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### Abstract

Background: School programs are set to effectively inform students about nutrition and healthy body weight to improve their health-related knowledge, which may in turn have a positive impact on students' dietary behaviors and healthy lifestyle. However, developing an effective nutrition-related education program is conditioned to a prior assessment of students' nutritional knowledge. Objective: This cross-sectional study aims to examine the levels of obesity-related nutrition knowledge possessed by secondary schools' students in Hebron and evaluate the association between their nutrition knowledge and dietary practices. Using the stratified random sampling procedures, a total of 469 students, average age of  $16 \pm 0.671$  years, were randomly selected from four different areas in Hebron. A dichotomous questionnaire, consisted of 16 items, was used to investigate the nutrition and obesity knowledge. Data collection included: age, gender, weight classification, parent's level of education and eating behaviours. The analysis showed low levels of obesity-related knowledge among the study sample, as indicated by the low mean scores of students' correct answers ( $9.7 \pm 3.3$ ). Significant higher mean scores were found in favor of female students ( $p < 0.05$ ); scientific stream students ( $p < 0.01$ ), with no significant correlations with students' dietary practices. This highlights the need to develop interventional and educational school programs in Palestine. This would increase students' awareness of obesity-related knowledge, and at the same time, promote the idea of a healthy diet and lifestyle to them.

### Keywords

Palestine, School students, Obesity-related knowledge, Dichotomous items, Nutrition knowledge

## Nutrition knowledge and dietary practices among secondary school students in Hebron-Palestine: a cross-sectional study

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### ABSTRACT

**Background:** School programs are set to effectively inform students about nutrition and healthy body weight to improve their health-related knowledge, which may in turn have a positive impact on students' dietary behaviors and healthy lifestyle. However, developing an effective nutrition-related education program is conditioned to a prior assessment of students' nutritional knowledge. **Objective:** This cross-sectional study aims to examine the levels of obesity-related nutrition knowledge possessed by secondary schools' students in Hebron and evaluate the association between their nutrition knowledge and dietary practices. Using the stratified random sampling procedures, a total of 469 students, average age of  $16 \pm 0.671$  years, were randomly selected from four different areas in Hebron. A dichotomous questionnaire, consisted of 16 items, was used to investigate the nutrition and obesity knowledge. Data collection included: age, gender, weight classification, parent's level of education and eating behaviours. The analysis showed low levels of obesity-related knowledge among the study sample, as indicated by the low mean scores of students' correct answers ( $9.7 \pm 3.3$ ). Significant higher mean scores were found in favor of female students ( $p < 0.05$ ); scientific stream students ( $p < 0.01$ ), with no significant correlations with students' dietary practices. This highlights the need to develop interventional and educational school programs in Palestine. This would increase students' awareness of obesity-related knowledge, and at the same time, promote the idea of a healthy diet and lifestyle to them.

**Keywords:** Nutrition knowledge, Obesity-related knowledge, Dichotomous items, Palestine, School students.

### INTRODUCTION

Obesity had become a global health problem in both developed and developing countries, and it is believed to be one of the major health issues in the 21 century. The percentages of people with obesity are steadily increasing [1]. Also, it is well documented that this epidemic has a considerable impact on the rates of morbidity and mortality. It was documented that people who are overweight or obese have higher risks of the development of non-communicable diseases, such as cardiovascular diseases and type-2 diabetes, skeletal-muscle related diseases, nonalcoholic fatty liver disease, sleep apnea, osteoarthritis, several types of cancers and other psychological and emotional well-being consequences [2]. Obesity represents a clear adverse health effect on all age groups, including children and adolescents. Children and adolescents who are overweight or obese

tend to stay obese in adulthood, where most of the chronic diseases are directly linked to the dietary behavior that has mainly formed during childhood [3].

Investigating the nutritional status of adolescents is relatively considered to be a notice concern in the field of health of people in this age group[4]. Thus, following healthy dietary habits and higher levels of physical activity is greatly encouraged, as it is believed to have a major role in maintaining their health and reducing their risk of obesity and the development of other non-communicable diseases [5]. The study of Kigaru et al., emphasized on the importance of increasing the level of awareness on these lifestyle factors, where they suggested that higher levels of nutrition knowledge would increase the probability of positively modify them [3]. Furthermore, research has shown that school-based programs play a crucial role in

promoting healthy lifestyles. However, it has limited effect on student's body mass index changes, and it needs further improvement and involvement of multi-components intervention programs to achieve the targeted success [6].

Nutrition knowledge is a term that is used in literature to describe the education related to diet and food selection. It is supposed to have a positive impact on receiver's dietary behavior [7]. In a systematic review, it was found that the majority of studies have reported significant but weak associations between higher levels of nutrition knowledge and good dietary choices [8]. However, it should be taken into consideration that there are plenty of other factors affecting dietary behavior, including taste preference, food cost, culture, and religious beliefs. Similarly, there are several determinants related to the level of nutrition knowledge such as gender, age, level of education and economic status [8].

In the case of adolescents, previous studies indicated that the level of their nutrition knowledge is affected by diverse factors. Surveys such as the one done by Arora et al., have revealed that female adolescents from urban areas have a higher level of nutrition knowledge when compared to their fellows from rural areas in India [9]. Moreover, the results of the HELENA study (Healthy Lifestyle in Europe by Nutrition in Adolescence), which was conducted in 10 different European countries, have shown that the levels of nutrition knowledge were higher among females, immigrant adolescents and participants of whom their parents have higher education level. Yet, this has not any significant relationship with weight status that was presented as BMI [10]. In contrast, in regards to gender, a study that was done in Italy to assess the nutrition knowledge and its correlation with nutritional status have reported non-significant difference of knowledge levels among genders [11]. In the same study, the level of nutrition knowledge was claimed to be higher among normal weight students if compared to the students who are overweight or obese. This might highlight the connection between the level of nutrition knowledge among adolescents and their nutritional status. A Turkish study has

reported that the participants' quality of diet was low and their nutrition knowledge levels were associated with their dietary behavior [12]. Nevertheless, among younger age groups, moderate level of nutrition knowledge was correlated with poor dietary practices; food choices, snacking and eating environment [3].

In Arabic countries, although extensive research has been carried out on the assessment of nutritional status and dietary practices among adolescents, sparse studies exist to evaluate their nutrition knowledge. One study has been conducted in Kuwait, where it reported a fair level of nutrition knowledge among first-year university students and recommended the implementation of more nutrition intervention educational programs [13]. Yet, to date, relatively limited research has examined the level of nutrition knowledge, and specifically the obesity-related knowledge, among Palestinian adolescents, and identify its relationship with their nutritional status, dietary habits, and lifestyle. Thus, the main objective of this study was to investigate the obesity-related nutrition knowledge among the Palestinian adolescent in the Hebron district, south of West Bank, Palestine. This study might provide guidance to the future school-based intervention educational studies.

## **METHODS**

### ***Study design and recruitment of participants***

This cross-sectional study was conducted between March and May 2017 on secondary school students who were enrolled in government schools that are located in Hebron district, south of Palestine. With the help of the ministry of education, six schools have been chosen from different areas, using the stratified random sampling to represent the Palestinian community; city, village, and camp. Two major secondary schools from the city were selected, to include males and female's schools. Also, two different villages were selected (one from north of Hebron and the other from the south) covering schools of both genders. Al-Arroub camp was picked to resemble the two camps in Hebron, two different secondary schools from Al-Arroub were included, again, one for each gender. After taking the permission from the ministry

of education, as a first step, each school was officially invited to participate in the study. This was followed by a visit from the research team for a short briefing on the study objectives, and the types of data that need to be collected. A second visit was done to invite the students verbally to participate, as they were informed that the participation is completely voluntary, and they can withdraw at any stage.

### ***Data collection***

The data was collected in the classrooms during school time, after providing the students with a short illustration and clarification about the study and the process of filling the questionnaire. The anthropometric measurements were completed after the students finished answering the questionnaire, by taking their weight and height based on the standard method reported in Lee and Nieman (1996) [14]. The data collection took about 45 minutes per class, including the anthropometric measurements.

Student's sociodemographic data was collected, including their age, gender, parent's level of education and economic status. This was in addition to other schooling data, like the academic stream, and other medical history and lifestyle practices information. Some dietary behaviors were also assessed using close-ended questions regarding skipping meals, snacking, fast food consumption, weight-loss or gain practices and students' main sources of nutrition-related information. The students were categorized into weight classification groups of underweight, normal weight, overweight and obese based on the definition of WHO-growth chart cut off points for 2-18 years old.

### ***The development of the Nutrition-related knowledge questionnaire***

A comprehensive review of the literature on similar studies [3, 4, 8, 10] that was conducted to determine knowledge, attitude and practices regarding nutrition related topics, all of the mentioned studies were performed before selecting the items to be included in this research questionnaire. A selection of other items was based on the basic nutrition and obesity-related knowledge that is assumed to be known among this age group in

the Palestinian community. Three Palestinian lecturers and PhD holders in the field of nutrition have developed the first draft of the questionnaire, where it contained 28 items. It was created in the English language, and then back-translated into Arabic, by certified English- Arabic translators. Moreover, the questionnaire was sent to six experts (4 nutrition experts and 2 assessment experts) to evaluate its content validity, which led to the exclusion of eight items that were considered as repetitive, vague or unlikeliness to be known among this age group. A pilot study was conducted on 30 participants from a secondary school, where the reliability was 0.71 using Cronbach alpha. Further analysis has indicated that deleting four items (3,6,8,18) would increase the reliability of the questionnaire to 0.809. Consequently, the final version of the questionnaire included 16 items to be answered as True/ False/ Do not know by students, and then coded as 1 for correct answers and 0 for Incorrect or Don't know answers for analysis. Then the sum of the answers was calculated to get the total score, out of 16, for each student.

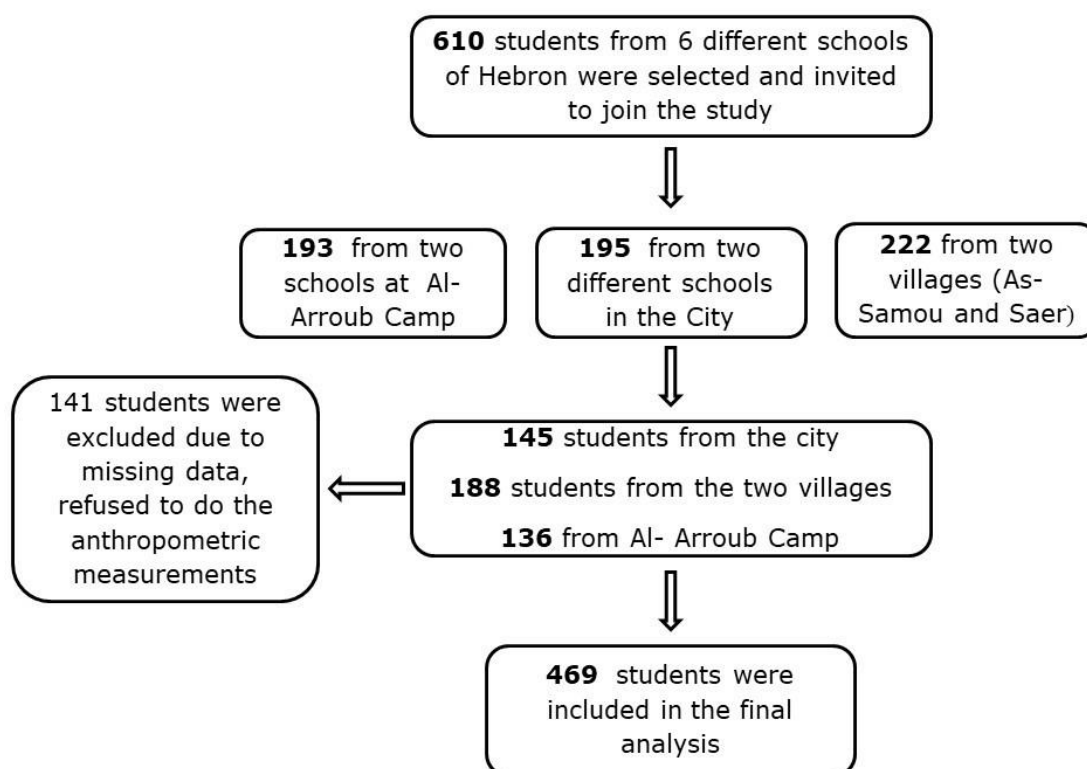
### ***Statistical analysis***

The Statistical Package for the Social Sciences (SPSS), version 21 was used to analyze the collected data. The normality test was done on the nutrition knowledge scores using the Kolmogorov Smirnov test. The descriptive analysis, means and standard deviations, was used to describe the continuous dependent and independent variables, where the categorical data were presented as percentages. Kruskal Wallis and Mann-Whitney U tests were conducted to examine the association between selected independent variables and the total score of the nutrition knowledge at  $\alpha < 0.05$ .

## **RESULTS**

### ***Subjects recruitments and characteristics***

A total of 610 students were recruited from the six schools. Due to missing and rejected measures, only 469 participants were included in the final analysis (Figure 1), 247 (52.7%) males and 222 (47.3%) females.



**Figure (1):** Subjects' recruitment flow chart.

The mean age of the participants was  $16 \pm 0.671$  years ranged from 15-19 years old. As shown in Table 1, students were nearly distributed between the scientific and literary, industrial streams; 50.5%, 49.5% respectively. Where 66.5% of them were in the 11<sup>th</sup> grade. Regarding the area of living, 145 (30.9%) students live in the city, 188 (40.1%) students

live in the selected villages and 136 (29%) students live in Al-Arroub camp. The level of parent's education varied widely among the students, where 19.8% have both their parents with at least a diploma or a university degree, and other 49.5% have parents with only school education. A considerable number of the students (45.5%) did not know about their family income.

**Table (1):** Students characteristics presented in numbers and percentages.

Demographic characteristics		n	Percentage (%)
Gender	Male	247	54
	Female	222	47.3
Grade	12 <sup>th</sup>	156	33.3
	11 <sup>th</sup>	313	66.7
Stream	Science	237	50.5
	Literacy + Industrial	232	49.5
Area of living	City	145	30.9
	Village	188	40.1
	Camp	136	29.0
Parents education	Both parents have diploma/ university degree	93	19.8

Demographic characteristics		n	Percentage (%)
	One of the parents has diploma /university degree	119	35.4
	Both parents at school level	232	49.5
	Others	25	5.3
Monthly income	Less than 3000	62	13.2
	3000- 5000	143	30.5
	More than 5000	51	10.9
	DK	213	45.5

DK: Do not know.

### Physical activity and dietary behavior

The results revealed that smoking is significantly more prevalent among males if compared to females ( $p < 0.01$ ). 21 students of the total sample reported having a chronic condition, including asthma, allergy, rheumatoid and chronic kidney disease. Regarding students' dietary behaviors, significant differences were found in meal patterns among genders (Table 2); females had higher rates of adherence to the daily

consumption of the three main meals ( $p < 0.05$ ), similarly, the percentage of females who take breakfast before going to school was significantly higher than males ( $p < 0.05$ ). Moreover, approximately 15% of the participants stated that they have tried to follow a healthy diet or weight management programs, with no significant difference between genders. However, the weight self-satisfaction was significantly lower among female ( $p < 0.05$ ).

**Table (2):** Students' lifestyle and dietary habits.

Characteristic		Total		Male		Female		P-value
		n	%	n	%	n	%	
Smoking	Non-smoker	382	81.7	185	39.4	198	42.4	0.000*
	Irregular smoker	51	10.9	35	7.5	16	7.5	
	Smoker	35	7.5	27	5.8	8	1.7	
Chronic diseases	Yes	21	4.5	13	2.8	8	1.7	0.261
	No	448	95.5	234	49.4	214	47.8	
Taking breakfast before going to school	Yes	244	52.0	141	30.1	102	21.8	0.042
	No	222	47.3	106	22.6	116	24.8	
Eating three main meals	Yes	274	58.9	161	34.6	113	24.3	0.001*
	No	191	40.7	84	18.1	107	23.0	
Eating between the meals (snacking)	Yes	316	67.4	167	36.0	149	32.1	0.766
	No	148	31.6	76	16.4	72	15.5	
Eating fats food / at least one time weekly	Yes	344	73.3	185	40.0	159	34.4	0.45
	No	118	25.2	62	13.4	56	12.1	

\* Significant difference ( $p$ -value  $< 0.05$ ).

Table 3 illustrates the distribution of students in terms of their sources of information in nutrition, where media (internet and TV shows) was the main source for the majority of the students.

**Table (3):** Dieting practices and the source of dietary information across genders.

		Total		Male		Female		P-value
		n	%	N	%	n	%	
Do you practice diet for any reason	Yes	72	15.4	43	9.2	29	6.2	0.116
	No	396	84.4	203	43.4	193	41.2	
Do you practice diet for weight loss	Yes	72	15.4	33	7.1	39	8.4	0.149
	No	390	83.2	208	45.0	182	39.4	
Are you satisfied with your weight	Yes	278	59.3	169	37.1	109	24.0	0.000*
	No	177	37.3	74	16.3	103	22.6	
Source of nutrition information	TV and Internet	331	70.6	163	38.9	168	40.1	0.698
	School	14	3.0	7	1.7	7	1.7	
	Nutritionist	74	15.8	42	10.0	32	7.7	
	Other	50	10.7					

\* Significant difference (p-value <0.05).

The analysis has shown that males seemed to be more physically active if compared to females (Table 4).

**Table (4):** Gender differences in terms of physical activity and exercise.

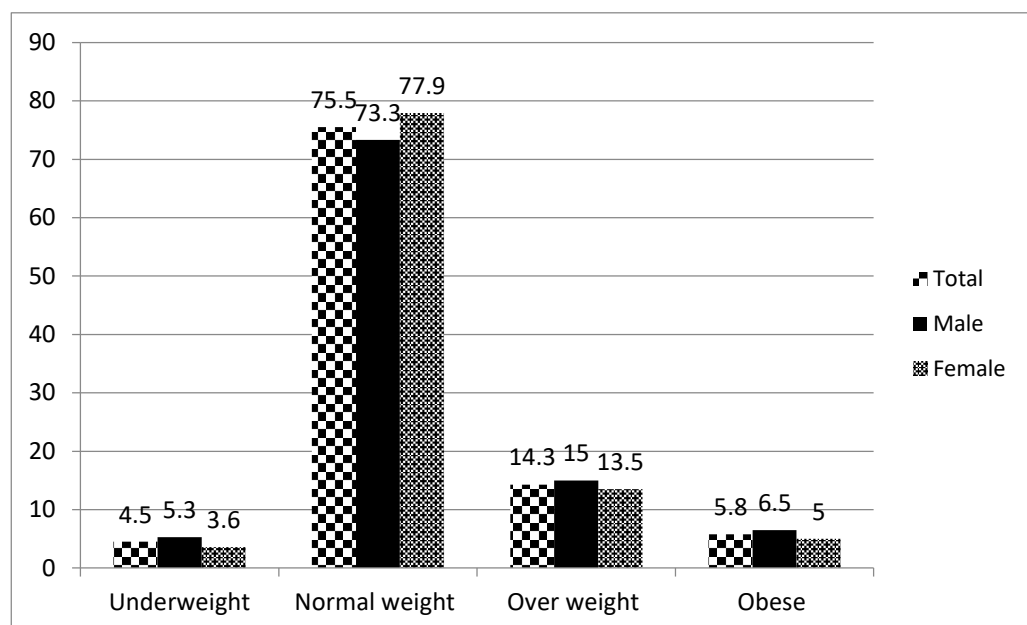
		Total		Male		Female		P value
		n	%	n	%	n	%	
Going to school	Walking	369	78.8	203	45.1	166	36.9	0.002*
	Bus/ car	81	17.3	30	6.7	51	11.3	
Number of PE. Classes/week	0	74	17.1	23	5.3	51	11.8	0.002*
	1-2	356	76	198	45.7	158	36.5	
	3>	3	0.6	3	0.7	0	0.0	
Play sports outside of school	Yes	276	37.7	172	38.0	104	23.0	0.001*
	No	177	58.5	68	15.0	109	24.1	
How many hours spent watching TV/smartphone	1-2	119	25.4	43	11.7	76	20.7	0.001*
	3-4	107	22.8	62	16.9	45	12.3	
	More than 4	141	30.1	92	22.3	59	16.1	
Setting during study	Always	171	36.5	43	11.7	76	20.7	0.001*
	Sometimes	291	62.0	62	16.9	45	12.3	
	Never	1	0.2	82	22.3	59	16.1	

It is shown by higher percentages of males walking to schools, a higher number of sports and physical education classes at their schools and higher levels of engagement in sports outside the school. Furthermore, females tend to significantly spend more time sitting during studying.

### Anthropometrics

Based on the WHO- CDC growth charts, the weight classification of this study sample has shown that the majority of students were normal weight, and 14.3%, 5.8 % were the percentages of the students who are overweight and obese, with no significant difference between genders (Figure 2).





**Figure (2):** Nutritional status of the students according to gender.

### Nutrition knowledge

The percentages of students' correct answers (CA) varied across different tested knowledge items (Table 5). The score of correct answer for students has a minimum of 3 to a maximum of 15 out of 16, with an

average of  $9.7 \pm 3.3$ . In addition, the score of correct answer was split into tertiles, which has shown that 131 of the participants were located in the lowest tertile for having low levels of nutrition knowledge, and 204, 134 of the students have moderate and high levels of knowledge, respectively.

**Table (5):** Frequencies and percentage of students answered the statement knowledge questions.

	Knowledge items	CA N (%)	ICA/DK N (%)
1	Obesity occurs due to an imbalance between energy intake and energy expenditures	367 (78.3)	102 (21.7)
2	Fat is not important for the human body and can be omitted from our diet	253 (53.9)	216 (46.1)
3	Weight measure is enough indicator for obesity	185 (39.4)	284 (60.6)
4	Skipping meals helps to lose weight	222 (47.3)	247(52.7)
5	Saturated and unsaturated fat give the same amount of calories	61 (13.0)	408 (87.0)
6	Obesity has genetic causes but dietary habits and sedentary lifestyle is a major reason	367 (78.3)	102 (21.7)
7	Fried food has higher calories as compared to boiled or roasted foods	355 (75.7)	114 (24.3)
8	Taking more calories than your requirements leads to obesity	322 (68.7)	147 (31.3)
9	Both carbohydrate and fats have the same amount of calories	160 (34.1)	309 (65.9)
10	Around half of our energy requirement must be taken from carbohydrate	167 (35.6)	302 (64.4)
11	Balanced food must contain fat, carbohydrate, protein, fruits, and vegetables	390 (83.2)	79 (16.8)

	Knowledge items	CA N (%)	ICA/ DK N (%)
12	Obesity can adversely affect the health even for young people and children	386 (82.3)	83 (17.7)
13	The energy requirement is affected by age, gender, weight, height, and physical activity	350 (74.6)	119 (25.4)
14	The food pyramid is a good way to know the balanced diet and daily exchange of the food group	359 (76.5)	110 (23.5)
15	Low physical activity leads to gain weight	352 (75.1)	117 (24.9)
16	Eating a large amount of fruits and vegetables help to lose weight	254 (54.2)	215 (45.8)

CA= Correct answer, ICA= Incorrect answer. DK= Do not know.

Scrutinizing through the results presented in table 5 would highlight that the item number 14 had the highest percentage for correct answer (83.2%), in which it asked the students if balanced food must contain fat, carbohydrate, protein, fruits, and vegetables. Similarly, item number 15 had a high percentage of 82% for correct answer where it suggests that obesity has adverse effects on children and young people. In contrast, item number 7 that asked about the calories content of saturated and unsaturated fat had the lowest

percentage of correct answer (13%). Additionally, 34.1% of the responses to the item number 12 were correct, in which it claims that carbohydrates and fat have the same calorie content. In response to the items related to the causes of obesity and its association with dietary behavior (no. 1,9,11,16,17 and 19), most of those surveyed had correct answer, where the average was 75.25%. Item number 20 that examined the knowledge around eating a large amount of fruits and vegetables to help weight loss had approximately 50% correct answer.

**Table (6A):** The relationship between the score of nutrition knowledge and sociodemographic characteristics.

Variables		n	Mean ± SD	P-value
Gender	Male	247	9.3±2.8	0.009* <sup>1</sup>
	Female	222	10.1±2.7	
Area of living	City	145	9.5±3.2	0.417 <sup>2</sup>
	Village	188	9.9±2.8	
	Camps	136	9.6±2.4	
Grade	12th	156	9.6±2.9	0.412 <sup>1</sup>
	11th	313	9.9±2.6	
Stream	Science	237	10.2±2.7	0.000* <sup>1</sup>
	Literacy + Industrial	232	9.2±2.9	
Parent's education	Both parents have diploma/ university degree	93	10.0±2.4	0.430 <sup>2</sup>
	One of the parents has a diploma /university degree	119	9.8±2.7	
	Both parents at the school level	232	9.6±2.9	
	Others	25	9.7±2.8	
Monthly income	Less than 3000	62	9.8±2.9	0.692 <sup>2</sup>
	3000- 5000	143	9.9±2.9	
	More than 5000	51	9.5±3.1	
	DK	213	9.6±2.7	
Smoking	Non-smoker	383	9.8±2.8	0.073 <sup>2</sup>
	Irregular smoker	51	9.8±2.9	
	Smoker	35	8.6±2.8	

Variables		n	Mean ± SD	P-value
Chronic diseases	Yes	21	9.4±3.1	0.594 <sup>1</sup>
	No	448	9.7±2.8	

1= Independent t-test 2= ANOVA

Furthermore, as can be seen in table 6A, the nutrition knowledge scores were significantly higher among female groups and the students in the scientific stream, while the scores did not significantly differ across other

variables, including the area of living, parent's level of education and family monthly income. In addition, the dietary behaviors related variables showed no significant relationship with the total score of nutrition knowledge of students (Table 6B).

**Table (6 B):** The relationship between the score of nutrition knowledge and nutrition-related factors.

Variables		n	Mean ± SD	P-value
BMI	Underweight	21	9.2±2.7	0.496
	Normal	345	9.7±2.8	
	Overweight	67	9.4±3.1	
	Obese	27	10.3±2.44	
Do you practice diet for weight loss	Yes	72	10.1±2.8	0.249
	No	396	9.6±2.8	
Are you satisfied with your weight	Yes	278	9.6±2.8	0.700
	No	177	9.7±2.9	
Source of nutrition information	TV and Internet	331	9.8±2.8	0.998
	School	14	9.8±2.4	
	Nutritionist	38	9.9±2.8	
	Other	36	9.8±2.9	

## DISCUSSION

The context of the current study was successfully set by its design, which evaluated the level of knowledge related to nutrition and obesity among school students in Palestine and getting insights on several factors affecting it. The study sample is considered to be representative of the Palestinian students' population, where it is approximately evenly distributed among genders and academic school streams (scientific and literacy, industrial), and a comparable distribution of the area of living in the cities, villages, and camps. Moreover, the rates of students who are overweight and obese in this study are similar to the results of other studies done on adolescents in Hebron city, Palestine [15], where 16.85% of the students were overweight and obese compared to 20.1% in our study. This may be considered as an evidence for the increase in the rates of obesity and overweight among Palestinian adolescents.

### *The score of knowledge items*

Based on the results of the tertile groups (high, moderate and low scores), the overall level of nutrition knowledge is considered to be low to moderate, where the average score of the students was located in the low score tertile, on the edge of the middle one. The level of nutrition knowledge was observed to be affected by the students' gender and academic status, while there was no significant relationship with their body mass index or any other tested dietary practices.

Although the results shown moderate levels of knowledge in nutrition and obesity, it might be argued that the set of questions that increased the total score were considered to be basic. The results of the HELENA study, which included adolescents from 10 different European countries, revealed that they got a relatively high average score in testing their nutrition knowledge [10].

It is noticeable that the items with low percentages of correct answers (7,12,13) were concerned about the calories content of macronutrients. While the items with high

percentages of correct answers where the items related to the adverse health effects of obesity and the association of balanced diet with obesity and ideal body weight. A possible explanation for this result might be that the current health program implemented in the Palestinian schools promotes a healthy lifestyle and encourage healthy snacking at school's cafeteria. It is worth mentioning that this program is set to be general, as it does not build a base of detailed-information on macronutrients and their calorie content. Therefore, the majority of the students in this research were not able to correctly answer the items that needed relatively more knowledge. Similar findings were reported by Kigaru et al. (2015), where the majority of Kenyan students managed to answer the questions related to healthy diet, balanced diet and fruits consumption correctly, while a much lower percentage of them were able to answer the questions about the source of energy and calories correctly (20%) [3]. However, in the same study, a high percentage of students (74%) answered the questions about fruits and vegetables consumption correctly, compared to approximately 50% of correct answers in the present study.

The findings of the current study are consistent with those of the aforementioned study conducted by Kigaru and colleagues (2015) where items that have to do with the calorie content of carbohydrates and different types of fat had relatively low percentages of correct answers among students [3]. This indicates that the information about calories and its variation between different food groups is not properly covered, and/or explained for students in school's health education programs.

#### ***The relationship between knowledge and obesity, dietary practices***

In this study, body mass index was found not to have any significant relationship with the level of knowledge in nutrition and obesity among the participants. In other words, the normal weight students do not have better levels of knowledge as compared to the students who are obese. These results are consistent with those of other studies which suggested that there is no significant correlation between BMI and nutrition knowledge test scores [10]. Similarly, other

studies found that the level of nutrition knowledge was not different among adolescents who are affected or not by obesity [16, 17].

One unanticipated finding of this research was that the student's tested dietary practices and lifestyle factors were not significantly related to their levels of knowledge. This is rather a controversial finding that is immensely reported in the literature across different age groups and subjects. Research has shown that nutrition knowledge is integrated with the public's health literacy, which is associated with their eating behavior and nutritional status [8]. Another study has been able to demonstrate that participants with a high level of nutrition knowledge would have a greater capability to apply this knowledge in their daily dietary practices [17]. However, it is interesting to note that people's dietary behavior is not inclusively affected by the level of their awareness and nutrition knowledge; it is rather linked to food preference, food availability, family eating pattern and culture, media effect and many other determinants [16-18]. This might be linked to the debatable finding of the current study.

#### ***The difference in nutrition knowledge across genders, academic streams***

The current study has reported significantly higher levels of nutrition knowledge among females (P-value= 0.009). Similarly, Ozcelik & Ucar (2008) have pointed out that females have significantly higher levels of nutrition knowledge if compared to males [19]. These findings corroborate the idea of Turrell et al. (2003) who concluded that females are more aware of diet and health issues, and accordingly, embrace dietary changes to a greater degree than men. In general, the higher rates of dietary compliance among females might be due to the suggestion that they are more knowledgeable about the relationship between food, nutrition, and health. Moreover, they tend to exhibit a more positive attitude towards health and food-related beliefs. It is also claimed that women manifest a more heightened concern about their personal and physical appearance compared to males. Lastly, it is argued that women are more likely

to prefer the taste of healthy foods and meals than men do [20].

As presented in the results, significant differences were found between the two groups of academic streams in terms of nutrition knowledge ( $p$ -value < 0.001). Students in the scientific stream got higher scores as compared to the students in the literacy and industrial streams. The relationship between dietary habits and academic performance is well documented, where it is stated that students who have poor diet quality are more likely to have lower academic performance [21, 22]. It is important to mention that there is a very limited number of studies conducted to assess the relationship between nutrition knowledge and academic performance in Palestine. However, one study that was conducted on university students reported better nutrition knowledge among participants with higher educational level or higher grades [23].

The findings of this research are subjected to at least three limitations. First, it only examined the nutrition knowledge among adolescents, which is considered to be a critical transitional stage for their physical and psychological development, in which several factors are involved in determining their dietary habits and nutritional status. Second, results would have been more informative if students' eating habits and their consumption of particular food items were taken into consideration. Third, the reader should bear in mind that there is little evidence on the effectiveness of the current school educational programs in Palestine that we could use to build on or to compare the results of this study to. Lastly, better understanding of the used sources of nutrition-related information would have helped in more comprehensive conclusions.

## CONCLUSION

The present study was designed to assess the level of nutrition knowledge and specifically obesity-related knowledge among the students in Hebron city. One of the main findings to emerge from the analysis is that overall obesity-related knowledge is insufficient, with the presence of statistically significant differences among genders. The level of the nutrition knowledge was affected by the academic streams, where students at the

literacy and industrial streams had lower levels of nutrition knowledge. Accordingly, this supports the idea that effective nutrition educational courses and programs should be developed and implemented at the schools in Palestine. This research has thrown up many questions in need of further investigation. For instance, considerably more work will need to be done to evaluate other factors that might have an effect on the level of nutrition knowledge and awareness outside schools and to design intervention research, in which focuses on improving the knowledge and the dietary practices among the students.

## DECLARATIONS

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**Authors' contributions:** M. B. conceived and planned the research, principle investigator, took lead in writing the manuscript. M. Q. carried out the data analysis and contributed to the writing process (introduction and results). O. A. Provided critical feedback and helped shape the manuscript. Edited the paper, prepared the references and data management

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