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Obesity Risk Factors among Beirut Arab University Students in Tripoli-Lebanon

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Abstract

Background: Studies among university students in developing countries had shown high prevalence of obesity. Obesity among young people increases lifetime chronic disease risk. Unhealthy dietary patterns including high consumption of fast foods and meal skipping specially breakfast have been suggested as major risk factors for the development of obesity in developed countries. Limited studies had explored the dietary patterns among university students in developing countries.

Objective: The study objective was to investigate the major dietary risk factors associated with the development of overweight and obesity among university students.

Design: The study was conducted through a cross sectional survey. Data were collected using an interview questionnaire, anthropometric, and dietary tools.

Subjects: 497 students (49.3% males & 50.7%females) with a mean age of 20.1 ± 1.7 years were chosen randomly.

Setting: The study was conducted at Beirut Arab University (BAU)/ Tripoli campus during fall semester 2014.

Results: The results showed that 26.6% of the studied sample were overweight or obese. Males (67.4%) were statistically significant more obese than females (32.6%). More than three quarters of students (76.8%) reported irregular meal patterns and high fast food consumption. The strongest protective factors for the development of obesity were breakfast consumption (OR: 0.531, 95% CI: 0.299, 0.941) female sex (OR: 0.467, 95% CI: 0.244, 0.893) & being a health science student (OR: 0.11, 95% CI: 0.014, 0.883).

Conclusions: Intervention programs to prevent overweight and obesity should be implemented among university students to encourage regular breakfast intake and adopting healthy food choices and lifestyle.

Keywords: Obesity; Risk; University; Students; Dietary; Lebanon

Introduction

Worldwide, there is an alarming rising prevalence of overweight and obesity in both developed and developing countries [1]. The rate of obesity has tripled in developing countries over the past 20 years [2]. Published data demonstrate that the rising epidemic of obesity in developing countries could be attributed to the nutrition transition prevailing in these countries over the past two decades [3]. Evidence from several studies indicates that obesity substantially increases the risk of numerous chronic diseases including cardiovascular diseases (CVD), type-II diabetes, gallbladder diseases, various malignancies and impairs quality of life [3,4]. The deleterious effects of obesity and related chronic diseases are more pronounced if obesity develops at a young age [5,6]. Obesity is a complex multi-factorial problem [7]. Unhealthy dietary habits have been documented to be among the major risk factors for obesity [7,8]. These unhealthy nutritional habits are becoming more frequent due to the nutritional transition that is spreading in developing countries [3,9]. Lebanon, a small country in the Middle East, has been experiencing a nutritional transition in food choices during the past years from the typical Mediterranean diet into the Westernized pattern [10]. Published data reported that university students seem to be the most affected by this nutrition transition [11]. Poor eating habits are major public health concern among young adults who experienced transition into university life [12]. The mushrooming of shopping malls, convenience stores, and vending machines have created an alarming situation for young adults to adopt unhealthy eating habits [13]. The most commonly reported unhealthy habits include: meal skipping, unhealthy snacking, low intakes of vegetables and fruits, and fast food consumption [14,15]. As a consequence, overweight and obesity are increasingly observed among university students in developing countries [16-19].

A number of studies evaluating the eating habits and obesity indices have been conducted among university students in Lebanon [20,21], however; these studies did not include North Lebanon. Consequently, there is a scarcity of data about the body mass index (BMI) distribution and dietary risk factors of Lebanese students living in northern Lebanon.

University students are important targets for the promotion of healthy lifestyles of the adult population. Therefore, the aim of this study was to investigate the risk factors associated with obesity among university students in North Lebanon which could enable further implementation of the most relevant education and health promoting programs in universities which may contribute significantly in reducing the prevalence of obesity among the young population.

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Methods

Sample and procedure

Through a cross-sectional study design a survey was conducted at Beirut Arab University (BAU) -Tripoli campus during the fall semester 2014/2015. To calculate the sample size a 30% prevalence rate of obesity was assumed with 95% confidence interval and 5% precision. The minimum required simple random sample was 266. Assuming a design effect of two to account for the effect of clusters the total final sample was 532 students. A proportionate cluster sample was selected (clusters being the 6 faculties at BAU). After exclusion of incomplete questionnaires 497 students aged 18-25 years were included in the study (49.3% males & 50.7% females). The study was approved by the institutional review board at BAU. Data collection was performed by trained researchers. Subjects were included if they fulfilled the inclusion criteria of being a Lebanese regular student within the age group of 18-25 years. The exclusion criteria included any student having any chronic metabolic disease like diabetes mellitus, chronic kidney or liver diseases and regular intake of specific drugs that may affect appetite or weight control. Those who expressed interest and provided their oral consent were recruited to participate in the study.

A structured anonymous interview questionnaire was developed by the authors based on previously published instruments which have been standardized and validated to be used among university students [20,22-27]. The questionnaire included questions to assess the socio-demographic characteristics, diet and food intake patterns and lifestyle behaviours followed by anthropometric measurements.

Measures

General and Socio-demographic characteristics: Questions inquiring about age, gender, the type of current residence and living conditions either alone or with family or friends, field of study, the number of semesters after joining the university and family medical history, were asked to define the general and socio- demographic characteristics of the study sample.

Anthropometric measurements: Anthropometric measurements including weight, height and waist circumference were assessed by trained field workers using standardized techniques [28] and calibrated scales. Standing height was measured to the nearest 0.1 cm without shoes, using a stadiometer. Participants wearing light clothes, were weighed to the nearest 0.1 kg, on a beam scale which was first calibrated using a standard weight and re-checked daily [29]. Body mass index (BMI) was calculated using the formula: body weight (Kg)/height (m^2) in accordance with the World Health Organization (WHO) criteria for overweight and obesity classification [30]. BMI values were classified into four categories: underweight (BMI ≤ 18.5 kg/m^2), normal weight (BMI between 18.5 and 24.9 kg/m^2), overweight (BMI between 25 and 29.9 kg/m^2), and obese (≥ 30 kg/m^2) (30).Overweight and obese categories were combined in the analysis. Central obesity was assessed by waist circumference measurement. Measurements were done to the nearest 0.1 cm using a non-stretchable measuring tape with centimetre and millimetre markings. The World Health Organization cut-off points for the risk of metabolic complications were used to identify subjects with an enlarged waist circumference (>94 cm (M); >80 cm (W) [31].

Dietary intake assessment: The dietary and food intake patterns including the regularity of meal consumption, regular breakfast intake, no of meals and number of snacks were assessed. A short semi quantitative Food Frequency Questionnaire (FFQ) was used covering different food categories (including the five basic food categories typically consumed by the Lebanese population). The FFQ used in this study was adapted from the questionnaire earlier administered in the Lebanese population) [32] and the Centres for Disease Control and Prevention (CDC) Global School Health Survey [33]; the items used were fruits, vegetables, carbonated beverages, fruit juices, sweetened juices, hot beverages (coffee, tea, Nescafe), sweet snacks, salty snacks, fast food and fried foods. Intake categories were never, rarely, 1-2 times/week, 3-4 times per week and >5 times daily. A diet score was developed based on the food frequency data to assess the dietary adequacy of the students. For this purpose, Intake categories were scored increasingly from 1-4 for healthy food items including: fruits, vegetables, fruit juices and milk. An inverse coding was assigned for unhealthy food items including: carbonated beverages, sweetened juices, hot beverages, sweet snacks, salty snacks, pastries and fried food. The total score was derived by summing the score for all the 10 food items included in the questionnaire. The total score varied from 10, the least healthy, to 40 the healthiest diet score.

Physical activity and lifestyle variables: In order to assess the physical activity level of the students, we used the short form of the International Physical Activity Questionnaire (IPAQ) for the last 7 days (IPAQ-S7S) [34]. We followed the instructions given in the IPAQ manual for reliability and validity. The IPAQ short form asks about three specific types of activity undertaken in leisure time, work-related and transport-related activity and domestic activities. The specific types of activity that were assessed are walking, moderate-intensity activities and vigorous intensity activities; frequency (measured in days per week) and duration (time per day) are collected separately for each specific type of activity. The items were structured to provide separate scores on walking; moderate-intensity; and vigorous-intensity activity as well as a combined total score to describe the overall level of activity. Computation of the total score requires summation of the duration (in minutes) and frequency (days) of walking, moderate-intensity and

Table 1: General characteristics of the study sample.

Variable	Total (N=497)	Males (N=245)	Females (N=252)	P Value
	Mean (SD)			
Age	20.10 ± 1.70	20.41 ± 1.88	19.80 ± 1.45	(0.000)
N (%)				
Academic Year				
1st year	155 (31.2%)	78 (31.8%)	77 (30.6%)	0.838
2nd year	111 (22.3%)	52 (21.2%)	59 (23.4%)	
3rd year and above	231 (46.5%)	115 (46.9%)	116 (46.0%)	
Field of study				
Other than health sciences	453 (91.1%)	244 (99.6%)	209 (82.9%)	(0.000)
Health Sciences	44 (8.9%)	1 (0.4%)	43 (17.1%)	
Living arrangements				
Living with parents	472 (95.0%)	229 (93.5%)	243 (96.4%)	0.111
Living with partner	9 (1.8%)	4 (1.6%)	5 (2.0%)	
Living with friends	7 (1.4%)	4 (1.6%)	3 (1.2%)	
Living alone	9 (1.8%)	8 (3.3%)	1 (0.4%)	
Living area				
Urban	307 (61.8%)	149 (60.8%)	158 (62.7%)	0.728
Sub-Urban	154 (31.0%)	76 (31.0%)	78 (31.0%)	
Rural	36 (7.2%)	20 (8.2%)	16 (6.3%)	
Family history of chronic illness				
No	288 (57.9	156 (63.7%)	132 (52.4%)	0.011
Yes	209 (42.1)%	89 (36.3%)	120 (47.6%)	

Table 2: Anthropometric measurements.

Variable	Total (N=497)	Males (N=245)	Females (N=252)	p-Value
	Mean (SD)			
Weight	66.89 ± 13.75	74.86 ± 12.34	59.15 ± 10.18	(0.000)
Height	167.64 ± 8.82	174.23 ± 6.44	161.23 ± 5.45	
BMI	23.69 ± 3.78	24.67 ± 3.64	22.74 ± 3.68	
Waist circumference	77.28 ± 11.08	82.58 ± 10.05	72.13 ± 9.5008	
N (%)				
BMI				
Underweight	22 (4.4%)	4 (1.6%)	18 (7.1%)	(0.000)
Normal	343 (69%)	152 (62%)	191 (75.8%)	
Overweight/Obese	132 (26.6%)	89 (36.3%)	43 (17.1%)	
Waist circumference				
Normal	433 (87.1%)	215 (87.8%)	218 (86.5%)	0.678
Increased	64 (12.9%)	30 (12.2%)	34 (13.5%)	

Table 3: Dietary intake patterns and behaviours of University Students Based on Gender.

Variable	MEAN ± SD			p-value
Number of meals	2.43 ± 0.70	2.53 ± 0.71	2.33 ± 0.68	0.001
Number of snacks	1.81 ± 0.67	1.82 ± 0.70	1.79 ± 0.635	0.657
N (%)	Total (N=497)	Males (N=245)	Females (N=252)	
Regularity of breakfast intake				
Daily	267 (53.7%)	124 (50.6%)	143 (56.7%)	0.17
Not daily	230 (46.3%)	121 (49.4%)	109 (43.3%)	
Regularity of meals intake				
Regular	115 (23.1%)	56 (22.9%)	59 (23.4%)	0.883
Not regular	328 (76.9%)	189 (77.1%)	193 (76.6%)	
Frequency of eating at fast food restaurants /week				
0-1	310 (62.4%)	117 (47.8%)	193 (76.6%)	(0.000)
2-3	154 (31.0%)	99 (40.4%)	55 (21.8%)	
5 or more	33 (6.6%)	29 (11.8%)	4 (1.6%)	
Meal size				
Small	158 (31.8%)	53 (21.6%)	105 (41.7%)	(0.000)
Medium	242 (48.7%)	116 (47.3%)	126 (50.0%)	
When stops eating				
Until feeling half full	108 (21.7%)	39 (15.9%)	69 (27.4%)	0.001
Until feeling completely full	276 (55.5%)	136 (55.5%)	140 (55.6%)	(0.000)
Until the plate is empty	113 (22.7%)	70 (28.6%)	43 (17.1%)	(0.000)
Types of diet				
Vegetarian	2 (0.4%)	1 (0.4%)	1 (0.4%)	0.984
Other	495 (99.6%)	244 (99.6%)	251 (99.6%)	
Meals in front of TV				
2 or less/week	120 (24.1%)	55 (22.4%)	65 (25.8%)	8.63
2-4/week	223 (44.9%)	99 (40.4%)	124 (49.2%)	0.013
Daily	154 (31.0%)	91 (37.1%)	63 (25.0%)	

vigorous-intensity activity. We categorized physical activity (short form) according to the official IPAQ scoring protocol [35] as low, moderate and high.

Data analysis

Frequencies, means and standard deviations were used to describe various socio-demographic, lifestyles, dietary and anthropometric characteristics. Chi squared test and students t- test were used to compare proportions and means respectively. The odds of being overweight or obese were determined using multivariate binary logistic regression analysis models where all the covariates were entered simultaneously each as an independent variable. All analysis was two tailed and a P-value of <0.05 was considered statistically significant. All analysis was performed using the statistical package for social sciences (version 21, Armonk, NY, USA).

Results

Characteristics of the subjects

A total of 497 university students with complete data was included in the analysis; 50.7% were females (N=245) and the remaining 49.3% were males (N=252). The mean age of participants was 20.1 ± 1.7 years, ranging between 17 and 25 years. Significantly higher differences were detected between male and female university students with respect to mean age, and field of study. (p<0.001). No significant differences were detected regarding the type of current residence and living conditions either alone or with family or friends, number of semesters after joining the university and family medical history (Table 1).

Anthropometric measurements

The results of this study showed that the overall prevalence of overweight and obesity was 26.7% whereas; the prevalence of underweight among the students was only 4% (Table 2). Based on BMI classification, the prevalence of overweight and obesity was significantly more common among male students compared to females (36.3% vs.17.1%, respectively). On the other hand, 7.1% of the female students were underweight as compared to only 1.6% males. There were no significant differences detected as regards the central obesity assessed by waist circumference between the male and female students.

Dietary intake patterns and behaviours

The dietary intake patterns were compared by gender as shown in table 3. Unhealthy eating patterns were observed among both males and females where the majority (76.9%) of the students reported taking meals irregularly. Both males and females consumed less than 3 meals per day with males having a significantly higher number of meals than females.

Based on gender, there were significant differences of students' dietary habits (Table 3). Males tend to eat more frequently at fast food restaurants as compared to females (40.4% males vs. 21.8% females eats 2-3 times/week). Concerning the meal size females tend to choose smaller (41.7% vs21.6%) or medium (50% vs.47.3%) sized meals while males tend to choose more the larger meals (31% vs. 8.3%). In addition a higher percentage of male students reported more frequently eating meals while watching television. On the other hand, 56.7% of the female students reported eating breakfast daily compared to 50.6% male students but the difference did not reach statistical significance.

Analysis of the semi-quantitative FFQ had shown significant differences between male and female university students with respect to their consumption of individual food categories regularly consumed by the Lebanese population. Males consumed more carbonated beverages, pastries, Sweetened artificial juice, fresh fruit juice and fried foods than females (Table 4).

Physical activity and lifestyle behaviours

Table 5 describes the smoking status and physical activity levels based on gender. Smoking was significantly more prevalent among males than females. The majority of the female students (76.2%)

Table 4: Food frequency intakes of some dietary items.

Variable	Total (N=497)	Males (N=245)	Females(N=252)	p-Value
N (%)				
Whole fruits				
Never/rarely	52 (10.5%)	32 (13.1%)	20 (7.9%)	0.12
1-2 times/week	123 (24.7%)	66 (26.9%)	57 (22.6%)	
3-4times /week	105 (21.1%)	49 (20.0%)	56 (22.2%)	
>5 times/week	217 (43.7%)	98 (40.0%)	119 (47.2%)	
Fresh fruit juice				
Never/rarely	140 (28.2%)	56 (22.9%)	84 (33.3%)	(0.000)
1-2 times/week	211 (42.5%)	94 (38.4%)	117 (46.3%)	
3-4times /week	85 (17.1%)	60 (24.5%)	25 (9.9%)	
>5 times/week	61 (12.3%)	35 (14.3%)	26 (10.3%)	
Vegetables				
Never/rarely	39 (7.8%)	20 (8.2%)	19 (7.5%)	0.152
1-2 times/week	111 (22.3%)	65 (26.5%)	46 (18.3%)	
3-4times /week	130 (26.2%)	60 (24.5%)	70 (27.8%)	
>5 times/week	217 (43.7%)	100(40.8%)	117 (46.4%)	
Milk/yogurt				
Never/rarely	160 (32.2%)	67 (27.3%)	93 (36.9%)	0.139
1-2 times/week	154 (31.0%)	81 (33.1%)	73 (29.0%)	
3-4times /week	74 (14.9%)	41 (16.7%)	33 (13.1%)	
>5 times/week	109 (21.9%)	56 (22.9%)	53 (21.0%)	
Pastries				
Never/rarely	64 (12.9%)	24 (9.8%)	40 (15.9%)	(0.000)
1-2 times/week	171 (34.4%)	69 (28.2%)	102 (40.5%)	
3-4times /week	104 (20.9%)	55 (22.4%)	49 (19.4%)	
>5 times/week	158 (31.8%)	97 (39.6%)	61 (24.2%)	
Carbonated beverages				
Never/rarely	127 (25.6%)	40 (16.3%)	87 (34.5%)	(0.000)
1-2 times/week	92 (18.5%)	38 (15.5%)	54 (21.4%)	
3-4times /week	74 (14.9%)	39 (15.9%)	35 (13.9%)	
Sweetened artificial juice				
Never/rarely	154 (31.0%)	57 (23.3%)	97 (38.5%)	(0.000)
1-2 times/week	147 (29.6%)	72 (29.4%)	75 (29.8%)	
3-4times /week	103 (20.7%)	55 (22.4%)	48 (19.0%)	
>5 times/week	93 (18.7%)	61 (24.9%)	32 (12.7%)	
Sweet snacks				
Never/rarely	65 (13.1%)	38 (15.5%)	27(10.7%)	0.347
1-2 times/week	117 (23.5%)	52 (21.2%)	65 (25.8%)	
3-4times /week	131 (26.4%)	65 (26.5%)	66 (26.2%)	
>5 times/week	184 (37.0%)	90 (36.7%)	94 (37.3%)	
Salty snacks				
Never/rarely	126 (25.4%)	65 (26.5%)	61 (24.2%)	0.567
1-2 times/week	167 (33.6%)	87 (35.5%)	80 (31.7%)	
3-4times /week	86 (17.3%)	38 (15.5%)	48 (19%)	
>5 times/week	118 (23.7%)	55 (22.4%)	63 (25.0%)	
Coffee/tea				
Never/rarely	70 (14.1%)	24 (9.8%)	46 (18.3%)	0.013
1-2 times/week	67 (13.5%)	30 (12.2%)	37 (14.7%)	
3-4times /week	70 (14.1%)	32 (13.1%)	33 (15.1%)	
>5 times/week	290 (58.4%)	159 (64.9%)	131 (52.0%)	
Fried food				
Never/rarely	55 (11.1%)	25 (10.2%)	30 (11.9%)	0.021
1-2 times/week	193 (38.8%)	81 (33.0%)	112 (44.4%)	
3-4times /week	152 (30.6%)	81 (33.1%)	71 (28.2%)	
>5 times/week	97 (19.5%)	58 (23.7%)	39 (15.5%)	

Table 5: Physical activity and lifestyle behaviors.

Variable	Total (N=497) (%)	Males (N=245) (%)	Females (N=252) (%)	p-Value
Smoking status				
Never smoked	297 (59.8%)	105 (42.9%)	192 (76.2%)	(0.000)
Previous smoker	52 (10.5%)	35 (14.2%)	17 (6.7%)	
Current smoker	148 (29.8%)	105 (42.9)	43 (17.1%)	
Physical activity				
Inactive	217 (43.8%)	79 (32.2%)	138 (55.0%)	(0.000)
Active	279 (56.3%)	166 (67.8%)	113 (45.0%)	
Low	217(43.8%)	79 (32.2%)	138 (55.0%)	(0.000)
Moderately active	180 (36.3%)	90 (36.7%)	90 (35.9%)	
High active	99 (20.0%)	76 (31.0%)	23 (9.2%)	

Table 6: Association between overweight/obesity and socio-demographic, dietary and lifestyle behaviors among university students.

Variable	Odds Ratio	95% CI
Age	1.173	0.928, 1.481
Gender		
Male	1	0.244, 0.893
Female	0.467	
Breakfast frequency		
Not Daily	1	0.312, 0.958
Daily	0.547	
Smoking status		
Never Smoked	1	
Previous Smoker	0.823	0.308, 2.196
Current Smoker	1.581	0.848, 2.948
Frequency of eating at TV		
≤2/Week	1	
2-4/Week	1.006	0.513, 1.970
Daily	0.775	0.367, 1.635
Health sciences student		
No	1	0.014, 0.881
Yes	0.109	
Family history		
No	1	
Yes	1.193	0.688, 2.069
Number of snacks	0.847	0.559, 1.282
Food score tertiles		
Tertile 1	1	
Tertile 2	1.153	0.568, 2.338
Tertile 3	1.852	0.933, 3.678
Physical activity		
No	1	0.479, 1.468
Yes	0.839	
Frequency of eating at restaurant		
0-1 Times per week	1	
2-3 Times per week	0.858	0.453, 1.623
5 times or more per week	0.757	0.273, 2.098
Meal size		
Regular	1	
Medium	0.69	0.371, 1.285
Large	1.262	0.579, 2.752
GPA	1.061	0.609, 1.849
Friends		
Rarely	1	
Twice a week	1.293	0.641, 2.606

Daily	1.374	0.672, 2.807
Trigger to stop eating		
Until feeling half full	1	
Until feeling completely full	0.721	0.353, 1.471
Until the plate is empty	1.494	0.657, 3.401
Type of diet		
Vegetarian	1	
Other	0.466	0.024, 9.235
Nutrition knowledge score	0.903	0.673, 1.212
Weight control measures		
No	1	0.153, 2.807
Yes	0.655	
Residence		
Living with parent	1	0.363, 4.003
Living with others	1.206	
Academic year		
1st Year	1	
2nd Year	1.129	0.099, 12.886
3rd Year	1.081	0.096, 12.148

reported that they had never smoked, on the other hand a significant ($p<0.001$) higher percentage of male students (42.9%) reported that they are currently regular smokers compared to only 17.1% of the female students.

The overall prevalence of low physical activity among the studied sample was 43.8%. The prevalence of low physical activity was significantly higher among females (55%) compared to 32.2% in males.

Association between overweight /obesity and socio-demographic, dietary and lifestyle behaviors among university students

Multivariate binary logistic regression analysis revealed that daily breakfast consumption (OR: 0.531, 95% CI: 0.299,0.941) female sex (OR: 0, 95% CI:) & being a health science student (OR: 0.11, 95% CI: 0.014, 0.883) was found to be the strongest protective factors for the development of overweight and obesity among university students as shown in table 6.

Discussion

Obesity is the most rapidly growing form of malnutrition [1,2]. Overweight and obesity in youth are powerful indicators of being overweight in adulthood and related chronic diseases [5]. The transition from school into university is usually coupled with a combination of stress, which can have a significant impact on students' health and lifestyle choices [36]. When students fail to adapt adequately this could have negative consequences towards their health behaviours and subsequent weight status [37]. The aim/objective of the present study was to assess the prevalence of obesity of university students living in north Lebanon and to investigate the associated dietary and lifestyle risk factors.

The findings of the present study revealed that more than one quarter of the studied sample were overweight and obese. In addition, a higher percentage of males were overweight and obese compared to females 36.3% vs. 17.1%, respectively), while a higher percentage of females were underweight (7.1% of females versus 1.6% of males). These findings were comparable with some of the reported data in the Middle East and Europe. In Lebanon almost similar figures were reported among university students living in the capital [20]. In the United Arab Emirates, a cross-sectional survey reported that the prevalence rate of obesity was 35.7% in males and this figure was higher than the rate in female [38]. In Saudi Arabia evaluation of weight status of 357 male university students showed that the prevalence of overweight and obesity was 37.5% [39]. A recent study which evaluated the prevalence of overweight and obesity from 22 low and middle income and emerging economy countries 2014, reported that in Egypt the prevalence rates of overweight and obesity were significantly higher in males than females but both rates were much higher than the findings of the present study (50.8% and 33.8% in males and females respectively) [40]. Published data among 390 medical students in Northern Greece showed consistent figures among males but lower figures among females (males: 38%, females: 9.6%) [41].

On the other hand, some studies reported overall lower prevalence rates of overweight and obesity. Published data among Lebanese university students by Salameh et al. [21], in which a self-reported BMI was used to assess weight status, revealed lower rates of overweight and obesity. In Tunisia compared to figures of the present study, the prevalence, rates of overweight and obesity were lower among males but higher among females (28.8%, 25.3% respectively) [40]. Moreover; much lower prevalence rates ranging from 10% to 14% among university students had been reported in China, Turkey and Iran [42-44].

The lower rate of obesity among female students can be explained by the fact that females are more concerned about their body shape and weight status than males, due to cultural perceptions which encourage females to be slimmer. And thus may adopt various restrictive behaviours to limit their caloric intake and avoid weight gain [45,46]. In contrast studies among female university students in Saudi Arabia and Nigeria [47,48], reported a higher prevalence rates of overweight and obesity compared to males and the authors attributed that to socio-cultural factors, body image misconception, physical inactivity and early marriage.

It has to be noted that differences encountered in the prevalence of overweight and obesity rates across countries may be attributed to socio- cultural factors, environmental, physical activity levels and nutritional knowledge and health awareness in these diversities of study samples across countries [49].

Research suggests that University students between the ages of 18 and 24 years have a high tendency to engage in unhealthy dietary and lifestyle habits including meal skipping, high fast food consumption and minimal physical activity [5,50]. Analysis of the dietary habits of the students in the present sample revealed an alarming adoption of unhealthy eating patterns and lifestyle habits. Our Results had shown that the majority of the studied sample (76.9%) had an irregular consumption of meals and students of both sexes have less than 3 meals daily (mean=2.43 ± 0.7). Furthermore, almost half of the students (46.3%) reported not having breakfast daily. These results were controversial to those previously reported among Lebanese university students, medical students in Greece, or in Turkey [20,41,51]. With the exception of high consumption of fried foods among Lebanese students, these studies indicated a far healthier eating pattern of the majority of students in terms of meal frequency, regularity and daily breakfast intake. This controversy could be attributed to the discrepancy in the levels of nutritional knowledge among those students and students of the present study. Students living in the capital city of Lebanon, medical students and those living in more developed countries could have better nutritional knowledge compared to students living in north Lebanon. This assumption has been further indicated in the present study by the finding of a significant association between health sciences students and lower tendency for the development of obesity.

It has been documented in the literature that regular breakfast intake is associated with a reduction in dietary fat, reduced impulsive snacking, lower cholesterol and lower body weight [52,53]. This was in accordance with our findings which revealed that daily breakfast intake was a significant protective factor against the development of overweight and obesity. Daily consumption of snacks in the present study was found to be significantly higher in males. However, the frequency of having snacks does not provide safe information about snack size and type [20].

A large proportion of male students in the present study reported a significantly higher frequency of fast food intake and larger meal sizes compared to females. These results were in accordance with published studies among university students in Northern Greece and Midwestern University in "country name" [41,54]. This could be explained by the fact that male students often select fast food due to its palatability, availability and convenience but females may have some concerns of the frequent consumption high fat meals in order to control their weight [55].

Females had shown healthier eating habits in terms of more frequent intake of fruits and vegetables, lower intake of fried food, carbonated drinks, pastries and sweetened artificial juices and had a significantly healthier diet score than males. The findings of lower intake of fruits and vegetables (healthy) and higher consumption of fast foods, fried foods and salty and sweet snacks of in the present compared to previously reported data among university students and youth populations in developed and developing countries [20,56,57] suggest the necessity of prompt actions to enhance adoption of more healthy eating habits.

The most important risk factors for the development of non-communicable diseases include Physical inactivity and tobacco smoking [58]. Evaluation of the physical activity levels of the present sample indicated a high prevalence of physical inactivity. Male students reported significantly higher levels of physical activity than females. This was in accordance with a recent study among Qatari students [59]. Although the link between physical activity and lowering the risk of obesity among both males and females has been established in a number of previous studies [56,60-62], the present study did not show a significant association between physical inactivity and overweight and obesity. Similar findings had been reported by other researchers who did not find a link between physical inactivity and overweight/obesity either for male or female students despite showing that the men are more likely to engage in physical exercise in their free time [63]. Other studies indicate that the relationship between BMI and physical activity occurs only among men [40,64].

As regards smoking status, smoking was uncommon among the students (29.8%) especially among females (17.1%). This was in accordance with previously reported data in Lebanon which reported that 62.4% of the students do not smoke, 7.2% were ex-smokers and 30.3% were current smokers [20]. On the other hand controversial data were reported among university students in Spain and other European countries where a higher prevalence of smoking was detected among females [56,65]. This could be attributed to the differences in socio-cultural and behavioural factors between Lebanon and these western countries.

Conclusion

The current research provides valuable data that could be used by policy makers, and university directors to plan strategies aiming at improving the health of future generations in Lebanon. The prevalence of overweight and obesity in the present sample may be lower in comparison to other published studies, but it is not low for what is considered to be health promoting and for disease prevention. Students had shown a relatively alarming prevalence of unhealthy dietary practices and lifestyle behaviours that should be targeted and modified. This could be achieved through promoting intervention programs that lead to changing the built environment and affecting behavioural modification of student's lifestyle and dietary habits. Universities represent a great opportunity for focused nutritional education programmes. Promoting healthy dietary and weight management practices might be of great importance when developing health education programs.

University students are thought to be a significant proportion of the socio-economic elite of tomorrow and thus their habits and behaviours are most likely to become the norm. Therefore mobilization of governmental efforts and drawing the attention of international agencies and local communities is needed to reduce the prevalence of overweight and obesity through proper educational practices, public health campaigns, and intervention programs.

Study Limitations

The findings of this study are limited by the use of a sample of students from just one university which may not be a representative of all university students in north Lebanon. Although, students attending Beirut Arab University include diversity of socio-economic standards but the majority are from the middle class therefore, samples from different universities may provide a more inclusive picture of university students taking into consideration religion and socio-economic status. However, baseline data about weight status and dietary habits among a sample of university students was certainly obtained from the present study to illustrate the risk factors associated with obesity among university students in North Lebanon which has not been reported before.

Author Contributions

Germine El Kassas conceived and designed the study; she contributed towards the questionnaire design, data collection supervision, statistical analysis, data interpretation, drafting and finalizing the manuscript. Leila Itani had contributed significantly towards the statistical analysis, revising and approving the final version of the manuscript. Zeina El Ali was involved in the data collection, and data entry.

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Conflict of Interest

No conflict of interest had been found between authors.

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