

Factors Associated with Obesity Among Palestinian University Students in West Bank

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Abstract

Background: Obesity and overweight among college and university students have caused a prime public health apprehension. Young adults with high BMI often become obese individual in late adulthood, consequently becoming at a high risk to develop chronic diseases. Therefore, this cross-sectional study aims to explore the prevalence of obesity and overweight among Palestinian students in universities, and their relationship with sociodemographic factors, dietary habits, psychosocial factors, and physical activity level.

Methods: A total sample of 1243 students, 772 (62.1%) females and 471 (37.9%) males, were included in the final analysis. The nutritional status was assessed using anthropometric measurements and dietary habits. Weight status was defined according to BMI WHO cut off points. Anxiety, stress, and depression were assessed using Arabic version of the Depression Anxiety Stress Scales. A short form of the Arabic version of IPAQ questionnaire was used to assess physical activity level.

Results: The results revealed that obesity prevalence was 3.3% and overweight was 16.10% among the students. Obesity was significantly more common among males, and those who are studying scientific specialization. Weight status was significantly related to anxiety ($P < 0.05$). Among the psychosocial factors, students with normal weight had significantly higher anxiety scores than obese or overweight students ($P < 0.05$). Obesity and overweight were significantly associated with lower self-satisfaction ($P < 0.05$).

Conclusion: The prevalence of obesity and overweight was low among the study sample. In spite of this, there is a need to promote intervention educational programs to improve their lifestyle in terms of physical activity and dietary habits.

Keywords: Undergraduate students, physical activity, obesity, psychosocial factor

Introduction

Obesity, which is defined as an excess body fat, is a complex, multifactorial, and largely preventable disease, affecting along with overweight, over a third of the world's population today.¹ Internationally, there is a growing rate of obesity in both developing and developed countries.² The prevalence of obesity has tripled in developing countries over the past 20 years as they quickly become more civilized, with raised consumption of empty calorie foods and adoption of a more sedentary lifestyle.^{2,3}

All the evidence points to an increasing trend of obesity among young adults, especially undergraduates. As many young adults undergo drastic alterations in their lifestyle such as leaving home, going to university, working, getting married, or even becoming pregnant. These important milestones in young adults' life, increase their likelihood to energy imbalance leading to weight gain, which maybe not important at that time but it can accumulate later in life.⁴

Previous studies, conducted among undergraduate university students in different developing countries, have showed an increased rate of overweight and obesity: Nigeria: 10%;⁵ Egypt: 25.3%–59.4%;^{6,7} Saudi females: 47.9%;⁸ Oman: 28.2%;⁹ Kuwait: 42%.¹⁰

Former studies revealed that factors associated with obesity are multifactorial in origin. In a former research,¹¹ the following factors were found to be associated with obesity among university students: (1) sociodemographic characteristics (especially males, older age students, and those with a high socioeconomic status); (2) Social factors: lack of social support, capital, and religiousness; (3) Dietary habits: low

intakes of fiber, high consumption of red meat, skipping meals especially breakfast, snacking behaviour, and excessive intake of energy by consuming a large number of meals per day; (4) Health risk behavior: physical inactivity, smoking, frequent alcohol consumption; and (5) Mental health and childhood abuse: depression, anxiety, sexual and verbal abuse.

Obesity has been recognized as a risk factor for the development of health issues including; type 2 diabetes, hypertension, cardiovascular disease, dyslipidemia, stroke, gallbladder disease, osteoarthritis, sleep apnea and breathing problems, some cancers (breast, colon, endometrial, kidney, gallbladder, liver), low quality of life, and mental illness (depression, anxiety, stress). Moreover, obesity is perceived as a risk factor for the development of bulimia nervosa.¹²

Psychosocial factors play a fundamental part in the etiology of obesity, and a great number of studies have shown that depression can be both a cause and a consequence of obesity with a bidirectional association.¹³ In USA, several researches have revealed an association between a lifetime diagnosis of mood disorders and overweight or obesity.^{14–16} A meta-analysis conducted by Blaine¹⁷ has supported the effect of adolescent depression on weight gain in adulthood.

Moreover, there is evidence that engaging in daily physical activity reduces the risk of developing obesity and promotes psychosocial well-being. Participating in sports activities throughout adolescence is usually continued into adulthood. Opportunities for engaging in physical activity are related to economic, cultural, and social factors. The age of undergraduates (18–25 years) is deemed as transition period between late adolescence and young adulthood, which is differentiated by autonomous living and increasing the risk to gain weight.

Physical inactivity, alterations in dietary habits during this period of life play an essential role in causing overweight and obesity.¹⁸

In Palestine, there is a lack of data about obesogenic factors which are essential in comprehending the high risk factors which should be focused for future alterations in public health interventions. Thus, this study was performed to determine the prevalence of obesity and overweight, psychosocial characteristics, and physical activity levels of undergraduates. We further want to examine if obesity and overweight are associated with physical activity level and psychosocial characteristics.

The Methodology and Study Instruments

Study Design, Settings, and Population

The current study utilized a cross-sectional design with an objective to explore the prevalence of obesity and its relationship with psychosocial factors and physical activity levels among Palestinian university students in the West bank region. The participants were selected from eight well-known universities in the region.

Sampling Procedure

The sample is drawn by cluster random sampling. The representative sample size calculation was based on the following formula:¹⁹

$$n = \left(\frac{z}{E} \right)^2 p(1-p).$$

Using 97% confidence level ($z = 2.17$), estimation error ($E = 0.03$), and the prevalence ($p = 0.5$), this formula gives $n = 1300$. Only students who agreed to sign the consent form were included in the data collection. The exclusion criteria included students with medical conditions, missing primary outcome data, and those who refused to join the study or sign the consent form.

Ethical Consideration

The study protocol was approved by the Internal Board Review Ethical Committee at An-Najah National university. All universities were sent a formal letter in order to participate in the study, and they were instructed about the study design, objectives, and the sort of data that would be gathered, with confirmation on the elective subscription. After the approving the request, the research team visited the universities' campuses and randomly invited the students who were available in campus during the data collection. The undergraduates, who concur to sign the approval letter, were involved in data gathering procedure.

Data Collection and Research Tools

Data collection started in September 2018 till June 2019. The collected data included sociodemographic characteristics: age, gender, marital status, place of living, academic achievement and field of study, monthly income and expenses, living status, self-reported medical history and smoking. The

participants' nutritional status assessment was done using the anthropometric measurements (weight and height).²⁰ The measurements were measured in duplicate then the mean was recorded. The BMI was calculated from the weight and height.²¹ Self-reported questions regarding the dietary habits and were also included in the data sheet. The questionnaire also included two commonly used scales; IPAQ²² and DASS.²³

In the current study, a validated Arabic version of Depression Anxiety Stress Scales (DASS) were used to assess the psychosocial parameters. The short form of DASS is composed of 21 instrument measuring current ("over the past week") symptoms of depression, anxiety, and stress. Participants were asked to use a 4-point combined severity/frequency scale to rate the extent to which they have experienced each item over the past week. The scale ranges from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). Scores for depression, anxiety, and stress were calculated by summing the scores for the relevant items.²³

The questionnaire collects information on the time (i.e., number of days and average time per day) spent being physically active and measures vigorous-intensity activity, moderate-intensity activity, walking activity, and sitting in the last consecutive seven-day period. These activity categories may be treated separately to obtain the specific activity patterns or multiplied by their estimated value in Metabolic Equivalent of Tasks (METs) and summed to gain an overall estimate of physical activity in a week <http://www.ipaq.ki.se>. One MET represents the energy expended while sitting quietly at rest and is equivalent to 3.5 ml/kg/min of VO_2 Max.²² The MET intensity values used to score IPAQ questions in this study were vigorous (8 METs), moderate (4 METs) and walking (3.3 METs) <http://www.ipaq.ki.se>. The IPAQ sitting question is an indicator of the time spent in sedentary activity and was not included as part of the summary score of total physical activity.

Statistical Analysis

All statistical analysis was carried out using the Statistical Package for Social Sciences (SPSS) software version 22 (IBM-SPSS Statistics 21). An alpha level of (0.05) was considered for all the statistical tests used in the study. Two-sided P values of (0.05) and (80%) power were considered to be statistically significant. The data were analyzed according to variable types. The descriptive analysis for the prevalence of obesity was done by calculating the frequencies and percentages. The association between the categorical variables were analyzed using Chi-square tests including place of living, faculty, marital status and body mass index, dietary habits and physical activities. The mean difference between the groups were done either by independent t -test or one-way analysis of variance (depression, anxiety, stress, physical activity).

The Results

Students' Recruitment

Figure 1 shows the participant recruitment steps, among the total of 1406 participants, only 1243 students were included in the final analysis: 772 (62.1%) females and 471 (37.9%) males. The rest of the participants were excluded mainly due to missing data in the DASS questionnaire.

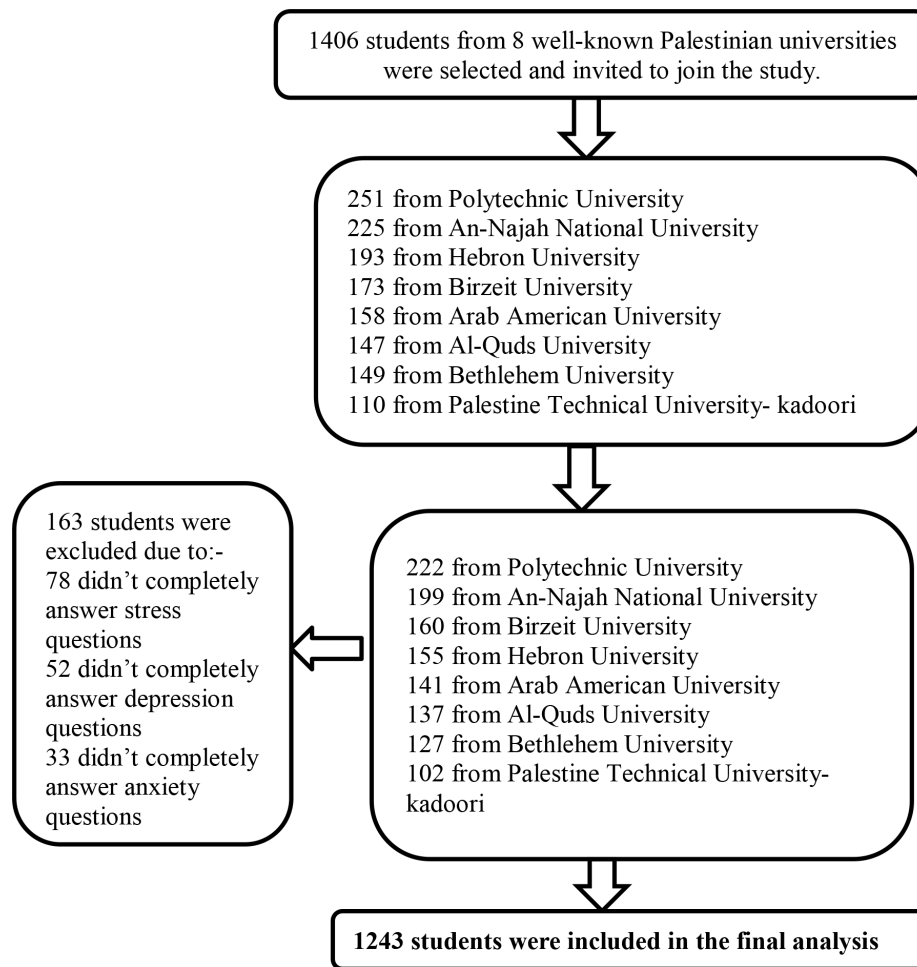


Fig. 1 Participants recruitment flow chart.

Students' Characteristics

Students' characteristics are summarized in [Table 1](#). Students were composed of males (37.9%) and females (62.1%). In the general sample, the mean age was 20.1 ± 1.4 years, ranged from 18–29 years old. Participated students belong to eight well-known Palestinian universities. Nearly half of the students (53.5%) were studying literary specializations, while the rest were studying scientific specializations. Almost all the participants (91.2%) stated to be single, while (5.3%) stated to be married and only (3.5%) stated to be others (separated, divorced). Nearly (29.8%) of participants were in their second year, (26.1%) in their third year, (22.0%) in their first year, (17.0%) in their fourth year, and only (5.1%) in their fifth year. Half of the participants (50.8%) were living in cities, (45.7%) were living in village, while the rest (3.5%) were living in camps. The majority of participants (88.7%) were living with their families, while only (11.3%) were living in university hostels. And according to their academic achievements, the majority (58.2%) were getting good grades, while the minority got (5.9%) were getting excellent grades. Moreover, family income for half of the students (47.7%) was around 3000–5000 NIS per month. Studying expenses for our participants was funded mainly by their families by a percentage of (80.5%).

Medical History of Students

Most of the participants (70.0%) stated that they are non-smokers. It is also found that smoking is more common by eleven times among males compared to females. Moreover, almost all the participated students (96.0%) were not suffering from chronic diseases.

Nutritional Status of the Students

The results revealed that majority of the participants (71.8%) had a normal weight, while the minority of participated student (3.30%) were classified within obesity category. As it can be seen from [Figure 2](#), obesity was more prevalent among males by (68.3%) than females by (31.7%).

Dietary Habits and Practices

Our results reveal that (35.9%) of students often eat three meals per day. Eating between basic meals on a daily basis was a habit for around (31.3%) of participants. A low percentage of students (10.1%) reported that they don't skip basic meals "e.g. breakfast, lunch, dinner". Around half of students (40.7%)

Table 1. **Socio demographic characteristics of students according to gender**

Variables		Males		Females	
		N	%	N	%
University name	Palestine Polytechnic University	106	47.7	116	52.3
	Hebron University	64	41.3	91	58.7
	Al-Quds University	65	47.4	72	52.6
	Bethlehem University	25	19.7	102	80.3
	An-Najah National University	71	35.7	128	64.3
	Birzeit University	59	36.9	101	63.1
	Arab American University	67	47.5	74	52.2
	Palestine Technical University	14	13.7	88	86.3
Field of study	Art	224	33.7	441	66.3
	Science	247	42.7	331	57.3
Marital status	Single	433	28.2	700	61.8
	Married	11	16.7	55	83.3
	Other "separated, divorced, widow"	27	61.4	17	38.6
Academic year	1st year	95	34.8	178	65.2
	2nd year	123	33.2	248	66.8
	3rd year	124	38.3	200	61.7
	4th year	90	42.7	121	57.3
	5th year	39	60.9	25	39.1
Academic achievement	Excellent	30	41.1	43	58.9
	Very good	125	36.0	222	64.0
	Good	276	38.2	447	61.8
	Fair	40	40.0	60	60.0
Area of living	City	240	38.0	391	62.0
	Village	211	37.1	357	62.9
	Camp	20	45.5	24	54.5
Study funding	Student	145	87.9	20	12.1
	Family	283	28.3	717	71.7
	Scholarships	25	45.5	30	54.5
	Other (e.g. organizations)	18	78.3	5	21.7
Family income	<3000	69	33.8	135	66.2
	3000–5000	191	32.4	398	67.6
	>5000	211	46.9	239	53.1
Type of housing	With family	400	36.3	702	63.7
	University hostels	71	50.4	70	49.6

often eat fast foods whereas only (4.6%) don't eat these type of foods. Moreover, a high percentage of students (41.4%) reported that they always eat meals with their families. Furthermore, (39.9%) of students were satisfied about their weight and shape. A low percentage of students (5.7%) always follow a diet plan and nearly greater than half of students (66.1%) follow a diet plan in order to lose weight.

Physical Activity Level of the Participants

The overall results of the physical activity revealed that nearly half of students (46.9%) are allocated in moderate physical

activity category, while (31.5%) of students were classified as having a high physical activity level and only (21.6%) of them have a low physical activity level. Table 2 reveals that high physical activity level was more predominant among Birzeit university students (38.8%) compared to other universities, followed by Palestine polytechnic university by (33.3%). Whereas Arab American university represents the highest percentage of students (29.8%) engaging in low physical activity, followed by Palestine technical university (29.4%). Furthermore, it was noticed that Palestine polytechnic university recorded the highest percentage of students (54.1%) who engage in moderate physical activity, followed by Hebron university students

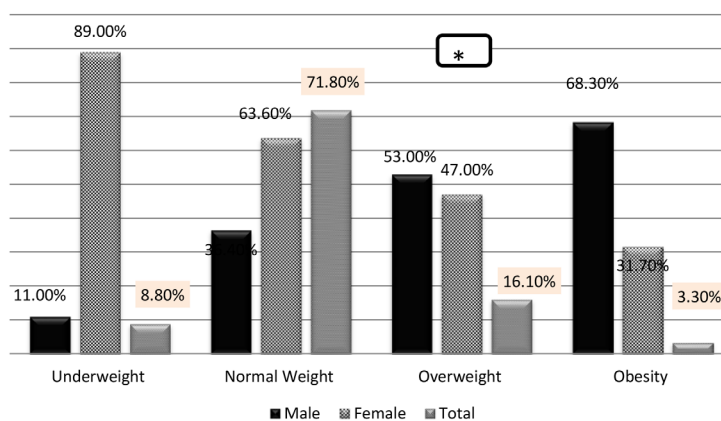


Fig. 2 Body mass index of the participants according to gender. *Significant at $P < 0.05$ using Chi square test.

Table 2. The association between physical activity level and socio-demographic variables

		Physical activity level			P-value
		Low N (%)	Moderate N (%)	High N (%)	
Marital status	Single	242 (21.4)	527 (46.5)	364 (32.1)	0.246
	Married	15 (22.7)	38 (57.6)	13 (19.7)	
	Other "separated, divorced, widow"	11 (25.0)	18 (40.9)	15 (34.1)	
Area of living	City	135 (21.4)	294 (46.6)	202 (32.0)	0.560
	Village	119 (21.0)	271 (47.7)	178 (31.3)	
	Camp	14 (31.8)	18 (40.9)	12 (27.3)	
Family income	<3000	51 (25.0)	98 (48.0)	55 (27.0)	0.196
	3000–5000	123 (20.9)	287 (48.7)	179 (30.4)	
	>5000	94 (20.9)	198 (44.0)	158 (35.1)	
Type of housing	With family	235 (21.3)	524 (47.5)	343 (31.1)	0.440
	University hostels	33 (23.4)	59 (41.8)	49 (34.8)	
University name	Palestine Polytechnic University	28 (12.6)	120 (54.1)	74 (33.3)	0.001*
	Hebron University	24 (15.5)	82 (52.9)	49 (31.6)	
	Al-Quds University	27 (19.7)	68 (49.6)	42 (30.7)	
	Bethlehem University	31 (24.4)	65 (51.2)	31 (24.4)	
	An-Najah National University	51 (25.6)	85 (42.7)	63 (31.7)	
	Birzeit University	35 (21.9)	63 (39.4)	62 (38.8)	
	Arab American University	42 (29.8)	55 (39.0)	44 (31.2)	
Academic year	Palestine Technical University	30 (29.4)	45 (44.1)	27 (26.5)	0.818
	1st year	54 (19.8)	135 (49.5)	84 (30.8)	
	2nd year	80 (21.6)	176 (74.4)	115 (31.0)	
	3rd year	76 (23.5)	151 (46.6)	97 (29.9)	
	4th year	46 (21.8)	89 (42.2)	76 (36.0)	
Field of study	5th year	12 (18.8)	32 (50.0)	20 (31.2)	0.009*
	Art	162 (24.4)	288 (43.3)	215 (32.3)	
	Science	106 (18.3)	295 (51.0)	177 (30.6)	
Academic achievement	Excellent	16 (21.9)	30 (41.1)	27 (37.0)	0.188
	Very good	71 (20.5)	153 (44.1)	123 (35.4)	
	Good	152 (21.0)	356 (49.2)	215 (29.7)	
	Fair	29 (29.0)	44 (44.0)	27 (27.0)	

*Significant at P -value < 0.05 using Chi-square.

(52.9%). Low physical activity level, and moderate physical activity among females (24.1%), & (50.9%), respectively was significantly more prevalent than males. It was also observed that low physical activity (24.4%), and high physical activity level (32.3%) among students studying literary specializations was significantly more common than students who were studying scientific specializations. Data analysis further revealed that physical activity level is significantly associated with university name ($P < 0.05$). Table 2 summarizes the associations between physical activity level and socio-demographic characteristics.

Students Psychosocial Status

The findings indicate that the overall all mean of depression, stress, and anxiety scale were 16.15 ± 9.66 , 18.75 ± 9.50 , and 12.77 ± 8.17 , respectively. Upon categorizing depression, anxiety and stress scores into normal, mild, moderate and severe following the manual cut off points, the results revealed that 28.6% of students had normal anxiety, followed by (26.1%) moderate anxiety, (23.7%) extremely severe anxiety, (13.5%) severe anxiety, and only (8%) had mild anxiety. In terms of depression, (28.0%) of students allocated in moderate category, followed by (27.0%) in normal category, (17.2%) in severe category, (14.3%) in extremely severe category, and only (13.5%) had mild depression. Moreover, the results confirm that (29.7%) of students had mild stress, followed by (28.9%) had moderate stress, (22.0%) had normal stress, (13.9%) had severe stress, while only (5.5%) had extremely severe stress. Table 3 illustrate the association between psychosocial factors and sociodemographic variables. Gender was significant associated

with stress and anxiety scores with gender and funding source. It is also revealed that depression, stress, and anxiety scores were significantly related to monthly income. Furthermore, the results clearly shows that anxiety is significantly related to the field of study. In addition, stress and depression scores is significantly associated with university name. On the other hand, it was noted that psychological factors are not related to marital status, academic achievement, academic year, family income, area of living ($P > 0.05$ using Kruskal Wallis test), and type of housing ($P > 0.05$ using Mann-Whitney test).

Obesity & Overweight with Socio-Demographic Factors and Dietary Habits

Our findings reveal that obesity and overweight was significantly associated with gender, field of study, weight dissatisfaction and following a diet plan in order to lose weight or to treat a health problem, (P -value < 0.05 using Chi-square test).

Obesity and Psychological Factors

Table 4 reveals that stress and depression were not significantly associated with obesity and overweight with stress and depression. However, anxiety was significantly related to obesity and overweight.

Obesity and Physical Activity Level

Furthermore, there were no association between BMI categories and physical activity levels using Chi-square test.

Table 3. The association between psychosocial factors and socio-demographic variables

		Stress Mean \pm SD	Depression Mean \pm SD	Anxiety Mean \pm SD
Gender	Male	17.58 \pm 9.10	15.68 \pm 9.13	11.65 \pm 7.62
	Female	19.46** \pm 9.67	16.43 \pm 9.96	13.44** \pm 8.41
Income	<1500	20.40 \pm 9.94	18.65 \pm 10.64	14.25 \pm 8.69
	1500–3000	18.40 \pm 9.38	15.74 \pm 9.45	12.61 \pm 7.79
	>3000	18.45* \pm 9.39	15.53* \pm 9.30	12.28* \pm 8.34
Field of study	Art	19.08 \pm 9.27	16.57 \pm 9.45	13.27 \pm 8.27
	Science	18.36 \pm 9.75	15.66 \pm 9.88	12.17** \pm 8.01
University name	Palestine Polytechnic University	18.55 \pm 9.61	16.27 \pm 9.9	12.81 \pm 8.52
	Hebron University	20.29 \pm 8.55	17.14 \pm 9.41	14.11 \pm 8.00
	Al-Quds University	15.98 \pm 8.78	13.95 \pm 9.07	10.62 \pm 7.53
	Bethlehem University	18.28 \pm 9.49	15.46 \pm 8.87	12.39 \pm 8.01
	An-Najah National University	20.50 \pm 9.68	17.86 \pm 10.03	13.72 \pm 8.20
	Birzeit University	18.77 \pm 9.50	15.97 \pm 9.22	13.03 \pm 8.08
	Arab American University	18.42 \pm 9.97	15.31 \pm 10.14	12.82 \pm 8.40
	Palestine Technical University	18.09* \pm 9.77	16.21* \pm 9.84	11.56* \pm 7.89
Source of funding	Student	17.15 \pm 8.83	15.70 \pm 9.10	11.56 \pm 7.63
	Family	19.08 \pm 9.57	16.29 \pm 9.77	13.08 \pm 8.23
	Scholarships	15.92 \pm 8.88	14.14 \pm 8.42	9.70 \pm 7.83
	Other (e.g. organizations)	22.34** \pm 10.28	17.91 \pm 11.28	14.86** \pm 7.64

*Significant at P -value < 0.05 using Kruskal-Wallis test. **Significant at P -value < 0.05 using Mann-Whitney test. SD: Standard Deviation.

Table 4. The association between obesity & overweight with psychological factors

	Obesity & Overweight	Normal weight	P-value
	Mean ± SD	Mean ± SD	
Stress	18.34 ± 9.63	18.69 ± 9.41	0.654
Anxiety	11.69 ± 7.81	12.93 ± 8.17	0.040*
Depression	15.41 ± 9.63	16.11 ± 9.51	0.314

*Significant at P-value < 0.05 using Mann-Whitney test. SD: Standard Deviation.

Discussion

The aim of this study was to determine the prevalence of obesity and overweight and its relationship with socio-demographic variables and dietary habits among undergraduate students at Palestinian universities, and to investigate if overweight and obesity is associated with psychosocial factors (e.g. stress, depression, anxiety) and physical activity level.

Body mass index was used to assess weight status. Based on BMI categories of weight status, results of this study confirmed that majority of undergraduates were of normal weight. In the general sample, the majority of students (71.8%) has a normal weight status, whereas the prevalence of obesity was (3.3%) and overweight (16.1%). This existing prevalence of overweight and obesity among the study sample is not high, compared to prevalence in other countries. For instance, it was reported that the prevalence of overweight and obesity in university of Basque was around 17.5%,²⁴ similarly, the prevalence of obesity and overweight were also higher undergraduate students in Lebanon by 7.2%, and 24%, respectively compared to the current findings.²⁵

In the current study, weight status is significantly differed according to gender. Normal weight was more common among females (63.3%) as compared to males (36.7%), while, obesity and overweight were more prevalent among males by (55.6%) than females by 44.4%. This finding is consistent with aforementioned studies,²⁴⁻²⁷ where males had a higher tendency to overweight and obesity. The lower prevalence of obesity and overweight among female undergraduates is foresaw because females are more careful about their weight status than males, due to community perceptions which promote females to be skinny. This supposition was upheld by the fact that only (11%) of males were categorized as undergraduate compared to (89%) of females in our studied sample. Undoubtedly, models and actresses on television and fashion magazines have a powerful influence on female's image perception and body shape. Unfortunately, undergraduate females consider the weight and shape of movie stars and fashion models as the ideal body weight and shape to attain.²⁸

Furthermore, the current study found a significant association between being obese or overweight with weight dissatisfaction ($P < 0.05$). Similar findings were reported in many other studies; for example, individuals classified within obesity and overweight categories reported lower self-esteem, and body shape and body weight dissatisfaction which in turn might affect their general health.^{29,30} In a former study performed by Johnson and Wardle, it was confirmed that weight dissatisfaction is the primary etiology of emotional eating, psychological distress, and bulimic symptoms seen in people who are attempting to maintain their weight.³¹

University Student Dietary Patterns: An Analysis

Usually, university students don't follow a healthy eating habits. The standard university student meal is poor in fruits and vegetables and rich in fat. Most often, undergraduates choose fast food since its more available, convenient, and palatable.³² In the current study, data analysis of students' eating habits indicates a low percentage of students (12.6%) do not eat three basic meals per day and only (10.1%) of students skip their main meals. Moreover, it was observed that only (3.1%) of students do not eat their meals with their families. Wansink and his colleagues reported that friends' behaviors may be have an important role as friends model behavior for each other and engaging in activities together, including meals and physical activity. For instance, if two friends are having lunch together, one friend's decision to eat dessert, to skip the vegetables, to get an extra portion, may mean that the other is encouraged, or perhaps pressured, to do the same.³³ So, it seems that healthy eating habits are relatively common among undergraduates, and this explain why the prevalence of obesity was a little bit low compared to other countries.

Obesity and Psychosocial Factors

To the best of our knowledge, this is the first performed study to investigate the association between psychosocial factors and obesity among university students in Palestine. Our study revealed that obesity and overweight is not significantly associated with stress and depression, elucidated by the reported nonsignificant mean differences. In accordance with our finding, Elfhag and his colleagues have observed that depression was not related to body weight.³⁴ However, these results are not consistent with the former studies that confirmed a bidirectional association between obesity and depression. McLaren et al. investigated the relationship between BMI and mental health in a population-based study of adults in Canada and found that subclinical anxiety and depression was higher among men with obesity compared to men with normal weight.³⁵ In an Arab country, Saudi Arabia, a study performed on male undergraduate revealed a strong evidence for the association between weight status and depression.³⁶

Our result can be interpreted by the fact that the association between obesity and depression is neither single nor simple. As it is suggested by many researchers that the association between these two disorders can be affected by various factors including; gene-by-environment interactions, eating and physical activity, socioeconomic status (SES), childhood experiences, and teasing.³⁷

In this regard, psychosocial and cultural factors can have a considerable importance so it appears that in more

conventional societies in which competitiveness, individualism, feelings of superiority are not of great importance, individuals with obesity will be forbidden from obtaining social advantages. Moreover, in such societies physical appearance is not a primary value due to moral and religious beliefs. Thus obesity does not attribute to psychological pressure, thereafter, resulting in depression. In addition, traditions toward clothing especially for females can also have an essential role, so that in the societies enjoying freedom of clothing (e.g. non-Arabic countries), people with obesity may be negatively valued in terms of physical appearance, in contrast, this problem is less notable in societies where there is no such clothing freedom.³⁸

In terms of stress, we have noticed that body weight status is not significantly associated with stress. The result was consistent with another conducted in USA where it was confirmed that there were no significant differences found between stress and categorical body mass index scores.³⁹ The literature regarding stress and weight gain is not decisive, however, some former studies have reported that there is a significant relationship between obesity and stress.^{36,40} It seems that habitual stress triggers a preference toward foods that are high in fat and sugar.⁴¹ Stressed students tend to have higher BMI compared to less stressed students due to the frequent consumption of more energy dense food.³⁹ The lack of significant findings for this association could be attributed to the fact that the overall sample population showed little variance in BMI to begin with. Nearly 3.3% of all students were classified within obesity category.

However, our study demonstrated that obesity and overweight is significantly associated with anxiety. This result is consistent with several findings.^{35,36} Some researchers suggested that obesity may be related with anxiety disorders by several ways. Low self-esteem which might result in anxiety among people with obesity. As a consequence, they will hardly attempt to lose weight, which is usually done without planning and might lead to failure. And at the end, weight control leads to excessive anxiety and worry.⁴²

Weight Status and Exercise Patterns

There is scientific evidence that engaging in physical activities can have various advantages in terms of therapeutic and preventive effects on health.⁴³ We have supposed that Palestinian students recognize the impact of healthy lifestyles. Nevertheless, awareness is just a part of providing health promotion and expressing behaviors. Moreover, there is no evidence to show that this awareness can be converted into practice in terms of maintaining health.⁴⁴

The current study reported that (21.6%) of students had low physical activity level, (46.9%) had moderate and only (31.5%) had vigorous activity level. These figures of physical activity are similar to a former study conducted in Egypt.⁷

Our study showed significant difference in physical activity levels between male and female students. This result is consistent with a former Sudanese study [Yousif et al., 2019]. On the other hand, insignificant association between gender and physical activity had been documented by former studies.^{7,45}

Surprisingly, our results showed that overweight and obesity is not significantly related to physical activity level.

Similarly, many former studies have revealed no significant relationship between prevalence of obesity and physical activity level.^{7,46} In contrary, other studies showed either positive association⁴⁴ or negative association.⁴⁰ The insignificant association of physical activity level and weight status can be illustrated by the fact that the prevalence of students with obesity and overweight was relatively low.

Limitation

This study had several limitations. Firstly; university students are not representative of young adults in general, and maybe the overweight or obesity prevalence and its related factors may be varied in other sectors of the population. Secondly; the study was a cross-sectional study and the temporal relationships between dietary habits and practices cannot be established in such studies. Thirdly; further prospective studies are warranted to comprehend whether anxiety may lead to overweight or obesity or vice versa. Fourth; the questions that have been used to report dietary habits wasn't enough. Fourthly; we have utilized only short IPAQ version. Fifth; the study did not include an estimation of total calories intake per day. Another limitation of the study was that all information collected in the study was based on self-reporting. It is possible that certain practices were under or over reported. Nonetheless, the current study is considered the only one of its kind to explore if obesity and overweight is associated with physical activity level and psychosocial factors among Palestinian undergraduates.

Conclusion

In spite the fact that the study found a relatively low prevalence of obesity and overweight among Palestinian undergraduates. The administrations are encouraged to implement nutrition and health promotion programs to reduce the tendency of overweight and obesity, especially among male undergraduates and to improve their eating habits. Furthermore, there was only significant association between being obese or overweight with gender, field of study, and following a diet plan. The body shape and body weight satisfaction was significantly lower among obese and overweight compared to normal. Moreover, the relationship between physical activity level, depression, and stress was not significant with the weight status. However, it was confirmed that obesity or overweight is significantly associated with BMI categories. These findings have provided valuable data to researchers, and universities' administrations. Extracurricular physical activities and sports should be implemented by the administrations to encourage undergraduates to be more physically active; in particular among females, and those who are studying literary specializations. We suggest that future studies should use the long version of IPAQ questionnaire, and the researchers should measure waist and hip circumference because they are considered another indicators for abdominal fat and total body fat.

Data Availability

Data and material available upon request and with permission of Dr. Manal Badrasawi at m.badrasawi@najah.edu.

Conflicts of Interest

The authors declare that they have no competing interests.

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Declarations

Ethics Approval and Consent to Participate

This project acquired an ethical approval from the Institution review Board for Ethical approval from An-Najah National University. The research procedures were conducted in accordance with the principle expressed in the Declaration of Helsinki. Informed consent was obtained from all the participants involved in the study. The written consent of participation was taken before the data collection.

Consent for Publication

Not Applicable.

Availability of Data and Materials

The dataset used and analysed in this study is available from corresponding Author on reasonable request.

Competing Interest

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Authors' Contribution

The authors have contributed in the manuscript as the following; Manal Badrasawi: the principle investigator has written the study proposal and protocol and supervise the data analysis. Monjed Samuh: the co-investigator, approve the study proposal, supervise the data collection data entry, revise the data analysis, approve the final manuscript file. Suzan Zeidan and Azza Dabous participated in the study protocol revision, data entry and write the first draft of the manuscript. research data management, and data analyses.

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