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THERAPY AREA: OTHER

Comparison of constipation and nutritional status with disease-related parameters in chronic obstructive pulmonary disease patients

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Abstract

Aim: The aim of the study was to determine the effects of constipation symptoms and nutritional status on disease-related parameters, such as disease duration, spirometry test and quality of life, of chronic obstructive pulmonary disease (COPD) patients.
Methods: The research was performed with 48 COPD patients attending the centre from January 2019 to August 2019. Assessment of constipation symptoms was done by Constipation Severity Instrument (CSI), whereas for quality of life assessment, St. George's Respiratory Questionnaire (SGRQ) was used. Patient's nutritional status was determined by food frequency questionnaire. Body mass index (BMI) and fat-free mass index (FFMI) of the patients were identified with the bioelectrical impedance analysis (BIA) method. Statistical assessment of data was done with SPSS 22 program.
Results: According to the relationship between CSI scores and COPD disease parameters, there was a weak positive correlation between the CSI obstructive defecation subscale and SGRQ activity score and weak positive correlation between CSI colonic inertia subscale and COPD duration from the diagnosis. We found a weak negative correlation between protein intake percentage and SGRQ impact score. As the disease duration increased, the total fat, polyunsaturated fatty acids and vitamin E intake of individuals were determined to reduce.
Conclusion: According to our results, there were some changes in the nutrient intake depending on the duration of COPD, and possible constipation in COPD patients may affect the quality of life.

1 | INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality worldwide that induces economic and social burden. It is expected that the prevalence of COPD will increase in the next 40 years due to the prevalence of smoking in developing countries and the increase in the elderly population in developed countries, with deaths from COPD expected to reach 5.4 million annually in 2060.[1] In the presence of classic COPD symptoms like dyspnoea, chronic sputum, cough and with exposure to risk factors, even if COPD is considered, guidelines published on COPD recommend confirming the airflow limitation with spirometry tests.[2] Accordingly, if the forced expiratory volume in the first second (FEV1) to forced vital capacity (FVC) ratio is lower than 0.70, COPD diagnosis is confirmed.[3]

Symptoms like dyspnoea and chronic cough may cause decrease in food intake and may lead to early feeling of fullness, which may prepare the ground for malnutrition among COPD patients.[4] On the other hand, physical inactivity developing due to COPD symptoms is also one of the major factors accelerating muscle destruction, and decreased muscle mass affects mortality, independent of airway limitation.[5,6] As the disease generally occurs at advanced age, other nutritional problems observed in the elderly (reduced appetite, dental problems, etc) contribute to the process.[7]

Currently, one of the most important public health problems of obesity is frequently observed among COPD individuals, and prevalence is reported as 18%–54%.[8] When the distribution of obesity according to stage is examined among COPD patients, it is stated to be more common in the mild and moderate stages and observed less in the severe stages. It is assumed that obesity has positive effects on survival in COPD; however, there is a need for more studies related to this topic.[9] Like the positive effects of obesity, there are limited numbers of studies about determining constipation and the effect of constipation on quality of life among COPD patients. However, when literature findings are investigated, it appears that constipation is among the commonly observed symptoms in COPD patients.[6,10,11] This study aimed to investigate the effect of nutritional status and possible constipation of COPD patients' quality of life and respiratory functions.

What's known

- Symptoms like dyspnoea and chronic cough may affect food intake and change nutritional status of chronic obstructive pulmonary disease (COPD) patients.
- There are limited studies about the effect of constipation on quality of life in COPD.

What's new?

- Nutrient intake may change depending on the duration of the disease.
- Constipation may affect quality of life in COPD patients.

2 | METHODS

2.1 | Study group

This is a single centre, cross-sectional study and was conducted with 48 COPD patients attending Medicana International Istanbul Private Hospital from January 2019 to August 2019. The research included all individuals aged 30 years and older with COPD diagnosis and no infectious findings. Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria were used for diagnosis; the research included individuals with FEV1/FVC < 0.70 and/or emphysema identified on computed tomography. Individuals with respiratory disease apart from COPD; with severe metabolic disease of heart, kidney or liver; with active tumour; with neurologic or psychiatric disease; and pregnant–breastfeeding cases were excluded from the research. Ethical permission for the research was provided by the Istanbul Aydin University Non-Interventional Clinical Research Ethics Committee dated 12 December 2018 and numbered 2019/05. Written informed consent was obtained from all subjects. The study protocol complied with the ethical guideline for the 2013 Declaration of Helsinki.

2.2 | Data collection and interpretation

The Constipation Severity Instrument (CSI) was developed by Varma et al, and it is a scale to identify the defecation frequency, intensity and difficulty experienced during defecation of individuals. It comprises three subscales of obstructive defecation, colonic inertia and pain. As points obtained on the scale increase, symptoms worsen.[12] We used the scale, which adopted to the Turkish language by Kaya et al, to assess constipation symptoms of patients.[13] Identification of nutritional status was performed with the food frequency questionnaire. Daily consumed mean energy and nutrient amounts were determined using the computer-supported nutritional program BeBIS 8 beta full version.

Body weight, body mass index (BMI) and fat-free mass index (FFMI) were determined with the bioelectrical impedance analysis (BIA) method (InBody 230, South Korea). For BMI assessment, the World Health Organization (WHO) classification was used.[14] For malnutrition assessment, the European Society for Clinical Nutrition and Metabolism (ESPEN) recommendations were used. Malnutrition was defined as (a) BMI < 18.5 kg/m^2 and/or (b) unintentional weight loss (>10% in indefinite time or >5% in the last 3 months) together with low BMI (<20 kg/m^2 in patients younger than 70 years and <22 kg/m^2 in those aged >70 years) or FFMI (<17 kg/m^2 in men and <15 kg/m^2 in women).[15,16]

The St. George's Respiratory Questionnaire (SGRQ) was used for assessment of respiratory quality of life.[17,18] We used its Turkish adopted version.[18] The SGRQ comprises three subsections and 76 items. The subsections are classified as symptoms, activity and impact. The symptom section includes severity of complaints like cough, shortness of breath and sputum; the activity section questions physical activities that are difficult due to shortness of breath, whereas the impact section gathers information about the attitudes and social and emotional status of individuals faced with negative effects of the disease in daily life.[18] Points are given for each of the three subsections, and later, total points are calculated.[19] Points vary from 0 to 100, with higher points indicating more severe progression of disease and lower quality of life. Spirometry test results, including FEV1 (% predicted) and FEV1/FVC values, which are used to describe the disease severity, were obtained from hospital records.

2.3 | Statistical analysis

Statistical assessment used the Statistical Package for the Social Sciences program (SPSS 22, Inc, Chicago, IL.). Before beginning statistical analyses, the SPSS normalisation test was used to assess

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whether continuous variables had normal distribution. Skewness and kurtosis values for all continuous variables were observed to vary between −1.5 and 1.5, and it was accepted that continuous variables had normal distribution. Comparison of BMI and COPD disease variables used the analysis of variance test, whereas comparison of CSI and COPD disease parameters used the Pearson correlation test; p value < .05 was accepted as statistically significant for all tests.

3 | RESULTS

The mean age of study population was 64.0 ± 10.6 years, and 70.8% were male. Disease duration was 61.8 ± 69.7 months, with FEV1 (% predicted) and FEV1/FVC values of 67.4 ± 26.6 and 62.6 ± 14.1, respectively. The SGRQ symptom, activity, impact and total scores were 40.3 ± 18.8, 45.3 ± 27.5, 23.3 ± 19.7 and 32.8 ± 20.0, respectively (Table 1).

According to the ESPEN criteria, there was no patient with malnutrition risk. According to BMI classification, 18.8% of patients had normal weight, 47.9% were overweight, 20.8% were obese class 1, and 12.5% were obese class 2. Correlation test results between BMI and COPD disease parameters did not identify any correlation (Table 2).

The correlations between CSI subscales and COPD disease parameters are given in Table 3. The CSI obstructive defecation subscale score and SGRQ activity score were found to have weak positive correlation (r = .364; P = .037). The CSI pain subscale score and SGRQ symptom score had weak negative correlation (r = −.344; P = .049). The colonic inertia subscale score and COPD disease duration were determined to have weak positive correlation (r = .346; P = .048).

When the correlation between energy and nutrient intake with COPD disease parameters was examined, there was a weak negative correlation between protein intake percentage and SGRQ impact score (r = −.363; P = .038) and a weak negative correlation between total fat (g) and polyunsaturated fatty acids (PUFA; g) intake with disease duration (Table 4). In addition to these, a weak negative correlation was identified between vitamin E intake and COPD duration (r = −.438; P = .011).

TABLE 1 Baseline characteristics of participants

Characteristics	Patients (n = 48)
Age (years)	64.0 (SD 10.6)
Sex (male)	34 (70.8%)
BMI (kg/m^2)	28.5 (SD 4.8)
FFMI (kg/m^2)	19.0 (SD 2.5)
CSI	
Obstructive defecation (0-28)	7.1 ± 3.6
Colonic inertia (0-29)	5.6 ± 3.0
Pain (0-16)	0.3 ± 1.0
CSI total score (0-73)	13.0 ± 5.8
Smoking history	
Smoking	17 (35.4%)
Ex-smoking	25 (52.1%)
Duration of COPD (month)	61.8 (SD 69.7)
Spirometry	
FEV1 (% predicted)	67.4 (SD 26.6)
FEV1/FVC	62.6 (SD 14.1)
SGRQ	
Symptom	40.3 (SD 18.8)
Activity	45.3 (SD 27.5)
Impact	23.3 (SD 19.7)
SGRQ total score	32.8 (SD 20.0)

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease; CSI, Constipation Severity Instrument; FEV1, forced expiratory volume in the first second; FFMI, fat-free mass index; FVC, forced vital capacity; SD, standard deviation; SGRQ, St. George's Respiratory Questionnaire.

4 | DISCUSSION

This study was done with the aim of investigating the effect of nutritional status, food consumption and constipation symptoms on respiratory function tests and quality of life of COPD patients. In a study researching the food consumption and malnutrition status of COPD patients, negative correlations were identified between the BMI of patients and dyspnoea levels and FEV1 values.[20] A study assessing body composition of COPD patients in the acute exacerbation period in Australia similarly stated that there was a negative correlation between BMI and FEV1 (% predicted).[21] Wu et al in their study investigating the correlation of BMI with respiratory test parameters, acute exacerbation and systemic inflammation (n = 744) stated differently that as BMI increased, there was an improvement in respiratory test parameters and a fall in the number of exacerbations and inflammation markers.[22] Another study identified a positive correlation between BMI and FEV1 (% predicted) and additionally emphasised that BMI was related to better respiratory parameters and that low BMI was a risk factor for COPD development.[23] In this study, contrary to the positive and negative results in the literature, there was no significant correlation found between BMI with spirometry test parameters and SGRQ. This result may be because the group included in the study was in stable period. Having exacerbations may have different effects on BMI.

There are limited numbers of studies explaining the presence of gastrointestinal symptoms, and especially constipation, in COPD patients and effect on COPD prognosis. The anatomic proximity of the thorax and gastrointestinal system organs may cause symptoms occurring in one system to affect the other. A study in 2014 identified increased intestinal permeability in COPD patients.[24] Another study found that COPD cases with gastro-oesophageal reflux disease had more acute exacerbation and lower respiratory test parameters compared with cases without it.[25] There are study data stating that abdominal distension pushes the diaphragm upward and worsens respiratory functions.[26,27] Though there are limited studies investigating the correlation between constipation and COPD,

TABLE 2 Correlation between BMI and disease-related parameters

	Normal (n = 9)	Overweight (n = 23)	Obese class 1 (n = 10)	Obese class 2 (n = 6)	p^*
SGRQ symptom	44.3 ± 16.3	35.4 ± 19.5	37.9 ± 16.3	53.3 ± 20.8	.223
SGRQ activity	47.4 ± 21.7	40.7 ± 29.4	48.4 ± 29.0	54.3 ± 28.9	.704
SGRQ impact	27.5 ± 20.4	20.1 ± 20.2	24.3 ± 19.7	27.6 ± 19.5	.734
SGRQ total	36.4 ± 18.8	29.1 ± 20.9	33.9 ± 19.3	40.1 ± 20.9	.601
Duration of COPD	77.8 ± 67.6	64.3 ± 86.6	40.5 ± 35.7	64.2 ± 41.0	.709
FEV1 (% predicted)	59.9 ± 32.1	73.5 ± 28.7	65.6 ± 18.6	58.2 ± 20.1	.452
FEV1/FVC	44.2 ± 20.8	35.0 ± 29.8	49.3 ± 26.2	24.1 ± 26.5	.276

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease; FEV1, forced expiratory volume in the first second; FVC, forced vital capacity; SGRQ, St. George's Respiratory Questionnaire.

*SPSS ANOVA test.

TABLE 3 Correlation between CSI and disease-related parameters

		SGRQ symptom	SGRQ activity	SGRQ impact	SGRQ total	Duration of COPD	FEV1 (% predicted)	FEV1/FVC
Obstructive defecation	*r*	−.229	**.364**	.096	.177	.045	.005	.253
	p	.199	**.037***	.596	.325	.803	.977	.155
Colonic inertia	*r*	−.030	−.059	−.135	.105	**.346**	.122	.143
	p	.867	.745	.454	.561	**.048***	.458	.426
Pain	*r*	**−.344**	.241	.095	.105	.026	.040	.094
	p	**.049***	.176	.599	.561	.886	.824	.601
CSI total	*r*	−.228	.243	.009	.076	.204	.068	.248
	p	.203	.173	.959	.673	.255	.708	.164

Abbreviations: COPD, chronic obstructive pulmonary disease; CSI, Constipation Severity Instrument; FEV1, forced expiratory volume in the first second; FVC, forced vital capacity; SGRQ, St. George's Respiratory Questionnaire.

Statistically significant values are indicated in bold.

*Pearson correlation test.

findings show that constipation is among the commonly observed symptoms of COPD.[6,10,28,29] The present study is based on clinical observations that constipation in COPD negatively affects disease parameters. Though correlation tests between CSI total score and COPD disease parameters in the research findings did not provide statistically significant results, there were correlations identified between CSI subscales and COPD disease parameters, though at weak levels. This may have been because most of individuals participating in the research were in mild and moderate stages of COPD and the sample size of the study population was low.

The positive weak correlation identified between the CSI subscale of obstructive defecation and SGRQ activity score shows that increased problems like difficulties experienced during defecation and lack of full excretion increase feelings of shortness of breath and confirms our clinical observations. In other words, constipation negatively affects activity in this patient group. However, contrary to expected, there was a weak negative correlation identified between the pain subscale and SGRQ symptom score, and this result may be due to the low number in the sample group participating in the research. There was a weak positive correlation found between the colonic inertia subscale and the COPD duration. These data are interpreted to show that the risk of constipation may increase in patients with advanced COPD.

In our knowledge, the only study investigating the effect of constipation on disease symptoms and quality of life in COPD cases was performed in China with 191 COPD individuals. According to the researchers' findings, constipation was negatively correlated with COPD symptoms (cough, sputum and wheezing), number of exacerbations and 6-min walking test.[11] There is a need for more clinical studies to more clearly determine the effect of constipation on COPD disease symptoms.

Correlation tests between nutrient intake and COPD disease parameters identified a weak negative correlation between protein percentage in diet and SGRQ impact score. In the literature, there are findings that with the increase in protein intake (especially branched chain amino acids), the patient's total body protein synthesis and fat-free mass increase.[30-32] A randomised controlled study investigating the effect of protein supplementation on COPD disease symptoms observed that COPD cases given a snack bar containing 18-g protein daily for 9 weeks had a significant level of improvement in SGRQ scores.[33] Considering the literature findings and the negative correlation between dietary protein intake

TABLE 4 Correlation between some nutrients and disease-related parameters

		SGRQ symptom	SGRQ activity	SGRQ impact	SGRQ total	Duration of COPD	FEV1 (% predicted)	FEV1/FVC
CHO (g)	*r*	−.020	.096	−.020	.029	−.128	−.087	.067
	p	.913	.594	.910	.874	.477	.630	.710
CHO (%)	*r*	.059	.046	.114	.093	.198	−.142	.153
	p	.743	.800	.527	.608	.268	.430	.395
Protein (g)	*r*	.017	.058	−.169	−.064	−.242	−.047	.066
	p	.923	.747	.347	.723	.175	.793	.716
Protein (%)	*r*	.030	−.231	−**.363**	−.296	.135	.205	−.055
	p	.868	.165	**.038***	.094	.455	.253	.760
Total fat (g)	*r*	−.088	.223	−.005	.081	−**.422**	−.034	.234
	p	.625	.213	.979	.653	**.014***	.852	.190
Total fat (%)	*r*	−.100	.015	−.027	−.025	−.251	.043	.161
	p	.581	.932	.881	.890	.159	.811	.371
Dietary fibre (g)	*r*	.048	.064	−.078	−.017	−.082	.117	−.043
	p	.792	.723	.667	.927	.649	.516	.813
Alcohol (g)	*r*	.081	.106	.052	.091	−.158	.166	.096
	p	.652	.559	.774	.615	.379	.356	.597
PUFA (g)	*r*	−.077	.247	.170	.187	−**.469**	−.035	.118
	p	.671	.165	.345	.298	**.006***	.846	.512
MUFA (g)	*r*	−.008	−.050	−.167	−.114	−.300	−.028	−.085
	p	.963	.782	.353	.527	.089	.876	.637
SFA (g)	*r*	.034	−.044	−.265	−.159	−.189	−.026	−.057
	p	.850	.809	.136	.378	.293	.887	.754
Cholesterol (mg)	*r*	.125	.098	−.169	−.067	−.100	−.134	.189
	p	.487	.589	.346	.710	.579	.456	.291
Vitamin A (μg)	*r*	.203	.019	−.090	−.009	−.123	−.155	.078
	p	.256	.956	.620	.962	.495	.390	.666
Vitamin E (mg)	*r*	−.066	.250	.198	.205	−**.438**	−.054	.062
	p	.715	.161	.269	.253	**.011***	.766	.733
Vitamin B_1 (mg)	*r*	.017	.058	−.169	−.064	−.242	−.047	.066
	p	.923	.747	.347	.723	.175	.793	.716
Vitamin B_2 (mg)	*r*	.008	−.011	−.272	−.152	−.184	−.063	.065
	p	.965	.954	.126	.400	. 305	.728	.761
Vitamin B_6 (mg)	*r*	−.111	.072	−.065	−.018	−.239	.072	.209
	p	.540	.692	.720	.919	.180	.692	.244
Folate (μg)	*r*	.124	.048	−.178	−.055	−.208	−.096	−.032
	p	.491	.790	.323	.761	.247	.594	.859
Vitamin C (mg)	*r*	−.027	.036	.050	.043	.275	−.105	.023
	p	.882	.843	.781	.811	.121	.559	.898
Sodium (mg)	*r*	.048	−.014	−.194	−.106	−.222	−.148	−.008
	p	.789	.938	.280	.557	.215	.411	.963
Potassium (mg)	*r*	−.099	.024	−.147	−.083	−.165	.061	.074
	p	.584	.894	.413	.648	.357	.734	.682
Calcium (mg)	*r*	−.040	.014	−.260	−.143	−.173	−.102	.010
	p	.824	.936	.144	.427	.335	.572	.955

(Continues)

TABLE 4 (Continued)

		SGRQ symptom	SGRQ activity	SGRQ impact	SGRQ total	Duration of COPD	FEV1 (% predicted)	FEV1/FVC
Magnesium (mg)	*r*	−.107	.059	−.156	−.072	−.181	.100	.077
	p	.552	.745	.387	.689	.314	.581	.668
Phosphorus (mg)	*r*	−.055	.083	−.186	−.073	−.258	.024	.031
	p	.761	.648	.299	.687	.147	.894	.865
Iron (mg)	*r*	−.033	.032	−.145	−.067	−.173	.057	.022
	p	.857	.858	.422	.711	.335	.751	.902
Zinc (mg)	*r*	.035	.003	−.224	−.116	−.173	−.018	−.019
	p	.847	.985	.210	.522	.335	.920	.915

Abbreviations: CHO, carbohydrate, COPD, chronic obstructive pulmonary disease; FEV1, forced expiratory volume in the first second; FVC, forced vital capacity; PUFA, polyunsaturated fatty acids, MUFA, monounsaturated fatty acids, SFA, saturated fatty acid; SGRQ, St. George's Respiratory Questionnaire.

Statistically significant values are indicated in bold.

*Pearson correlation test.

and SGRQ observed in this study, it is concluded that advanced-stage COPD patients should be carefully monitored for diet components and research be completed with larger sample groups to understand the possible effects.

Weak negative correlations were identified between total fat (g) and PUFA (g) consumption with disease duration; in other words, COPD patients with longer disease duration were identified to have reduced fat consumption. This reduction is consistent with literature studies related to the nutrient intake of very severe stage COPD cases.[34,35] Vitamin E, known as a strong antioxidant, plays a role in reducing membrane damage and oxidative stress and as a result is thought to have protective effects on lung health.[36] Though vitamin E supplementation was shown to suppress DNA damage,[4] prevent lipid oxidation and reduce the number of acute exacerbations[37] in COPD, findings about the effect on respiratory functions are contradictory.[37,38] A study investigating the nutrient intake of COPD patients found that vitamin E intake of patients was significantly low compared with control group.[39] The present study determined that increased COPD duration was associated with lower vitamin E intake. Symptoms like dyspnoea and chronic cough may cause decrease in food intake and may lead to early feeling of fullness,[4] and as disease generally occurs at advanced age, other nutritional problems observed in the elderly, such as reduced appetite and dental problems, contribute to the process.[7] However, contrary to literature, apart from fatty acids and vitamin E, we did not encounter any findings that nutrient intake reduced with the increase in COPD stage/duration in our study. This result may be due to the present study including a low number of individuals with severe and very severe stages of COPD.

5 | CONCLUSION

This study investigated the effect of possible constipation and nutritional status of COPD patients on quality of life. According to our results, there were some changes in the nutrient intake depending on the duration of COPD, and constipation in COPD patients may affect the quality of life.

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The research has been derivated from master's thesis to article.

DISCLOSURE

No potential conflict of interest relevant to this article was reported by the authors.

AUTHOR CONTRIBUTIONS

Gözde Gürsoy Coşkun contributed to the conception and design of the study, acquisition of data, analysis and interpretation of data and drafting and final approval of the manuscript; Serap Andac-Ozturk contributed to the conception and design of the study, analysis and interpretation of data and writing of the manuscript; Zeliha Arslan Ulukan contributed to the conception and design of the study, acquisition of data, analysis and interpretation of data and writing of the manuscript. All authors participated in the study design, reviewed and revised the manuscript and approved the final manuscript.

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