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Determination of Adherence to Mediterranean Diet, Physical Activity Level and Relationship Between Chronic Disease in Adults: Cross-Sectional Study

Erişkinlerde Akdeniz Diyetine Uyum, Fiziksel Aktivite Düzeyi ve Kronik Hastalık Arasındaki İlişkinin Belirlenmesi: Kesitsel Araştırma

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ABSTRACT Objective: The purpose of the study was to determine the adherence of adults to the Mediterranean diet (MD), physical activity status, and the association between adherence to the MD and chronic disease. **Material and Methods:** A total of 380 individuals were included in this cross-sectional study. The adherence to the MD was evaluated with the Mediterranean Diet Adherence Scale (MEDAS), and physical activities with the International Physical Activity Questionnaire (IPAQ). **Results:** There was no difference between men and women in terms of physical activity level assessed by IPAQ score and IPAQ classification (p>0.05). Moderate-high adherence to the MD in adults, mean MEDAS score, obesity, and chronic disease were significantly higher in women than in men (p<0.05). the rates of the individuals that had moderate/high adherence to the MD and the mean body mass index (BMI) values, frequency of chronic disease and frequency of previous dietary counseling were higher (p<0.05). In addition the frequency of previous dietary counseling was higher in physically inactive individuals (p<0.05). There were significant positive relations were detected between the MEDAS and BMI values (r=0.126, p=0.014). There were negative significant relations between IPAQ score, BMI (r=-0.118, p=0.022) and waist circumference values (r=-0.124, p=0.018). **Conclusion:** It was determined that while moderate compliance with the MD was observed, the level of physical activity was low in adults. It has shown the necessity and importance of developing preventive health services for nutrition and physical activity in the prevention and treatment of chronic diseases.

Keywords: Mediterranean diet; physical activity; obesity

ÖZET Amaç: Bu çalışmanın amacı, erişkinlerin Akdeniz diyetine uyumunu, fiziksel aktivite durumunu belirlemek ve Akdeniz diyetine uyum ile kronik hastalık arasındaki ilişkiyi incelemektir. **Gereç ve Yöntemler:** Bu kesitsel çalışmaya toplam 380 (18-65 yaş) kişi dâhil edildi. Akdeniz diyetine uyum, Akdeniz Diyetine Uyum Ölçeği [Mediterranean Diet Adherence Scale (MEDAS)] ile fiziksel aktivite düzeyi Uluslararası Fiziksel Aktivite Anketi [International Physical Activity Questionnaire (IPAQ)] ile değerlendirildi. **Bulgular:** Bu çalışmada, IPAQ skoru ve IPAQ sınıflandırması ile değerlendirilen fiziksel aktivite düzeyi açısından erkekler ve kadınlar arasında anlamlı fark yoktu (p>0,05). Akdeniz diyetine orta-yüksek uyum gösteren erişkin bireylerde, ortalama MEDAS skoru, obezite ve kronik hastalık varlığı, kadınlarda erkeklere göre anlamlı olarak daha yüksekti (p<0,05). Ayrıca Akdeniz diyetine orta/yüksek düzeyde uyum gösterenlerin, ortalama beden kitle indeksi (BKİ) değerleri, kronik hastalık sıklığı ve daha önce diyet danışmanlığı alma sıklığı daha yüksekti (p<0,05). Ayrıca fiziksel olarak aktif olmayan bireylerde, daha önce diyet danışmanlığı alma sıklığı daha yüksekti (p<0,05). MEDAS ve BKİ değerleri arasında anlamlı ve pozitif ilişkiler saptandı (r=0,126, p=0,014). IPAQ puanı, BKİ (r=-0,118, p=0,022) ve bel çevresi (r=-0,124, p=0,018) değerleri arasında negatif yönde ve anlamlı ilişkiler vardı. **Sonuç:** Elde edilen verilere göre erişkinlerde Akdeniz diyetine orta uyum görülürken, fiziksel aktivite düzeyinin ise az olduğu belirlendi. Kronik hastalıkların önlenmesi ve tedavisinde, beslenme ve fiziksel aktiviteye yönelik koruyucu sağlık hizmetlerinin geliştirilmesinin gerekliliğini ve önemini göstermiştir.

Anahtar Kelimeler: Akdeniz diyeti; fiziksel aktivite; obezite

Physical activity along with adequate and balanced nutrition is indispensable for a healthy lifestyle. An unhealthy diet and being physically inactivity, which must be corrected to maintain and improve health are among the common risk factors.[1] In a cohort study examined the relations between dietary behaviors and mortality because of coronary heart disease, lower mortality rates were found among par-

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ticipating countries in the Mediterranean.[2] This condition was associated with traditional dietary behaviors such as higher vegetable consumption in Italy, higher olive oil consumption in Greece and higher fish consumption in Dalmatia.[3] The Mediterranean diet (MD) is rich in plant foods such as oilseeds, grains, vegetables, fruits, legumes and olives. This diet includes moderate-to-high fish or seafood, moderate eggs, poultry and dairy products, moderate of wine-fermented beverages such as turnip, grape juice, and low consumption of red meat.[4] It is considered that this nutrition concept may prevent the formation of chronic diseases because of properties such as increasing vegetable consumption.[5,6]

According to many studies that were conducted previously with different methods in different populations, adherence to the MD reduces the chronic inflammatory diseases such as cardiovascular diseases, diabetes mellitus, some cancer types, neurodegenerative diseases, obesity and decreases mortality rates because of cardiovascular diseases.[5,7-10] It was also reported that inactivity and nutritional habits increase the chronic diseases.[1,11]

There is a close relationship between lifestyle, obesity, and chronic diseases. although body mass index (BMI) is used widely in clinical and epidemiological studies to evaluate the presence of obesity, the classification of BMI is far from perfect in providing an accurate measurement of body fat amount and distribution. The data such as waist circumference, waist-to-hip ratio, and waist-to-height ratio provide better quality data on obesity because they also provide insight into abdominal fat.[12] Previous studies showed that MD is related with lower BMI levels, total fat and abdominal adiposity.[13,14] It is also already known that body total fat rate decreased with physical activity.[15]

In recent years, societies have moved away from the MD with the changes in lifestyle habits, become more sedentary. Therefore, it is very important to define the current status of the health conditions regarding the nutritional behaviors and physical activity, to determine the priority problems and raise the awareness of the community on this issue.

The purpose of the present study was to determine the adherence of adults to the MD, physical activity status, and to examine the association between adherence to the MD and chronic disease.

MATERIAL AND METHODS

PARTICIPANTS AND STUDY DESIGN

This cross-sectional study was conducted in 2021. The population of the study consists of individuals between the ages of 18-65 living in Gaziantep. The sampling unit consists of individuals who applied to a private hospital in Gaziantep between June 2021-August 2021. Patients were included in the study by simple random sampling method. Inclusion criteria were being older than 18 years old and younger than 65 years old, and volunteering. Individuals who were pregnant, have receive special diet therapy for their chronic disease, have a disease that prevents them from doing physical activity and did not have an intellectual level who could not answer the questions were excluded from the study. A total of 380 volunteer individuals between the ages of 18-65 were included in the study. Written informed consent was obtained from the individuals. The study was conducted in line with the ethical principles outlined in the Declaration of Helsinki. The study was approved by Kahramanmaraş Sütçü İmam University Non-Invasive Research Ethics Committee (date: Jun, 08, 2021, no: 02), and was registered at ClinicalTrials.gov (NCT05001256).

CONDUCTING DATA

The data of the participants were recorded on a questionnaire that was prepared beforehand and that contained structured questions. The questionnaire that was applied through face-to-face interviews consisted of 3 parts:

Sociodemographic Characteristics

The variables that were related to demographic characteristics and health status of individuals were questioned. Also, nutritional habits (meal frequency, skipping meals) and previous nutritional counseling received from a dietitian were questioned.

Mediterranean Diet Adherence Scale

The Mediterranean Diet Adherence Scale (MEDAS) was used to determine compliance to the MD. There

are 14 questions in this scale. The first 12 questions the frequency of food consumption, and 2 of them question the food consumption habits. Each question is scored as 0 and 1 point. After the points are obtained, the score is evaluated as ≤5 (low), 6-9 (moderate), and ≥10 (high) adherence.[16] Turkish validity and reliability study of the MEDAS scale was conducted.[17]

International Physical Activity Questionnaire

International Physical Activity Questionnaire (IPAQ) examine the physical activity levels. In the questionnaire, in which daily activities and activity status of the last week are evaluated, individuals are grouped as inactive [<600 metabolic equivalent (MET)], minimally active (600-3,000 MET) and active (>3,000 MET). Calculation of the score includes the sum of time (minutes) and frequency (days) of walking, moderate-intensity activity, and severe activity. The energy required for activities is calculated with the MET/minute score. The standard MET values for these activities were determined as follows; sitting 1.5 MET, walking 3.3 MET, moderate intensity physical activity 4.0 MET, severe physical activity 8.0 MET. Turkish validity and reliability study of the IPAQ scale was carried out.[18]

STATISTICAL ANALYSIS

SPSS version 20.0 was used for data analysis (SPSS Inc., Chicago, IL, USA). The mean (X) and standard deviation (SD) values for the continuous variables, numbers (n) and percentage (%) values for categorical variables were given as descriptive statistics. Kolmogorov-Smirnov test was used for the normality of the data distribution. Chi-square test was used in the group comparisons for categorical variables. Compare mean values in independent groups were evaluated the Mann-Whitney U test and Student's t-test. The relations between the 2 continuous variables were evaluated with the Spearman correlation analysis. The results were accepted significant at the $p<0.05$ level.

The sampling size was found to be 334 when the odds ratio of those with diabetes compared to those without diabetes for the MEDAS scores in previous study was calculated as 1.02, alpha=0.05, and power=0.080.[19]

According to the post hoc power analysis, the power of the study was found to be 0.86 according to the comparison of the MEDAS scores of women and men, and 0.99 according to the relationship between IPAQ and BMI.

RESULTS

Mean age of the participants (77.9% female, 22.1% male) was 41.29±13.69 (min: 18, max: 65) years. The mean MEDAS score was found to be 6.6±1.6 (min: 1.0, max: 12.0); 25.0% of the participants showed low, 72.1% moderate and 2.9% high compliance to the MD. The mean IPAQ score was found to be 735.3±899.0 (min: 0, max: 6072.0) and among all participants, 60.3% were inactive, 35.3% were minimally active and 4.5% were active. The presence of chronic disease was 45% [31 (8.2%) with hypertension, 12 (3.2%) with high cholesterol, 10 (2.6%) with cardiovascular diseases, 13 (3.4%) with asthma, 1 (%0.3) with cancer, 5 (%1.3) with depression, 16 (%4.2) with diabetes mellitus, 17 (4.5%) with thyroid diseases, 1 (0.3) with epilepsy, 33 (8.7) with diabetes mellitus and hypertension, 33 (8.7) with other disease]. Sociodemographic characteristics and health status of participants were given in Table 1.

Comparison of participants' sociodemographic characteristics, MD compliance status and physical activity status by gender were given in Table 2. There was no difference according to gender in terms of age, mean BMI, skipping meals, mean IPAQ score and IPAQ classification ($p>0.05$). The rate of being married, the rate of not working, the rate of income less than expenditure, the rate of having a chronic disease, the rate of receiving dietary counseling, the rate of being obese, the rate of moderate and high compliance with the MD adherence, and the mean MEDAS score were significantly higher in women ($p<0.05$). The rate of being at university or higher education level and the mean waist-hip ratio were higher in males ($p<0.05$).

Main characteristics of the study population according to their compliance to the MD (MEDAS) were given in Table 3. The individuals who had low compliance to the MD and those who had moderate/high adherence were similar in terms of age, ed-

TABLE 1: Sociodemographic characteristics and health status of participants.

Characteristics (n=380)	n	%
Gender		
Female	296	77.9
Male	84	22.1
Social marital status		
Married	270	71.1
Single	110	28.9
Educational level		
Illiterate/literate	11	2.9
Primary school	80	21.1
Secondary school	40	10.5
High school	80	21.1
University and over	169	44.5
Labour force status		
Employee	27	7.1
Officer	57	15.0
Self-employment	30	7.9
Not working	178	46.8
Retired	88	23.2
Income and expense status		
Income is more than expense	71	18.7
Income is less than expense	113	29.7
Income is equal to expense	196	51.6
Chronic disease*		
No	209	55.0
Yes	171	45.0
BMI (kg/m^2)		
Underweight (<18.5)	10	2.6
Normal (18.5-24.9)	143	37.6
Overweight (25-29.9)	107	28.2
Obese (≥30)	120	31.6
Meal skipping status		
Yes	173	45.5
Sometimes	126	33.2
No	81	21.3
Receiving nutrition counseling from dietitian		
Yes	118	31.1
No	262	68.9
Adherence to the Mediterranean Diet (MEDAS)		
Low	95	25.0
Moderate	274	72.1
High	11	2.9
Physical activity level (IPAQ)		
Inactive	229	60.3
Minimally active	134	35.3
Active	17	4.5

*Diabetes, hypertension, cardiovascular diseases, dyslipidemia, metabolic fatty liver disease, cancer, asthma, thyroid diseases, mood disorders; BMI: Body mass index; MEDAS: Mediterranean Diet Adherence Scale; IPAQ: International Physical Activity Questionnaire.

ucation level, BMI classification, waist-hip ratio, skipping meals, smoking status, IPAQ score and IPAQ classification ($p>0.05$). The rate of having less income than expense was higher in individuals who had low compliance to the MD ($p<0.05$). The participants who had moderate-high adherence to the MD were probability to be married, mean BMI ($p<0.05$), and previously received dietary counseling ($p<0.05$) were higher when compared to the participants who had low adherence to the MD ($p<0.05$). The participants who had low adherence to the MD were lower frequency of chronic disease (Table 3).

Main characteristics of the study population according to their adherence to the physical activity level (IPAQ) were given in Table 4. The inactive and minimally active/active individuals according to physical activity levels were similar in terms of mean MEDAS score and MEDAS classification, age, education level, income and expenditure status, mean BMI, BMI classification, waist-hip ratios, the incidence of chronic diseases, skipping meals and smoking status ($p>0.05$). The frequency of having received previous nutritional counseling from a dietitian was higher in the physically minimally active/active participants than in the inactive participants ($p<0.05$) (Table 4).

The frequency of having received nutritional counseling from a dietitian was higher in participants who had chronic disease than in participants without chronic diseases ($p<0.05$) (Table 5).

When the correlations between the mean MEDAS and IPAQ scores of the individuals who had health-related parameters were examined, significant and positive relations were detected between the MEDAS and BMI scores ($p=0.014$, $r=0.126$). There were negative and significant relations between IPAQ score, BMI ($p=0.022$, $r=-0.118$) and waist circumference scores ($p=0.018$, $r=-0.124$) (Table 6).

DISCUSSION

The purpose of the present study was to determine the adherence of adults to the MD and physical activity levels and to examine the associated health outcomes.

In present study, the status of having a chronic disease, the rate of receiving dietary counseling, the

TABLE 2: Comparison of participants' sociodemographic characteristics, Mediterranean diet compliance status and physical activity status by gender.

Characteristics (n=380)	Female	Male	p value
Total n (%)	296 (77.90)	84 (22.10)	-
Age (mean±SD)	41.20±13.30	41.63±15.08	0.954
Social marital status n (%)			
Married	220 (74.3)	50 (59.5)	**0.008**[a]
Single	76 (25.7)	34 (40.5)	
Educational level n (%)			
Illiterate/literate	11 (3.7)	-	**0.002**[b]
Primary school	69 (23.3)	11 (13.1)	
Secondary school	30 (10.1)	10 (11.9)	
High school	70 (23.6)	10 (11.9)	
University and over	116 (39.2)	53 (63.1)	
Labour force status n (%)			
Employee	13 (4.4)	14 (16.7)	**0.000**[a]
Officer	43 (14.5)	14 (16.7)	
Self-employment	11 (3.7)	19 (22.6)	
Not working	172 (58.1)	6 (7.1)	
Retired	57 (19.3)	31 (36.9)	
Income and expense status n (%)			
Income is more than expense	48 (16.2)	23 (27.4)	**0.044**[a]
Income is less than expense	94 (31.8)	19 (22.6)	
Income is equal to expense	154 (52.0)	42 (50.0)	
Chronic disease* n (%)			
No	154 (52.0)	55 (65.5)	**0.029**[a]
Yes	142 (48.0)	29 (34.5)	
Waist-hip ratio (mean±SD)	0.82±0.09	0.92±0.11	**0.000**[c]
BMI (kg/m^2) (mean±SD)	27.27±6.03	27.82±5.15	0.237
BMI classification n (%)			
Underweight (<18.5)	8 (2.7)	2 (2.4)	**0.008**[b]
Normal (18.5-24.9)	121 (40.9)	22 (26.2)	
Overweight (25-29.9)	70 (23.6)	37 (44.0)	
Obese (≥30)	97 (32.8)	23 (27.3)	
Meal skipping status n (%)			
Yes	132 (44.6)	41 (48.8)	0.437
Sometimes	103 (34.8)	23 (27.4)	
No	61 (20.6)	20 (23.8)	
Receiving nutrition counseling from dietitian n (%)			
Yes	100 (33.8)	18 (21.4)	**0.031**[a]
No	196 (66.2)	66 (78.6)	
Adherence to the Mediterranean Diet (MEDAS) classification n (%)			
Low	67 (22.6)	28 (33.3)	**0.035**[b]
Moderate	218 (73.6)	56 (66.7)	
High	11 (3.7)	-	
MEDAS score (mean±SD)	6.72±1.64	6.15±1.64	**0.012**[c]
IPAQ classification n (%)			
Inactive	181 (61.1)	48 (57.1)	0.676
Minimally active	103 (34.8)	31 (36.9)	
Active	12 (4.1)	5 (6)	
IPAQ score (mean±SD)	688.71±871.98	899.52±976.48	0.070

[a]Pearson chi-square; [b]Fisher's exact test; [c]Mann-Whitney U test (p<0.05); SD: Standard deviation; BMI: Body mass index; MEDAS: Mediterranean Diet Adherence Scale; IPAQ: International Physical Activity Questionnaire.

TABLE 3: Main characteristics of the study population according to their adherence to the Mediterranean diet (MEDAS).

	Adherence to the Mediterranean diet		
Characteristics (n=380)	**Low**	**Moderate/high**	**p value**
Age (years) (mean±SD)	39.38±14.02	41.93±13.55	0.117[b]
Education level (university and over) n (%)	45 (47.4)	166 (58.2)	0.065[a]
Income less than expenses n (%)	39 (41.1)	74 (26.0)	**0.020[a]**
BMI (kg/m^2) (mean±SD)	26.35±5.25	27.74±6.01	**0.033[b]**
BMI classification (obese) n (%)	21 (22.1)	99 (34.7)	0.152[a]
Waist-hip ratio (mean±SD)	0.86±0.12	0.84±0.10	0.158
Chronic disease (yes) n (%)	30 (31.6)	141 (49.5)	**0.002[a]**
Meal skipping status (yes/sometimes) n (%)	74 (77.9)	225 (79.0)	0.928[a]
Receiving nutrition counseling from dietitian (yes) n (%)	21 (22.1)	97 (34.0)	**0.030[a]**
Smoking status (yes) n (%)	26 (27.4)	57 (20.0)	0.132[a]
IPAQ score (mean±SD)	746.8±1074.4	731.4±834.6	0.885[b]
IPAQ classification (inactive) n (%)	56 (58.9)	173 (60.7)	0.762[a]
IPAQ classification (minimally active/active) n (%)	39 (41.1)	112 (39.3)	0.762[a]

[a]Chi-square p (p<0.05); [b]Student t test p (p<0.05); SD: Standard deviation; BMI: Body mass index; kg: Kilogram; m: Meter; MEDAS: Mediterranean Diet Adherence Scale; IPAQ: International Physical Activity Questionnaire. Bold values indicate statistical differences.

TABLE 4: Main characteristics of the study population according to their adherence to the physical activity level (IPAQ).

	Physical activity level (IPAQ)		
Characteristics (n=380)	**Inactive**	**Minimally active/active**	**p value**
Age (years) (mean±SD)	42.11±13.66	40.05±13.70	0.153[b]
Education level (university and over) n (%)	97 (42.4)	72 (47.7)	0.307[a]
Income less than expenses n (%)	68 (29.7)	45 (29.8)	0.945[a]
BMI (kg/m^2) (mean±SD)	27.57±6.06	27.13±5.52	0.475[b]
BMI classification (obese) n (%)	79 (34.5)	41 (27.2)	0.353[a]
Waist-hip ratio (mean±SD)	0.85±0.10	0.84±0.11	0.562[b]
Chronic disease (yes) n (%)	110 (48.0)	61 (40.4)	0.143[a]
Meal skipping status (yes/sometimes) n (%)	180 (78.7)	119 (78.8)	0.978[a]
Receiving nutrition counseling from dietitian (yes) n (%)	60 (26.2)	58 (38.4)	0.012[a]
Smoking status (yes) n (%)	55 (24.0)	28 (18.5)	0.206[a]
MEDAS score (mean±SD)	6.53±1.70	6.70±1.58	0.331[b]
Adherence to the Mediterranean diet (low) n (%)	56 (24.5)	39 (25.8)	0.762[a]
Adherence to the Mediterranean diet (Moderate-to-high) n (%)	173 (75.5)	112 (74.2)	0.762[a]

[a]Chi-square p (p<0.05); [b]Student t test p (p<0.05); IPAQ: International Physical Activity Questionnaire; SD: Standard deviation; BMI: Body mass index; kg: Kilogram; m: Meter; MEDAS: Mediterranean Diet Adherence Scale. Bold values indicate statistical differences.

TABLE 5: The frequency of chronic diseases according to the participants' receiving nutrition counseling status.

	Chronic disease				
	No		Yes		
Characteristics (n=380)	**n**	**%**	**n**	**%**	**p value**
Receiving nutrition counseling from dietitian					
Yes	51	24.4	67	39.2	0.002*
No	158	75.6	104	60.8	

*Chi-square p (p<0.05).

TABLE 6: The relationship between the participants' BMI values, waist circumference, waist to hip ratio and MEDAS score or IPAQ score

	BMI (kg/m²)		Waist circumference (cm)		Waist to hip ratio	
Characteristics (n=380)	**r**	**p value**	**r**	**p value**	**r**	**p value**
MEDAS score	0.126*	0.014*	0.043	0.408	-0.031	0.549
IPAQ score	-0.118*	0.022*	-0.124*	0.018*	-0.087	0.094

*Spearman correlation analysis (p<0.05); BMI: Body mass index; kg: Kilogram; m: Meter; cm: Centimeter; MEDAS: Mediterranean Diet Adherence Scale; IPAQ: International Physical Activity Questionnaire.

rate of being obese, the rate of moderate and high compliance to the MD, and the mean MEDAS score were higher in women. According to the Türkiye Nutritional Health Survey 2017 (TBSA 2017), mean BMI score of men was lower than women and the prevalence of obesity was higher in women.[20] The worldwide prevalence of obesity was also higher in women than in men.[21] In the literature data, the rate of being obese according to BMI was higher in women like in our study. It is already known that obesity increases the risk of chronic diseases such as hypertension, Type 2 diabetes, dyslipidemia, and cardiovascular diseases.[22,23] In present study, the rate of having a chronic disease was also higher in women. In this context, it is important for women to acquire healthy lifestyle habits. In the present study, the rates of moderate-to-high adherence to the MD and the mean MEDAS scores were higher in women than in men. Although there are many nutrition models in the world as examples of healthy nutrition, the most frequently associated nutritional model that has a healthy lifestyle and positive health outcomes is the Mediterranean type of nutrition model.[24] The results differ in studies that evaluate the MD adherence status in men and women.[25-27] The higher adherence of women to the MD in our study may be because of the fact that women had higher rates of having received dietary counseling from a dietitian compared to men. The rate of women who had previously received dietary counseling from a dietitian and the rate of moderate-to-high compliance to the MD being higher than men may be because of the high prevalence of chronic diseases and obesity in women. In our study, the rate of not working in any job and having a low education level was higher in women. In many studies that were conducted previously, high sociocultural level was related with good adherence to the MD.[26,28-30] As participation in business life is a factor that can make it difficult to prepare meals at home and have a regular diet, explains why women's adherence to the MD is higher than men.[29-31] Moreover, the mean waist-hip ratio, which is thought to be a better indicator of health-related parameters, was significantly higher in males in our study. According to the World Health Organization, a ideal waist-hip-ratio is 0.90 or less in men and 0.85 or less for women.[32] The waist/hip ratio of women was in the normal risk group in terms of cardiovascular risk in our study and the waist/hip ratio of male individuals was in the high-risk group in terms of cardiovascular risk. This may be explained by the fact that women are better adherence to the MD. On the other hand the prevalence of chronic diseases was statistically and significantly higher in women than in men. We believe that this was because of the fact that the obesity rate by BMI was higher in women than in men. Although it was reported in the TBSA 2017 report and in the studies in the literature that the physical activity levels of men were higher.[26,27] The mean IPAQ score and IPAQ subclasses were found to be similar in terms of gender in our study.

In the present study, the rate of having less income than the expenses in participants that had low adherence to the MD was higher than those that had moderate-high adherence. It is considered that the purchasing power of the foods that should be consumed in the MD nutrition model decreased because of the economic problems experienced at the global level in recent years.[33,34] Other hand, foods e.g. red meat and foods that contain sugar which is not rec-

ommended to be consumed frequently in the MD, are not cheap and their consumption increased in the last decade in the worldwide. For this reason, it is considered that the reasons for such changing trends because of the MD must be explained better.[32] The mean BMI and the prevalence of chronic diseases were found to be higher in those with moderate/high compliance to the MD than in those who had low adherence in our study. Also, a positive and significant relation was detected between the MEDAS score and the BMI. Unlike our findings, it was found in a recent study that the mean BMI of the participants with high compliance to the MD was lower than those with low adherence.[26] In a study that was conducted with male firefighters, it was found that better adherence to the MD after age adjustment was related with decreased BMI scores.[35] Individuals that had a high BMI score and chronic diseases may be more likely to comply with the MD to improve their health status in our study. Also, the frequency of having previously received nutritional counseling from a dietitian was higher in participants who had chronic diseases when compared to participants without chronic diseases. We believe that this may have caused the higher adherence of individuals with chronic diseases to the MD.

The frequency of having received nutritional counseling from a dietitian was higher in individuals who were minimally active/active according to their physical activity levels when compared to those who were inactive. However, IPAQ score showed a significant negative correlation with BMI and waist circumference in the correlation analysis. It was found in a recent study that the mean BMI score of participants who had high physical activity levels was lower than those who had low physical activity levels. In the same study, the frequency of hypertension was found to be less in participants who had high physical activity levels.[26] It is an expected outcome that individuals receiving healthcare services are also more likely to engage in physical activity which is a positive health behavior.

Our study is one of the few studies in our country that examines the effects of adherence to the MD on health outcomes. In this context, it is also important in terms of providing data for further studies to be planned in our country. The present study was poor in determining the cause-effect relations because of its cross-sectional design. Another limitation was the population which the study was conducted consisted of individuals who applied to the hospital and received healthcare services and who have chronic diseases. Also, the fact that the study population consisted of mostly female individuals was another limitation.

CONCLUSION

Determining the nutritional status and physical activity levels of individuals is valuable both in terms of determining the priority problems that need to be solved and in determining the relationships between the diet and physical activity status and health outcomes. In our study, a relationship was observed between adherence to the MD and BMI and chronic disease. In addition, dietary counseling was associated with both adherence to the MD and IPAQ score. Our results encourage the inclusion of get dietary counseling for adopting a physically active lifestyle and minimizing the comorbidities associated with wrong eating habits. One of the most important points that must be emphasized in line with the results obtained in the present study is the necessity and importance of developing preventive healthcare services about nutrition and physical activity. These results will likely help researchers and health administrators to better tailor forthcoming studies in the field of nutrition and public health. It is very important to increase the awareness of the society on the positive effects of adequate and balanced nutrition and being physically active on chronic diseases and obesity.

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Zekiye İpek Katırcı Kırmacı, Seren Kurtgil, Nezihe Otay Lüle, Yusuf Şinasi Kırmacı;* ***Design:*** *Zekiye İpek Katırcı Kırmacı, Seren Kurtgil, Nezihe Otay Lüle, Yusuf Şinasi Kırmacı;* ***Control/Supervision:*** *Zekiye İpek Katırcı Kırmacı;* ***Data Collection and/or Processing:*** *Zekiye İpek Katırcı Kırmacı, Seren Kurtgil, Nezihe Otay Lüle, Yusuf Şinasi Kırmacı;* ***Analysis and/or Interpretation:*** *Zekiye İpek Katırcı Kırmacı;* ***Literature Review:*** *Zekiye İpek Katırcı Kırmacı, Nezihe Otay Lüle;* ***Writing the Article:*** *Zekiye İpek Katırcı Kırmacı, Seren Kurtgil, Nezihe Otay Lüle, Yusuf Şinasi Kırmacı;* ***Critical Review:*** *Zekiye İpek Katırcı Kırmacı, Nezihe Otay Lüle;* ***References and Fundings:*** *Zekiye İpek Katırcı Kırmacı, Seren Kurtgil, Nezihe Otay Lüle, Yusuf Şinasi Kırmacı;* ***Materials:****Zekiye İpek Katırcı Kırmacı, Seren Kurtgil, Nezihe Otay Lüle, Yusuf Şinasi Kırmacı.*

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