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The Effect of Mediterranean Diet Compliance on COVID-19 Symptoms and Disease Severity

Akdeniz Diyetine Uyumun COVID-19 Semptomları ve Hastalık Şiddeti Üzerine Etkisi

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Abstract

The aim of the research is to investigate the relationship between the adherence to a Mediterranean type of diet, which is an anti-inflammatory diet, and the degree of severity and symptoms of the disease in patients with COVID-19 infection. In the study, a short questionnaire form containing questions about demographic information, disease severity, and what symptoms they experienced was given to individuals who had previously had COVID-19 infection. The adaptation of individuals to the Mediterranean diet (MD) was evaluated with the Mediterranean Diet Adherence Screener (MEDAS). SPSS software program was used to analyze the effect of the MD on COVID-19 severity and symptoms. A total of 715 people, including 283 (39.6%) men and 432 (60.4%) women, were included in the study. It was determined that 33.7% (241/715) of the individuals had MD compliance, while 66.3% (474/715) did not have MD compliance. It was observed that 77.8% (556/715) of the individuals participating in the study had a mild recovery from the COVID-19 infection process. It was observed that thin and obese individuals had more difficulty recovering ($p<0.05$). The top 5 most common symptoms in COVID-19 patients were found to be as follows: fatigue-weakness (87%), low back-joint pain (76.4%), headache (70.5%), olfactory disorder (66%), and taste disorder (61%), respectively. No significant difference was found between adherence to a Mediterranean-type diet and COVID-19 severity and symptoms ($p>0.05$). In conclusion, no significant relationship was found between adherence to the MD and the severity of the COVID-19 infection. However, considering the effects of the Mediterranean-type diet, which is an anti-inflammatory diet, on obesity, it is thought that adherence to this diet will have a positive effect on decreasing the severity of COVID-19 transmission indirectly, if not directly.

Keywords: COVID-19, Mediterranean diet, Nutrition, Anti-inflammatory.

Özet

Bu çalışmanın temel amacı anti-inflamatuar bir beslenme şekli olan Akdeniz tipi beslenme alışkanlığının COVID-19 enfeksiyonu geçiren hastalarda hastalık şiddeti ve semptomları ile ilişkisini araştırmaktır. Çalışmada, daha önce COVID-19 enfeksiyonu geçirmiş olan bireylere demografik bilgiler, hastalık şiddeti ve hangi

semptomları yaşadıkları ile ilgili sorular içeren kısa bir anket formu uygulanmıştır. Bireylerin Akdeniz diyetine uyumu ise Akdeniz Diyetine Bağlılık Ölçeği (*Mediterranean Diet Adherence Screener*, MEDAS) ile değerlendirilmiştir. Akdeniz tipi beslenmenin COVID-19 şiddeti ve semptomlarına etkisini analiz etmek için SPSS yazılım programı kullanılmıştır. Çalışmaya 283 erkek (%39.6) ve 432 (%60.4) kadın olmak üzere toplam 715 kişi dahil edildi. Bireylerin %33.7'sinin (241/715) MD uyumunun olduğu, %66.3'ünün (474/715) ise MD uyumunun olmadığı belirlendi. Çalışmaya katılan bireylerin %77.8'inin (556/715) COVID-19 enfeksiyon sürecini hafif atlattığı belirlendi. Zayıf ve obez olan bireylerin hastalığı daha ağır geçirdiği saptandı ($p<0.05$). COVID-19 hastalarında en fazla görülen ilk 5 semptomun sırasıyla; yorgunluk-halsizlik (%87), bel-eklem ağrısı (%76.4), baş ağrısı (%70.5), koku alma bozukluğu (%66) ve tat alma bozukluğu (%61) olduğu görüldü. Akdeniz tipi beslenme ile COVID-19 şiddeti ve semptomları arasında anlamlı bir sonuç bulunamadı ($p>0.05$). Sonuç olarak çalışmamızda, Akdeniz diyetine uyum ile COVID-19 enfeksiyonu hastalık şiddeti arasında anlamlı bir ilişki saptanmamıştır. Ancak, anti-inflamatuar bir beslenme şekli olan Akdeniz tipi beslenme alışkanlığının obezite üzerindeki etkileri de düşünüldüğünde, doğrudan olmasa bile dolaylı olarak COVID-19 geçirme şiddetine olumlu bir etkisi olacağı düşünülmektedir.

Anahtar Kelimeler: COVID-19, Akdeniz diyeti, Beslenme, Anti-inflamatuar.

Introduction

Coronavirus disease (COVID-19), which affected the whole world and caused severe acute respiratory syndrome, spread rapidly all over the world in a short time and was finally declared as a pandemic in March, 2020 [1,2]. This disease, which mainly affects the respiratory system, is seen as a serious cause of morbidity and mortality [3–6]. COVID-19 infection may occurs as an asymptomatic infection, while it can seen that upper respiratory tract symptoms such as cough, chills, fever, fatigue and shortness of breath in the majority of patients [7,8]. It is happening that the most common complications in severe cases are sepsis, acute respiratory distress syndrome (ARDS), heart failure, and septic shock [4,9]. Severe viral pneumonia causes respiratory failure and this can potentially lead to fatality [6].

Nutrition has a significant impact on the general health of individuals, reducing the risk of noncommunicable diseases and susceptibility to the development of infections. The World Health Organization (WHO) [10]. Has stated that there is no proven diet to prevent COVID-19 infections, however, it assumes from research on viral infections that nutritional status will play an important role in patient outcomes [11]. In addition, it is thought that a diet model characterized by anti-inflammatory properties may provide benefits against infections in patients with COVID-19.

The MD, which is at the forefront of anti-inflammatory nutrition models, is considered as a characteristically traditional eating habit maintained by people living in different countries in the Mediterranean region rather than a specific diet [12,13]. It is known as a nutrition model in which fruits, vegetables, legumes, whole grains, oilseeds, and seafood are consumed frequently, poultry is consumed a few times a week, red meat is consumed less frequently, and the main fat component is olive oil [12–14] The protective effects of this diet, which is associated with low mortality, protects against diseases and has positive effects on health; this is thought to be caused by the presence of antioxidants, dietary fiber, unsaturated fatty acids, bioactive components, and anti-aging secondary plant metabolites taken into the body through this diet [13,15–17]. Although polyphenols in the MD are among the leading bioactive compounds that positively affect health, phytochemicals such as carotenoids, phytosterols, glucosinolates, and melatonin are other important compounds provided by the MD [18]. Adherence to the MD has been shown to have a positive effect on outcomes related to cardiovascular diseases, diabetes, and other cardiometabolic disorders that predispose one to COVID-19 infection [19–21]. In the light of this information, the high antioxidant, anti-inflammatory, anti-microbial, and immunomodulatory properties of the MD attract attention as a promising nutritional type to alleviate the severity of COVID-19 infection.

This study was planned to determine the effect of Mediterranean-type nutrition on Covid-

19 symptoms in individuals who have had COVID-19 and to contribute to the existing relevant literature.

Material and Method

This study is a retrospective study carried out with the voluntary participation of adult individuals over the age of 18 who had previously confirmed COVID-19 infection within the borders of Malatya province, Republic of Turkey. Ethics committee approval was obtained from Malatya Turgut Özal University Clinical Research Ethics Committee on 09.04.2021 with the decision number finalized in 2021/06 The data of the study were collected by face-to-face interview methods and an online survey system between April and May 2021.

Inconsistent and unreliable data were not included in the data set. A short questionnaire form was given to the individuals, including questions about their demographic characteristics, the severity of the disease, the symptoms experienced during the disease, their diet, and physical activity.

The adaptation of individuals to the MD was evaluated with the Mediterranean Diet Adherence Screener (MEDAS), which was developed by Martinez-Gonzalez et al. [21] and validated by Schröder et al. with a scoring range of 0-14 points [22]. The Turkish Validity and Reliability Study Pehlivanoğlu et al. [23] includes a total of 14 questions, 2 of which are related to food consumption habits, and 12 of which are related to food consumption frequency. Each question is worth 0 or 1 point. According to MEDAS; A total score of 7 and above indicates that the individual has an acceptable degree of adherence to the MD, and a score of 9 and above indicates that the individual has a strict adherence to the MD. In this study, those with a MEDAS score of 0-6 were considered as not adhering to the MD, and those with a score of 7-14 were considered in adherence to the MD.

The SPSS Statistics 25 Package Program (IBM, Inc, Chicago, Illinois, USA) was used for the analysis of the data obtained from the study. While evaluating the data, descriptive statistical methods (number, percentage, mean, standard deviation) were used. Student t-test, chi square, and one way ANOVA tests were used for the analysis of the data. The findings obtained from the research were evaluated at the 95% confidence interval and at the 5% significance level.

Results

The participants included in the research consist of individuals who have previously experienced and survived COVID-19 infection. A total of 854 individuals participated in the study, and the data of 139 individuals whose data were unreliable and inconsistent were excluded from the data set. A total of 715 people, including 283 men and 432 women, were included in the study.

A total of 601 (84.1%) of the participants had a university or higher education level. While the mean age of the male participants was 35.83±9.78, the mean age of the female participants was found to be 32.58±9.02. The mean Body Mass Index (BMI) for men was 27.61±4.57 kg/m^2, and the mean BMI for women was 24.48±4.30 kg/m^2. It was observed that the majority (556/715, 77.8%) of the individuals participating in the study had a mild COVID-19 infection. The mean age and BMI of individuals with severe COVID-19 infection were higher, but the result was not statistically significant ($p>0.05$). It was determined that 33.7% (n=241) of the individuals had MD compliance, while 66.3% (n=474) did not have MD compliance. Individuals who were compatible with the MD had lower BMIs. In Table 1, the participants' age, gender, COVID-19 status, and MD adherence scale (MEDAS) compliance status are given.

There was no significant difference between the genders of the individuals, skipping meals, daily water consumption, physical activity, or Mediterranean-type nutritional status and COVID-19 status ($p>0.05$). Considering the patient's progression of COVID-19 alongside the BMI values of the individuals; it was observed that the thin individuals with a BMI value below 18.5 kg/m^2 and the obese individuals with a BMI value above 30 kg/m^2 had a harder time recovering from the disease ($p<0.05$). The relationship between the COVID-19 disease severity of the participants and their gender, BMI, skipping meals, water consumption, physical activity, and MEDAS compliance is shown in Table 2.

Table 1. Average age and BMI* of the participants according to gender, COVID-19 transmission status, and MEDAS** compliance status.

	n	%	Age	BMI
Gender				
Male	283	39.6	35.83±9.78	27.61±4.57
Female	432	60.4	32.58±9.02	24.48±4.30
p			<0.001*	<0.001*
COVID-19 disease severity				
Mild	556	77.8	33.60±9.36	25.62±4.62
Severe	159	22.2	34.81±9.78	26.05±4.82
p			0.153	0.306
MEDAS Compliance				
Incompliant (0-6 points)	474	66.3	33.65±9.01	25.93±4.84
Compliant (7-14 points)	241	33.7	34.29±10.3	25.30±4.27
p			0.394	0.088

*BMI: Body Mass Index. **MEDAS: Mediterranean Diet Adherence Screener.

Table 2. The relationship between COVID-19 disease severity of the participants and gender, BMI*, skipping meals, water consumption, physical activity, and MEDAS** compliance

COVID-19 Disease Progression	Mild (n=556)		Severe (n=159)		Total (n=715)		p
	n	%	n	%	n	%	
Gender							
Male	219	77.4	64	22.6	283	100	0.844
Female	337	78	95	22	432	100	
BMI (kg/m^2)							
Underweight (<18.5	12	54.5	10	45.5	22	100	0.017*
Normal (18.5-24.9)	261	81.3	60	18.7	321	100	
Overweight (25-29.9)	191	77	57	23	248	100	
Obese (>30)	92	74.2	32	25.8	124	100	
Skipping of meals							
Yes	178	81.7	40	18.3	218	100	0.253
No	138	75.8	44	24.2	182	100	
Sometimes	240	76.2	75	23.8	315	100	
Daily water intake							
1-2 glasses	59	72	23	28	82	100	0.572
3-5 glasses	179	78.9	48	21.1	227	100	
6-8 glasses	180	77.6	52	22.4	232	100	
9+ glasses	138	79.3	36	20.7	174	100	
Physical activity							
Yes	121	79.6	31	20.4	152	100	0.538
No	435	77.3	128	22.7	563	100	
MEDAS Compliance							
Incompatible (0-6 points)	371	78.3	103	21.7	474	100	0.647
Compatible (7-14 points)	185	76.8	56	23.2	241	100	
Total	556	77.8	159	22.2	715	100	

*BMI: Body Mass Index. **MEDAS: Mediterranean Diet Adherence Screener.

Table 3. The relationship between individuals' COVID-19 symptoms and Mediterranean diet compliance.

	MEDAS* incompatible (0-6 points) (n=474)		MEDAS* compatible (7-14 points) (n=241)		Total		p
Symptoms	n	%	n	%	n	%	
Fever	239	50.4	104	43.2	343	48	0.066
Cough	258	54.4	139	57.7	397	55.5	0.409
Sneezing	146	30.8	87	36.1	233	32.6	0.153
Sputum	150	31.6	76	31.5	226	31.6	0.976
Sore throat	262	55.3	132	54.8	394	55.1	0.898
Fatigue-weakness	410	86.5	212	88	622	87	0.581
Lumbar-joint pain	355	74.9	191	79.3	546	76.4	0.195
Headache	326	68.8	178	73.9	504	70.5	0.159
Diarrhea	114	24.1	56	23.2	170	23.8	0.809
Abdominal pain	86	18.1	42	17.4	128	17.9	0.813
Nausea	136	28.7	60	24.9	196	27.4	0.282
Constipation	47	9.9	25	10.4	72	10.1	0.848
Indigestion	72	15.2	42	17.4	114	15.9	0.440
Gas	94	19.8	41	17	135	18.9	0.363
Difficulty breathing	151	31.9	69	28.6	220	30.8	0.377
Loss of appetite	232	48.9	124	51.5	356	49.8	0.526
Loss of taste	283	59.7	153	63.5	436	61	0.327
Loss of smell	303	63.9	169	70.1	472	66	0.098

*MEDAS: Mediterranean Diet Adherence Screener

According to the results of our study, the most common symptoms in COVID-19 infection are; respectively, fatigue-weakness (87%), low back-joint pain (76.4%), headache (70.5%), smell disorder (66%), taste disorder (61%), cough (55.5%), and sore throat (55.1%). These symptoms were observed in more than half of the patients. It was observed that the symptoms of fever, sputum, sore throat, diarrhea, abdominal pain, nausea, gas, and respiratory distress were seen less in individuals with Mediterranean-type diet adherence, but there was no statistically significant result ($p>0.05$). The relationship between COVID-19 symptoms observed in individuals and MD compliance is shown in Table 3.

Discussion

In this study, it was investigated how the Mediterranean type of diet affects the severity and symptoms of the disease in patients with COVID-19 infection. According to the results of our study, it was observed that the mean age of patients with a severe form of the disease was higher ($p>0.05$). When the literature was examined, it was seen that the average age of those who had severe Covid 19 disease was higher than those who had mild form of the disease, similar to what was seen in our study [24–26].

When examined according to BMI groups, it was determined that thin and obese individuals had a significantly more severe COVID-19 infection than normal and slightly obese individuals ($p<0.05$). In the study of Wu et al. [27], it was reported that obese or low-weight patients are at higher risk for COVID-19- related pneumonia, similar as what has been suggested in our study, and therefore extra care should be taken when treating low-weight and obese COVID-19 patients. In a study conducted by Kim et al. [28] on 10,861 people, it was shown that weakness and obesity were statistically associated with poor outcomes such as increased mechanical ventilation time, increased risk of pulmonary complications, and high mortality in patients hospitalized for COVID-19 infection.

In our study, it was observed that the mean BMI of those with severe disease and those with low adherence to the MD were higher ($p>0.05$).

According to the results of studies conducted to determine the relationship between obesity and COVID-19, it has been reported that as BMI increases in COVID-19 cases, the rate of catching the disease and the severity of the disease increases [26–28]. The protective effects of the Mediterranean type of diet against obesity are well known. In a study conducted with 10,000 people lasting approximately 5 years, it was determined that adherence to a Mediterranean-type diet was associated with a reduced risk of weight gain [29]. For this reason, although a statistically significant relationship was not found according to the results of our study, it was thought that the Mediterranean-type diet would be associated with low BMI and indirectly help individuals to overcome the disease more easily.

When the literature is examined, it has been reported that men generally have more severe and symptomatic COVID-19 infections than women, more complications that accompany the disease, and ultimately a higher mortality rate [30–34]. In our study, no significant relationship was found between COVID-19 disease severity and symptoms and gender ($p>0.05$).

According to the results of this study, the most common symptoms in people who have had COVID-19 are; fatigue-weakness, low back-joint pain, headache, olfactory disorder, taste perversion, cough, and sore throat (Table 3). In a study, it was reported that the most common symptoms were fever (73.15%), cough (35.23%), and fatigue (4.36%) [24]. In another study, it was reported that the most common symptoms during the disease process were cough (67.8%), fever (43.8%), and headache (13.6%) [25]. Fever has always been shown as the first clinical symptom for COVID-19 patients. However, studies confirm that COVID-19 symptoms are very variable, fever alone is insufficient in public screenings, and that additional indications must be included in screenings for COVID-19.

In our study, individuals with high MD compliance constituted 33% of the participants. In a study conducted by Ponzo et al. on 900 healthcare workers, it was shown that individuals reporting SARS-COV-2 infection had a significantly lower MD score [35]. In the study of Perez-Araluce et al., better adherence to the MD was associated with a lower risk of COVID-19 [36]. In the results of our study, no significant difference was found between Mediterranean-type diet compliance and disease severity. However, it was found that symptoms such as fever, sputum, headache, diarrhea, abdominal pain, nausea, and respiratory distress were less common in individuals on a MD. The MD is a diet model that includes foods rich in bioactive components, antioxidants, and anti-inflammatory agents. In addition to preventing obesity, it has been reported that the MD may have a protective effect against the COVID-19 epidemic by reducing oxidative stress and metabolic inflammation mediated by nicotinamide adenine dinucleotide phosphate (NADPH) oxidase (NOX) and NF-κB, thanks to the polyphenols it contains [37,38]. It is thought that for this reason, symptoms related to inflammation may be seen less frequently in people with high MD adherence.

There are some limitations of our study. The participants' subjective evaluation of the online questionnaire, the fact that the participants were not questioned whether they took pharmacological treatment or immune system supportive food supplements, the fact that there were more female participants than males in the study, the fact that the overall number of individuals adhering to a MD was low, the average age of participants being within a narrow range, and the number of elderly participants being low are the limitations of our study.

Conclusion

The MD is a diet model that contains foods rich in bioactive components, antioxidants, and anti-inflammatory agents which provides an individual with much nutritional diversity. It is known that the MD has positive effects on the prevention of obesity and is an anti-inflammatory diet model. Although, in the results of our study no significant relationship was found between adherence to the MD and the severity of COVID-19 infection, considering the effects of the MD on obesity it is thought that adherence to the diet would have a positive effect on decreasing the severity of COVID-19, even if not directly.

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