, 55.6% were normal weight, 31.3 % were overweight, and 9.0 % were obese) and 24.1% reporting 3-4 times per week intake of fried foods (3.1% of them were underweight, 60.4% were normal weight, 29.2 % were overweight, and 7.3 % were obese).

As for eating daily with friends and family; 33.2% of the students reported eating daily with friends and family (3.8% of them were underweight, 51.5% were normal weight, 30.3 % were overweight, and 14.4 % were obese), 26.9% reported eating daily with friends and family 3-4 times per week (2.8% of them were underweight, 57.0% were normal weight, 29.0 % were overweight, and 11.2 % were obese)

Two thirds of the student reported the intake of soft drinks often with no difference between males and females.

4. Discussion

The consequences of childhood and adolescent obesity include metabolic syndrome and type 2 diabetes in youth and in adulthood and the development of obesity in adulthood. The most important factors underlying the obesity epidemic are the current opportunities of excessive energy intake coupled with limited energy expenditure. [10] The purpose of this study was to assess the prevalence of overweight and obesity and examine eating habits in a sample of Pharos University students. Body mass index was used to assess weight status. Study findings indicate that overweight and obesity prevalence among the studied population is 37%, 47.5% for females and males respectively and 42 % for the total sample. Prevalence of overweight was 33.3% in males as compared to 26.5 % in females. Obesity was more common among male students than females in the studied population; 14.2% of males

were obese compared to 10.5% of females. These figures are in contrast to the data from recent studies concerned with obesity prevalence in Egypt and aimed to analyze determinants of adult Egyptian female obesity by in-depth review based on secondary data collection; indicating that a particular issue in Egypt is that prevalence of obesity is more than double among females (46%) as compared to males (22%) and that obesity among Egyptian females increases with age, wealth, urban residency, unhealthy diet, and physical inactivity. [11] Reports produced by UNICEF Egypt to present updated and quality data on overweight and obesity among adolescents 15-19 years both males and females; showed that 33% for overweight and obesity; 30% males and 36% females, this did not differ by urban and rural locations. [4] The 2015 Egypt Health Issues Survey (EHIS) allowed for an assessment of the extent to which adults in Egypt are overweight and obese. Considering the BMI distribution, half the women age 15-59 were obese, and an additional 26 percent were overweight (i.e. for overweight and obesity 76%). The majority of men had a BMI of 25.0 or higher and were considered overweight (34 percent) or obese (26 percent) (i.e. for overweight and obesity 60%). As expected, the relationship between age and BMI is marked. Among women, the proportion overweight or obese increases from 42 % in the 15-19 age groups to more than 90 % among women age 40 and older. Among men, the proportion overweight or obese is lower at every age than among women. Nevertheless, the majority of men age 25 and older are overweight or obese, and the proportion overweight or obese peaks at 79 percent among men age 50-54 years [12].

In a recent study evaluating the prevalence of underweight, overweight and obesity as well as associated risk factors among school going adolescents in seven African countries using cross sectional data from the Global School-based Student Health Survey (GSHS); the prevalence of both overweight and underweight was relatively high. Being overweight ranged from 8.7% (Ghana) to 31.4% (Egypt). Obesity rates ranged from 0.6% (Benin) to 9.3% (Egypt) i.e. for both overweight and obesity 40.7%. Females had a higher overweight prevalence for every age group in five of the countries, exceptions being Egypt and Malawi. [13] Another study published in the *New England Journal of Medicine* 2017 analyzed data from 68.5 million people; the study examined 195 nations and regions across more than three decades, from 1980 to 2015. For obesity rates in adults, Egypt tops the list worldwide; the study found that 35 percent of Egyptian adults (around 19 million Egyptians) suffer from obesity - the highest rate in the world. [14]

The lower rate of obesity among female students in the current study can be explained by the fact that dieting is a common practice among young women, irrespective of weight. [15] In consistence with the results of the current study, are the recent trends in the prevalence of underweight, overweight, and obesity in Korean adults; showing that obesity occurrence in men was trending upward with respect to overweight/obesity, however, the obesity trends in women were leveling off from overweight/obesity. [16] A body image based on the notion that "slim is beautiful" has been adopted among young females. Although researchers have validated the accuracy of self-reported height and weight data, women may underestimate weight by 2.1 kg. Thus, the weight and

BMI changes calculated in these studies may be underestimates. Heavier people may underestimate their weight, and height tends to be over reported. [17] Similar studies in other Middle East [6,8] and other countries were consistent with these results; confirming more common obesity rates among male students than females in college population [18,19,20]. In contrast, only 7.9% of Iranian male college students were above the normal body weight [21]. That rate decreased to 2.9% among Chinese college students with a percentage of obesity as low as 0.4. [22]

In terms of eating habits, university students usually do not follow healthy eating habits. The typical university student diet is high in fat and low in fruits and vegetables. [23] Students often select fast food due to its palatability, availability and convenience. [24] In this study, data analysis of students' eating habits revealed that 80% were taking meals irregularly and half of students reported eating two main meals per day. Most students were taking snacks daily or three to four times per week (68.1% female vs. 71.6% males). However, there was a significant gender difference in the frequency of snacking in the studied sample ($p = 0.034$); which may further contribute to the lower rate of obesity among female students. In a prospective analysis of adult men, increasing the number of eating occasions beyond 3 meals a day was associated with greater risk of gaining ≥ 5 kg over 10 years (HR, 1.15; 95% CI, 1.06–1.25 for ≥ 2 versus 0 additional eating occasions). [25]

A systematic review of 16 studies from Europe has showed that eating breakfast is associated with a reduced risk of becoming overweight or obese and a reduction in the BMI in children and adolescents. [26] In general, the percentage of skipping breakfast in the EMR countries is higher among girls than boys and increases with age. In Bahrain, about 42% and 59% of school boys and girls aged 10–15 years skipped their breakfast, respectively. In Saudi Arabia, 74% of school girls aged 12–16 years skipped or irregularly consume breakfast. [21] Almost equal percentage of Lebanese males (32.2%) and females (31.5%) university students consumed their breakfast daily, while the rest either consumed it irregularly or did not consume it. [8] Studies about the relationship between breakfast intake and obesity in EMR are few and all of them are cross-sectional. In UAE, Kerkadi [27] found that 72.2% of nonobese female university students eat their breakfast regularly, and the rest (25.8%) were either overweight or obese. Among adults, it was reported that 68.7% of Saudi women who skipped breakfast were obese, and the rest (31.3%) were nonobese.

There was a correlation between body mass index and breakfast intake in the current study, 42.2% of student were taking breakfast daily; half of them were overweight or obese with a significant difference between categories in the studied sample ($p = 0.046$). Population studies show that eating breakfast is tied to lower weight and healthier diet, along with lower risk of cardiovascular disease. Yet, studies that assign breakfast skippers to a daily breakfast do not support a strong causal role of breakfast for weight management. Contrary to the widely-adopted views; recommendations to eat or skip breakfast had no visible effect on weight loss in free-living adults who were attempting to lose weight. [28] It is possible that some people who add breakfast are not eating the right things or

cutting back on what they eat later in the day, resulting in more calories but not necessarily good nutrition.

Mapping out what to eat ahead of time, especially for busy people who eat on the go, can help create a diet that is better for cardiovascular risk prevention. Structured thinking can help people eat the right amount of food throughout the day and eat at the right time.

Equivalent studies from Lebanon and China [8,24], obviously revealed diversity in eating habits among male college students in different societies. Various studies on college students revealed higher rates of obesity in males than in females. [8,18] In KSA, Al-Rethaiaa et al; found that 21.8% of male students were overweight and 15.7% were obese. The most common eating habits encountered were eating with family, having two meals per day including breakfast, together with frequent snacks and fried food consumption. Vegetables and fruits, except dates, were not frequently consumed by most students. [6] Most of Saudi students (63.3%) eat irregular meals while 64.6% of Lebanese and 81.6% of Chinese male students take regular meals. About half of PUA students have breakfast daily compared to one third of Lebanese and two thirds of Chinese students. The majority of PUA students (45.7) reported eating two meals per day; likewise, in KSA and Lebanon most of students (55.7% and 47.9% respectively) eat only two meals per day. In contrast, the vast majority of Chinese students (74.3%) eat meals thrice a day. Two thirds of students (66.8%) were taking snacks daily or 3 - 4 times per week. Eating snacks was a daily habit in about one third of Saudi, half of Lebanese and only about one tenth of Chinese college students.

Soft drinks intake was common among students; as about 72.4% of the studied sample reported the intake of soft drinks often with no difference between males and females. About 60% of those who reported consuming soft drinks often were of normal weight; while 47% of those who reported no consumption of soft drinks were overweight or obese. This controversy could be attributed to the inconsistency in differentiating between carbonated beverages known as soft drinks, and liberal consumption of their conceptualized "healthy alternatives"; fresh fruit juice and sweetened artificial juice.

Less than half of the students reported eating vegetables daily or 3-4 times per week and 65.3% of the students reported eating fried foods daily or 3-4 times per week. These habits need to be corrected using educational programs to promote healthy eating habits. Most of the students eat with their families. Fruit consumption was a common habit; 60% of students reported daily intake or 3/4 per week. Male students tend to eat more fruit daily as compared to females. On the other hand, 83.5% of Chinese and 56.3% of Lebanese male students consume vegetables three times or more per week. Moreover, 49% of Lebanese students eat fruits at the same rate. About half of students were eating with family as with most Saudi and Lebanese students who eat with family, while most Chinese students eat alone.

5. Conclusions

The study findings reveal that half of students were classified into the normal BMI group, with the prevalence of BMI > 25 being 42% among college students in (PUA),

irregular and infrequent meals together with low vegetables intake and frequent snacking were the most common unhealthy eating habits of the students. Significant differences were observed between the two genders with respect to frequent snacking by males.

6. Recommendations

This study has shown that the prevalence of overweight and obesity among PUA students were lower than those last documented by national authorities in Egypt; but to continue with this lifestyle and unhealthy dietary habits will lead to an increase in overweight and obesity rates which will have a negative impact on the health status of Egyptian population in general. Effective interventions aiming to improve students' eating behaviors such as providing markets to sell healthy meals in university and increase physical activity are a necessity. Education in the area of nutrition, especially with respect to information relating to sources of nutrition and healthy weight management is a call for action as university arenas represent the final opportunity for nutritional education of a large number of students.

Limitations

The findings of this study are limited by the use of a convenience sample of students from just one university which may not be a representative of all university students in Egypt. Furthermore, students attending Pharos University are usually of high socio-economic standards; therefore, samples from different universities may provide a more inclusive picture of university students taking into consideration socio-economic status. However, baseline information about weight status and eating habits among a sample of university students was certainly obtained from the present study.

Authors Contributions

Authors jointly analyzed the data, revised the final version critically, and approved it. Genena D formulated the major concepts of this paper and provided overall supervision. Salama AA wrote and edited versions of the paper. Both authors provided information and references for this paper.

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