Original Article

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The Relationship Between Attitudes Towards Healthy Nutrition, Adherence to Mediterranean Diet and Blood Parameters in Adults

Yetişkinlerde Sağlıklı Beslenmeye İlişkin Tutum, Akdeniz Diyetine Uyum ve Kan Parametreleri Arasındaki İlişki

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ABSTRACT

Objective: This study was carried out to evaluate the relationship of adult individuals attitudes towards healthy nutrition and adherence to the Mediterranean diet (MD) with blood biochemical parameters [fasting blood glucose, HbA1c, triglyceride, total cholesterol, high density lipoprotein (HDL)-cholesterol, low density lipoprotein (LDL)-cholesterol, aspartate aminotransferase (AST), alanine aminotransferase (ALT) and creatinine] and anthropometric measurements [body weight, height, body mass index (BMI), waist/height ratio, body fat weight and percentage].

Methods: The study was conducted with 120 volunteers (30 men, 90 women) aged 20-64 who were admitted to Gaziosmanpaşa Municipality Barrier-Free Life and Solidarity Center for dietitian service between 15 December 2021-15 June 2022. Questionnaire with 48 questions examining sociodemographic characteristics, eating habits, meal order and frequency, Attitude Scale for Healthy Nutrition (ASHN) consisting of 21 questions, MD Assessment Tool (MDAT) consisting of 14 questions, and Food Frequency Questionnaire (FFQ) were applied to the individuals participating in the study by face to face interview method.

Results: In the study, as the adherence to the MD increased in male individuals, the body fat percentage and weight, waist/height ratio, triglyceride, total and LDL-cholesterol, AST and ALT levels decreased significantly, HDL-cholesterol level statistically significantly increased ($p<0.05$). As the adherence to the MD

ÖZ

Amaç: Yetişkin bireylerin sağlıklı beslenmeye ilişkin tutum ve Akdeniz diyetine (AD) uyumlarının kan biyokimyasal parametreleri [açlık kan glikozu, HbA1c, trigliserit, total kolesterol, yüksek yoğunluklu lipoprotein (HDL)-kolesterol, düşük yoğunluklu lipoprotein (LDL)-kolesterol, aspartat aminotransferaz (AST), alanin aminotransferaz (ALT) ve kreatinin] ve antropometrik ölçümleri [vücut ağırlığı, boy uzunluğu, beden kütle indeksi (BKİ), bel/boy oranı, vücut yağ ağırlığı ve yüzdesi] ile ilişkisini değerlendirmek amacıyla yapılmıştır.

Yöntemler: Çalışma 15 Aralık 2021-15 Haziran 2022 tarihleri arasında Gaziosmanpaşa Belediyesi Engelsiz Yaşam ve Dayanışma Merkezi'ne diyetisyen hizmeti için başvuran 20-64 yaş arası 120 (30 erkek, 90 kadın) gönüllü birey ile yürütülmüştür. Çalışmaya katılan bireylere sosyodemografik özelliklerini, beslenme alışkanlıklarını, öğün düzeni ve sıklıklarını irdeleyen 48 soruluk anket formu, besin tüketim sıklığı, 14 sorudan oluşan AD uyum ölçeği ve 21 sorudan oluşan sağlıklı beslenmeye ilişkin tutum ölçeği yüz yüze görüşme yöntemi ile uygulanmıştır.

Bulgular: Erkek bireylerde AD'ye uyum arttıkça vücut yağ yüzdesi ve ağırlığı, bel/boy oranı, trigliserit, total ve LDL-kolesterol, AST ve ALT değerleri istatistiksel olarak anlamlı bir şekilde azalırken, HDL-kolesterol değeri istatistiksel olarak anlamlı şekilde artmıştır ($p<0,05$). Kadın bireylerde AD'ye uyum arttıkça BKİ, vücut yağ yüzdesi ve bel/boy oranı ile vücut yağ ağırlığı, trigliserit, total ve

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increased in female individuals, the BMI, body fat percentage and waist/length ratio and body fat weight values, and triglyceride, total and LDL-cholesterol levels decreased significantly ($p<0.05$).

Conclusion: As a result, a nutritional model suitable with the MD has a positive effect on anthropometric measurements and blood biochemical parameters in adults. The MDcan be considered as a protective nutrition model in the prevention of various diseases.

Keywords: Mediterranean diet, anthropometric measurement, blood biochemical parameter, attitude towards healthy nutrition

ÖZ

LDL-kolesterol ile ALT değerleri istatistiksel olarak anlamlı bir şekilde azalmıştır ($p<0,05$).

Sonuç: Sonuç olarak yetişkin bireylerde AD'ye uygun bir beslenme modeli, antropometrik ölçümler ve kan biyokimyasal parametreleri üzerinde olumlu bir etki yaratmaktadır. AD çeşitli hastalalıkların önlenmesinde koruyucu bir beslenme modeli olarak değerlendirilebilir.

Anahtar Sözcükler: Akdeniz diyeti, antropometrik ölçüm, kan biyokimyasal parametre, sağlıklı beslenmeye ilişkin tutum

Introduction

The World Health Organization defines health as "not only the absence of diseases and ailments, but a state of complete physical, mental and social well-being" (1). Health, as it is understood today, is a multidimensional concept that includes not only the absence of disease, but also a state of complete physical, mental and social well-being (2). Increasing evidence supports that diet patterns low in fatty and processed meat, saturated fat, refined grains, salt and sugar, that is, adequate and balanced diet, prevent non-communicable diseases such as hypertension, hypercholesterolemia, obesity, diabetes and cancer, and positively affect health (3,4). As part of dietary management, the Mediterranean diet (MD) is recommended, characterized by a high intake of fruits, vegetables, legumes, nuts, moderate wine and olive oil, and associated with many health benefits (5). When the studies conducted to determine the protective effect of nutrition on human health are examined, the MD is adopted as the most qualitative nutritional style among healthy diet models, despite the existence of many healthy diet models that are frequently recommended (5-7). High consumption of fish, fruits and vegetables, and fiber-rich foods is associated with better health and consumption of these foods is stated to be part of the MD. It is suggested that the protective effect of the MD on health status may be related to a better biologically perceived health status through various mechanisms such as a beneficial effect on metabolism, cell resistance to oxidation, and sensitivity to insulin (3).

The MD took its place in the medical literature for the first time with the publication of the data obtained as a result of the Seven Countries Study initiated by Ancel Keys et al. in the late 1950s (8). MD is a predominant dietary pattern among people living in olive tree growing regions of the Mediterranean basin. While the main determinants of the MD are climate, flora and poverty, the second factor is aiming to reduce the import or consumption of red meat, which was expensive at that time (9). MD expresses the presence of some common nutritional characteristics such as high amounts of olive oil, fruits, vegetables, legumes and nuts, moderate amounts of fish and dairy products, and small amounts of meat and meat products. Consumption of moderate amounts of wine is also accepted as long as it is not contrary to religious and social norms (4). At the end of 2010, MD, which was registered on the UNESCO Representative List of the Intangible Cultural Heritage of Humanity, has become the target of increasing studies on environmental sustainability in recent years due to its lower greenhouse gas emissions and lower water footprints compared to current Western dietary models (10,11).

The mechanisms by which MD reduces the risk of cardiovascular disease, certain types of cancer, and other metabolic diseases are not clearly known, but many interrelated and overlapping factors are assumed to play a role. Lipid-lowering effect, protection against oxidative stress, inflammation and platelet aggregation, modification of hormones and growth factors that play a role in cancer pathogenesis, inhibition of nutrient sensing pathways by specific amino acid restriction, and intestinal microbiota-mediated production of metabolites that affect metabolic health are the mechanisms of the traditional MD that mediate its longevity and health effects (12).

Data from epidemiological studies show that diet continues to be a key factor in the prevention of cardiovascular disease, obesity, type 2 diabetes and some of the most common types of cancer. In this context, it shows that adherence to MD may have a protective effect against cardiovascular disease, stroke, obesity, diabetes, hypertension, various types of cancer, allergic diseases, and finally Alzheimer's disease and Parkinson's disease (12,13). In one epidemiological study, higher adherence to MD was associated with significantly reduced deaths from heart and cancer diseases, independent of individual dietary components (12). In the current study, it was aimed to evaluate the relationship between attitudes towards healthy eating, adherence to the Mediterranean diet and blood biochemical parameters in adult individuals in line with this information.

Methods

The research, which was a cross-sectional study, was conducted with adult individuals who were admitted for dietitian service to Gaziosmanpaşa Municipality Barrier-Free Life and Solidarity Center located in Gaziosmanpaşa district of İstanbul province between 15 December 2021 and 15 June 2022. In order to carry out the study, a work permit was obtained from the Gaziosmanpaşa Municipality Culture and Social Affairs Directorate. The number of individuals who applied to the

center for the first time in the 6-month period before the start of the study was 500. If the average population is known over this number, the minimum sample number was calculated as 81 in the calculation made with 90% confidence interval and 10% margin of error. A total of 120 volunteer adults including 30 men and 90 women who were aged 20-64 years, were not pregnant and non-lactating, did not have any chronic diseases and eating disorders, and volunteered to participate in the study, were included in the study. A questionnaire consisted of 48 questions about sociodemographic characteristics, nutritional habits, meal order and physical activity status, anthropometric measurements (body weight, height, BMI, waist/height ratio, body fat weight and percentage) and blood biochemical parameters [fasting blood glucose, HbA1c, triglyceride, total cholesterol, high density lipoprotein (HDL)-cholesterol, low density lipoprotein (LDL)-cholesterol, aspartate aminotransferase (AST), alanine aminotransferase (ALT) and creatinine], Attitude Scale for Healthy Nutrition (ASHN) consisting of 21 questions, MD Assessment Tool (MDAT) consisting of 14 questions, and Food Frequency Questionnaire (FFQ) were applied by face-to-face interview method.

Statistical Analysis

All the data obtained as a result of the research were evaluated using SPSS 26.0 statistical package program. In the study, descriptive and comparative analyzes were applied in order to evaluate the frequency of food consumption, compliance with the MD and their attitudes towards healthy eating. Categorical variables from descriptive statistics were given as numbers and percentages, and numerical variables were given as mean, standard deviation, minimum and maximum values. The rates in the groups were compared with the chi-square test. Comparisons of two independent groups were made with Student's t-test when numerical variables met the normal distribution condition and with Mann-Whitmey U test when they did not meet the normal distribution condition. More than two independent group comparisons of numerical variables were made with the one-way ANOVA test when the normal distribution condition was met in the groups, and with the Kruskal-Wallis test when the normal distribution condition was not met. Subgroup analyzes were performed with Bonferroni test as parametric test and Mann-Whitney U test as nonparametric test and interpreted with Bonferroni correction. Statistical alpha significance level was accepted as $p<0.05$.

Results

The distribution of demographic characteristics of the individuals participating in the study by gender is given in Table 1. In the study conducted with a total of 120 individuals, 25% were male (n=30) and 75% were female (n=90), with an age range of 20-64 years. The mean ages of male and female individuals were 34.7±11.7 years and 40.2±10.5 years, respectively.

The classification of individuals' adherence to the MD according to gender is given in Table 2. Of all individuals 12.5% (n=15) showed low compliance to the MD, 59.2% (n=71) moderate compliance, and 28.3% (n=34) high compliance. When the compliance of the individuals participating in the study to MD was compared according to gender, and no statistically significant difference was found between the genders ($p>0.05$).

In line with the results of the ASHN applied to individuals, individuals were divided into groups and the answers given in Table 3 were grouped according to gender. Of all individuals 46.7% (n=56) had a high ideal level of attitude towards healthy nutrition, 40.8% (n=49) had a high, 12.5% (n=15) moderate attitude. No statistically significant difference was found between genders in terms of ASHN group ($p>0.05$).

Table 1. Distribution of demographic characteristics of individuals by gender

	Male (n=30)		Female (n=90)		Total (n=120)	
	n	%	n	%	n	%
Mean Age ($\bar{X}$ ± SD) (year)	34.7±11.7		40.2±10.5		38.8±11.0	
Min-max (year)	20	58	20	62	20	62
Marital status						
Married	15	50.0	76	84.4	91	75.8
Single	15	50.0	14	15.6	29	24.2
Educational status						
Primary-middle school	3	10.0	33	36.7	36	30.0
High school	12	40.0	25	27.8	37	30.8
Pregraduate-graduate	12	40.0	29	32.2	41	34.2
Postgraduate-doctorate	3	10.0	3	3.3	6	5.0
Occupation						
Public	11	36.7	14	15.6	25	20.8
Private sector	13	43.3	7	7.8	20	16.7
Student	5	16.7	2	2.2	7	5.8
Unemployed/not working	1	3.3	67	74.4	68	56.7
Smoking						
Yes	13	43.3	14	15.6	27	22.5
No	17	56.7	76	84.4	93	77.5
Alcohol						
Yes	4	13.3	5	5.6	9	7.5
No	26	86.7	85	94.4	111	92.5
Previous diet status						
Yes	13	43.3	73	81.1	86	71.7
No	17	56.7	17	18.9	34	28.3
Diet planner						
Dietitian	7	53.8	59	80.8	66	76.7
Myself	6	46.2	14	19.2	20	23.3

SD: Standard deviation

The data on the relationship between MD compliance and anthropometric measurements of individuals according to gender are given in Table 4. The mean body fat weight, body fat percentage and waist/height ratio of male individuals decreased statistically significantly as adherence to MD increased ($p<0.05$). In female individuals, in addition to the mean body fat weight, body fat percentage and waist/height ratio, the mean body weight and BMI values also decreased statistically significantly as adherence to MD increased ($p<0.05$).

The results comparing the relationship between individuals' adherence to MD and blood biochemical parameters according to gender are given in Table 5. While the mean levels of triglycerides, total and LDL-cholesterol, and AST and ALT of male subjects decreased statistically as adherence to MD increased, HDL-cholesterol level increased statistically significantly ($p<0.05$). In female individuals, mean triglyceride, total and LDL-cholesterol and ALT levels decreased statistically significantly as adherence to MD increased ($p<0.05$).

The results regarding the relationship between individuals' attitudes towards healthy nutrition according to gender and their anthropometric measurements are given in Table 6. The mean BMI and waist/height ratio of male individuals decreased statistically significantly as the attitude towards healthy nutrition increased ($p<0.05$). In female individuals, all anthropometric measurements except total weight, BMI, body fat weight, body fat percentage and waist/height ratio decreased statistically significantly as the attitude towards healthy nutrition increased ($p<0.05$).

The relationship between individuals' attitudes towards healthy nutrition and their blood biochemical parameters is compared in Table 7. While the mean triglyceride, total and LDL-cholesterol levels of male individuals decreased statistically significantly and HDL-cholesterol level increased statistically significantly as the attitude towards healthy nutrition increased ($p<0.05$). In female individuals, mean triglyceride, total and LDL-cholesterol levels decreased statistically significantly as the attitude towards healthy nutrition increased ($p<0.05$).

Table 2. Classification of individuals'adherence to the Mediterranean diet by gender

	Male (n=30)		Female (n=90)		Total (n=120)		
	n	%	n	%	n	%	p*
Low adherence (≤5)	6	20.0	9	10.0	15	12.5	
Moderate adherence (6-9)	15	50.0	56	62.2	71	59.2	0.300
High adherence (≥10)	9	30.0	25	27.8	34	28.3	

*Chi square test

Table 3. Classification of individuals' attitudes towards healthy nutrition by gender

	Male (n=30)		Female (n=90)		Total (n=120)		
	n	%	n	%	n	%	p*
Moderate (43-63)	6	20.0	9	10.0	15	12.5	
High (64-84)	8	26.7	41	45.6	49	40.8	0.126
Ideally high (85-110)	16	53.3	40	44.4	56	46.7	

*Chi square test

Table 4. Evaluation of adherence to Mediterranean diet and anthropometric measurements of individuals by gender

	Male (n=30)				Female (n=90)			
	Low adherence ($\bar{X}$ ± SD) (n=6)	Moderate adherence ($\bar{X}$ ± SD) (n=15)	High adherence ($\bar{X}$ ± SD) (n=9)	p*	Low adherence ($\bar{X}$ ± SD) (n=9)	Moderate adherence ($\bar{X}$ ± SD) (n=56)	High adherence ($\bar{X}$ ± SD) (n=25)	p*
Weight (kg)	84.7±11.4	81.3±7.7	77.7±7.0	0.281	83.5±14.6$^{\#}$	79.2±12.8$^{\#}$	71.4±11.5	**0.014**
Height (cm)	171.0±6.8	177.9±6.4	179.4±7.6	0.064	157.0±5.8	161.1±5.6	156.1±32.5	0.276**
BMI (kg/m²)	29.1±4.7	25.8±3.3	24.3±2.6	0.067**	34.9±6.1$^{\#\varnothing}$	30.5±4.6$^{\#¥}$	26.9±4.4$^{¥\varnothing}$	**<0.001**
Body fat percentage (%)	24.0±4.6$^{\#}$	20.3±5.8	15.9±3.1	**0.014**	42.5±7.7$^{\#}$	39.0±5.9$^{\#}$	33.7±6.3	**<0.001**
Body fat weight (kg)	20.6±6.6$^{\#}$	16.8±5.8	12.8±3.4	**0.034**	36.3±12.0$^{\#}$	31.6±9.2$^{\#}$	24.4±8.3	**0.001**
Waist/height ratio	0.59±0.06$^{\#}$	0.55±0.06	0.50±0.03	**0.010**	0.66±0.09	0.62±0.08$^{\#}$	0.55±0.07$^{\#}$	**<0.001**

*One-way ANOVA, **Kruskal-Wallis, #Different from high adherence, ¥Different from low adherence, $^{\varnothing}$Different from moderate adherence

Discussion

Considering the age, gender and physiological factors of individuals, the nutrition model adopted in a healthy diet that encourages low fat content, high fiber content and fruit and vegetable consumption in order to meet all the nutrients they need in an appropriate amount is one of the most important factors affecting human health (5,6).

Although the nutritional models associated with health in general are plant-based nutrition models, MD stands out because of its protective role on human health. When the studies in the field of nutrition are examined, MD is accepted as the most qualitative nutrition model among the healthy diet models (5,7,14). MD creates a protective effect on health through various mechanisms such as lipid-lowering effect, protection against oxidative stress, inflammation and platelet aggregation, etc. (3,12).

Although it is known that MD has a positive effect on blood biochemical parameters and anthropometric measurements of individuals, studies on the subject in our country are not sufficient. This study was carried out with adult volunteers who were admitted to Gaziosmanpaşa Municipality Barrier-Free Life and Solidarity Center for dietitian service in order to examine the relationship of MD with many parameters and to contribute to the literature in this area.

In the study conducted with a total of 120 individuals [30 males (25%) and 90 females (75%) who were aged 20-64 years], the average age of the individuals was 38.8±11.0 years and 75.8% of all individuals were married (Table 1). A study conducted to evaluate the relationship between MD and anthropometric measurements and nutritional habits was conducted with adult volunteers (32.8% males, 67.2% females) with a mean age of 35.19±12.76 years (19-65 years) (15). In another study conducted

Table 5. Evaluation of adherence to Mediterranean diet and blood biochemical parameters of individuals by gender

	Male (n=30)				Female (n=90)			
	Low adherence ($\bar{X}$ ± SD) (n=6)	Moderate adherence ($\bar{X}$ ± SD) (n=15)	High adherence ($\bar{X}$ ± SD) (n=9)	p*	Low adherence ($\bar{X}$ ± SD) (n=9)	Moderate adherence ($\bar{X}$ ± SD) (n=56)	High adherence ($\bar{X}$ ± SD) (n=25)	p*
Fasting blood glucose (mg/dL)	96.6±12.4	89.1±8.0	87.2±5.2	0.104	93.8±8.1	91.3±8.8	89.7±9.6	0.493
HbA1c (%)	5.3±0.3	5.2±0.4	5.0±0.2	0.166	5.4±0.3	5.4±0.4	5.3±0.3	0.130
Triglyceride (mg/dL)	184.7±56.0$^{\#,Ø}$	123.4±20.3$^{\#¥}$	83.9±11.7$^{¥Ø}$	**<0.001**	154.7±64.0$^{\#}$	110.8±43.3$^{\#}$	72.4±22.5$^{¥}$	**<0.001****
Total-cholesterol (mg/dL)	201.9±14.2$^{\#,Ø}$	175.8±18.9$^{\#,¥}$	141.6±18.4$^{¥,Ø}$	**<0.001**	233.8±31.5$^{\#,Ø}$	192.5±27.8$^{\#,¥}$	152.9±23.2$^{¥,Ø}$	**<0.001****
HDL (mg/dL)	34.7±6.7$^{\#}$	40.7±6.9$^{\#}$	50.1±7.7$^{¥}$	**0.001**	52.4±12.4	52.5±13.0	55.0±12.0	0.220**
LDL (mg/dL)	153.2±28.0$^{\#,Ø}$	118.8±19.4$^{\#¥}$	87.0±11.9$^{¥,Ø}$	**<0.001**	145.0±28.6$^{\#,Ø}$	116.9±22.0$^{\#,¥}$	87.7±20.5$^{¥,Ø}$	**<0.001**
Creatinine (mg/dL)	0.86±0.11	0.76±0.14	0.77±0.11	0.202**	0.69±0.06	0.65±0.12	0.67±0.08	0.425**
AST (U/L)	17.0±4.3$^{\#}$	15.1±3.4	12.7±1.7	**0.018****	21.4±10.2	16.0±4.7	16.2±3.9	0.634**
ALT (U/L)	21.5±12.4$^{\#}$	16.8±4.9$^{\#}$	12.2±2.4$^{¥,Ø}$	**0.013****	21.9±10.5$^{\#,Ø}$	16.0±6.0$^{¥}$	13.0±4.5$^{¥}$	**0.002**

*One-way ANOVA, **Kruskal-Wallis, #Different from high adherence, ¥Different from low adherence, ØDifferent from moderate adherence
SD: Standard deviation, HDL: High density lipoprotein, LDL: Low density lipoprotein, AST: Aspartate aminotransferase, ALT: Alanine aminotransferaz

Table 6. Evaluation of Individuals' Attitudes to Healthy Nutrition by Gender and Anthropometric Measurements

	Male (n=30)				Female (n=90)			
	Moderate ($\bar{X}$ ± SD) (n=6)	High ($\bar{X}$ ± SD) (n=8)	Ideally high ($\bar{X}$ ± SD) (n=16)	p*	Moderate ($\bar{X}$ ± SD) (n=9)	High ($\bar{X}$ ± SD) (n=41)	Ideally high ($\bar{X}$ ± SD) (n=40)	p*
Weight (kg)	84.7±11.4	82.3±8.9	78.7±6.7	0.390**	83.6±14.1	80.5±12.2	73.0±12.5	**0.010**
Height (cm)	171.0±6.8	176.8±7.8	179.4±6.2	0.050	162.7±7.4	160.4±5.6	157.5±25.7	0.588**
BMI (kg/m²)	29.1±4.7	26.5±4.0	24.6±2.4	**0.031**	32.6±6.2	31.2±4.3	28.0±5.2	**0.004**
Body fat percentage (%)	24.0±4.6	20.0±7.1	18.0±4.3	0.070	39.7±6.2	40.1±5.6	35.3±7.3	**0.004**
Body fat weight (kg)	20.6±6.6	16.9±7.1	14.5±4.2	0.091	33.7±10.5	32.8±8.7	26.4±9.9	**0.006**
Waist/height ratio	0.59±0.06	0.56±0.07	0.51±0.04	**0.010**	0.62±0.08	0.63±0.07	0.58±0.09	**0.015**

*One-way ANOVA, **Kruskal-Wallis
SD: Standard deviation, BMI: Body mass index

Table 7. Evaluation of individuals' attitudes to healthy nutrition by gender and blood biochemical parameters

	Male (n=30)				Female (n=90)			
	Moderate ($\bar{X}$ ± SD) (n=6)	High ($\bar{X}$ ± SD) (n=8)	Ideally high ($\bar{X}$ ± SD) (n=16)	p*	Moderate ($\bar{X}$ ± SD) (n=9)	High ($\bar{X}$ ± SD) (n=41)	Ideally high ($\bar{X}$ ± SD) (n=40)	p*
Fasting blood glucose (mg/dL)	96.6±12.4	89.8±9.1	87.7±5.9	0.101	96.3±12.3	90.7±8.2	90.3±8.7	0.176
HbA1c (%)	5.3±0.3	5.3±0.3	5.0±0.4	0.101	5.4±0.3	5.4±0.4	5.4±0.3	0.587
Triglyceride (mg/dL)	184.7±56.0	128.8±23.2	98.5±21.6	**<0.001**	153.8±60.4	110.8±43.2	87.0±39.0	**0.001****
Total-cholesterol (mg/dL)	201.9±14.2	184.7±16.7	152.2±21.1	**<0.001**	222.6±39.2	193.0±29.5	169.8±32.9	**<0.001**
HDL (mg/dL)	34.7±6.7	39.1±6.8	46.8±8.2	**0.005**	52.2±11.9	52.1±12.3	54.5±13.2	0.745**
LDL (mg/dL)	153.2±28.0	124.6±20.9	98.0±18.8	**<0.001**	139.7±38.4	118.9±21.9	97.9±23.5	**<0.001**
Creatinine (mg/dL)	0.86±0.11	0.75±0.12	0.77±0.13	0.176**	0.67±0.07	0.67±0.10	0.65±0.12	0.938**
AST (U/L)	17.0±4.3	15.0±2.7	13.8±3.3	0.250**	15.4±3.6	16.5±6.5	16.9±4.6	0.572**
ALT (U/L)	21.5±12.4	16.0±4.1	14.6±5.0	0.214**	17.1±6.9	16.8±7.0	14.5±6.1	0.228**

*One-way ANOVA, **Kruskal-Wallis
SD: Standard deviation, HDL: High density lipoprotein, LDL: Low density lipoprotein, AST: Aspartate aminotransferase, ALT: Alanine aminotransferaz

with 70 (71.4% females) individuals aged 20-64 on adherence to MD, 85.7% of the individuals were married (16). The age range, gender distribution and marital status of the individuals included in this study are consistent with those studies.

The Mediterranean diet, which limits the intake of harmful fats for health and encourages the intake of beneficial fats, plays an important role in preventing abnormal or excessive fat accumulation in the body through various metabolic pathways, and thus the high level of many anthropometric measures that signal obesity (17,18). In a study conducted to examine the relationship between adherence to MD and anthropometric measurements, in parallel with this study, it was reported that as the adherence to MD increased, the body fat weight of individuals decreased statistically significantly ($p<0.05$) (19). In a cohort study of 1,214 participants living in Southern Italy, the waist/height ratio was found to be statistically significantly lower in individuals with a MDAT score ≥7 in line with this study ($p<0.05$) (20).

In a study conducted with 188 Italians to analyze the change in body composition due to MD, which played an important role in the prevention of obesity, positive and statistically significant relationship was found between MD and the variation of both total body fat weight and gynoid body fat weight ($p<0.05$) (21). After a 2-year follow-up in another study using multiple diet quality scores, one of which was the MDAT score, to evaluate compliance with certain dietary recommendations or consumption of healthy foods, it was reported that as MDAT score increased, the waist circumference and BMI values of individuals decreased statistically significantly ($p<0.05$) (22). In another study, body weight and BMI values of both male and female individuals decreased statistically significantly as adherence to MD increased ($p<0.05$). Likewise, body fat percentage, body fat weight, waist circumference and waist/height ratio of male and female individuals decreased statistically significantly as adherence to MD increased ($p<0.05$) (15).

In another study, body weight and BMI values of individuals decreased statistically significantly as MDAT score increased ($p<0.05$) (23). In another study, waist circumference measurements decreased statistically significantly while MDAT score increased ($p<0.05$), but no significant correlation was found between MDAT score and BMI value ($p>0.05$) (24). In another study on MD, waist circumference measurements were found to be statistically significantly lower in individuals with a higher MDAT score ($p<0.05$) (25). As a result of another study, it was determined that as adherence to MD increased, in parallel with this study, individuals' BMI, waist circumference, waist/height ratio and body fat percentage decreased statistically significantly ($p<0.05$) (26). In another study conducted to examine the relationship between MD and body fat weight, waist circumference measurements of both male and female individuals were found to be statistically significantly lower as adherence to MD increased ($p<0.05$). The results of the study showed that adherence to MD rich in plant-derived foods and unsaturated fatty acids was associated with lower waist circumference and, therefore, lower abdominal adiposity in European men and women (27). In another study, as individuals' adherence to MD increased, waist/hip ratio and BMI values decreased statistically significantly ($p<0.05$). The probability of being obese was found to be 51% lower with higher adherence to MD (28). In another study, the BMI values of individuals with high adherence to MD were found to be statistically significantly lower than those with lower adherence to MD ($p<0.05$) (29).

It was shown in a study that better adherence to MD, which was associated with many health benefits, reduced the odds of being obese in both men and women by 30%. In addition, BMI, waist circumference and body fat weight of individuals with higher adherence to MD were found to be statistically significantly lower in parallel with this study ($p<0.05$). The results of that study emphasized the importance of including MD in lifestyle and nutritional habits education in order to prevent overweight and obesity (30).

There is a lower intake of saturated fat and lower plasma cholesterol levels in MD, mostly due to the high consumption of extra virgin olive oil, oilseeds, and whole grains, as well as the very low consumption of meat, milk, and butter. There is a strong correlation between greater adherence to MD, which contributes to lower plasma cholesterol levels, and a lower incidence of coronary heart disease (12,31). In a study conducted to determine the relationship between MDAT score and biochemical nutritional markers, the total cholesterol levels of the individuals were found to be statistically significantly lower as the adherence to MD increased ($p<0.05$). While it was found to be significantly lower ($p<0.05$), HDL-cholesterol levels in women were found to be statistically significantly higher in the group with high adherence to MD ($p<0.05$) (32). In another study, as adherence to MD increased, the mean total cholesterol level of individuals was found to be statistically significantly lower, consistent with this study ($p<0.05$) (33). In another study conducted to investigate the effects of MD on metabolic health, the total and LDL-cholesterol levels of individuals following MD were found to be significantly lower ($p<0.05$). Each 1-unit increase in MD index corresponded to a 2% decrease in total and LDL-cholesterol levels, and this decrease was found to be statistically significant ($p<0.05$) (34).

In a randomized study on MD, the LDL-cholesterol levels of the group that received MD supplemented with extra virgin olive oil were found to be significantly lower than the control group ($p<0.05$) (35). In another study conducted, HDL-cholesterol levels of individuals increased statistically significantly, in parallel with this study, as adherence to MD increased ($p<0.05$) (16). In another population-based study, as the adherence to MD increased, the total cholesterol/HDL cholesterol ratio decreased statistically significantly ($p<0.05$), while HDL-cholesterol levels increased statistically significantly ($p<0.05$) (36). In another study conducted in Southern Italy, HDL-cholesterol levels were found to be statistically significantly higher in individuals with a MDAT score ≥7 ($p<0.05$) (20).

In another study conducted to evaluate the relationship of MD and its individual components with the chronic risk factors profile in adult individuals, individuals with higher adherence to MD had a more favorable plasma lipid profile, that is, statistically significantly lower LDL-cholesterol and triglyceride levels and higher HDL-cholesterol levels, in line with this study ($p<0.05$). The findings of the study support the concept that the beneficial health effects of MD, which is an appropriate nutritional model, lie in the synergy between the nutrients it contains (29). In a meta-analysis to evaluate the effect of MD on liver enzymes, the mean AST level decreased statistically significantly as the adherence to MD increased ($p<0.05$), while the mean ALT level decreased as the adherence to MD increased, but MD did not have an effect on the ALT level ($p>0.05$) (37).

In a study on attitudes towards healthy nutrition, BMI values decreased as individuals' attitudes towards healthy nutrition increased, but this decrease was not found to be statistically significant in contrast to this study ($p>0.05$). Similarly, as individuals' attitudes towards healthy nutrition increased, their body weights decreased, but this decrease was not statistically significant ($p>0.05$) (38). In another study, BMI values of male individuals were found to be higher than female individuals (26.11 ± 3.80 kg/m² and 22.67 ± 4.52 kg/m², respectively). In the study, no statistically significant relationship was found between BMI and ASHN mean score ($p>0.05$). In terms of gender, the BMI value of female individuals who were in the highest class in the ASHN classification was 18.50-24.99 kg/m², while the BMI value of male individuals was between 18.50-24.99 kg/m². Although there was no statistically significant relationship between individuals' BMI values and ASHN score, having a high attitude towards healthy nutrition might contribute to the existence of a healthy BMI value (39). In another study on attitudes towards healthy nutrition, a statistically significant relationship was found between the ASHN score and BMI value ($p<0.05$) (40). In another study, there was a statistically significant relationship between the BMI values of individuals and their mean score of ASHN ($p<0.05$) (41), while a statistically significant relationship was not found between the ASHN sub-dimensions and BMI values of individuals in another study ($p>0.05$) (42). In another study, no significant relationship was found between the attitude towards healthy nutrition and BMI ($p>0.05$) (43).

Study Limitations

This study gained a unique place in the current literature by examining many relationships such as adherence to MD, attitudes towards healthy nutrition, and blood biochemical parameters, anthropometric measurements and nutrient intake levels. However, the sample size was limited as the study was only conducted with individuals who received dietitian service in a center located in Gaziosmanpaşa. Individuals who wanted to receive dietitian services in the center were mostly women. For this reason, it should be noted that the sample size should be larger and homogeneous in similar studies conducted in the future.

Conclusion

Adequate and balanced nutrition, which is a very important factor for individuals to lead a healthy life, comes up with many healthy alternatives. Scientific studies have shown that high adherence to MD, which is one of the healthiest nutrition models known, is protective against many diseases. For this reason, specific nutrients that form the basis of MD should be included in the nutrition of individuals in an adequate and balanced way. Individuals should develop regular physical activity habits and

make this process sustainable with an appropriate program. Considering the positive effect of good adherence to MD on both anthropometric measurements and blood biochemical parameters, individuals admitting to living centers should be given training on the benefits, content and application of MD.

Ethics

Ethics Committee Approval: Kırıklareli University Health Sciences Institute (date: 15.1.2021/decision no: 10).

Peer-review: Externally peer reviewed.

Authorship Contributions

Concept: M.Y., M.P., Design: M.Y., M.P., Data Collection or Processing: M.Y., Analysis or Interpretation: M.Y., M.P., Literature Search: M.Y., M.P., Writing: M.Y.

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