

Factors Associated with Adherence to the Mediterranean Diet among Palestinian High School Females' Students in Hebron City: Cross-sectional Study

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Abstract

Objectives: The main aim of our study is to explore the Mediterranean diet adherence and to evaluate the relationship between KIDMED scores and selected variables school students in Hebron city, Palestine.

Methods: A cross-sectional study was performed on 360 voluntary female student, aged between 15–18 years. Socio-demographic data, nutritional habits, and anthropometric measurements were obtained from self-administered questionnaires. The Mediterranean Diet Quality Index for children and adolescents was used to assess the adherence to the Mediterranean diet.

Results: Results indicated that 37.5% of the students had a low adherence to Mediterranean diet, 53.1% had a moderate adherence to Mediterranean diet, and 9.40% had a high adherence to Mediterranean diet. KIDMED scores are significantly associated all dietary habits listed below, with an exception for following a diet plan. Furthermore, it was noticed that KIDMED scores are negatively associated with age, first meal, and overnight fasting. On the other hand, the scores are positively associated with last meal, and number of main meals.

Conclusion: In conclusion, results should plead for an increased awareness in Palestinian high- schools, supporting students to be more adherent to the Mediterranean diet, in order to prevent a further increase in metabolic diseases later in adulthood.

Keywords: KIDMED, Adolescents, Obesity, nutrition transition

Introduction

The Mediterranean diet (MD) has boardly been discussed by various studies due to its favorable health effects.¹ The conventional MD is similar to vegetarian diet with an increased content in monounsaturated fatty acids (MUFAs) primarily from olive oil, which shapes its main source of fats, and therefore it would be normal to anticipate the health advantages it gives.^{1,2} In fact, Mediterranean dietary styles vary among societies but are all distinguished by an increased intake of vegetables and fruits, cereals and breads (mainly whole grain), nuts and pulses, fish and poultry, combined with an occasional intake of lean cuts of red meat (less than two servings per week), and a moderate alcohol intake (particularly wine).²

Researches regarding the MD have usually indicated that a more adherence has been related with a reduced risk of cardiovascular diseases, diabetes mellitus, and obesity. This relationship being partially due to the influence of the MD on inflammatory markers, and on abdominal adiposity.³ Some studies have lately revealed the beneficial effect of MD on cognitive performance.⁴ Few researches have demonstrated the etiology behind this effect, but when measuring the impact of the MD on the brain function of elderly and adults, findings have shown that this therapeutic impact is mainly due to the antioxidants properties and the B vitamin content of the MD.⁴

Palestine, among other Mediterranean countries, has been facing a nutritional transition during the past years. It has been hypothesized that urbanization along with the phenomenon of nutrition transition and the shift from the traditional Mediterranean to a "Westernized" diet, can illustrate the

increase in the adolescence obesity especially in those countries where it is assumed to be distinguished by healthier dietary habits.⁵ Indeed, demographic transition has the potential to influence food choices in various areas of the Mediterranean area. Furthermore, modernization of community results in a chain of unhealthy lifestyle habits such as low physical activity as well as sedentary activities (television and computer use), which mainly impact youth.⁶

Because the risk of chronic diseases during adulthood is greatly based on the dietary patterns adopted in adolescence, youth attitudes and behaviors have become an area of elevated interest over the past years.⁷ Researches have shown that adolescents in many Mediterranean areas are experiencing a decreased adherence to the Mediterranean diet (AMD), for instance, the youth in Turkey,⁷ Greece,⁸ and Italy,⁹ while adolescents in Spain has been able to follow a traditional MD.¹⁰ In Lebanon, youths have reported a low AMD and the adoption of a new western-like dietary habits,¹¹ which may shape one of the major determinants of the growing prevalence of obesity among young people in Lebanon during the past decades.¹² Several tools have been utilized to measure the AMD, and one of them is KIDMED test (Mediterranean Diet Quality Index for children and adolescents) that was improved and validated by Serra-Majem and his colleagues, a tool specifically designed to measure the adherence of children and adolescents to the MD.¹³

Obesity during adolescence is one of the most remarkable public health problem. It has been noticed that the prevalence of overweight among adolescents in the USA has been growing

quickly over the bygone years¹⁴ and similar trends have been reported in both European and Arabic countries.¹⁵ The most alarming rates have been recorded especially for the Mediterranean countries (Spain, Greece, Cyprus, and southern Italy) and the British islands, reaching the average of one third of the children.¹⁶ Overweight and obesity among young are related with severe metabolic consequences in youth that could continue during adulthood if not addressed early.⁵

According to a recent study conducted by Badrasawi et al.,¹⁷ it was confirmed that there is a considerable prevalence of obesity and overweight among Palestinian adolescents living in Hebron city. To our knowledge, the dietary patterns of Palestinian adolescents have only been measured by using a validated food frequency questionnaire (FFQ)¹⁷ rather than adopting the scoring method of the KIDMED method. Thus, the main aim of our study is to explore the AMD of adolescents and to evaluate the relationship between KIDMED scores and sociodemographic, dietary habits, and anthropometric measurements among high school students in Hebron city, Palestine.

Methodology

Study Design

A cross-sectional study was carried out on sample of four high-schools across Hebron city, Palestine. The main aim of the study is to evaluate the association of Mediterranean diet adherence with sociodemographic, body weight status, and dietary habits among high-school students in Hebron city, Palestine. The participants were selected from four well-known schools in the region. The data collection started in April 2017 until May 2017. The schools were invited to join the study through a formal procedure with the Ministry of Education. 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. 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.

Data Collection

The collected data included sociodemographic characteristics: age, grade, mother and father income, family monthly income, self-reported medical history. The socioeconomic status (SES) was based on family monthly income. The participants' nutritional status assessment was done using the anthropometric measurements (weight, height, waist and hip circumference).¹⁸ The measurements were measured in duplicate then the mean was recorded. The BMI was calculated from the weight and height,¹⁹ in order to calculate the BMI for-age percentiles using the CDC growth charts. According to the CDC classifications, students with measures located between the 5th and the 85th percentile are considered to have a normal weight. However, percentiles lower than 5th are considered as underweight, percentiles between 85th and 95th are considered as overweight, and percentiles ≥ 95 th are considered as obese.²⁰ Self-reported questions regarding the dietary habits were also included in the data sheet. The questionnaire also included KIDMED index.¹³

Assessment of the Mediterranean Diet

The degree of AMD was assessed using the KIDMED index. It is characterized by a total of 16 questions answered by yes or no. Questions denoting a negative aspect in the report to the Mediterranean diet were scored -1 and those with a positive aspect were scored $+1$. The KIDMED index ranged from 0 to 12. Subjects with KIDMED scores ≤ 3 are considered having a poor AMD, those with scores between 4 and 7 have a moderate adherence, and those with scores ≥ 8 have a high AMD.¹³

Ethical Considerations

This project acquired an ethical approval from the Deanship of Scientific Research Ethical Committee at Palestine Polytechnic University. Informed written and verbal consents have been collected from all participants prior to data collection.

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. Sociodemographic, lifestyle characteristics, eating habits, and anthropometric measurements were evaluated by means and percentages for continuous and categorical variables, respectively. To evaluate the associations between variables, the ANOVA and Kruskal-Wallis for continuous variable.

Results

Students' Recruitment

Figure 1 shows the students recruitment steps. A total of 360 female students were included in the final analysis. Only one student has been excluded from the study due to missing data (KIDMED questions).

Students' Characteristics

Students' characteristics are summarized in Table 1. 360 females were included in the study. The mean age was 15.9 ± 0.6 years, ranged from 15–18 years old. Participated students belong to four high-schools in Hebron region, Palestine. Nearly three-quarter female students (76.9%) were in the eleventh grade, whereas the rest were in the tenth grade. Moreover, family income for nearly half of the students (53.4%) was around 3000–5000 NIS per month. With regard to the educational level of students' mother, the analysis revealed that (54%) were high school graduates, (18.4%) were middle school graduates, (15.9%) were a bachelor degree, (4.7%) were illiterate, (4.2%) were holding a diploma degree, and only (2.8%) were postgraduates. For students' fathers, these levels were (48.5%), (24.8%), (18.9%), (2.5%), (1.4%), (3.9%), respectively.

Medical History of Students

Almost all the participated females (98.1%) stated that they are not suffering from chronic diseases, while only (1.9%) reported that they have a chronic diseases.

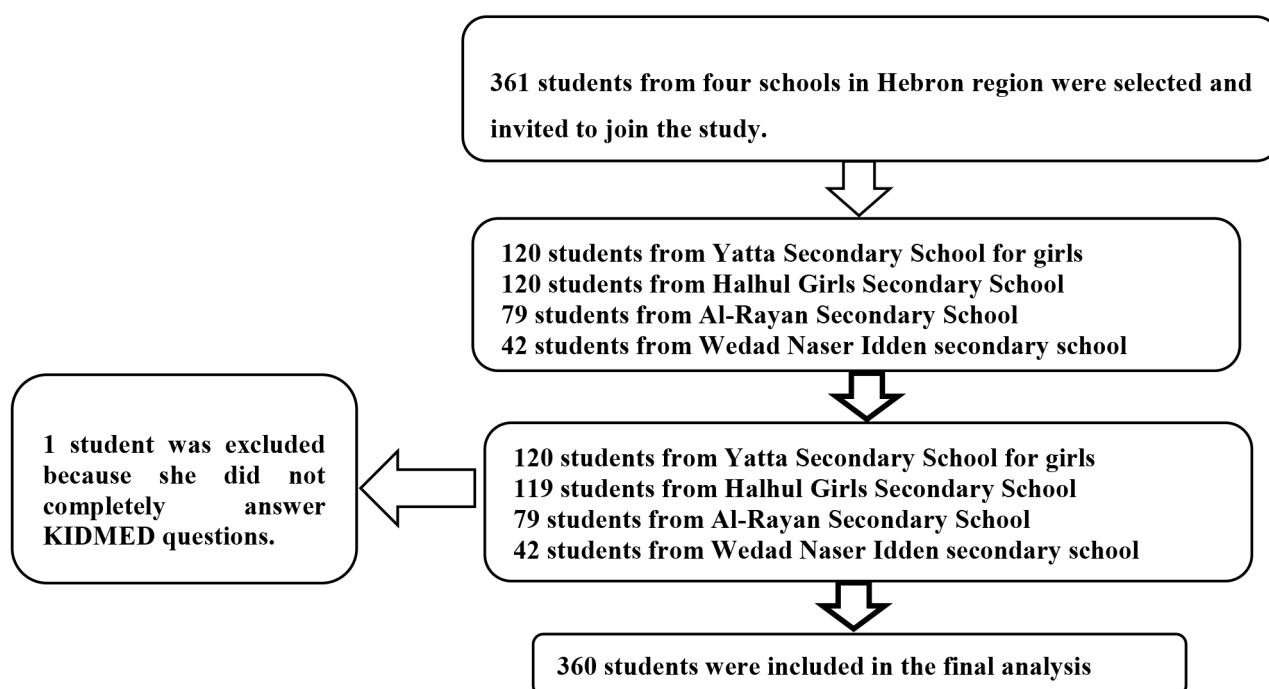


Fig. 1 Students recruitment flow chart.

Table 1. Socio demographic characteristics of students

Variables		Total = 360	
		N	%
School name	Yatta Secondary School for girls	120	33.3
	Halhul Girls Secondary School	119	33.1
	Al-Rayan Secondary School	79	21.9
	Wedad Naser Idden secondary school	42	11.7
Grade	11th grade	277	76.9
	10th grade	83	23.1
Mother's education level	High school	194	54.0
	Middle school	66	18.4
	Bachelor	57	15.9
	Illiterate	17	4.7
	Diploma	15	4.2
Father's education level	Postgraduate studies	10	2.8
	High school	172	48.5
	Medium school	88	24.8
	Bachelor	67	18.9
Family monthly income	Postgraduate studies	14	3.9
	Illiterate	9	2.5
	Diploma	5	1.4
	<3000 NIS	80	23.0
	3000–5000 NIS	186	53.4
>5000 NIS	82	23.6	

NIS, Israeli new shekel.

Nutritional Status of the Students

Figure 2 reveals that majority of the participants (68.3%) had a normal weight, while the minority of participated student (5.0%) were classified within obesity category.

Dietary Habits and Practices

Our results reveal that (43.1%) of students sometimes eat three meals per day. The highest percentage of students (35.0%) don't care about their dietary habits, while only (7.8%) of students care about their dietary habits. Eating between basic meals on a daily basis was a habit for around (22.8%) of participants, whereas only (12.3%) of them don't eat between meals. Analysis also reveals that nearly half of students (42.3%) reported that they skip their main meals. Moreover, approximately (50.6%) often eat fast foods whereas only (8.6%) don't eat these type of foods. Moreover, a high percentage of students (55.5%) reported that they always eat meals with their families, while only (1.9%) of students don't eat meals. In addition, three quarter (70.8%) of students don't follow a diet plan. Furthermore, the highest percentage of students (37.4%) of students were satisfied about their weight and shape.

Association between KIDMED Scores and Socio-demographic Characteristics

Figure 3 shows that (37.5%) of the students had a low AMD, (53.1%) had a moderate AMD and (9.40%) had a high AMD. Data analysis also reveals that KIDMED scores are not associated with socio-demographic characteristics. It was also noticed a negative association between age and KIDMED scores ($P < 0.05$ using Pearson correlation).

Association between KIDMED Scores and Dietary Habits

Table 2 illustrates that KIDMED scores were significantly associated all dietary habits listed below, with an exception for

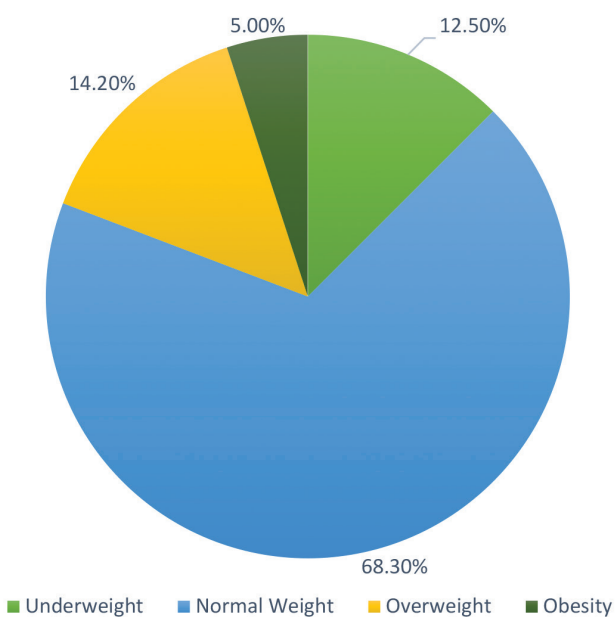


Fig. 2 Nutritional status of students according to BMI for age growth charts.

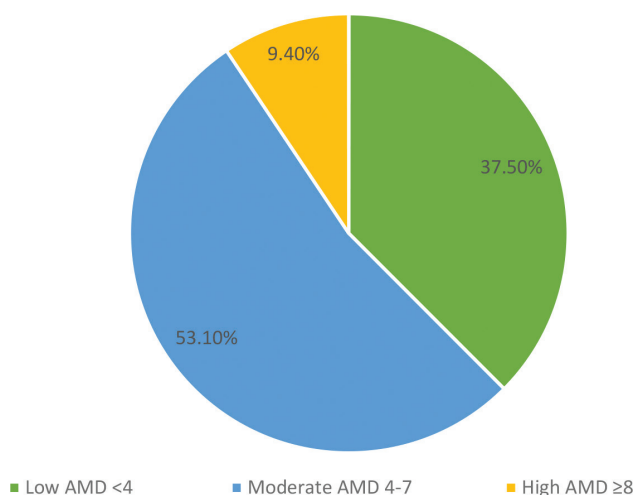


Fig. 3 Students categories according to their KIDMED scores.

following a diet plan. Furthermore, it was confirmed that KIDMED score are negatively associated with first meal, and overnight fasting, whereas the scores are positively associated with last meal, and number of main meals ($P < 0.05$, $P < 0.01$ using Pearson correlation).

Discussion

Since the adolescence is a critical period during which students may adopt lasting health behaviors, the present transition in the dietary pattern adopted by this group of age is a critical aspect to monitor. The main aim of our study is to explore AMD and to evaluate the relationship between KIDMED scores and sociodemographic, dietary habits, and anthropometric measurements among high school students in Hebron city, Palestine.

Nearly half of our adolescents had a moderate AMD (53.1%) was relatively similar to percentages obtained in Spain (65.9%),¹⁰ Cyprus (55.5%),²¹ Turkey (51.6%),⁷ Greece (51.2%),⁸ and

Table 2. Relationship between KIDMED scores and dietary habits

Variables		KIDMED score		P-value
		Mean ± SD		
Eating three main meals per day	Always	5.42 ± 2.20	0.000*	
	Often	4.95 ± 2.07		
	Sometimes	3.88 ± 2.17		
	Never	3.41 ± 1.97		
Eating between meals	Always	4.74 ± 2.52	0.017*	
	Often	4.28 ± 2.35		
	Sometimes	4.54 ± 1.99		
	Never	3.50 ± 1.96		
Skipping main meals	Always	3.23 ± 1.94	0.000*	
	Often	4.39 ± 2.20		
	Sometimes	4.54 ± 2.17		
	Never	5.63 ± 2.27		
Eating fast food	Always	2.86 ± 2.15	0.000*	
	Often	4.09 ± 2.28		
	Sometimes	4.75 ± 2.08		
	Never	5.45 ± 1.91		
Eating with the family	Always	4.75 ± 2.24	0.01*	
	Often	4.18 ± 2.16		
	Sometimes	3.78 ± 2.13		
	Never	2.29 ± 1.60		
Concern about dietary habits	Always	6.29 ± 2.12	0.000*	
	Often	4.75 ± 2.20		
	Sometimes	4.29 ± 1.96		
	Never	3.82 ± 2.26		
Following a diet plan	Always	3.78 ± 1.72	0.264	
	Often	4.92 ± 2.16		
	Sometimes	4.07 ± 2.40		
	Never	4.44 ± 2.21		
Weight satisfaction	Always	4.38 ± 2.19	0.025*	
	Often	4.42 ± 2.16		
	Sometimes	5.08 ± 2.33		
	Never	3.93 ± 2.22		

*Significant at P -value < 0.05 using Kruskal-Wallis test. SD, Standard deviation.

southern Spain (51.1%).²² Our analysis also reveals that the lowest percentage of students (9.40%) had a high AMD. This result was consistent with former studies.^{8,9,21} On the contrary, Spain and Southern Spain seemed to have the highest percentages of adolescents who had a high AMD (30.9% and 46.9%, respectively).^{10,22} Data from previous studies point out that diets of Mediterranean populations are progressively shifting away from the conventional and beneficial patterns.²³ Numerous factors have result in this nutrition transition, such as the urbanization of life, and the increased commercial availability of food.²⁴ Furthermore, less time spent on cooking, a stressful lifestyle, and the increased availability and variety of household devices have also been suggested as determinants of nutrition transition.²⁴

Among students' sociodemographic characteristics, we have found that age is negatively associated with KIDMED scores. These findings are in accordance with former studies.^{3,22} Regarding to socio-economic status, the current study found that SES was not significantly associated with KIDMED scores. This finding is inconsistent with a former study where it was found that students from public schools were found to have a high AMD compared to private schools.³

It was also noticed that higher parental education level was related to a better KIDMED score, but the education level of parents was not a significant predictor of the KIDMED score. This finding can be explained by the fact that higher parental education level may be linked to higher income and therefore greater availability of healthy foods, elevated motivation towards following a healthy lifestyle or elevated nutrition knowledge.²⁵ This result was inconsistent with former studies, where it was revealed a positive independent effect of household education on the quality of children's diet.²⁶⁻²⁸

Adoption of the MD has been linked with positive impacts on endothelium function, metabolic syndrome, insulin resistance, and lipoprotein levels.^{26,29} Regarding the anthropometric measurements, some researchers found an inverse association between MD and BMI,^{30,31} whereas others observed no correlation.³² In our analysis, it was noticed a higher body weight is related with a lower KIDMED scores, however, the relationship between these two variables was not significant.

Less is, however, known about the relationship between the dietary habits and KIDMED scores. Our study noticed that dietary habits (three meals/day, eating between meals, skipping main meals, eating fast food, and concern about dietary habits) was a strong predictor of KIDMED scores of adolescents. For instance, we have found that KIDMED scores were higher among those who eat always three meals per day, students who always eat between meals, students who don't skip meals, students who don't eat fast food, students who eat with their families, and among students who have always a great concern about their dietary habits. Based on our knowledge, no other study has sought this association, but studies have shown that meal skippers tend to have poor dietary habits, with an irregular snacking frequency and a high consumption of unhealthy beverages and foods.³³

Our participants ate frequently with their families, which is in agreement with other data.³⁴ Only (1.7%) reported that they do not eat with their families. These regular family meals may result in the formation of healthy eating habits and could be as role models for healthy food choices.²⁵

Our study also showed that KIDMED scores were significantly better among students who care more about their body image and their dietary habits. To our knowledge, this study was the first of its kind that have explored this association. The only explanation for this finding is that having concern about dietary habits will result in following a healthy diet which

could be similar to MD, this means that the diet will be rich in fruits, vegetables, and whole grains.

Limitations

There were several limitations in this study. Firstly, the general sample contain only female students (no male students participated in the current study). Therefore, further studies should be performed on larger sample groups with wider age ranges, living in larger geographical areas. The limited age range, region and number of students cannot be generalized to the whole of Palestine. Secondly, it was a cross-sectional study design. Therefore, we could not determine the causality of this association, only the interrelationships. However, instead they are valuable indications that can be used in future investigations. Thirdly, data collected were self-reported. This may lead to misreporting and recall bias because of the nature of the study and the young age of students. Fourthly; dietary assessment was not included in the current study. Nonetheless, the current study is considered the only one of its kind to explore AMD and whether KIDMED scores are associated sociodemographic, dietary habits, and anthropometric measurements among Palestinian high school students in Hebron city.

Conclusion

This study provides important data regarding a certain population of Palestinian adolescents living in Hebron city. We have found that nearly half of our participated students had a moderate AMD. Adolescents represent priority targets for making action and understanding their dietary habits is further considered an essential part to plan an educational interventions aimed at improving eating behaviors and, their health. Therefore, we highly encourage that educational institutions should highlight the health benefits of a MD. We have also found that adherence to Mediterranean diet was essentially unrelated to BMI. This evidence needs to be further explored, as well as its impact on health and disease.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon reasonable request.

Acknowledgments

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Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper. ■

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