Prevalence, Risk Factors and Psychosocial Status of Obese and Overweight Adolescents in Hebron City, Palestine

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Abstract

Background and aims: Obesity and overweight among children and adolescents have caused a prime public health apprehension because they are significantly associated with medical and psychosocial comorbidity. Children with high body mass index often become obese adults, who are at risk of many chronic conditions such as diabetes and cardiovascular disease. It is vital to further examine obesity and overweight in school children and identify their modifiable risk factors. Therefore, this cross-sectional study aims to explore the prevalence of obesity and overweight among Palestinian adolescents in secondary schools, and their relationship with sociodemographic factors, dietary habits, lifestyle, and healthy nutrition awareness. **Methods:** The participants were randomly selected from four different areas in Hebron city, Palestine. A total sample comprising 392 students, females (51.3%) and males (48.7%), was included in the final analysis. The nutritional status was assessed using anthropometric measurements and dietary habits. Obesity and overweight were defined using World Health Organization–Centers for Disease Control and Prevention sex-specific growth chart for children, aged 2 to 18 years. Anxiety, stress, and depression were assessed using Arabic version of the Depression Anxiety Stress Scales. **Results:** The results revealed that obesity prevalence was 3.3% and overweight was 13.8% among the students, with no significant association with gender, age, or area of living. Obesity and overweight were significantly associated with lower self-satisfaction ($P < 0.01$). **Conclusion:** Considerable prevalence levels of obesity and overweight were reported among the study sample. There is a need to promote intervention educational programs to increase students' awareness on obesity and overweight, and promote healthy diet intake and lifestyle among them.

Keywords: Adolescents, nutritional knowledge obesity, palestine, prevalence

INTRODUCTION

Obesity, defined as abnormal and surplus fat accumulation, has become an epidemic and a major health challenge in many parts of the world. Obesity and overweight could be described as the New World syndrome. The number of overweight and obese population dramatically increased as reported by the World Health Organization.[1] The report clearly pointed out that more than 1 billion adults were overweight and 300 million people were obese, with an increase in the obese people suffering from obesity comorbidities.[1] Recent research showed that this escalating epidemic of obesity could put population in many countries at risk of developing noncommunicable diseases, such as cardiovascular complications, diabetes, hypertension, and others.[1-3]

Although obesity has adverse health effects in all age groups, obesity among teenagers and adolescents is of special concern. Studies have demonstrated differences in global psychological concerns (emotional well-being, suicidal ideation, and peer concerns), social relationships, and school experiences (lower grade point, holding back grades, considering oneself as poor student, disliking, or even quitting school) between overweight and nonoverweight adolescents.[4,5] Moreover, prevalence of negative social, educational, and psychological reports tended to be the greatest among obese girls.[5] Adolescents

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with obesity face stigmatization and discrimination in many aspects of their lives, which would hinder their psychological well-being.[6] For example, Bener and Tewfik[7] reported that obesity is significantly associated with body image dissatisfaction and psychological problems among 500 Qatari female adolescents, aged 14 to 18. In their systematic review, Preiss *et al.*[8] reported a bidirectional association between depression and obesity; obese persons had a 55% increased risk of developing depression, whereas depressed persons had 58% increased risk of becoming obese.

The multifactorial causes of obesity have made the researchers' task more difficult in determining the direct and the most contributing causes, which include, for example, lifestyle, energy intake, environmental factors (home, school, social, and economic status), heavy marketing of energy dense foods, and preference and mental health. These factors play important roles in the rising prevalence of obesity worldwide.[1,3]

Obesity and overweight among young-aged children lead to have obese adults with comorbidities. Many studies showed that higher levels of body mass index (BMI) during childhood can predict overweight later in life.[9] Overweight children also had more cardiovascular risk factors, such as high blood pressure, hyperlipidemia, or elevated insulin levels, compared to nonobese children, which, in turn, increased the risk of these individuals to get earlier cardiovascular disease if they were tracked into adulthood.[10] Orthopedic problems, such as Blount's disease, skin fungal infections, and acanthosis nigricans, hepatic steatosis and steatohepatitis, pseudotumor cerebri, and psychological and behavioral problems were associated with childhood obesity.[10]

Middle East countries, including the Arab countries, Eastern Mediterranean countries, Turkey, Iran, and North Africa are witnessing similar global trend in the increase of obesity prevalence.[2] In Jordan, the age-standardized prevalence of obesity was 28.1% for men and 53.1% for women,[11] whereas in Egypt, obesity prevalence was 36.4% in North Egypt (39.7% rural and 27.2% urban) and 28% in South Egypt (28.8% rural and 25.6% urban).[12] In the United Arab Emirates, it was 25% in males and 42% in females; in Tunisia 8% in males and 33% in females; in Iraq 8% in males and 19% in females; and in Greece 30% in males and 26% in females.[13] In Palestine, prevalence percentages varied from 2.3% overweight among preschool children to 10.9% up to 46% among adults with significant differences because of gender and area of living (urban *vs.* rural).[1,14]

In short, prevalence of obesity and overweight has been reported in Arab countries, including Palestine, with a noticeable variation in the prevalence percentages due to gender, age, and other demographic variables. Hence, there is an urgent need to explore the risk factors and health adverse effects of obesity among different age groups in Arab countries. Various research designs, including longitudinal, case control, and other related study designs, could be used for this purpose. This study aimed to determine the prevalence, risk factors, and psychosocial characteristics of

obese and overweight secondary school students in Hebron city, located in the south of West Bank, Palestine. The results of this study have significantly paved the way for further research to determine the risk factors of obesity using the prospective study design.

METHODOLOGY
Study design

The current study utilized the cross-sectional design with an objective to explore the prevalence and risk factors of obesity and overweight among Palestinian secondary school students, residing at Hebron city, and to determine the relationship between obesity and psychosocial factors. The study participants were selected from schools located in four areas in Hebron city using the stratified random sampling procedures. The sample size was calculated twice, using Cochrane formula for prevalence studies. The first was for obesity prevalence wherein the sample size was 179, and the second was for overweight prevalence wherein the sample size was 379; the later was considered as the required sample size.[15] The data collection started in February 2017 until May 2017. The schools were invited to join the study through a formal procedure with the Ministry of Education. After the permission had been obtained from the Ministry, a suitable time was arranged with each school separately. All participants were informed about the study design and objectives and briefed about the type of data that would be collected, with an emphasis on the optional participation. Only students who agreed to sign the consent form were included in the data collection, giving a rate of 82%. 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. The local ethics committee also approved and supported the current study.

Data collection

The collected data included sociodemographic characteristics: age, gender, area of living, grade (class), student academic achievement, parents' education, family income, and self-reported medical history and smoking. The participants' nutritional status assessment was done using the anthropometric measurements (weight, height, mid-upper arm circumference, waist circumference, hip circumference, and calf circumferences).[16] All the measurements were taken twice and the mean of the readings was recorded. Then, the BMI was calculated from the weight and height. The categorization of obesity, overweight, normal weight, and underweight was done using the Centers for Disease Control and Prevention–WHO (2000) growth chart.[17] Dietary intake was assessed using a validated food frequency questionnaire.[18] The nutritionist Pro software was used to analyze the food and determine the macronutrients and energy intake. Self-reported questions regarding the dietary habits and lifestyle were also included in the data sheet. The psychological parameters including depression, stress, and anxiety were assessed using the

validated Arabic version of the Depression Anxiety Stress Scales.[19] The sampling procedures ensured a representative sample with comparable distribution of gender, area of living, grades, and streams [Table 1].

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 incidences was analyzed using Chi-square tests because the variables were of categorical type. The mean difference between the groups was calculated by either independent *t*-test or one-way analysis of variance.

RESULTS

Subject recruitment

Figure 1 shows the participant recruitment steps for the study areas. Among the total of 610 participants, only 392 students were included in the final analysis: 201 (51.3%) females and 191 (48.7%) males. The rest of the participants were excluded mainly due to missing data or they refused to do the anthropometric measurements.

Subjects' characteristics

The mean age of the participants was 17 ± 0.691 year, ranging from 15 to 19 years. As shown in Table 1, the majority of the students [280 (71.4%)] were in the 10th and 11th grades. The students were evenly distributed between the streams: scientific (51%) and literary (49%). A big number [176

(44.9%)] lived in villages, whereas 97 (24.7%) participants lived in the city and 119 (30.4%) lived in camps. As for parents' education, 183 (46.7%) participants reported that both parents had only school education, and only 83 (21.2%) had both parents with at least diploma or university degree. Nearly half of the students [185 (47.2)] did not have information about the family income.

Table 2 shows that smoking is five times more common among males compared to females. Eight students reported presence of chronic diseases such as asthma, rheumatoid, and type 1 diabetes mellitus.

Nutritional status of the participants

Figure 2 shows the nutritional status of the participants according to the WHO growth chart. The results revealed that the majority of the participants were normal weight (73%), with total obesity of 3.3% and overweight 13.8% with no difference between males and females.

Table 3 shows that all the associations between being obese, overweight, normal weight, and underweight with all of the sociodemographic variables including gender, age, area of living, grade (class), economic status, parents education, and academic achievements were not significant using Chi-square test (*P*>0.05).

Table 3 also shows the association between obesity with dietary habits and lifestyle. Only weight and body shape satisfaction had significant association with obesity and overweight (*P*<0.01). Interestingly, other poor dietary habits like eating fast food, skipping meals, not doing sport or activities, or riding a vehicle to school showed no significant association with obesity and overweight. The relationship between students' diet intake with nutritional status is summarized in Table 4. The table indicates the significant relationship between the intake of total calories

Table 1: Sociodemographic characteristics of the students according to gender							
Variables		**Male**		**Female**		**Total**	
		n	%	*n*	%	*n*	%
Area of living	City	46	24.1	51	25.4	97	24.7
	Village	89	46.6	87	43.3	176	44.9
	Camps	56	29.3	63	31.3	119	30.4
School class	Grade 10 + 11	135	70.7	145	72.1	280	71.4
	Grade 12	56	29.3	56	27.9	112	28.6
Stream	Scientific	95	49.7	105	52.2	200	51
	Literary + artificial	96	50.3	96	47.8	192	49
Parents education	Both parents have diploma/university degree	50	26.2	33	16.4	83	21.2
	One of the parents has diploma/university degree	51	26.7	57	28.4	108	27.6
	Both parents in school level	79	41.4	104	51.7	183	46.7
	Others	11	5.8	7	3.5	18	4.6
Family income	<3000	21	11	29	14.4	50	12.8
	3000–5000	56	29.3	48	23.9	104	26.5
	5000<	35	18.3	18	9	53	13.5
	Don't know	79	41.4	106	52.7	185	47.2
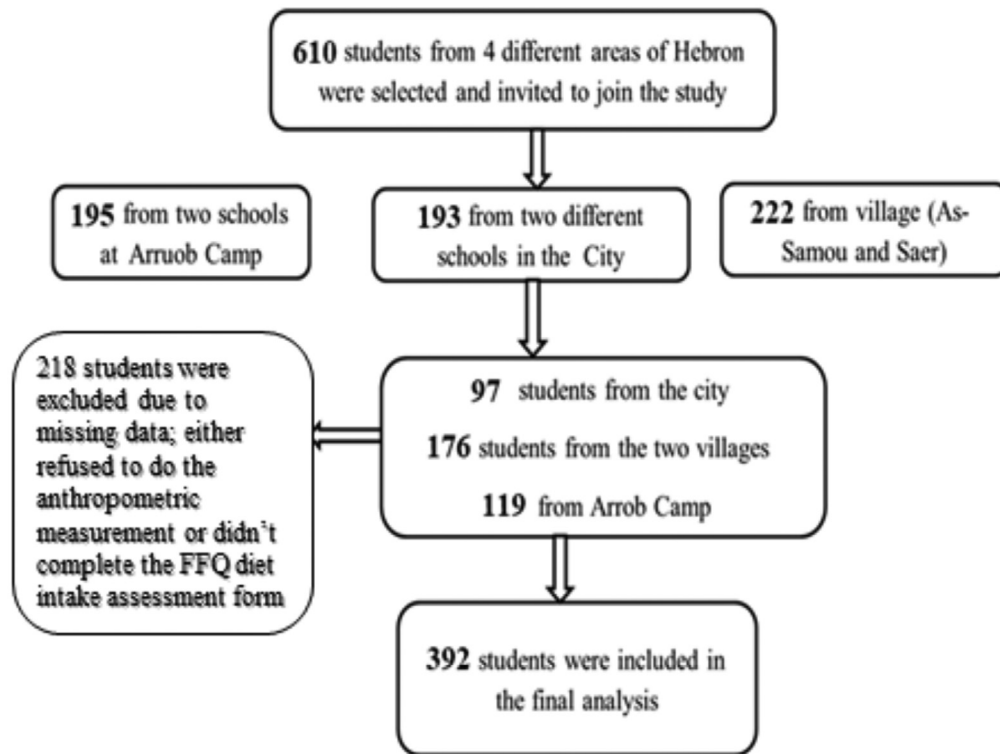
Figure 1: Patients' recruitment flow chart.

Table 2: Smoking status and chronic diseases

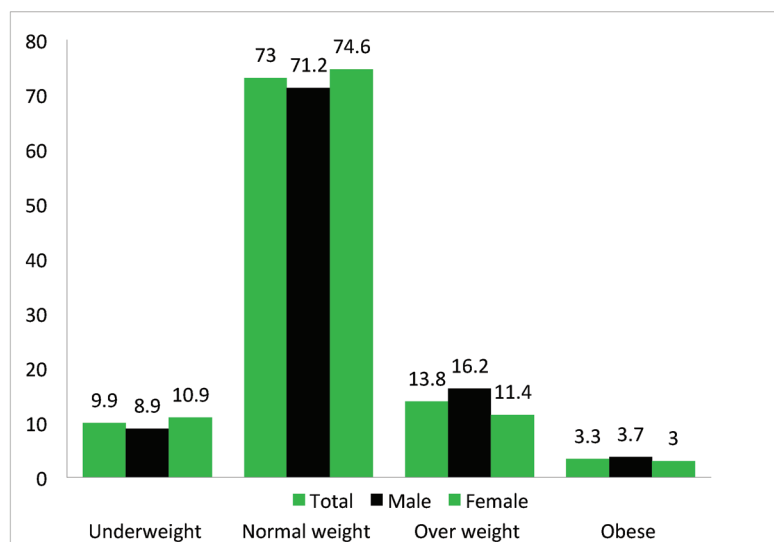| Variables		Male		Female		Total	
		n	%	*n*	%	*n*	%
Smoking	Nonsmoker	155	81.2	189	94	344	87.8
	Irregular smoker	22	11.5	9	4.5	31	7.9
	Smoker	14	7.3	3	1.5	17	4.3
Chronic diseases	Yes	8	4.2	7	3.5	15	3.8
	No	183	95.8	194	96.5	377	96.2

Figure 2: Nutritional status of the students according to WHO growth chart.

Table 3: The association between obesity with dietary habits and lifestyle

Variables		Obese + overweight	Normal weight	*P* value
Skipping meals	Yes	43	189	0.854
	No	22	89	
Eat fast food	Yes	47	202	0.803
	No	17	79	
Sport or activities	Yes	40	167	0.744
	No	24	110	
Transportation	Walk	52	226	0.816
	Bus or car	12	48	
Snack at school	Yes	56	246	0.557
	No	10	35	
Breakfast	Yes	29	153	0.152
	No	36	128	
Main meal	Yes	32	164	0.123
	No	35	118	
Dinner	Yes	43	190	0.591
	No	24	91	
Eating habits	Yes	26	113	0.876
	No	40	166	
Eat between meals	Yes	43	195	0.504
	No	23	86	
Family meal	Yes	60	258	0.774
	No	6	20	
Diet	Yes	10	44	0.880
	No	57	238	
Weight satisfaction	Yes	23	192	0.000*
	No	42	83	
Body shape satisfaction	Yes	21	194	0.000*
	No	46	79	
Eating outside	Yes	32	108	0.071
	No	30	168	
Nutrition information source	TV/Internet	44	208	0.675
	Educational lectures	1	9	
	Dietitian	14	47	

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

Table 4: Diet intake of the students according to nutritional status

	Units	Obese Mean ± SD	Overweight Mean ± SD	Normal weight Mean ± SD	Underweight Mean ± SD	P value
Total calories	Kcal/day	2998±326	2249±410	2237±328	1926±346	0.000*
Protein	g/day	115±29	124±40	129±38	137±32	0.224
Fat	g/day	120±40	119±42	131±42	137±39	0.119
Carbohydrate	g/day	387±79	299±103	239±112	248±97	0.025*
Sugar intake	g/day	48±26	50±23	59±29	59±23	0.096
Fiber	g/day	24±12	22±9	25±9	25±8	0.231

*Significant at *P* < 0.05 using one-way analysis of variance test. SD: standard deviation.

and carbohydrates with nutritional status, *P*<0.01 and *P*<0.05, respectively.

Furthermore, there were no significant associations between obesity and various psychosocial factors as shown in Table 5. The same goes with the association between BMI categories and stress, depression, and anxiety categories using Chi-square test as shown in Table 6.

Discussion

Overall, this study has determined a prevalence of obesity (3.3%) and overweight (13.8%) among the study sample, secondary school adolescence, in Hebron city, with no significant differences in distribution according to gender, age, and other sociodemographic variables. This existing prevalence of overweight and obesity among the study

sample is not high, compared to prevalence in other countries. The study also found that all the reported dietary habits showed nonsignificant relationships with obesity, whereas the total calories intake and carbohydrate intake were significantly higher among obese and overweight participants, as compared to normal and underweight.

The current study reported prevalence of obesity higher than a previous study conducted in the same setting, Palestine. For instance, Musaiger[1] found that the prevalence of obesity was 5% and 3.5% in males and females, respectively, whereas the overweight was 12.7 among males and 12.5 among females in Hebron city. This slight difference in the prevalence might be due to the differences in the cut-off points used to define obesity. They used international obesity task force (IOTF) references to define obesity,[1] whereas in the current study, the WHO reference values were used. Another reason might be the method of sample selection in both the studies. However, a recent study reported an increase in the obesity prevalence (6% in females and 6.6% in males) in a sample aged 15 to 18 years using similar cut-off points references (the WHO–Centers for Disease Control and Prevention, 2000) growth chart, with no significant difference due to gender.[20] This increase in obesity among adults is supported by the increase found in the current study, and if these percentages are compared to previous researches conduced on adults in Palestine, they indicate that the obesity prevalence increases in Palestine with age. For example, the first National and Health Survey showed

that 8.2% of obesity among male adults and 7.7% among females aged 18 to 24 in Palestine.[21]

With a reference to other Arab neighboring countries to Palestine, higher prevalence rates of overweight and obesity (18.9% and 8.6%, respectively) were reported among Syrian adolescents based on the same obesity and overweight reference values used in the current study.[22] Furthermore, they found significant higher prevalence in males compared to females and, interestingly, with high-educated parents.[22] In Kuwait, Rey-López *et al*.[23] have recently found an alarming prevalence of obesity and overweight. They have found that the prevalence of obesity and overweight together is 54% in females and 59% in males without significant difference, and there is no significant relationship between the found prevalence and parents' education and other sociodemographic variables.

The current study showed no significant differences in the prevalence of overweight and obesity due to the area of living (i.e., city, village, or camp). This finding concurs with a previous study conducted to compare the prevalence of obesity in urban, rural areas, and camps in Gaza strip in Palestine among adults.[24] However, another study reported higher prevalence of obesity among female adults in urban areas than in rural areas.[14]

It is noteworthy to highlight that the studies that have been conducted among teenagers including the ones cited above did not report the place of living as a factor for obesity and overweight. Research shows that area of living, either urban or rural, might have an impact on nutrition and health status because of changes in the lifestyles and dietary habits.[25] In 10 European countries, significant differences in obesity prevalence were reported between urban and rural areas.[25] Similar findings were reported in India.[26] The reason why our study did not find any difference in obesity according to the area of living may be due to the characteristics of this age group. This means that the students usually walk to schools as they live not far from schools and have almost similar lifestyle. Moreover, the food choices are not affected by the area of living.

Table 5: The relationship between obesity and psychosocial factors

| | Obese + overweight | Normal | P value |
	Mean ± SD	Mean ± SD	
Depression	5.6±3.5	5.3±3.8	0.609
Stress	7.9±4.3	7.7±4.6	0.742
Anxiety	4.5±3.6	4.7±3.8	0.631

Not significant $P > 0.05$ using independent *t*-test. SD: standard deviation.

Table 6: The association between obesity and level of depression, stress, and anxiety

		Obese + overweight	Normal	Total	P value
Depression	Mild	27 (44.3)	128 (47.8)		0.712
	Moderate	29 (47.5)	114 (42.5)		
	Severe	5 (8.2)	26 (9.7)		
Stress	Mild	19 (28.8)	97 (36.6)		0.123
	Moderate	43 (65.2)	141 (53.2)		
	Severe	4 (6.1)	27 (10.2)		
Anxiety	Mild	31 (46.3)	124 (46.3)		0.345
	Moderate	26 (38.8)	86 (32.1)		
	Severe	10 (14.9)	58 (21.6)		

Not significant, $P > 0.05$ using Chi-square test.

Obesity, weight satisfaction, depression, stress, and anxiety

The current study found a significant association between being obese or overweight with weight dissatisfaction ($P<0.001$). Similar findings were reported in many other studies; for example, obese and overweight males and females reported lower self-esteem, and body shape and body weight dissatisfaction affected their mental well-being and might lead to psychological problems, such as depression.[4,27]

To the best of our knowledge, among the few studies that investigated the relationship between obesity and psychological variables, this is the first one conducted in Palestine. The study did not show significant relationships between obesity and depression, stress, and anxiety, indicated by the reported nonsignificant mean differences. The association between the BMI categories and psychosocial factor levels (normal, normal–moderate, and high) was also not significant. These findings are not consistent with the previous studies that reported a bidirectional relationship between obesity and depression.[8,28] In their review, Nemiary *et al.*[29] reported that during this critical period of life (i.e., teenagers), obese teens have higher incidences of mental health disorders such as depression, anxiety, and poor self-esteem, than nonobese teens.[29] Boutelle *et al.*[30] found a relationship between being obese and having depressive symptoms among Western female teenagers. In an Arab country, Qatar, a study conducted on female adolescents revealed a strong evidence for the association between body image dissatisfaction with psychological problems among obese and overweight participants.[7] Recent research showed unusual prevalence of psychopathology in the morbidly obese. The most frequent finding was depression and, to a lesser extent, anxiety disorders.[31]

It is clear that the relationship between anxiety and obesity is not easy to be established because anxiety, as well as obesity, is a multidimensional trait. Their impact on the quality of life varies in accordance to differences in BMI, gender, and sociocultural environment. Thus, the causal relationship between anxiety and obesity might not be straightforward. It seems that there is a positive but weak correlation between them. To strengthen this association prospective, there is a need to conduct well-designed studies.[31]

Although the studies that investigated the relationship between obesity and stress symptoms are not many, a few studies reported the relationship between dietary habits, food intake, physical activity, and other factors that may lead to obesity with stress.[32] A large-scale study (Health and Behavior in Teenagers Study) reported that high level of stress is associated with eating more fatty food, less fruits, more snacking, and breakfast skipping.[32] A significant correlation between obesity and stress level was found among undergraduate male students, but not among the females; further analysis revealed that around 12% of the BMI variation was predicted by stress.[33]

Diet intake and dietary practices

Obesity is explained as an imbalance between energy intake and energy expenditure. Energy intake, macronutrients intake distribution, portion size, and dietary habits are the main factors that are usually included in obesity-related assessment.[34] The current study reported dietary intake profile, total calories intake, carbohydrate, fat, protein, and fiber and sugar intake among the study participants. Significant difference in total energy intake was found among the BMI groups. In addition to the significant difference in carbohydrate intake, obese and overweight participants consume more carbohydrate as compared to normal and underweight participants. Although these findings are predictable, the association between being obese or overweight with the dietary habits and lifestyle was not significant. This may be because the participants underreported the activities, or the sample is homogenous in terms of lifestyle and activities because of similar ages and schools' systems.

CONCLUSION

The study found considerable prevalence of obesity and overweight among Palestinian adolescents living in Hebron. There is no significant association between being obese or overweight with any of the sociodemographic variables. The body shape and body weight satisfaction was significantly lower among obese and overweight compared to normal. Moreover, the relationship between depression, stress, and anxiety was not significant with the weight status. The findings have provided useful information to researchers, schools' administrations, and parents. School interventions and programs could be conducted to educate students and their parents about obesity and its risk factors. Further research using different study designs is recommended to examine obesity and its risk factors among other age groups and in different areas in Palestine.

Limitation

The main limitation of this study is that it utilizes the cross-sectional design. Longitudinal prospective study design is more informative, and would be able to determine the cause-and-effect relationship. The study was conducted in one city in Palestine, representing only the south of West Bank and not all of Palestine. Finally, the sample size is relatively small.

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Conflicts of interest

There are no conflicts of interest.

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