



# Relationship Between Adherence to Mediterranean Diet with, Nutritional and Physical Fitness Status Among Young Athletes from Football Sports Academy- Palestine

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**Abstract**

**Background:** Lifestyle and dietary habits are related to better health and better physical function and fitness. Mediterranean diet is considered one of the healthy diet which is recommended for athletes. The aim of the study was to investigate the relationship between Mediterranean Diet Adherence (AMD) and other healthy lifestyle indicators of health among members of sport academy clubs from Hebron in Southern West Bank.

**Methods:** This study included the males participants from 4 different sport academies in Hebron Southern West Bank. Anthropometric measurements (weight and height) were obtained to categorize the weight into underweight, normal, overweight or obese according to WHO growth charts. Dietary information were obtained using a questionnaire that captures adherence to Mediterranean diet. Physical performance fitness tests were used to measure level fitness among participants. Analysis of data was performed by SPSS TM, version 21.

**Results:** A Total 116 participants were included in the study, The mean age  $13 \pm 3$  years; 78 % of participants have normal weight, 5% are classified as obese. 21.7% of the students have a low AMD, 47% had a moderate AMD and 31.3% has a high AMD. Adherence to MD was not related to body mass index or physical performance.

**Conclusion:** According to the findings of this study Adherence to MD was not associated with body weight and physical performance among the study sample.

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**Keywords:** Mediterranean diet; Physical Performance; Sport academy.



## Background

Involvement in professional physical activity increases the demand for optimal nutrition intake and body composition [1]. This is particularly important for athletes in adolescence period where peak height and growth are achieved increase the demand for nutritious food [2]. Healthy nutrition and increase intake of particular nutrients and supplementation are popular among athletes to improve performance [3,4]. However, adolescence is a period when unhealthy lifestyles are common. At the same time some athletes may lower their intake to lose weight [5]. Hence dietary recommendation to athlete is important to provide adequate nutrition and guide their weight control behavior. Otherwise nutrition deficiency could happen frequently among young athletes [6].

On the other hand, emphasizing intake of particular nutrient could affect body composition. Although body composition of athletes may be healthy, nutrition knowledge and the effect of each nutrient on body composition should be promoted among young athletes [7]. Training itself has high energy demand, proteins are needed for maximal muscle strength, calcium and vitamin D are needed for healthy skeleton and fatty acids are needed for growth and development [8]. Relative to non-sports adolescents, adolescents who are engaged in sports tend to consume more fruits, vegetables and milk, but at the same time more likely to consume sugar-sweetened drinks and eat fast food. At the same time, rate of taking breakfast by young athletes vary between studies and is different for females relative to males [9].

Adherence to healthy dietary habits such as Mediterranean Diet (MD) was suggested to improve body composition and performance. MD diet is well known to prevent degenerative disease [10]. At the same time, being rich in complex carbohydrate makes it plausible that it will enhance athletic performance. MD consists of consumption of whole grains, cereals, beans, legumes, nuts and many servings of fruits and vegetables and lean meat, fish [11]. MD could provide protection from oxidative stress that is induced by exercising. At the same time MD can increase muscle mass without increasing body weight [12] which may lead to enhanced physical activity performance. Previous study on Palestinian adolescents shows irregular meal habits and inclination towards a westernized diet in city like Ramallah [13]. Palestinian adolescents represent more than 30% population in Palestinian territories [14]. Dietary habits and physical activity were studied by Sabbah et al. However dietary patterns and behaviors among Palestinian athletes have not been studied before. Hence the aims of this study were 1) to evaluate adherence to MD 2) to evaluate the relationship between MD and body composition 3) to evaluate the association between MD and physical performance among Palestinian sport academies trainees.

## Materials and methods

### Study design

This study utilized cross sectional design with an aim to determine the relationship between adherence to Mediterranean diet with nutritional status and level of fitness among young athletes from four different football sport academies in the South of west bank, Palestine (Kharas, Bani Neim, Bietlahem and Mamoun Khatieb). The football sport academies are kind of sport clubs which was approved in Palestine in 2016 from

the ministry of youth and sport. The collected data included sociodemographic data of the participants, medical history, adherence to Mediterranean diet, fitness assessment and dietary practices. The data is collected from June 2018 to July 2018. Formal Letters asking for permission from trainers and coaches were sent to to aforementioned academies. After the permission, participants could choose to engage in the study or reject. The protocol and procedures of the study are accepted by the ethical committee of Palestine Polytechnic University.

### Sample size & sampling procedure

Sample size computation is done by utilizing G-power software. A convenience sampling method was utilized in this study. The required sample size was 110 participants. Eligible participants had to meet a certain inclusion criteria. These standards included: 1) All Palestinian young athletes who are members in a registered football sport academy that belongs to the ministry of Youth and sports, 2) School age and teens participants, 3) Participates who were following regular exercise schedule in the sport academy.

### Nutritional status assessment

Anthropometric measurements included body weight, body height and waist circumference. Body weight for athletes was measured by using an electronic scale, every individual was asked to take off any weighty stuff such as shoes, jackets, and handbag with an intention to get a precise measurement. The scale was calibrated each time prior to measuring the athlete. The athlete was required to stand in a Frankfurt horizontal plane. Height measurement was taken in centimeters following the standard methods in [15]. Just as one statement that Body Mass Index (BMI) was calculated from weight "wt" and height "ht". Then, the BMI was categorized according to WHO – growth chart according to age. BMI for-age percentiles using the CDC growth charts. According to the CDC classifications, participants with measures located between the 5th and the 85th percentile were considered to have a normal weight. However, percentiles lower than 5th are considered as underweight, percentiles between 85th and 95th were considered as overweight, and percentiles  $\geq 95$ th were considered as obese. Self-reported questions regarding the dietary habits were also included in the data sheet. The questionnaire also included KIDMED index [16].

### 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  $\leq 3$  are considered having a poor AMD, those with scores between 4 and 7 have a moderate adherence, and those with scores  $\geq 8$  have a high AMD [16].

### Physical fitness assessment

The level of physical fitness of the participants were assessed using Broad jump test (f explosive leg power), vertical jump test (test of lower body power), 4\*10 shuttle run test (to assess motor skills: speed of movement, agility and coordination), back scratch test (for flexibility) and accelerated test (power and agility). Athletes were briefed how to perform the tests, the instruction was given by the coaches following the standard method reported in [17].

## Statistical analysis

The Statistical Package for the Social Sciences SPSS TM, version 21 was used to analyze the collected data, 5% alpha level and 80% power were considered in all of the statistical tests. Descriptive analysis including the means and the standard deviations were used to analyze the continuous data. The categorical data were described by percentages. The Independent Samples t-test was used to determine the significant differences in the mean scores of nutritional status, physical fitness variables and adherence to Mediterranean diet. The correlations between adherence to Mediterranean diet with nutritional status and physical function was done using Pearson correlation test.

## Results

A total of 116 participants from 4 different sport academies are included in the final analysis. Participants characteristics are summarized in Table 1. The mean age of the participants was 13±3 years old, ranged from 7-16 years old. The majority of the participants (84.1%) were in primary schools, around one third of the participants have excellent academic achievement.

**Table 1:** Participants characteristics presented in number and (%).

Variables		n (%)
Academy name	Kharas	20 (17.2)
	Bani neim	26 (22.4)
	Bietlahem	41 (35.3)
	Mamoun khatieb	29 (25.0)
Age	7-12 years	51 (44.0)
	13- 16	65 (56.0)
Education	Primary	74 (84.1)
	Secondary	14 (15.9)
Academic acheivment	Excellent	36 (31.9)
	Very good	35 (31.0)
	Good	29 (25.7)
	Fair	13 (11.5)
Father education	Not educated	7 (6.1)
	Primary	22 (19.1)
	Secondary	45 (39.1)
	Diploma	6 (5.2)
	Bachelor	26 (22.6)
Mother education	Postgraduate	9 (7.8)
	Not educated	11 (9.6)
	Primary	13 (11.3)
	Secondary	43 (37.4)
	Diploma	12 (10.4)
	Bachelor	30 (26.1)
	Postgraduate	6 (5.2)

Table 2. summarizes the participants sports profile and life style, 35% of the participants play football, around half of them have an athletes relative. More than 70% of the participants have 1-2 years period of membership in the academy, 86% of the participants have the training only in the academy, more than 50% have 3 days training /week. For Life style, all of the participants reported no smoking, around three quarter of the participants reported 8-10 hours sleep each day and eat regular three main meals.

**Table 2:** Participants sport profile and life style characteristics presented in number (1%).

Variables		n (%)
Athlete relative	Yes	51 (44.0)
	No	65 (56.0)
Game	Football	41 (35.3)
	Gymnasti	2 (1.7)
	Karate	1 (.9)
	Swimming	1 (.9)
Academy membership period	6-12 mnth	30 (25.9)
	12- 24	71 (61.2)
	24- 36	8 (6.9)
	More than 36 months	7 (6.0)
Number of exercise day inside the academy	1-2 days	57 (49.1)
	3-4 days	59 (50.9)
Number of exercise day outside the academy	Yes	16 (13.9)
	No	99 (86.1)
Sleeping hours	<8 hours	19 (16.4)
	8-10 hours	73 (62.9)
	More than 10 hours	24 (20.7)
Number of main meals	Less than 3 main meals	31 (26.7)
	3 main meals	71 (61.3)
	More than 3 meals	14 (12)

### Nutritional status of the students

78% of participants had normal weight, 16% were overweight, 5% were obese and only 1% were underweight.

### Adherence to mediterranean diet

The mean score of adherence to Mediterranean diet was (6.8 ± 4.8) ranged from 2-14 points.

The results revealed that (21.7%) of the students have a low AMD, (47%) had a moderate AMD and (31.3%) has a high AMD. Data analysis also reveals that AMD 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).

The relationship between adherence to Mediterranean diet with nutrition status and level of fitness.

Table 3 illustrates that KIDMED scores were significantly not associated with all of nutritional status parameters and fitness status using one way Anova test. Further analysis using Pearson correlation test was done using the KIDMED row score with the continuous variables also showed similar findings the correlation was not significant with any of the variables.

Table 4 illustrates the relationship between BMI for age categories with the score of fitness tests. The results revealed significant relationship BMI and the score of set and reach test  $p < 0.05$  using one way Anova test, which revealed that participant who are normal or over weight have better flexibility as compared to obese. Broad jump test and vertical jump test showed that there are better performance reported among normal and overweight participants as compared to obese, but the differences didn't reach the significant level.

**Table 3:** The relationship between AMD with nutrition and fitness status.

	Poor kidmed (n=18)	Moderate kidmed (n=39)	High kidmed (n=26)	p-value
BMI	19.5 ± 4.9	19.6 ± 3.8	17.7 ± 2.8	0.119
MUAC	21.4 ± 4.1	22.4 ± 3.4	21.8 ± 2.8	0.551
Waist circumference	73.9 ± 10.6	75.9 ± 10.5	74.5 ± 7.6	0.715
Hip circumference	37.1 ± 7.6	38.1 ± 6.7	36.8 ± 5.2	0.721
Calf circumference	28.3 ± 5.8	28.6 ± 5.1	34.5 ± 38.9	0.519
Broad jump test	168.8 ± 25.8	166.9 ± 33.2	184.5 ± 23.5	0.051
Vertical jump test	210.8 ± 18.9	225.5 ± 26.1	224.6 ± 23.2	0.08
4*10 shuttle run test	12.0 ± 0.8	11.5 ± 1.2	11.4 ± 1.1	0.1
Set and reach test	2.8 ± 5.9	2.4 ± 5.3	3.7 ± 6.1	0.6
Back scratch test	2.2 ± 4.1	2.9 ± 4.8	2.8 ± 6.5	0.9
Accelerate test	9.8 ± 2.6	10.4 ± 2.3	11.4 ± 3.2	0.12

**Table 4:** The relationship between nutritional status and level of fitness.

	Under weight (n=1)	Normal weight (n=90)	Over weight (n=19)	Obese (n=6)	p-value
Broad jump test	210.00	211.16 ± 96.729	154.16 ± 44.197	155.83 ± 4.701	.021
Verticle jump test	255.00	185.99 ± 61.095	184.16 ± 72.340	229.17 ± 40.794	.253
4*10 shutle run test	10.00	11.50 ± 1.041	11.64 ± 1.082	12.33 ± 1.211	.183
Set and reach test	.00	1.54 ± 4.353	2.33 ± 6.973	4.73 ± 4.082	.035*
Back scratch test	.00	1.60 ± 4.024	2.92 ± 6.613	4.33 ± 4.320	.224
Accelerate test	9.00	9.16 ± 3.651	9.16 ± 3.934	9.83 ± 1.329	.907
Days of exercise inside the academy	3.00	2.68 ± .981	2.79 ± .918	2.17 ± .408	.375

## Discussion

Very few studies have investigated adherence to traditional Palestinian cuisine and its similarity to Mediterranean diet. It is likely that Palestinian cuisine is very much similar to cuisine in countries like Lebanon which is on the Northern border of historical Palestine [18]. MD is a healthy diet that was described by Ancel Keys in 1960. It is associated with reduced mortality from chronic diseases such as cancer and CVD. It consists of high intake of plant food, olive oil and fish and low intake of red meat. For up to author knowledge this is first study to assess adherence to Mediterranean diet among young Palestinian athletes. We found that 47% of young Palestinian athletes in fact had high adherence to MD in a southern West Bank area. Only 31% had low adherence to MD among studied group. The findings in this study is not very different than other findings among young athletes in Spain which is another Mediterranean country [19]. The level of adherence to MD was 47% among young swimmers and seemed to improve with education sessions on

the importance of MD to athletes performance in Cyprus [11]. Similar educational intervention would help to increase awareness among Palestinian athletes on the importance of traditional MD diet. One factor that could have played role in adherence to MD is the relatively reasonable educational level of parents of studied young athletes.

The higher adherence to MD diet seemed to correlate inversely with school achievement. Whether adherence to more traditional Palestinian diet is associated with lower consumption of bioavailable iron in form of meat and hence iron deficiency anemia that may affect school performance needs further investigation in future studies and is important question to address.

Another study among Greek students showed positive association between MD and school performance ( $B = 0.14$ ,  $p = 0.001$ ) [20]. Also, adherence to MD diet was associated with



better school performance among youth from Spain [21]. These conflicting results needs further investigation including studying other factors linked to school performance such as anemia which is prevalent among Palestinian children as was observed in some studies.

5% and 16% of studied youthful athletes were obese and overweight respectively. Overweight and obese athletes are twice at risk to have injury during sports relative to normal weight athletes [22]. Results on association between adherence to MD and lower obesity rate are not consistent with some studies indicating that MD in fact is protective from obesity [23]. Moreover, studies on the association between obesity and MD among youth athlete are scarce. The beneficial effects of MD could be ascribed to high content of monounsaturated fatty acids and low content of saturated fatty acids. In addition to lower total calories and lower carbohydrate which interfere with insulin mediated increase in fat accumulation in the body [24]. In our study, young athletes with high MD score tended to have lower BMI, albeit not statistically significant, whereas there was no significant difference in WC or hip circumference according to MD score categories.

At the same time, youth who were obese and overweight tended to have lower physical performance in only two tests (Broad jump test and set and reach test). Also youth with higher MD score committed to longer duration hours of training. However, using supplementation in clinical trials with factors such as olive oil and omega 3 fatty acid did not enhance physical performance in athletes [25], whereas among young university students motivation for sports was associated with higher adherence to MD [26] which could explain the finding in our study with regards to longer hours of training positive association with MD. The improvement in athletes performance with MD diet could be linked to decreased oxidative stress and decrease in BMI among consumer of MD diet.

Sleeping hours in this study was associated with inverse commitment to training as assessed with the duration of joining the sports academy, the duration of training in days and hours. All domains of athletes performance including speed, endurance, neurocognitive function and physical health have been are positively linked to adequate sleeping hours [27]. Hence the findings in our study needs further investigation. It is worthy to mention that some studies indicated that athletes tend to have poorer quality of sleeping relative to non-athletes controls [28]. So the association in our study may reflect that the participants who are determined athletes tend to sleep less, rather than sleeping may lead to improved training satisfaction.

This study without limitation including its cross sectional design, involvement of athletes only from Southern areas of West Bank, and not including multiple adjusted models. However, it is the first study that addresses factors linked to MD intake and athletes performance. In addition we used different forms of test to assess physical activity and we included participants from 4 different regions in Southern West Bank.

## Conclusion

In Summary, among a group of young athletes from Southern West Bank, high prevalence of adherence to MD diet, three meals a day, and 8 sleeping hours existed. The adherence to MD diet seems to occur simultaneously with low level of obesity among studied group, although adherence to MD diet was not statistically associated lower BMI. Moreover, devoted athletes

could have lower quality sleeping but this needs further investigation. We recommend educational sessions to youth in Southern West Bank, particularly athletes that advocate adherence to plant based Palestinian traditional cuisine that could represent a type of MD that exist in many countries located around MD, in addition to inclusion of at least three meals a day and adequate sleeping to improve general wellbeing and athletes performance.

## Advance in Knowledge

The study is the first in Palestine to highlight the relationship between nutrition and physical fitness among Palestinian athletes. The study gives comprehensive data about adherence to Mediterranean diet, and physical fitness using validated and reliable method of assessment. The study helped to identify the gap in the literature about sport, nutrition and fitness among Palestinian, the findings of this study can be used for future educational program targeting the Palestinian athletes.

## Application to patient Care

Addressing and describing the nutritional status of the athletes, will participate to prevent the sport related nutrition health issues (micronutrients deficiency, osteoporosis and others), which are common among athletes and expose them to serious health problems.

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