Original Article

Relationship between Adherence to the Traditional Mediterranean Diet and Body Compositions in a Turkish Population

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Abstract

Background: The Mediterranean diet is one of today's popular diet patterns. The adherence to the Mediterranean diet is associated with a healthier and longer life.
Aim: The aim of our study is to determine the relationship between adherence to the traditional Mediterranean diet and body compositions.
Methodology: Two hundred fifty-six participants who applied to ….. State Hospital Nutrition and Diet Polyclinic were included to this cross-sectional study. The questionnaire form consisting of four parts [descriptive information, weekly physical activity duration, anthropometric and Bioelectrical Impedance Analysis (BIA) measurements and 14-item Mediterranean Diet Adherence Screener (MEDAS)] was applied to the participants. Participants were divided into two groups as those below the acceptable MEDAS level of seven (Group 1, n=128) and those with the acceptable MEDAS level of seven or above (Group 2, n=128).
Results: The mean value of the MEDAS score was found to be 6.15 ± 2.16. Considering the effects of adherence to the traditional Mediterranean diet on body composition; body weight, height, body mass index, waist circumference, hip circumference, waist / height ratio, neck circumference, body fat mass, body muscle mass, body water mass and BMR were found to be statistically significantly lower in Group 2 where adherence with the Mediterranean diet is high than Group 1. Pearson correlation analysis showed that as the MEDAS scores increased, the above body compositions of participants decreased.
Conclusion: In this study, the adherence to the Mediterranean diet was moderate and as the adherence to diet increased, obesity rates decreased.

Key words: Traditional Mediterranean diet, adherence, body composition

Introduction

Human health is related to many factors such as nutrition, heredity, climate and environmental conditions (Saygın et al., 2011). Nutrition is an action that should be done consciously in order to take the nutrients necessary to protect and improve health and to improve the quality of life. Adequate and balanced nutrition is essential in maintaining health and preventing diseases. People who have enough and balanced nutrition have a healthy and balanced body composition. (Trichopoulou et al., 2011; Alarcón de la Lastra et al., 2001).

The Mediterranean diet is one of today's popular diet patterns. The Mediterranean Diet is characterized by the consumption of vegetables, fruits, legumes and grains, moderate levels of fish, high amounts of unsaturated fatty acids, low-medium levels of dairy products, low levels of meat and moderate wine (Trichopoulou et al., 2011). The Mediterranean diet can be defined not only as the consumption of some foods, but also as a lifestyle specific to people living in the Mediterranean region. The adherence to the Mediterranean diet is associated with a healthier and longer life (Alarcón de la Lastra et al., 2001). Recent studies showed that Mediterranean eating habits have positive effects on cognitive functions and the course of chronic diseases such as diabetes and hypertension (Sánchez-

Hernández et al., 2020). In a study, as the adherence to the Mediterranean diet increased, the waist and hip circumferences, waist-hip ratio and body mass index (BMI) of the participants decreased (Panagiotakos et al., 2005). In another study, the prevalence of obesity was lower in individuals with high adherence to the Mediterranean diet compared to those with low levels (Schröder et al., 2011). As increasing adherence to the Mediterranean diet, overall mortality decreases and quality of life increases (Eguaras et al., 2015).

Although there are studies on the Mediterranean diet in Turkey, there is not find a comprehensive study published in the English literature and conducted to determine the relationship between body composition and adherence to the Mediterranean diet. The aim of our study is to determine the relationship between adherence to the traditional Mediterranean diet and body compositions.

Methodology: It was planned to include all adult volunteers who applied to ….. State Hospital Nutrition and Diet Polyclinic between June 2017 and February 2018 to lose weight between the ages of 19-65 to this cross-sectional study. Two hundred fifty-six (91.4%) of 280 individuals who agreed to participate were included in the study.

For the study, a questionnaire form consisting of four parts was applied to the participants who filled the informed consent form after obtaining permission from ….. University Clinical Research Ethics Committee (….-….-2017-08/12). These four sections in the questionnaire consist of descriptive information, weekly physical activity duration, anthropometric and Bioelectrical Impedance Analysis (BIA) measurements and 14-item Mediterranean Diet Adherence Screener (MEDAS).

The age, gender, marital status, educational status, smoking and alcohol use status and weekly physical activity durations of the individuals participating in the study were questioned with the form of "descriptive information" and "weekly physical activity period".

Body weight (kg), body fat ratio (%), fat mass (kg), body muscle ratio (%), body muscle mass (kg), body water ratio (%), body water mass (kg), basal metabolic rate (BMR) and BMI (kg / m2) were measured using “Tanita BC 418, Tanita Corporation of America, Inc., Illinois, USA” brand bioelectrical impedance analyzer.

Height measurement was measured using a stadiometer with the feet side by side and the head on the Frankfort horizontal plane. For waist circumference, the measurement was made with a tape measure from the midpoint between the lowest rib bone and the crista-iliac prominence when the individual was standing in the normal relaxed position of the abdomen, arms hanging at the sides and legs adjacent. While waist circumference of 94 cm and above in men and 80 cm and above in women are the risk limits for chronic diseases, 102 cm and above in men and 88 cm and above in women are the high risk limit. For the hip circumference, measurement was made from the widest part of the hip with a tape measure. The waist / hip ratio was obtained by the ratio of waist circumference (cm) to hip circumference (cm). If the waist / hip ratio is greater than 0.90 in male patients and 0.85 in female patients, these values are accepted as android type obesity. The waist / height ratio was obtained by the ratio of waist circumference (cm) to height (cm). Waist / height ratio warning level limit is 0.5 for men and women. Neck circumference was determined by measuring from the superior edge of the cricothyroid membrane while the individual was standing (Pekcan, 2014).

To determine the adherence of individuals to the traditional Mediterranean diet, the "14-item Mediterranean Diet Adherence Screener" improved by Martinez-Gonzalez et al. (2012) was used. In this scale, there are a total of 14 questions, two of which are about food consumption habits and 12 of them about food consumption frequency, and the score range varies between zero and 14 points. The score given for each question is zero or one point. 14-item Mediterranean Diet Adherence Screener questions and criteria for getting 1 point are given in Table 1 (Martinez-Gonzalez et al., 2012). A total score of seven and above indicates that the individual has an acceptable level of adherence with the Mediterranean diet, and a score of nine and above indicates that the individual has strict adherence with the Mediterranean diet (León-Muñoz et al., 2012). The validity and reliability study of the scale was made by Pehlivanoglu, Balcıoglu & Ünlüoglu (2020) in Turkey and the Cronbach Alpha coefficient was found to be 0.829. Participants were divided into two groups as those below the

acceptable MEDAS level of seven (Group 1) and those with the acceptable MEDAS level of seven or above (Group 2).

International Business Machines SPSS Statistics 22.0 (SPSS Inc., Chicago, IL, USA) program was used for statistical evaluation. After examining the suitability of the quantitative data obtained as a result of the research to normal distribution; Student T Test was used in independent groups for comparing variables that fulfill the parametric test assumptions, and Mann Whitney U Test was used in cases where the parametric test assumptions did not meet. In the evaluation of categorical data, Chi square test was used. Pearson test was used for correlation analysis. Descriptive statistics were given as mean ± standard deviation, numbers and percentages. P <0.05 was taken as the limit of significance.

Ethics approval statement: The protocol for the research project has been approved by Trakya University Ethics Committee (TÜTF-BAEK-2017-08/12). Before starting the study, an "informed consent form" was taught to individuals.

Results

The mean age of 256 individuals participating in the study is 37.12 ± 12.24 years, 84 (32.8%) of the participants are male and 172 (67.2%) are female. The mean value of the MEDAS was found to be 6.15 ± 2.16. There were 128 participants each in Group 1, consisting of participants who scored below the acceptable MEDAS level of seven, and Group 2, which was composed of participants who scored seven and above. The mean age and female gender ratio of those who high adherence to the traditional Mediterranean diet was higher (p=0.004, p=0.001, respectively). There was no significant difference between the groups in terms of marital status, educational status, smoking-alcohol use and weekly physical activity durations. (p>0.05) (Table 2).

When the changes in the body weight of the participants in the last 6 months are examined; the average weight gain values in Group 2 were statistically significantly less than those in Group 1 (p=0.048). Considering the effects of adherence with the traditional Mediterranean diet on the disease risk according to waist circumference, waist / hip ratio and waist / height ratio of the individuals participating in the study; according to waist circumference, the ratios of risky and high-risk male participants were found to be statistically significantly lower in Group 2 than Group 1 (p=0.001, p=0.005, respectively). There was no significant difference between the groups in terms of risk for women in terms of waist circumference, waist / hip ratio and waist / height ratio in both genders (p>0.05) (Table 3).

Considering the effects of adherence to the traditional Mediterranean diet on body composition; body weight, height, BMI, waist circumference, hip circumference, waist / height ratio, neck circumference, body fat mass, body muscle mass, body water mass and BMR were found to be statistically significantly lower in Group 2 where adherence with the Mediterranean diet is high than Group 1 (p<0.05). The Pearson correlation analysis showed that as the MEDAS scores increased, body weight, height, BMI, waist circumference, hip circumference, waist / height ratio, neck circumference, body fat mass, body muscle mass, body water mass and BMR of the participants decreased (Table 4).

Table 1.Questions of 14-item Mediterranean Diet Adherence Screener and criteria for 1 point (9)

Questions	Criteria for 1 point
1. Do you use olive oil as main culinary fat?	Yes
2. How much olive oil do you consume in a given day (including oil used for frying, salads, out-of-house meals, etc.)?	≥4 tablespoons
3. How many vegetable servings do you consume per day? (1 serving: 200 g [consider side dishes as half a serving])	≥2 (≥1 portion raw or as a salad)
4. How many fruit units (including natural fruit juices) do you consume per day?	≥3
5. How many servings of red meat, hamburger, or meat products (ham, sausage, etc.) do you consume	<1

per day? (1 serving: 100–150 g)	
6. How many servings of butter, margarine, or cream do you consume per day? (1 serving: 12 g)	<1
7. How many sweet or carbonated beverages do you drink per day?	<1
8. How much wine do you drink per week?	≥7 glasses
9. How many servings of legumes do you consume per week? (1 serving: 150 g)	≥3
10. How many servings of fish or shellfish do you consume per week? (1 serving 100–150 g of fish or 4–5 units or 200 g of shellfish)	≥3
11. How many times per week do you consume commercial sweets or pastries (not homemade), such as cakes, cookies, biscuits, or custard?	<3
12. How many servings of nuts (including peanuts) do you consume per week? (1 serving 30 g)	≥3
13. Do you preferentially consume chicken, turkey, or rabbit meat instead of veal, pork, hamburger, or sausage?	Yes
14. How many times per week do you consume vegetables, pasta, rice, or other dishes seasoned with sofrito (sauce made with tomato and onion, leek, or garlic and simmered with olive oil)?	≥2

Table 2. Characteristics of participants by adherence to the Mediterranean diet

Characteristics	Group 1 (n=128)	Group 2 (n=128)	P value
Age, yr	35.2 ± 12.7	39.0 ± 11.4	0.011*
Sex, n (%)			
Female	73 (57)	99 (77.3)	<0.001β
Male	55 (43)	29 (22.7)	
Marital status, n (%)			
Single	75 (58.6)	88 (68.7)	0.059
Married	53 (41.4)	40 (31.3)	
Educational level, n (%)			
Primary or less	33 (25.8)	36 (28.1)	0.734
Secondary	42 (32.8)	42 (32.8)	
High	53 (41.4)	50 (39.1)	
Smoking, n (%)			
Current smokers	45 (35.2)	32 (25)	0.118
Unused	72 (56.2)	88 (68.8)	
Former smokers	11 (8.6)	8 (6.2)	
Alcohol intake, n (%)			
Yes	22 (17.2)	21 (16.4)	0.500
No	106 (82.8)	107 (83.6)	
Physical activity, min/d	192.2 ± 85.1	192.4 ± 74.9	0.992

* Student t test, β Chi-square test

Table 3. Weight change and risk situations according to body compositions participants

	Group 1 (n=128)	Group 2 (n=128)	P value
Has your body weight changed in the last 6 months? n (%)			
Yes	84 (65.6)	90 (70.3)	0.270
No	44 (34.4)	38 (29.7)	
Increased, n=87			
n (%)	46 (52.9)	41 (47.1)	
Weight gain, kg (mean ± ss)	7.85 ± 3.8	5.59 ± 2.0	0.048*
Total weight gain, kg	361	229	
Decreased, n= 88			
n (%)	38 (43.2)	50 (56.8)	
Weight reduction, kg (mean ± ss)	5.79 ± 2.4	7.74 ± 3.8	0.146
Total weight reduction, kg	220	387	
Waist circumference			
Female, n (%)			
≥ 80 (risk), n=163	70 (42.9)	93 (47.1)	0.419
≥ 88 (high risk), n= 136	59 (43.9)	77 (46.1)	0.386
Male			
≥ 94 (risk), n=59	45 (76.3)	14 (23.7)	0.002β
≥ 102 (high risk), n= 41	33 (80.5)	8 (19.5)	0.004β
Waist/hip ratio			
Female, n (%)			
≥ 0.85 (risk), n=135	55 (40.8)	80 (59.2)	0.249
Male			
≥ 0.90 (risk), n=56	36 (64.3)	20 (35.7)	0.471
Waist/height ratio n (%)			
≥ 0.50 (risk), n=236	120 (50.8)	116 (49.2)	0.243

* Student T test, β Chi-square test

Table 4. Association between the MEDAS scores and the body compositions of the participants

Body Composition	Group 1 (n=128)	Group 1 (n=128)	P (Student T test)	Total MEDAS scores	
				P	Pearson correlation coefficient
Weight (kg)				<0.001	-0.413
Women	86.0 ± 15.5	77.5 ± 14.5	<0.001		
Men	104.6 ± 22.3	88.1 ± 23.2	0.002		
Total	93.9 ± 20.8	79.9 ± 17.3	<0.001		
Height (cm)				0.002	-0.194
Women	159.2 ± 6.9	158.6 ± 5.9	0.589		
Men	175.0 ± 6.6	173.4 ± 6.5	0.297		
Total	165.9 ± 10.4	161.9 ± 8.7	0.001		
Body mass index (kg/m^2)				<0.001	-0.360
Women	34.0 ± 6.3	30.9 ± 5.7	0.001		
Men	34.0 ± 6.6	29.2 ± 7.0	0.002		
Total	34.0 ± 6.4	30.6 ± 6.0	<0.001		
Waist circumference (cm)				<0.001	-0.307
Women	98.1 ± 10.9	94.8 ± 11.2	0.057		
Men	105.8 ± 13.6	96.3 ± 14.7	0.004		
Total	101.4 ± 12.7	95.2 ± 12.1	<0.001		
Hip circumference (cm)				<0.001	-0.337
Women	112.1 ± 10.1	107.7 ± 10.5	0.007		
Men	115.4 ± 11.8	105.5 ± 13.6	0.001		
Total	113.5 ± 10.9	107.2 ± 11.3	<0.001		
Waist/hip ratio				0.394	
Women	0.87 ± 0.05	0.88 ± 0.05	0.566		
Men	0.91 ± 0.1	0.91 ± 0.05	0.836		
Total	0.89 ± 0.1	0.89 ± 0.05	0.732		
Waist/height ratio				<0.001	-0.234
Women	0.62 ± 0.1	0.60 ± 0.1	0.044		
Men	0.60 ± 0.1	0.55 ± 0.1	0.012		
Total	0.61 ± 0.1	0.58 ± 0.1	0.011		
Neck circumference (cm)				<0.001	-0.302
Women	37.3 ± 3.0	36.4 ± 2.8	0.050		
Men	41.1 ± 3.4	39.5 ± 3.8	0.067		
Total	38.9 ± 3.7	37.1 ± 3.3	<0.001		
Body fat ratio (%)				0.577	
Women	41.5 ± 5.9	38.9 ± 6.5	0.008		
Men	28.6 ± 8.0	24.2 ± 9.9	0.032		
Total	35.9 ± 9.4	35.6 ± 9.6	0.748		
Body fat mass (kg)				<0.001	-0.267
Women	36.5 ± 10.9	30.9 ± 10.1	0.001		
Men	31.3 ± 13.2	23.3 ± 13.5	0.010		
Total	34.3 ± 12.2	29.2 ± 11.4	0.001		
Body muscle ratio (%)				0.723	
Women	58.5 ± 5.9	61.0 ± 6.5	0.010		
Men	71.5 ± 8.2	75.5 ± 9.8	0.055		
Total	64.1 ± 9.5	64.3 ± 9.5	0.873		
Body muscle mass (kg)				<0.001	-0.367
Women	49.5 ± 5.3	46.8 ± 6.2	0.003		
Men	73.4 ± 10.7	65.8 ± 11.6	0.004		
Total	59.7 ± 14.4	51.1 ± 11.1	<0.001		
Body water ratio (%)				0.646	
Women	42.9 ± 4.3	44.6 ± 4.8	0.018		
Men	52.2 ± 5.8	55.7 ± 7.0	0.019		
Total	46.9 ± 6.8	47.1 ± 7.1	0.813		
Body water mass (kg)				<0.001	-0.379
Women	36.4 ± 4.0	34.3 ± 4.5	0.002		
Men	53.7 ± 7.9	47.7 ± 8.2	0.002		
Total	43.8 ± 10.4	37.3 ± 7.9	<0.001		
Basal metabolism rate (kcal/d)				<0.001	-0.398
Women	1550.9 ± 188.6	1444.4 ± 196.9	<0.001		
Men	2229.7 ± 378.1	1955.7 ± 362.6	0.002		
Total	1842.6 ± 441.3	1560.3 ± 324.2	<0.001		

Discussion

Examining the effects of nutrition on health with nutritional model analysis has become more prominent than evaluating individuals' nutritional intake or food consumption. Mediterranean diet is one of the healthiest eating models known among nutrition models (Schröder, 2007). Despite being a country with a Mediterranean coast, exploring the relationship between body composition and adherence with the traditional Mediterranean diet have been published in English literature in Turkey did not find a comprehensive study. This situation is a deficiency for our country, where the traditional Mediterranean diet is frequently applied and has a coast to the Mediterranean.

A total score of seven and above indicates that the individual has an acceptable grade of adherence with the Mediterranean diet, and a score of nine and above indicates that the individual has strict adherence with the Mediterranean diet (León-Muñoz et al., 2012). The mean score of the MEDAS was 6.15 ± 2.16 in our study. The MEDAS scores of the 50% participants had an acceptable level of seven and above, and their adherence with the traditional Mediterranean diet was moderate. In the study conducted by Pehlivanoglu, Balcıoglu & Ünlüoglu (2020), the MEDAS score of 42.25% of the participants was seven and above. Similar to our study, the mean MEDAS scores were 6.34 and 6.83±3.34 of individuals reached accordance with the MD in the León-Muñoz et al. (2012) and Pehlivanoglu, Balcıoglu & Ünlüoglu's (2020) studies, respectively. In the study of Martinez-Gonzalez et al. (2012), it was found to be higher than our study (8.66 ± 2.0). The reason for this high may be the fact that this study was conducted in a region where food in the Mediterranean diet can be accessed more easily, unlike the region where our study was conducted. In addition, in studies conducted with adults in recent years in Mediterranean countries, it has been shown that the traditional and beneficial features of the Mediterranean diet have been abandoned (Trichopoulos & Lagiou, 2004). Changes in eating habits, such as the increase in the frequency of eating outside the home and the availability of snack foods, occur due to changes in lifestyle, social environment and environmental factors.

In a study, the adherence with the Mediterranean diet increased with increasing age (Patino-Alonso et al., 2014). In another study, women had higher dietary adherence than men (Hurley et al., 2009). In a few studies, the adherence with the Mediterranean diet was higher in men (Martínez-González et al., 2012; León-Muñoz et al., 2012). In our study, the mean age and female gender ratio of individuals who high adherence with the traditional Mediterranean diet were higher. The increase in life experience in individuals with increasing age and the fact that women generally give more importance to diet may explain these findings.

Body weight / height indexes aim to express the correct weight for height. Body mass index is one of the most widely used indexes today (Pekcan, 2014). In Schröder et al.'s study (2011), it was detected that high adherence to the Mediterranean diet was associated with lower obesity rate. These findings are similar to previous data that reported a lower risk of obesity rate among individuals highly adhering to the Mediterranean diet (El Kinany et al., 2020). There are other studies showing that as the adherence to the Mediterranean diet increases, the BMI values decreases in both genders (Bouzas et al., 2020)). In our study, as the adherence to the traditional Mediterranean diet increased, it was found that body weight, height and BMI decreased significantly, and a negative relationship was found between Mediterranean diet adherence and BMI in both genders. The effect of the Mediterranean diet to reduce obesity is due to the delay of gastric emptying, increase in satiety, prolonged chewing time, low glycemic index and low energy content of foods with high pulp (Schröder, 2007).

With the realization of the importance of android type obesity; waist / hip ratio started to be used in the diagnosis of abdominal obesity. Waist / hip ratio being ≥ 0.90 in men and ≥ 0.85 in women increases the risk of android obesity and related chronic diseases (Pekcan, 2014). In a study, it was found that as the adherence with the Mediterranean diet increased, the waist circumference and waist / hip ratio of individuals decreased (Tzima et al., 2007). Waist-to-height ratio being ≥0.50 is a risk factor for chronic diseases such as cardiovascular diseases and diabetes mellitus (Pekcan, 2014). In our study, as the score of adherence with the Mediterranean diet increased, the waist / height ratios of male and female individuals decreased significantly. This difference was not detected in the waist / hip ratio. In a study, it was reported that as

individuals' adherence with the Mediterranean diet increased, their body fat percentage decreased (Boghossian et al., 2013). In our study, body fat ratios of male and female individuals were found to be lower in the group with high adherence with the Mediterranean diet. In addition, as the score of adherence with the Mediterranean diet increased, body fat, muscle and water masses and basal metabolic rates decreased in men and women.

The limitation of our study are that the study sample was limited to a small number of people due to the use of a nutrition and diet outpatient clinic. Therefore, the results of our study did may not reflect those of the general population.

As a result, in this study, the adherence to the Mediterranean diet was moderate and as the adherence to Mediterranean diet increased, obesity rates decreased. In order to increase adherence in our country, education on the traditional Mediterranean diet should be increased in schools and primary health care centers, and it should be easier for individuals to access the foods in this diet within the scope of preventive medicine.

References

Alarcón, de la Lastra, C., Barranco, M.D., Motilva, V., & Herrerías, J.M. (2001). Mediterranean diet and health: biological importance of olive oil. *Curr Pharm Des*, 7(10):933-50.

Bartolomé, J., Arranz, A.G., Agudo-Conde, C., Gomez-Marcos, M.A., García-Ortiz, L., & EVIDENT Group. (2014). Factors associated with adherence to the Mediterranean diet in the adult population. *J Acad Nutr Diet*, 114(4):583-9.

Boghossian, N.S., Yeung, E.H., Mumford, S.L., Zhang, C., Gaskins, A.J., Wactawski-Wende, J., Schisterman, E.F., & BioCycle Study Group. (2013). Adherence to the Mediterranean diet and body fat distribution in reproductive aged women. *Eur J Clin Nutr*, 67(3):289-94.

Bouzas, C., Bibiloni, M.D.M., Julibert, A., Ruiz-Canela, M., Salas-Salvadó, J., Corella, D., Zomeño, M.D., Romaguera, D., Vioque, J., Alonso-Gómez, Á.M., Wärnberg, J., Martínez, J.A., Serra-Majem, L., Estruch, R., Tinahones, F.J., Lapetra, J., Pintó, X., Ríos, A.G., Bueno-Cavanillas, A., Gaforio, J.J., Matía-Martín, P., Daimiel, L., Martín-Sánchez, V., Vidal, J., Vázquez, C., Ros, E., Fernandez-Lázaro, C.I., Becerra-Tomás, N., Gimenez-Alba, I.M., Muñoz, J., Morey, M., Oncina-Canovas, A., Tojal-Sierra, L., Pérez-López, J., Abete, I., Casañas-Quintana, T., Castro-Barquero, S., Bernal-López, M.R., Santos-Lozano, J.M., Galera, A., Angullo-Martinez, E., Basterra-Gortari, F.J., Basora, J., Saiz, C., Castañer, O., Martín, M., Notario-Barandiarán, L., Belló-Mora, M.C., Sayón-Orea, C., García-Gavilán, J., Goday, A., & Tur, J.A. (2020). Adherence to the Mediterranean Lifestyle and Desired Body Weight Loss in a Mediterranean Adult Population with Overweight: A PREDIMED-Plus Study. *Nutrients*, 12(7):2114.

Eguaras, S., Toledo, E., Hernández-Hernández, A., Cervantes, S., & Martínez-González, M.A. (2015). Better adherence to the Mediterranean diet could mitigate the adverse consequences of obesity on cardiovascular disease: The SUN Prospective Cohort. *Nutrients*, 7(11):569-74.

El Kinany, K., Deoula, M.M.S., Hatime, Z., Boudouaya, H.A., Atassi, M., El Asri, A., Benslimane, A., Nejjari, C., Ibrahimi, S.A., Lagiou, P., & El Rhazi, K. (2020). Modified Mediterranean diet score adapted to a southern Mediterranean population and its relation to overweight and obesity risk. *Public Health Nutr*, 29:1-7.

León-Muñoz, L.M., Guallar-Castillón, P., Garciani, A., López-García, E., Mesas, A.E., Aguilera, M.T., Banegas, J.R., & Rodríguez-Artalejo, F. (2012). Adherence to the Mediterranean diet pattern has declined in Spanish adults. *J Nutrition*, 142(10):1843-50.

Martínez-González, M.A., García-Arellano, A., Toledo, E., Salas-Salvadó, J., Buil-Cosiales, P., Corella, D., Covas, M.I., Schröder, H., Arós, F., Gómez-Gracia, E., Fiol, M., Ruiz-Gutiérrez, V., Lapetra, J., Lamuela-Raventos, R.M., Serra-Majem, L., Pintó, X., Muñoz, M.A., Wärnberg, J., Ros, E., Estruch, R., & PREDIMED Study Investigators. (2012). A 14-item Mediterranean diet assessment tool and obesity indexes among high-risk subjects: the PREDIMED trial. *PloS One*, 7(8):431-34.

Panagiotakos, D.B., Chrysohoou, C., Pitsavos, C., & Stefanadis, C. (2006). Association between the prevalence of obesity and adherence to the Mediterranean diet: the ATTICA study. *Nutrition*, 22(5):449-56.

Patino-Alonso, M.C., Recio-Rodríguez, J.I., Belio, J.F.M., Colominas-Garrido, R., Lema- Hurley, K.M., Oberlander, S.E., Merry, B.C., Wrobleski, M.M., Klassen, A.C., & Black, M.M. (2009). The healthy eating index and youth healthy eating index are unique, nonredundant measures of diet quality among low-income, African American adolescents. *J Nutr*, 139(2):359-364.

Pehlivanoglu, E.F.Ö., Balcıoglu, H., & Ünlüoglu, İ. (2020). Turkish validation and reliability of Mediterranean Diet Adherence Screener. *Osmangazi J Med*, 2020;42(2):160-4. (In Turkish)

Pekcan G. (2014) Determination of nutritional status. In: Baysal A (Editor) Dietary Manual. Hatiboglu Press, Ankara, Turkey, 67-142. (In Turkish)

Sánchez-Hernández, M.S., Rodríguez-Caldero, M.C., Martín-Pérez, M.P., Mira-Solves, J.J., Vitaller-

Burillo, J., & Carratalá-Munuera, M.C. (2020). Impact of adherence to Mediterranean diet and/or drug treatment on glycemic control in type 2 diabetes mellitus patients: DM2-CUMCYL study. *Prim Care Diabetes*, S1751-9918(20)30220-5.

Saygın, M., Öngel, K., Çalışkan, S., Yaglı, M., Has, M., Gonca, T., & Kurt, Y. (2011). Nutritional habits of Süleyman Demirel University students. *Med J Süleyman Demirel Üniv*, 18(2):43-47. (In Turkish)

Schröder, H. (2007). Protective mechanisms of the Mediterranean diet in obesity and type 2 diabetes. *J Nutr Biochem*, 18(3):149-60.

Schröder, H., Fitó, M., Estruch, R., Martínez-González, M.A., Corella, D., Salas-Salvadó, J., Lamuela-Raventós, R., Ros, E., Salaverría, I., Fiol M, Lapetra, J., Vinyoles, E., Gómez-Gracia, E., Lahoz, C., Serra-Majem, L., Pintó, X., Ruiz-Gutierrez, V., & Covas, M.I. (2011). A short screener is valid for assessing Mediterranean diet adherence among older Spanish men and women. *J Nutr*, 141(6):1140-5.

Trichopoulos, D., & Lagiou, P. (2004). Mediterranean diet and overall mortality differences in the European Union. *Public Health Nutr*, 7(7):949-51.

Trichopoulou, A., Costacou, T., Bamia, C., & Trichopoulos, D. (2003). Adherence to a mediterranean diet and survival in a Greek population. *New Eng J Med*, 348(26):2599-2608.

Tzima, N., Pitsavos, C., Panagiotakos, D.B., Skoumas, J., Zampelas, A., Chrysohoou, C., & Stefanadis, C. (2007). Mediterranean diet and insulin sensitivity, lipid profile and blood pressure levels, in overweight and obese people; the Attica study. *Lipids Health Dis*, 6(22):1-7.