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Adherence to The Mediterranean Diet Among Adolescent Female Volleyball Players And Non-Athlete Controls

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Abstract

Background: The Mediterranean diet (MD) is considered one of the healthiest eating patterns in the world. MD can be an alternative dietary pattern for adolescent athletes to achieve their performance goals since it contains nutrients rich in carbohydrates, which are important for improving athletic performance and recovery, and contains antioxidant nutrients that reduce the harmful effects of training.
Purpose: The aim of this study was to compare the adherence to MD in adolescent female volleyball players and non-athlete controls and their nutritional status.
Material and Methods: A total of 70 female adolescents in the 12-14 age group, 35 volleyball players and 35 non-athlete controls, participated in the study. Adherence to MD was assessed by the Mediterranean Diet Quality Index in Children and Adolescents (KIDMED) questionnaire, and a two-day food consumption record was used to obtain information about the nutritional status. In the comparison of differences between two groups, the independent samples t-test was used for normally distributed data, and the Mann-Whitney U test was used for non-normally distributed data.
Results: There was no difference between the KIDMED index scores of the adolescent volleyball players and the group of non-athlete controls ($p>0.05$). The adherence to MD of a large part of both groups is average. In other words, the improvement of the dietary pattern is needed. When energy, macronutrient and micronutrient intakes were assessed, only protein and zinc intakes were different between the groups ($p<0.05$). The protein and zinc intake levels of the control group were higher than the athlete group.
Conclusions: Dietary patterns of adolescents should be improved for growth and development, healthy life, protection against some diseases in the future, and sportive performance.

Keywords: KIDMED, Adolescent Athletes, Sedentary, Nutritional Status, Mediterranean Diet

INTRODUCTION

In recent years, major changes have been observed in the lifestyle of adolescents around the world. Under the effect of globalization and urbanization, there has been a rapid increase in the consumption of foods with low nutritional value, processed and energy-dense foods as well as ready-to-eat products. This situation has caused dietary habits to diverge from healthy diets, especially among adolescents (Rosi et al., 2019). Since healthy eating practices that start in adolescence continue in adulthood, it is important to gain healthy eating behaviors during this period (Galan-Lopez, Sánchez-Oliver, Ries, & González-Jurado, 2019a). An active lifestyle that includes sports together with a healthy diet should be adopted in adolescence (Calella et al., 2020).

Among different dietary patterns, the Mediterranean diet (MD) is considered one of the healthiest eating patterns (Galan-Lopez et al., 2019a). Legumes, whole grains, nuts and seeds, fruits and vegetables consumption are high in this diet. It provides moderate to high consumption of fish, moderate consumption of low-fat dairy products, poultry, wine and low consumption of red (Grassi et al., 2020; Idelson, 2017; Manzano-Carrasco et al., 2020a; Muros & Zabala, 2018; Peraita-Costa et al., 2020; Ramírez-Vélez et al., 2018). Extra virgin olive oil is the main source of dietary fat and the monounsaturated fat content is higher (Cabrera et al., 2015; Grassi et al., 2020). Therefore, the importance of this dietary pattern is that it is a balanced and varied diet and provides most of the recommended macronutrients and micronutrients in correct proportions. As a result, MD contains a low content of saturated fatty acids, high amounts of fiber and complex/low-glycemic index carbohydrates, significant amounts of antioxidants, vegetable protein and a balanced ratio of n-6/n-3 fatty acids (Cabrera et al., 2015; Idelson, 2017).

It is stated that adherence to MD protects against diseases such as cardiovascular and cerebrovascular diseases, diabetes, obesity, osteoporosis, cognitive decline, depression, neurodegenerative diseases, and cancer (Cabrera et al., 2015; Muros & Zabala, 2018; Peraita-Costa et al., 2020). Adherence to MD shows significant protection regarding mortality and morbidity (Galan-Lopez, Ries, Gisladottir, Domínguez, & Sánchez-Oliver, 2018).

Exercise causes varying degrees of mechanical and metabolic stress in the human body, leading to inflammation and oxidative stress. Due to its high content of antioxidant and anti-inflammatory nutrients, MD has a protective effect in combating the adverse effects of oxidative stress (D'Angelo & Cusano, 2020). In particular, phytonutrients like carotenoids, polyphenols, glucosinolates, sulfur compounds (Peraita-Costa et al., 2020) and antioxidant compounds found in MD prevent possible decreases in antioxidant levels in target tissues and blood, which are the result of oxidative stress caused by vigorous exercise because it is known that vigorous exercise causes mitochondrial generation and/or the loss of superoxide and hydrogen peroxide, with or without decrease of the vitamin E content in both muscle and the liver. Antioxidants, especially polyphenols, help protect body cells from free radical damage (D'Angelo & Cusano, 2020). Moreover, nutrients such as n-6 and n-3 essential fatty acids, oleic acid, and dietary fiber contained in MD also help prevent lipoperoxidation, improve lipid profile and endothelial function by showing anti-inflammatory and antithrombotic properties (Peraita-Costa et al.,

2020). Briefly stated, MD is compatible with nutritional recommendations for athletic performance. MD can be an ideal dietary pattern that can be used by adolescent athletes to achieve athletic goals (Calella et al., 2020; D'Angelo & Cusano, 2020; Philippou, Middleton, Pistos, Andreou, & Petrou, 2017).

Although studies show a relationship between a positive effect on health and high levels of physical activity and adherence to the Mediterranean diet (Manzano-Carrasco et al., 2020a; Manzano-Carrasco et al., 2020b; Muros & Zabala, 2018), adherence to MD is rapidly decreasing in the Mediterranean countries, especially among children and adolescents (Evaristo et al., 2018). These countries are replacing MD with a Western diet rich in animal products, refined carbohydrates and fat, and lacking in fruit and vegetable consumption (Muros & Zabala, 2018). Studies on adherence to MD and its health effects in children and adolescents in the Mediterranean and non-Mediterranean countries have increased in recent years (Galan-Lopez et al., 2019b). However, a limited number of studies are available in athletic populations. The aim of this study is to compare the adherence to MD in adolescent female volleyball players and non-athlete controls and their nutritional status. We hypothesized that KIDMED index score in volleyball players is higher than non-athlete controls and energy, macro and micro nutrient intakes would differ between the two groups.

METARIAL AND METHODS

Participants

This study was conducted on 70 volunteer adolescents, including 35 female athletes between the ages of 12-14, who attend different volleyball clubs in Antalya, Turkey, and train for at least 1.5 hours a day, and 35 female non-athletes who receive education in schools where athletes are educated, have a similar socioeconomic level with athletes, become active only in physical education lessons, do not exercise apart from that and have normal body mass index (BMI) values (15-85th percentile range according to the WHO BMI classification according to age) (Organization, 2007). Individuals with any health problems and using medication were not included in the study.

Procedure

The participants, club and school administrators and families were informed about the study, and written permission was obtained from their parents because the participants were under 18. The study was conducted in accordance with the declaration of Helsinki. The characteristics of the participants are presented in Table 1. A questionnaire containing demographic data such as date of birth, weight, height, socioeconomic status, exercise frequency and intensity, and the Mediterranean Diet Quality Index in Children and Adolescents (KIDMED) were applied to the participants to determine adherence to the Mediterranean diet, and two-day food consumption records were taken to determine the nutritional status.

Table 1. Descriptive characteristics of participants

Characteristics	**Volleyball Players** (n=35) (Mean±SD)	**Non-athlete Controls** (n=35) (Mean±SD)
Age (years)	12,42±0,77	12,74±0,92
Weight (kg)	49,25±7,51	49,54±8,59
Height (cm)	157,97±4,88	156,91±9,01
BMI (kg/m^2)	19,68±2,35	20,04±2,37

SD: Standart Deviation; BMI: Body Mass Index

Measures

Adherence to the Mediterranean Diet

Adherence to MD was assessed using the KIDMED index. Developed by Serra-Majem et al., the KIDMED index is a nutritional index that assesses adherence to MD and diet quality in children, adolescents, and young adults aged between 2-24 years (Baydemir, Ozgur, & Balci, 2018; Manzano-Carrasco et al., 2020b; Serra-Majem et al., 2004). The KIDMED index is widely used in cross-sectional studies (Serra-Majem et al., 2004) to assess dietary habits (Baydemir et al., 2018) but is newly used in athlete populations (D'Angelo & Cusano, 2020). The KIDMED index consists of 16 questions with "yes" and "no" options, 12 of which express positive (+1 point) association and 4 of which express negative (-1 point) association (see Table 2). The KIDMED index is calculated as the sum of each answer, and points range from 0 to 12. Levels of adherence were classified into three groups: poor adherence (very low-quality diet) (≤3), average adherence (improvement of the dietary pattern is needed) (4–7), and good adherence: optimal MD (≥8) to the MD (Serra-Majem et al., 2004).

Table 2: KIDMED index (Serra-Majem et al., 2004)

Items	**Score**
Takes a fruit or fruit juice every day	+1
Has a second fruit every day	+1
Has fresh or cooked vegetables regularly once a day	+1
Has fresh or cooked vegetables more than once a day	+1
Concumes fish regularly (at least 2-3/week)	+1
Goes >1/week to a fast food restaurant (hamburger)	-1
Likes pulses and eats them >1/week	+1
Concumes pasta or rice almost every day (5 or more per week)	+1
Has cereals or grains (bread, etc.) for breakfast	+1
Concumes nuts regularly (at least 2-3/week)	+1
Uses olive iol at home	+1
Skips breakfast	-1
Has a dairy product for breakfast (yoghurt, milk, etc.)	+1
Has commercially baked goods or pastries for breakfast	-1
Takes two yoghurt and/or some cheese (40g) daily	+1
Takes sweets and candy several times everyday	-1

Food Consumption Records

A twenty-four-hour food consumption record can be taken for one day, and the number of days can be increased to increase reliability (Pekcan, 2008). In this study, the 24-hour food consumption record was taken as a training day and a non-training day for volleyball players,

and a weekday and a weekend for the non-athlete group. The participants recorded in detail what they ate and drank from morning to evening on the "Food Consumption Record Form" on the record days. How to write the measurements, amounts and types of foods consumed on the form was explained by providing training before the study. Food consumption records were calculated by an expert dietician, using the Nutrition Information System (BeBiS 7.2) program for the energy and micro and macro nutrient compositions of the diets (BeBiS, 2004). This database contains Turkish food composition tables for all foods.

Energy requirements of the participants were evaluated as lightly active (median, PAL = 1.4) for the control group and moderately active (median, PAL = 1.6) for the athlete group, according to the Turkey Dietary Guidelines (TUBER), using the energy requirement and energy reference values for female children and adolescents according to their physical activity level. Since there are no micronutrient and macronutrient recommendations for active individuals or athletes in TUBER, the Sports Dietitians Australia position statement was taken into account in the protein, carbohydrate, and calcium intake recommendations of volleyball players, and the protein requirement of volleyball players was evaluated as 1.2 g/kg/day, carbohydrate requirement as 5 g/kg/day, and calcium requirement as 1300 mg/day (Desbrow et al., 2014). The protein requirement of the control group was determined as 0.9 g/kg/day, carbohydrate requirement as 130 g/day, and calcium requirement as 1150 mg/day (TÜBER, 2016). Other nutritional elements were evaluated in both groups according to the TUBER data.

Statistical Analysis

Data were analysed using the SPSS version 22 (SPSS, IBM Corp., Armonk, NY, USA). The qualitative variables are expressed in frequencies and percentages (%), while the quantitative variables are presented as means (mean) and standard deviations (SD). Normality of data distribution was confirmed by Shapiro-Wilk test and homogeneity of variances was performed by Levene's test. In the comparison of differences between two groups, the independent samples t-test was used for normally distributed data, and the Mann-Whitney U test was used for non-normally distributed data.

RESULTS

There is no significant difference between the KIDMED index total scores of adolescent female volleyball players and the non-athlete control group ($p>0.05$). The adherence to MD of a large part of both groups is average. In other words, the improvement of the dietary pattern is needed (see Table 3).

Table 3. KIDMED index score in **v**olleyball players and non-athlete controls

Variables	**Volleyball Players** (n=35) **(Mean±SD)**	**Non-athlete Controls** (n=35) **(Mean±SD)**	
KIDMED Score	5.74±2.12	5.74±2,32	Z=-0,231 p=0.822
	n (%)	**n (%)**	
KIDMED Score			
Poor	7 (20.0)	7 (20.0)	
Average	22 (62.9)	19 (54.3)	
Good	6 (17.1)	9 (25.7)	

SD: Standart Deviation
KIDMED: Mediterranean Diet Quality Index
Z: Mann-Whitney U test statistical value

The food consumption record analysis of the volleyball players and the control group are given in Table 4. There is no significant difference between the volleyball players and the control group in terms of daily energy intake ($p>0.05$). However, the percentage of meeting the recommended reference value is 69.92±20.95% in volleyball players and 84.17±25.47% in the control group, respectively, and there is a significant difference ($p<0.05$).

A significant difference was found between the groups in the amount of protein consumed per day, the percentage of total energy intake coming from protein, and the percentage of meeting the reference value ($p<0.05$). The protein consumption amount of the control group is higher than the athletes. Carbohydrate intakes are similar in both groups. However, there is a significant difference in the percentage of energy from carbohydrates and the percentage of meeting the reference value between the groups ($p<0.05$). There is no significant difference between the groups in terms of daily fiber, fat, and EPA+DHA consumption ($p>0.05$).

There is no significant difference between the groups in terms of daily vitamin consumption, daily iron, calcium and magnesium intake and percentages of meeting the reference value ($p>0.05$). There is a significant difference between the two groups in terms of daily zinc intake and the percentage of meeting the requirement ($p<0.05$). The daily zinc consumption of the control group is higher than athletes.

Table 4. Food consumption record analysis in volleyball players and non-athlete controls

Energy, amount of macro and micro nutrients	**Volleyball Players** (n=35) Mean ± SD	**Non-athlete Controls** (n=35) Mean ± SD		
Energy				
kkal/day	1405.36±428.01	1501.71±464.86	Z=-0.840	p=0.401
TUBER %	69.92±20.95	84.17±25.47	Z=-2.684	p=0.007*
MACRONUTRIENTS				
Protein				
g/day	53.02±21.31	65.49±22.64	Z=-2.743	p=0.006*
g/kg/day	1.10±0.43	1.35±0.52	Z=-2.279	p=0.023*
TE %	15.26±2.23	17.97±3.82	t=3.629	p=0.001*
SDA%-TUBER %	91.68±35.65	150.12±57.78	Z=-4.781	p=0.000*
Carbohydrate				
g/day	161.18±46.10	157.57±59.04	Z=-1.169	p=0.243
g/kg/day	3.35±1.03	3.27±1.32	Z=-1.057	p=0.290
TE %	47.63±6.96	42.94±7.39	t=-2.730	p=0.008*
SDA%-TUBER %	67.02±20.61	121.25±45.38	Z=-5.891	p=0.000*
Fiber (g/day)	16.33±7.20	15.85±6.91	Z=-0.264	p=0.792
Fat				
g/day	58.84±22.45	65.29±22.18	Z=-1.545	p=0.122
TE %	37.14±6.64	39.06±6.97	t=1.117	p=0.243
EPA+DHA				
g/day	0.28±0.18	0.35±0.35	Z=-0.229	p=0.819
TUBER %	110.74±73.61	141.49±140.60	Z=-0.229	p=0.819
MICRONUTRIENTS				
Vitamin A				
mcg/day	914.04±446.15	791.38±380.64	Z=-1.357	p=0.175

TUBER %	152.33±74.36	131.90±63.44	Z=-1.363	p=0.173
Vitamin D				
mcg/day	1.32±1.99	1.20±1.54	Z=-0.499	p=0.618
TUBER %	9.15±13.14	8.38±10.14	Z=-0.298	p=0.774
Vitamin C				
mg/day	109.31±70.43	82.69±45.50	Z=-1.333	p=0.182
TUBER %	156.25±100.62	118.1224±64.99	Z=-1.334	p=0.182
Vitamin B_6				
mg/day	1.33±0.72	1.36±0.50	Z=-0.769	p=0.442
TUBER %	130.48±82.49	136.67±56.42	Z=-0.543	p=0.587
Vitamin B_{12}				
mcg/day	3.87±2.40	4.38±2.62	Z=-1.398	p=0.150
TUBER %	108.57±72.61	124.90±75.62	Z=-1.439	p=0.162
Iron				
mg/ day	8.85±3.35	9.62±3.52	Z=-0.793	p=0.428
TUBER %	67.91±25.95	73.41±27.38	Z=-0.557	p=0.578
Calcium				
mg/day	597.90±255.19	611.83±209.17	t=0.250	p=0.804
SDA%-TUBER %	45.99±19.63	53.20±18.18	t=1.594	p=0.115
Magnesium				
mg/ day	225.31±85.12	237.50±83.33	t=0.605	p=0.547
TUBER %	90.14±34.05	94.99±33.34	t=0.603	p=0.549
Zınc				
mg/ day	7.36±3.15	8.46±2.85	Z=-2.108	p=0.035*
TUBER %	68.7824±29.40	79.07±26.60	Z=-2.108	p=0.035*

TE: Total energy intake, TUBER: Turkey Dietary Guidelines, SDA: Sports Dietitians Australia, *p<0.05
SD: Standart Deviation
Z:Mann-Whitney U test statistical value
t:Independent samples T test statistical value

DISCUSSION

Proper nutrition is essential for an athlete to optimize training and competition performance (D'Angelo & Cusano, 2020). Especially during adolescence, young people become independent in choosing their food (Calella et al., 2020), and their nutritional needs are relatively high compared to adults in order to support growth and development. It is also known that the needs of adolescent athletes are higher than their non-athletic peers. Especially adolescent athletes need reliable resources to maintain health and prevent injuries as they progress in their sports careers (Parnell, Wiens, & Erdman, 2016). With the increasing number of studies, the importance of the Mediterranean diet for children and adolescents has been emphasized in recent years (Galan-Lopez et al., 2019a). In the Mediterranean diet, the presence of healthy foods, food variety, consumption of foods in season, and preservation of the freshness of the product are at the forefront. All foods in the diet, including desserts, are recommended in sparing and measured amounts (D'Angelo & Cusano, 2020). The positive relationship between the Mediterranean diet and sports performance is due to the high rate of antioxidant and anti-inflammatory foods in the Mediterranean diet, which have a protective effect in combating the adverse effects of oxidative stress and reduce the harmful effects of training. At the same time, MD can be an ideal dietary pattern to meet the energy and macronutrients and especially micronutrients that athletes need to achieve growth and development as well as performance goals in adolescence since it contains foods rich in carbohydrates, which are important for improving athletic performance and recovery (Calella et al., 2020; D'Angelo & Cusano, 2020; Philippou et al., 2017).

The aim of this study was to compare the adherence of adolescent female volleyball players and non-athlete controls to MD and their nutritional status. It was hypothesized that the KIDMED index scores of volleyball players would be higher than the non-athlete control group and that the energy, macronutrient and micronutrient intake levels obtained as a result of the food consumption record analysis would be higher in the athlete group. However, there was no difference between the KIDMED index scores of adolescent volleyball players and the non-athlete control group. Macronutrient and micronutrient intake levels were not different except for protein and zinc. The amount of protein and zinc consumed daily by the sedentary group was higher than the athlete group.

In this study, 17.1% of adolescent female volleyball players had good adherence to MD, and 62.9% of them had average adherence to MD, while 25.1% of non-athlete controls had good adherence to MD and 54.3% of them had average adherence to MD. There was no significant difference between the KIDMED scores of the two groups ($p>0.05$). Likewise, Sahingoz and Sanlier (2011) conducted a study with 890 volunteers aged between 12-14 years in Ankara (Turkey) and showed that 17.9% of the participants had low adherence to MD, 59.2% had moderate adherence to MD and 22.9% had an optimal quality adherence to MD (Sahingoz & Sanlier, 2011). In another study conducted in Turkey, a total of 497 high school students were evaluated in the provinces of Kırşehir and Antalya, and it was demonstrated that 31.4% of female students had poor adherence to MD, 57.9% had average adherence to MD and 9.7% had good adherence to MD, while 30.7% of male students had poor adherence to MD, 58.9% had average adherence to MD and 11.5% had good adherence to MD (Yardimci, Ozdogan, Ozcelik, & Hovland, 2016). In another cross-sectional study conducted with adolescents aged between 12-18 years in Portugal, a Mediterranean country, it was found that 6.4% had a poor level, 52.8% had an average level and 40.8% had a good quality level (Evaristo et al., 2018). In their study, in which they evaluated 785 male adolescents aged 11-14 years who came from different regions of Turkey for the national basketball team selection, Erol et al, (2010) stated that 55.7% of the participants had moderate diet quality, 39.9% had good diet quality, and 4.5% had low diet quality (Erol, Ersoy, Pulur, Özdemir, & Bektaş, 2010). Likewise, Torun and Yildiz (2013) found low quality in 10.5%, moderate quality in 64.2%, and optimal quality in 25.3% of the football players in their study with adolescent football players aged 10-14 years in Antalya (Torun & Yildiz, 2013). When reviewing other studies in the Mediterranean basin, Philippou et al, (2017) found that 15% of the participants had poor adherence to MD, 65% had moderate adherence to MD, and 21% had good adherence to MD before they gave nutrition training in their study with 65 adolescent swimmers in Cyprus (Philippou et al., 2017). In Spain, Manzano-Carrasco et al, (2020b) showed that 6.7% had low adherence to MD, 57.6% had moderate adherence to MD and 35.7% had high adherence to MD in their cross-sectional study with a total of 1676 participants from different sports schools aged between 6-17 years (Manzano-Carrasco et al., 2020b). In Italy, in the study conducted by Calella et al, (2020), evaluating the KIDMED index of 5 different groups consisting of gym members and volleyball, swimming and gymnastics athletes and inactive adolescents, 16.3% of volleyball players showed optimal adherence to MD, while 10.6% of inactive adolescents showed optimal adherence to MD (Calella et al., 2020).

Adolescents typically adhere to an energy-dense diet but with a low nutritional value. Conversely, better food intakes are reported in adolescent athletic populations compared to their sedentary peers. At the same time, athletes have higher irregular eating rates compared to non-athletes (Parnell et al., 2016). According to the SDA position statement, there are currently no predictive equations to accurately determine the energy requirements of adolescent athletes. To determine whether the total energy intake is appropriate, the growth and development markers of an adolescent athlete throughout his/her lifetime must be compared with reference standards (Desbrow et al., 2014). In this study, we used the TUBER data as the reference value for energy intake. Although there was no significant difference in terms of energy intake between volleyball players and the control group, the percentage of meeting the energy requirement was significantly lower in volleyball players compared to the control group.

It is difficult to evaluate the adequacy of macronutrient intake in young athletes due to the lack of reference values and recommendations for macronutrients in adolescent athletes and the use of adult values. Regarding carbohydrates, recommendations based on body weight rather than the percentage of total energy coming from carbohydrates are thought to best reflect the athlete's needs and vary between 3-12 g/kg bodyweight depending on training load (Parnell et al., 2016). In this study, the reference value was determined as 5 g/kg/day in line with the SDA position statement recommendations for volleyball players. It is important to replenish glycogen stores between or after training because carbohydrates are an important source of energy for training and brain function. Replenishing glycogen stores, total daily carbohydrate intake and timing of consumption are important (Desbrow et al., 2014). In this context, it was predicted that the carbohydrate consumption of volleyball players would be higher compared to the control group. There is no difference between the groups in terms of daily carbohydrate consumption.

It is stated that the dietary protein intake required generally ranges between 1.2 and 2.0 g/kg/day in adult athletes (Thomas, Erdman, & Burke, 2016). It is reported that adolescent athletes generally have a protein intake in the range of 1.2-1.6 g/kg/day (Desbrow et al., 2014). In our study, adolescent female volleyball players consume an average of 1.1 g/kg/day of protein. Considering that the food consumption record is taken on a day with training and a day without training, athletes met a large part of their protein requirement. There is a difference between the daily protein consumption by female adolescents in the control group and athletic adolescents. Females in the control group consumed more protein than they needed.

Adequate dietary fat is important for providing adequate energy, as well as the proper intake of fat-soluble vitamins and essential fatty acids. Fat tissue stored in the muscle and body fat in the form of triacylglycerol are the main endogenous energy store for both adults and adolescents. The intake of at least 30% was reported in adolescent athletes (Desbrow et al., 2014). In our study, the percentage of total energy from fat is 37.14±6.64% for volleyball players and 39.06±6.97% for the control group. There is no significant difference in terms of average daily fat intake between the groups. Both groups consumed more fat than they needed.

Deficiencies in micronutrients such as iron, iodine and vitamin A can have serious negative consequences (Peng, Berry, & Goldsmith, 2019). Calcium is important mineral for bone growth, bone mass, nerve impulses, and muscle contraction. Less than 15% of female athletes

aged 9-18 years meet the recommended calcium intake. Furthermore, vitamin D plays a role in bone health and calcium absorption (Berg, 2019). It is also well known that vitamin D has positive effects on athletic performance (Farrokhyar et al., 2017). In our study, there is no difference in terms of calcium and vitamin D intake between adolescent volleyball players and the control group. In both groups, calcium consumption and vitamin D intake from foods are below the recommended values. There is no difference in terms of vitamins A, C, B_6 and B_{12} and magnesium intakes between the groups. Both the control group and athlete group met the requirements. There is no difference in terms of iron consumption between the groups, but iron intake is below the recommended amount in both the athlete group and control group. There is a difference in terms of zinc intake between the groups. The zinc intake of the control group is higher than athletes. Athletic adolescents met 68.78±29.40% of the requirement, while the control group met 79.07±26.60% of the requirement.

As a result, the level of adherence of a large part of both groups to MD is average, i.e. the improvement of the dietary pattern is needed. When energy, macronutrient and micronutrient intakes are evaluated, only protein and zinc intakes differ between the groups. The protein and zinc intake levels of the control group are higher than the athlete group. While the protein requirement is met in both groups, the zinc requirement is below the recommended value. While the energy and carbohydrate needs of athletes were below the requirement, they were met to a significant extent in the control group. Fat intake was above the requirement in both groups. While the requirement for vitamins A, C, B_6, B_{12} and magnesium was met in both groups, vitamin D, iron and calcium intake was below the recommended value. In this study, dietary habits were evaluated with the KIDMED index, and nutritional status was evaluated with two-day food consumption records. There is a need for more comprehensive studies with larger sample sizes, including anthropometric measurements and biochemical evaluations.

CONCLUSIONS

In the last decade, major changes have been observed in the lifestyles of adolescents around the world, leading to significant changes in their diet and food consumption (Rosi et al., 2019). With the shift to the Western diet, it is thought that the decrease in adherence to MD in Mediterranean countries in the last decade may be associated with the increase in the incidence of chronic non-communicable diseases (Idelson, 2017). The vegetables, fruits, nuts, legumes, whole grains contained in MD are rich in various minerals and vitamins and therefore reduce the risk of micronutrient deficiencies (Peng et al., 2019). Adherence to MD is associated with a better nutrient intake profile (Serra-Majem et al., 2009; Serra-Majem, Ribas, García, Pérez-Rodrigo, & Aranceta, 2003) and is reported as an ideal dietary pattern for healthy nutrition due to its positive contribution to the cardiometabolic profile (Ramírez-Vélez et al., 2018). Both adolescents and athletic adolescents can improve their quality of life by adopting the Mediterranean diet. Adolescents and especially athletic adolescents, their families and trainers should be aware of the importance of nutrition in terms of growth and development, healthy life, protection against some diseases in the future and sportive performance. Physicians, sports physicians, dieticians and trainers have important duties in this sense. National policy programs

should be developed, and families and adolescents should be educated about nutrition starting from childhood, which is the main target.

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Conflict of interest
The authors declare that there is no conflict of interests.

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