RESEARCH

THE EFFECT OF THE ADHERENCE TO THE MEDITERRANEAN DIET ON FRAILTY IN OLDER PEOPLE WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

Turkish Journal of Geriatrics
DOI: 10.31086/tjgeri.2022.319
2022; 25(4): 600-610

■ Sedat ARSLAN[1]
■ Canan BOZKURT[2]
■ Hülya BULUT[3]

Abstract

Objective: To examine the adherence of older people diagnosed with chronic obstructive pulmonary disease to the Mediterranean diet and its relationship with frailty.

Methods: This descriptive and cross-sectional study included 446 people aged 65 and over who were hospitalized for chronic obstructive pulmonary disease exacerbations. Disease staging with the Global Initiative for Chronic Obstructive Lung Disease system, Modified Medical Research Council dyspnea intensities, Mediterranean Diet Adherence Screener, and Tilburg Frailty Index.

Results: All older people in the chronic obstructive pulmonary disease exacerbation period were frail. A mild, negative relationship was found between adherence to the Mediterranean diet and frailty levels (r= -0.267; p<0.001). Mediterranean Diet Adherence Screener explained 6.9% of frailty alone (adjusted R^2 = 0.069, p<0.001) and 11.9% of frailty together with disease stage (adjusted R^2 = 0.119, p<0.001).

Conclusions: These findings support the suggestion that a nutrition model based on the Mediterranean diet plays an important role in the management of frailty in older people with chronic obstructive pulmonary disease. High adherence to the Mediterranean diet is associated with lower dyspnea and disease severity in older people with chronic obstructive pulmonary disease and may help reduce frailty.

Keywords: Diet, Mediterranean; Frailty; Geriatrics; Pulmonary Disease, Chronic Obstructive.

CORRESPONDANCE

[1] Sedat ARSLAN

Phone : +905557354114
e-mail : sarslan@bandirma.edu.tr

Received : Jun 13, 2022
Accepted : Nov 05, 2022

[1] Bandirma Onyedi Eylul University, Faculty of Health Science, Department of Nutrition and Dietetics, Balikesir, Turkey

[2] Bandirma Onyedi Eylul University, Faculty of Health Science, Department of Nursing, Balikesir, Turkey

[3] S.B.Ü. Dr. Suat Seren Chest Diseases and Thoracic Surgery Training and Research Hospital, Nursing, İzmir, Turkey

INTRODUCTION

Frailty Syndrome (FS) is generally defined as a decrease in reserves in multiple organ systems and includes physiological, cognitive, and sociocultural aspects. Although several functional definitions exist, FS was defined as "a health syndrome with multiple causes and contributions, characterized by a decrease in physiological function that increases the individual's vulnerability to decreased strength and endurance, increased dependence, and/or death" by a consensus group in 2013 (1). In this context, FS represents a comprehensive syndrome that leads to increased patient disability, healthcare costs, hospitalization rates, morbidity, and mortality, and is associated with chronic disease (2).

Studies have reported evidence that frailty might play an important role in the development of some chronic diseases and vice versa (i.e., chronic diseases may also cause frailty) (3). It is well known that seven of the first ten most common diseases that cause the highest mortality in the world are non-communicable chronic diseases, such as heart disease, stroke, cancer, diabetes, and chronic lung disease, and are responsible for 71% of all deaths (4). Chronic obstructive pulmonary disease (COPD), like other chronic diseases, is a serious public health problem, and its morbidity and mortality rates are increasing globally. COPD is a major global problem, considering the increased prevalence and incidence of COPD and its individual, social, and economic burdens (5).

Although the relationship between frailty and COPD has not been fully elucidated, they share common risk factors (e.g., age, smoking) and physiopathological processes, including systemic inflammation and endocrine dysfunction. Considering the common physiopathological outcomes of frailty and COPD, such as sarcopenia, neuroendocrinal disorders, and chronic malnutrition, diet, and nutrition have become more critical in the management of frailty and COPD. This is because diet and nutrition are modifiable risk factors for the development and progression of chronic diseases, such as COPD, and frailty (6,7).

Excessive consumption of red and processed meat is associated with poorer lung function and an increased risk of COPD (8). It has also been suggested that the current loss of adherence to healthy diets, such as the Mediterranean diet, leads to reduced consumption of fruits, vegetables, whole grains, and fish and increased consumption of processed and refined foods, which contribute to the high prevalence of chronic diseases (9,10). In this context, the Mediterranean diet, an accepted healthy nutrition model, provides effective amounts of fiber, antioxidants, phytosterols, polyphenols, and unsaturated fatty acids. The main foods that provide these nutrients are olive oil, wine, fish, and vegetables, especially tomatoes, onions, garlic, thyme, mint, rosemary, parsley, and dill, which contain significant amounts of omega-3 and vitamins C, E, and A (11,12). The possible beneficial effects of the Mediterranean diet on lung function have been demonstrated in a cross-sectional study with smokers and patients with associated diseases, such as asthma and COPD (13).

In light of previous studies, the hypothesis of our study was that there is a negative association between adherence to a Mediterranean diet and frailty in elderly patients with COPD. This study was conducted in Izmir, the third-most populous city in the Aegean Region in Turkey, a prominent region for agriculture and olive production and thus considered to be the most adaptable to the Mediterranean diet.

MATERIALS AND METHODS

Study Design

This is a descriptive, cross-sectional, and correlational study.

Study Population and Sample

The research population included patients 65 years old and over who were treated for COPD at

the Pulmonary Inpatient Clinic of Dr. Suat Seren Chest Diseases and Thoracic Surgery Training and Research Hospital for Pulmonary Diseases and Surgery. The G*Power 3.1.9.2 program was used to calculate the required sample size, which was found to be 319 given the effect size $\rho = 0.20$, $\alpha = 0.05$, and power (1-β) of 95%. However, to increase the generalizability of the study sample and reduce the margin of error, 446 older people were included in the study.

The inclusion criteria for this study were individuals who were literate, able to speak and understand Turkish, diagnosed with COPD, and hospitalized due to COPD exacerbation, aged 65 and over, agreed to participate in the study, and were not diagnosed with Alzheimer's, dementia, delirium, or any psychiatric disease by a physician. Individuals who did not meet the inclusion criteria and did not agree to participate in the study were excluded.

Data Collection Tools

The data collection tools used in this study were the participant identification form (PIF), Mediterranean Diet Adherence Screener (MEDAS), and Tilburg Frailty Index (TFI).

The PIF was created by the researchers in line with the literature and included a total of 16 questions, seven questions for sociodemographic features (age, gender, educational status, etc.), nine questions for health and disease status (height, weight, smoking and alcohol habits, number of years with COPD, GOLD stage, mMRC dyspnea score, presence of comorbidity, lifestyle health perception). The income levels of the participants were questioned based on the statement. Income levels were evaluated in 3 categories as low, medium and high, and people were asked to choose their perceived income levels. BMI was calculated using the formula body weight (kg)/ body length (2) (m2) and categorized based on the WHO classification. According to this classification, a BMI of 18.5–24.9 kg/m^2 is normal, 25.0–29.9 kg/m^2 is overweight, and ≥30 kg/m^2 is obese (14).

MEDAS, which consisted of 14 questions and had been used in 32 studies (PREDIMED) investigating Mediterranean diet habits, was demonstrated by Schröder et al. to be a valid and reliable tool (15). Two of the items of the scale are related to food consumption habits, and the remaining twelve items are related to food consumption frequency. Scored as 1 or 0 points based on the amount of consumption, the maximum score is 14 total points. A score of seven or above indicates that the individual can be considered adhering to the Mediterranean diet, while a score of nine or above indicates that the individual has a strict adherence to the Mediterranean diet. The validity and reliability study for the Turkish version of MEDAS was performed by Özkan Pehlivanoğlu et al. in 2019 (16).

The TFI was developed by Gobbens et al. (17) in 2010; the validity and reliability study of the Turkish version was performed by Arslan et al. (18) in 2018. The TFI includes a total of 15 questions in three dimensions that constitute frailty (eight items in the physical component, four items in the psychological component, and three items in the social component). Eleven items were answered as "yes" and "no"; four items were answered as "yes", "sometimes", and "no". In items 1, 12, and 15, "no" is coded as "1" and "yes" is coded as "0"; all other items are coded in reverse (yes=1 and no=0). For items with three choices; the "sometimes" option is coded as "0" in item 9 and "1" in items 10, 11, and 14. The score range is 0-15; a score of five or higher is considered as having frailty (17,18).

Data Collection Method

After the approval of the ethics committee and the institution, the data were collected by the researchers through the face-to-face interview technique, which lasted 10-15 minutes, after obtaining verbal consent from the individuals who met the inclusion criteria and made the necessary explanations.

Ethical Aspect of Research

Permission to use the scales was obtained via e-mail from the responsible authors who performed the validity and reliability studies of the Turkish versions of MEDAS and TFI. The ethics committee approval was obtained from the institution (approval number 2021/70); permission was also obtained from the Izmir Provincial Health Directorate to which the hospital is affiliated.

Evaluation of Data

Data analysis was performed with IBM SPSS 23.0 statistical package program. Skewness and kurtosis coefficients were used to evaluate the normal distribution of continuous variables; values between (-1.5) and (+1.5) were considered to indicate normal distribution. The descriptive statistics were presented as number, percentage, mean, and standard deviation. Independent-Samples *t*-test, Kruskal-Wallis *H*-test, Mann-Whitney *U*-test, and one-way analysis of variance (ANOVA) were used for comparisons of descriptive features and scale scores. Pearson analysis was used to evaluate the relationship between continuous data and scale scores; linear logistic regression was performed to determine the effect of independent variables on the dependent variables. The results were evaluated at the 95% confidence interval and the $p<0.05$ significance level.

RESULTS

The mean age of the individuals included in the study was 73.56±4.62 years; 51.8% of them were 75 years or older. Of the participants, 59.4% were male, 87.2% were married, 78.7% had eight years of education or less, 67.5% were retired, 55.2% had low income, and 52% lived in rural areas (Table 1).

Of the participants, 57.2% were overweight, 53.2% had quit smoking, and 65.4% never consumed alcohol. The average years of having COPD was 17.29±4.86; 41.5% of the participants had COPD for more than 20 years; 59% had GOLD stage III; 55.8% had an mMRC dyspnea severity of 3. At least one additional disease other than COPD was present in 98% of the participants. The mean MEDAS score, which shows the level of adherence to the Mediterranean diet, was 8.45±2.28; 49.4% of them adhered to the Mediterranean diet closely. The mean TFI score, which indicates the frailty level, was 10.13±2.17, and all patients (100%) were frail based on the cutoff score of 5 (Table 2).

Table 1. Sociodemographic characteristics of older COPD patients

Variables	n	%
Age (years) (Mean±SD) (Min-Max)	73.56±4.62 (65-88)	
65-74	215	48.2
75 ≤	231	51.8
Gender		
Male	265	59.4
Female	181	40.6
Marital status		
Single	57	12.8
Married	389	87.2
Education status		
≤ 8 years	351	78.7
≥ 9 years	95	21.3
Labor status		
Unemployed	124	27.8
Worker	21	4.7
Retired	301	67.5
Income status		
Low	246	55.2
Medium	191	42.8
High	9	2.0
Residential area		
City	214	48.0
Rural	232	52.0
TOTAL	**446**	**100.0**

The comparison of the participants' adherence to the Mediterranean diet and frailty when they are grouped according to their sociodemographic characteristics is shown in Table 3. Significant differences were found between the groups based on gender and occupational status ($p<0.001$). Men had lower MEDAS scores and higher TFI scores than women. The difference in the occupational groups originated from retirees, who had lower MEDAS

Table 2. Health and disease characteristics and scale scores of the participants

Variables	n	%
	Mean±SD (Min-Max)	
BMI	29.71±2.37 (20.96-35.16)	
BMI Classifications		
Normal (18.50-24.99 kg/m^2)	12	2.7
Over weight (25-29.99 kg/m^2)	255	57.2
Obese (≥30 kg/m^2)	179	40.1
Smoking status		
Smoker	142	31.8
Ex-smoker	237	53.2
Non-smoker	67	15.0
Alcohol Consumption		
Drinking	19	4.3
Withdrawal	135	30.3
Non-drinking	297	65.4
COPD years Mean±SD (Min-Max)	17.29±4.86 (5-30)	
COPD years		
< 11	56	12.5
11-19	205	46.0
19 <	185	41.5
GOLD Stage		
Stage II	73	16.4
Stage III	263	59.0
Stage IV	110	24.6
mMRC Dyspnea Scale		
≤2	73	16.4
3	249	55.8
4	124	27.8
Comorbidity		
Yes	437	98.0
No	9	2.0
MEDAS Mean±SD (Min-Max)	8.45±2.28 (2-13)	
MEDAS		
Low adherence (<7p)	92	20.6
Medium adherence (7p-8p)	134	30.0
High adherence (9p≤)	220	49.4
TFI	10.13±2.17 (5-15)	
TFI Classification		
Frail (≥5p)	446	100.0
TOTAL	**446**	**100.0**

scores and higher TFI scores than the other groups. There was a significant difference between the MEDAS scores of groups based on their area of residence ($p<0.05$, those living in rural areas had higher MEDAS scores); however, there was no significant difference between their TFI scores ($p>0.05$) (Table 3).

The comparison of the participants' adherence to the Mediterranean diet and frailty when they are grouped according to the variables related to health and disease status is shown in Table 4. Significant differences were found between the MEDAS scores of the participants grouped based on their BMI category, smoking status, and alcohol consumption ($p<0.05$); however, no significant difference was found between their TFI scores ($p>0.05$). In the posthoc analyses, the difference between the MEDAS scores was found to be due to the normal BMI group, non-smokers, and alcohol users.

Significant differences were found between the groups when the participants were grouped based on disease-specific variables such as the number of years with COPD, GOLD staging, and mMRC dyspnea severity, and their MEDAS and TFI scores were compared ($p<0.001$). According to the posthoc analyses, the mean MEDAS score was lower and the mean TFI score was higher for those who had COPD for 20 years or more and whose disease severity was GOLD stage IV and dyspnea severity was 4 (Table 4).

The explanatory power of the models developed by multivariate linear regression analysis (Adjust R^2) according to the data obtained from the participants was given in Table 5. Accordingly, the explanatory power of the relationship between adherence to the Mediterranean diet and frailty level was 6.9% (Model 1; $\beta = -0.267$, Adjust $R^2 = 0.069$, $p<0.001$). The explanatory power of the adherence to the Mediterranean diet and GOLD staging together for the frailty level was 11.9% (Model 2; Adjust $R^2 = 0.119$, $p<0.001$) (Table 5).

DISCUSSION

Considering that Fried et al. (19) (2001) established a frailty phenotype that includes weight loss, fatigue, weakness, slowness, and low physical func-

Table 3. Comparison of MEDAS and TFI scores of the participants grouped based on sociodemographic variables

Variables	MEDAS 8.46±2.27		TFI 10.00±2.89	
Age				
65-74 (n=215)	8.49±2.26	t= 0.317	10.26±2.21	t= 1.141
75 ≤ (n=231)	8.42±2.30	p>0.05	10.02±2.11	p>0.05
Gender				
Male (n=265)	7.97±2.34	t= -5.633	10.46±2.22	t= 5.079
Female (n=181)	9.16±1.97	**p<0.001**	9.33±2.46	**p<0.001**
Marital Status				
Single (n=57)	8.24±2.12	t= -0.778	10.26±2.94	t= 0.742
Married (n=389)	8.49±2.29	p>0.05	9.96±2.29	p>0.05
Education status				
≤ 8 years (n=351)	8.38±2.36	t= 4.078	10.04±2.32	t= 0.164
≥ 9 years (n=95)	8.54±1.97	p>0.05	9.82±2.73	p>0.05
Labor status				
Unemployed (n=124)	9.11±2.05	X^2= 18.556	9.49±2.29	X^2= 10.312
Worker (n=21)	9.13±2.28	**p<0.001**	9.39±3.46	**p<0.001**
Retired (n=301) [a]	8.14±2.30		10.25±2.29	
Income status				
Low (n=246)	8.42±2.34	X^2= 0.802	10.15±2.22	X^2= 3.294
Medium (n=191)	8.47±2.21	p>0.05	9.86±2.60	p>0.05
High (n=9)	9.11±1.76		8.89±1.27	
Residential area				
City (n=214)	8.22±2.07	t= 2.216	10.19±2.16	t= 0.490
Rural (n=232)	8.70±2.47	**p<0.05**	10.09±2.18	p>0.05

t: Independent Sample t test; X^2: Kruskal Wallis H; [a] The group causing intergroup significance

tion components, individuals with COPD constitute a vulnerable group of older people who may also exhibit frailty. Based on this information, all older people with COPD participating in our study were frail according to the assessment tool we used (≥5 points), and their frailty levels were quite high based on the mean score (10.13±2.17). Also in Turkey reported that the prevalence of frailty in older people with COPD ranged from 50.2% to 84.7% (20). The difference in this study is thought to be due to the fact that the study sample consisted of individuals who were treated in the hospital due to COPD exacerbation. In our study, advanced age was not a predictor of frailty because frailty levels were quite high in the 65-74 age group as well as in those 75 and over. However, contrary to the common view, there are opinions arguing that chronological age is not the only factor to be taken into account and that some individuals may remain strong and active even at advanced ages (21).

Despite high levels of frailty in both genders, the main finding that caught our attention was that the frailty level of males was significantly higher than that of females in our study. Although it was claimed that women were frailer than men and some studies supported this view (19,20). However, this is the first time a higher level of frailty was reported for men. Such a higher level of frailty can be attributed to the man with COPD exacerbation being more affected by the disease burden or the difference in the assessment tools used in the study. A similar study reported that the unemployed were frailer (20); similarly, our study concluded that the retired had a higher level of frailty. Indeed, it is assumed that this is related to the fact that the male gender in our study had higher frailty. It is thought that the dif-

Table 4. Comparison of MEDAS and TFI scores of the participants grouped based on variables related to health and disease status.

Variables	MEDAS 8.46±2.27		TFI 10.00±2.89	
BMI Classifications				
Normal (n=12) [a]	9.17±1.94	X^2= 7.422 **p<0.05**	8.92±1.78	X^2= 5.468 p>0.05
Over weight (n=255)	8.78±2.12		10.12±2.18	
Obese (n=179)	8.39±2.37		10.24±2.15	
Smoking status				
Smoker (n=142)	8.23±2.20	F= 4.427 **p<0.05**	9.89±2.50	F= 0.746 p>0.05
Ex-smoker (n=237)	8.39±2.28		9.98±2.37	
Non-smoker (n=67) [a]	9.19±2.67		9.81±2.21	
Alcohol Consumption				
Drinking (n=19)	9.05±2.42	X^2= 13.475 **p<0.05**	10.25±2.43	X^2= 4.526 p>0.05
Withdrawal (n=135)	8.99±2.02		9.70±2.37	
Non-drinking (n=297) [a]	8.18±2.33		10.12±2.39	
COPD years				
<11 (n=56)	9.84±1.72	F=17.333 **p<0.001**	9.50±2.06	F=11.411 **p<0.001**
11-19 (n=205)	8.58±2.24		9.80±2.11	
19< (n=185) [a]	7.90±2.27		10.69±2.13	
GOLD Stage				
Stage II (n=73)	9.12±2.00	F=11.534 **p<0.001**	9.40±2.12	F=20.875 **p<0.001**
Stage III (n=263)	8.61±2.19		9.89±2.13	
Stage IV (n=110) [a]	7.63±2.43		11.20±1.92	
mMRC Dyspnea Scale				
≤2 (n=73)	9.12±2.00	F=12.361 **p<0.001**	9.45±2.16	F=27.243 ***p<0.001***
3 (n=249)	8.65±2.17		9.77±2.10	
4 (n=124) [a]	7.65±2.44		11.27±1.87	

X^2: Kruskal Wallis H; F: One Way ANOVA; [a] The group causing intergroup significance

ference may be due to the fact that the retirees are predominantly men since the unemployed group is mostly composed of women and the labor force is generally composed of men in the Turkish population.

Similar to our study, Bozkurt et al. (20) (2021) reported no relationship between smoking and frailty levels; however, in the same study, those who consume alcohol were found to have lower frailty, unlike our study. It is assumed that the difference may be due to the differences in the patient groups involved.

A significant relationship was found between the level of frailty and the number of years with COPD and GOLD disease stage, which indicate the disease burden, and the mMRC scale, which indicates the severity of dyspnea. This difference was due to individuals who have lived with COPD for many years and had the end-stage disease and severe dyspnea. In fact, this did not change the result that all older

Table 5. The relationship between the disease stage of the participants and their adherence to the Mediterranean diet or frailty level according to multiple linear regression analysis

Models	B (95.0%CI for B)	ß	t	*p*	Adjust R^2	Model p
Model 1. TFI						
MEDAS	-0.253 (-0.339, -0.169)	-0.267	-5.832	**0.000**	0.069	**0.000**
Model 2. TFI						
MEDAS	-0.206 (-0.291, -0.121)	-0.216	-4.748	**0.000**	0.119	**0.000**
GOLD Stage	0.791 (0.486, 1.096)	0.232	5.092	**0.000**		

TFI: Tilburg Frailty Index; MEDAS: Mediterranean Diet Adherence Screener; GOLD: Global Initiative for Chronic Obstructive Lung Disease; B: unstandardized coefficients; CI: confidence interval; β: standardized regression coefficient; R^2: coefficient of determination.

COPD patients in our study were frail, but the fact that the participants were being treated for COPD exacerbations may also explain the increased frailty levels. Similarly, the positive correlation of these values with frailty as indicators of disease and dyspnea severity was also in line with the findings of a previous study (20).

Nutritional imbalances in older people lead to morbidity and mortality and emerge as protein-calorie malnutrition in advanced ages. A study have also focused on dietary patterns, such as the Mediterranean diet, to understand the relationship between frailty and diet (22). In our study, the mean MEDAS score, which shows the level of adherence to the Mediterranean diet, was 8.45±2.28; approximately half of the participants were found to follow the Mediterranean diet closely. This was expected because İzmir, where the study was conducted, is one of the provinces where the consumption of olives, olive oil, and vegetable-based foods is among the highest in the country. Being on the coast of the Aegean Sea, fish is consumed regularly in İzmir. Cheese and especially yogurt have an indispensable place in Turkish cuisine and are consumed frequently. It was found that women adhered to the Mediterranean diet more closely than men. Similarly, a recent study with older patients hospitalized in the departments of internal medicine in Italy reported that women had higher adherence to the Mediterranean diet than men (23). In line with their frailty, retirees had a significantly lower level of adherence to the Mediterranean diet compared to other groups. This can be attributed to the fact that the retiree group is mostly composed of men. Dinu et al. (24) observed no relationship between adherence to the Mediterranean diet and area of residence (rural vs. city). In our study, on the contrary, individuals living in rural areas had higher MEDAS scores ($p<0.05$). We think that this difference may be due to the fact that individuals living in rural areas consume more natural foodstuffs. It may also be due to the lack of an equal representation of the different areas of residence in our study.

When the adherence of the older people to the Mediterranean diet was compared with their BMIs, we found that the individuals with normal weight adhered to the Mediterranean diet more closely than the overweight and obese individuals. This was expected, but it may be wrong to make a definitive judgment since the number of participants with normal weight was quite low.

We found that the adherence to the Mediterranean diet decreased as the number of years with COPD, disease stage, and severity of dyspnea in-

creased. In fact, the groups that underlie this significant difference were those with COPD for more than 20 years, GOLD stage IV, and mMRC dyspnea severity of "4"; however, even these groups showed "moderate adherence" to the Mediterranean diet. On the other hand, a cross-sectional study with smokers and asthma and COPD patients have reported possible beneficial effects of the Mediterranean diet on lung function (13). Therefore, it can be concluded that high adherence to the Mediterranean diet might have a slowing effect on the progression of the disease, even if their lung function is impaired due to COPD. As we indicated in Table 5, the disease stage had a negative correlation with the MEDAS score, albeit at a very low level. Although the result of this analysis is not sufficient to make a definitive judgment, it is known that vitamin C and omega-3 fatty acids in the Mediterranean diet are associated with high lung function in individuals with COPD as well as in healthy individuals (25). Similarly, a positive correlation has also been shown between vitamin E found in olives, a staple in the Mediterranean diet, and forced vital capacity (FVC) and forced expiratory volume in 1 second (FEV_1), which indicates the disease stage (26).

The aim of our study was to examine the relationship between adherence to the Mediterranean diet and the level of frailty in older people with COPD, and to our knowledge, this was the first study conducted in Turkey. In line with the data we obtained, the effect of adherence to the Mediterranean diet on the frailty level was 6.9%. The combined effect of adherence to the Mediterranean diet and disease stage on the frailty level was 11.9%. We think that our sample group is representative of conditions with a high physio pathological burden such as both COPD and old age. Based on these results, that all older people under treatment for COPD exacerbation were frail, even in a region with high adherence to the Mediterranean diet, may indicate that the burden of disease and the level of frailty might be further increased in societies that do not comply with the Mediterranean diet or have adopted other dietary models. Of course, diet alone is not sufficient, but it is an important modifiable factor that is thought to have substantial benefits for both the disease burden and frailty in older people with COPD.

There were several limitations to our study. First, the study has a descriptive and associated pattern; therefore, the results of the study do not suggest causality. We evaluated only the elderly who received inpatient treatment. Finally, the sample was small and findings were limited to the chest clinics of a single hospital in Turkey. These disadvantages, together with our non-random sampling and single-center data collection, limit the generalizability of the findings to all Turkish older people with COPD.

Despite the limitations noted above, this study demonstrated the importance of adherence to MD in geriatric populations with COPD to reduce frailty level. It was observed that frailty levels were lower in the group with high adherence to MD. In addition, the strength of our study is that it is the first study to examine the relationship between adherence to the Mediterranean diet and frailty in the geriatric COPD population in Turkey.

CONCLUSION

Frailty is a syndrome that increases with advanced age and comorbidity. Although it was first thought to be only a physiological phenomenon, over the years it has been established as a biopsychosocial concept and that there are mental and social dimensions to it as well as physical aspects. However, due to the fact that it has been on the agenda for the last 30 years, the focus has been on the physical dimension to prevent or eliminate the development of frailty. In this context, physical activity and healthy nutrition have been emphasized in the literature. Thus, this study consisted of older hospitalized patients, who were diagnosed with COPD, and hence

have many risk factors for frailty. In this context, we think that the Mediterranean diet, which is accepted as one of the most valid healthy nutrition models in line with the data in the literature and in our study, may be beneficial for COPD and frailty syndrome. Thus, it would be appropriate to recommend the Mediterranean diet by health professionals for the management of these physiopathological conditions. This study provides instructions for future longitudinal or experimental studies.

REFERENCES

1. Morley JE, Vellas B, Abellan van Kan G, et al. Frailty consensus: a call to action. J Am Med Dir Assoc 2013;14(6):392–397. (PMID: 23764209)
2. Kapucu S, Ünver G. Fragile elderly and nursing care. Osmangazi Journal of Medicine. 2017;39(1):122-129. (DOI:10.20515/otd.288967) (in Turkish)
3. Pollack LR, Litwack-Harrison S, Cawthon PM, et al. Patterns and predictors of frailty transitions in older men: the osteoporotic fractures in men study. J Am Geriatr Soc 2017;65(11):2473–2479. (PMID: 28873220)
4. World Health Organization. Noncommunicable Diseases [e-book]. WHO Publication; 2021 [Internet]. Avaliable from: https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases Accessed: 08.03.2022
5. Agustí A, Vogelmeier C, Faner R. COPD 2020: changes and challenges. Am J Physiol Lung 2020;319: L879–83. (PMID: 32964724)
6. Schulze MB, Martínez-González MA, Fung TT, Lichtenstein AH, Forouhi NG. Food based dietary patterns and chronic disease prevention. BMJ 2018;361:k2396. (PMID: 29898951)
7. Berthon BS, Wood LG. Nutrition and Respiratory Health—Feature Review. Nutrients 2015;7:1618–1643. (PMID: 25751820)
8. Kaluza J, Harris H, Linden A, Wolk A. Long-term unprocessed and processed red meat consumption and risk of chronic obstructive pulmonary disease: a prospective cohort study of women. Eur J Nutr 2019;58:665–672. (PMID: 29532164)
9. Schwingshackl L, Schwedhelm C, Hoffmann G, et al. Food groups and risk of all-cause mortality: a systematic review and meta-analysis of prospective studies. Am J Clin Nutr 2017;105:1462–1473. (PMID: 28446499)
10. GBD 2017 Diet Collaborators. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden Of Disease Study 2017. Lancet 2019;393:1958–1972. (PMID: 30954305)
11. Papassotiriou I, Shariful Islam SM. Adherence to Mediterranean diet is associated with lung function in older adults: data from the health and retirement study. J Am Coll Nutr 2021;40(2):119–124. (PMID: 32202968)
12. Mazzocchi A, Leone L, Agostoni C, Pali-Schöll I. The secrets of the Mediterranean diet. Does [only] olive oil matter? Nutrients 2019;11(12):2941. (PMID: 31817038)
13. Singh D, Agusti A, Anzueto A, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive lung disease: The GOLD Science Committee Report 2019. Eur Respir J 2019;53(5):1900164. (PMID: 30846476)
14. World Health Organization. BMI classification; 2004 [Internet]. Available from: http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi. Accessed: 25.10.2022
15. Schröder H, Fitó M, Estruch R, et al. A short screener is valid for assessing Mediterranean diet adherence among older Spanish men and women. J Nutr 2011;141(6):1140–1145. (PMID: 21508208)
16. Özkan Pehlivanoğlu EF, Balcıoğlu H, Ünlüoğlu İ. Turkish validation and reliability of Mediterranean Diet Adherence Screener. OJM 2020;42(2):160-164. (DOI:10.20515/otd.504188) (in Turkish)
17. Gobbens RJJ, van Assen MALM, Luijkx KG, Wijnen-Sponselee MT, Schols JM. The Tilburg Frailty Indicator: psychometric properties. J Am Med Dir Assoc 2010;11(5):344–355. (PMID: 20511102)
18. Arslan M, Koç EM, Sözmen MK. The Turkish adaptation of the Tilburg Frailty Indicator: a validity and reliability study. Turk J Geriatr 2018;21(2):173–183. (DOI: 10.31086/tjgeri.2018240418)
19. Fried LP, Tangen CM, Walston J et al. Frailty in Older Adults: Evidence for a Phenotype. J Gerontol A Biol Sci Med Sci. 2001;56(3):M146-M157. (PMID: 11253156)

20. Bozkurt C, Yildirim Y, Şenuzun Aykar F. The effect of frailty level on acceptance of illness in older people with chronic obstructive pulmonary disease. Turk J Geriatr 2021;24(2):244–254. (DOI: 10.31086/tjgeri.2021.221)
21. Heppenstall CP, Wilkinson TJ, Hanger HC, Keeling S. Frailty: dominos or deliberation. NZ Med J 2009;122(1299): 42–52. (PMID: 19684647)
22. Chan R, Leung J, Woo J. Dietary patterns and risk of frailty in Chinese community-dwelling older people in Hong Kong: a prospective cohort study. Nutrients 2015;7(8):7070–7084. (PMID: 26305253)
23. Buglio A Lo, Bellanti F, Capurso C, Paglia A., Vendemiale G. Adherence to Mediterranean diet, malnutrition, length of stay and mortality in elderly patients hospitalized in internal medicine wards. Nutrients 2019;11(4):790. (PMID: 30959815)
24. Dinu M, Pagliai G, Giangrandi I, et al. Adherence to the Mediterranean diet among Italian adults: results from the Web-Based Medi-Lite Questionnaire. Int J Food Sci Nutr 2021;72(2):271–279. (PMID: 32657181)
25. Atlantis E, Cochrane B. The association of dietary intake and supplementation of specific polyunsaturated fatty acids with inflammation and functional capacity in chronic obstructive pulmonary disease: a systematic review. Int J Evid Based Healthc 2016 Jun;14(2):53–63. (PMID: 26134547)
26. Hanson C, Lyden E, Furtado J, et al. Serum tocopherol levels and vitamin E intake are associated with lung function in the normative aging study. Clin Nutr 2016;35(1):169–174. (PMID: 25715694)