RESEARCH ARTICLE

Evaluation of malnutrition detected with the Nutritional Risk Screening 2002 (NRS-2002) and the quality of life in hospitalized patients with chronic obstructive pulmonary disease

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Abstract

Background: Patients with severe chronic obstructive pulmonary disease (COPD) have impaired quality of life, but the relationship between their nutritional status and quality of life has not been established. The aim of this study was to determine the relationship between quality of life and nutritional status in hospitalized COPD patients.

Methods: Demographic data, quality of life and nutritional status of 90 inpatients with a mean age of 68.76 ± 10.85 years were enrolled in the study. The Nutritional Risk Screening 2002 (NRS-2002) tool was used to evaluate their nutritional status. The quality of life was assessed using the Short Form-36 (SF-36) questionnaire. The correlation analysis was used for the relationship between SF-36 subscales and nutritional status variables.

Results: Of the 90 COPD patients included in the study, 54.4 % were men, and 45.6 % were women. Moderate, severe, and very severe COPD were detected in 37.8 %, 38.9 %, and 23.3 % of the patients, respectively. At risk of malnutrition were 55.6 % of the 90 COPD patients, whereas 44.4 % were not. The scores for physical function, physical role functioning, pain, general health, emotional role functioning, vitality, social function, and mental function subscales were lower in the patients at risk of malnutrition ($p < 0.001$). There was a statistically significant negative correlation between malnutrition score and the subscores of SF-36 related to physical function, physical role functioning, pain, general health, emotional role functioning, vitality, social function, and mental function ($p < 0.001$).

Conclusions: COPD patients were found to have a high risk of malnutrition that adversely affects their quality of life. Therefore, the evaluation of the nutritional status of COPD patients should be an integral part of their clinical treatment plans aiming towards improving their quality of life. Hippokratia 2016, 20(2):147-152

Keywords: Chronic obstructive pulmonary disease, COPD, malnutrition, nutritional status, Nutritional Risk Screening, NRS-2002, quality of life, Short Form-36, SF-36

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Introduction

Chronic obstructive pulmonary disease (COPD), which is a preventable and treatable disease, is gradually increasing its prevalence all over the world due to smoking habit along with the increase in the elderly population and is causing significant economic and social burden[1]. COPD is a major cause of chronic morbidity and mortality and has been estimated that will be the third leading cause of death in the world by 2030. In Turkey, mortality associated with COPD is increasing with a frequency of 7.1 %, which is similar to the prevalence launched in European countries[2-5]. Nutritional disorders commonly coexist with COPD. The weight loss and muscle wasting due to deterioration of nutritional status adversely affect respiratory and peripheral muscle functions and exercise capacity thus general health status of the patients[6].

High total energy expenditure of the body along with inadequate nutrition is an important factor triggering malnutrition. In these patients, the rate of malnutrition and cachexia has been reported to be 22 %[7]. High mortality has been reported in patients with lower mean body mass index (BMI)[8]. In patients with COPD, malnutrition and low body weight are significant negative independent risk factors affecting survival and quality of life[1].

Questionnaires, which allow the assessment of life quality in clinical and field studies, are subjective methods allowing patients to evaluate from their own perspective how their disease influences their daily life. Short Form-36 (SF-36), Sickness Impact Profile (SIP), the Quality of Well Being (QWB), and the Nottingham

Health Profile (NHP) questionnaires are the most commonly used scales for the assessment of overall quality of life in COPD patients[9]. Several studies have investigated malnutrition and life quality in patients with COPD whose life quality is adversely affected by the disease. To the best of our knowledge, no study has been performed to determine the relationship between life quality and nutritional status in Turkish patients suffering from COPD. Therefore, the current study aimed to assess the relationship between the quality of life and nutritional status in COPD patients.

Material and Methods

Subjects

This prospective study was conducted between March 2014 and September 2014 after obtaining permission by the Erciyes University Clinical Research Ethics Committee (decision number 104/2014). Initially, the sample size was assessed as 120 patients by taking into account expert opinion providing that the correlation between the two scales was at least $r = 0.3$, $\alpha = 0.05$, and power $= 0.80$. Rearrangements were performed according to the results of the interim analysis, which was performed at various intervals in parallel to increasing sample size (30, 60, and 90 patients). According to the results of these analyses, when the sample size reached 90 COPD patients, the initially predicted statistical requirements were met thus the data collection process was terminated. In total, 90 patients who received treatment for COPD as inpatients at the Gevher Nesibe Chest Diseases hospital were included in the study.

Inclusion and exclusion criteria

Because COPD usually becomes apparent after 40 or 50 years of age[10], we included in the study COPD patients who were aged between 44 and 88 (mean 68.76 ± 10.85) years, and clinically stable and cognitively intact according to physician's diagnosis. Only the patients consecutively admitted and hospitalized with acute exacerbation of COPD between March 2014 and September 2014, were included.

We excluded from the study, women who reported on admission been pregnant or lactating, patients who had a history of major recent surgery or trauma, and those with a concomitant disease that might influence their nutritional status (heart disease, uncontrolled diabetes, cirrhosis, chronic renal failure, or uncontrolled cor pulmonale). Also, any patient treated with oral steroids, immunosuppressors, long-term oxygen therapy (LTOT) or noninvasive ventilation (NIV) was excluded from the study[11]. The study was initiated and completed with 90 inpatients.

Methods

Stages of COPD patients were determined according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria by the responsible physician specialists[1]. The patients with forced expiratory volume in 1 second (FEV1) ≥80 % (with or without chronic cough), FEV1 <80 % but ≥50 % (chronic cough, with or without phlegm), FEV1 <50 % but ≥30 % (chronic cough, phlegm), and FEV1 <30 % or FEV1 <50 % + dyspnea, were defined to have mild, moderate, severe and very severe COPD, respectively.

Lung function was measured by routine spirometry (Spiro RS232, PK Morgan, Kent, United Kingdom) following standards recommended by European Respiratory Society[12]. The highest values from minimum three technically acceptable spirometric maneuvers were used and expressed as a percentage.

Data related to personal information and nutritional habits of the patients were obtained with face to face interviews by three researchers from March to September 2014.

The body weight of the patients was calculated with 0.1 kg precision digital scale (King, EB817, Ningbo, China). The height of individuals was measured with a stadiometer (SECA202, Hamburg, Germany) while the person was standing without shoes, feet were together, and head was maintained in the Frankfort Horizontal Plane position (triangle of eyes in alignment with the upper side of auricle). BMI (kg/m^2) values were calculated by dividing the weight (kg) by height (m) square[13].

Nutritional status of patients was evaluated with the Nutritional Risk Screening 2002 (NRS-2002) form proposed by the European Society for Clinical Nutrition and Metabolism (ESPEN) for the hospitalized patients within the first 48 hours following admission. NRS-2002 form is composed of two parts. In the first part, the severity of the disease, food intake (presence of reduction), and weight loss within the preceding three months were questioned. If the answers to all questions were "no", no question from second part was asked, and weekly scans were continued. If the response to any of the questions was "yes", we proceeded to the second part in which the patient was assessed regarding malnutrition and its severity. The severity of the malnutrition was classified as absent (0 points), mild (one point), moderate (two points), and severe (three points). Patients with a total score of three or above were considered to be at risk of malnutrition[14].

SF-36, developed by the Medical Outcomes Study, is a general scale that measures the quality of life. SF-36 was specified as a valid instrument by Mahler et al[15] as well as Boueri et al[16] to measure health-related quality of life in patients with COPD. Reliability and validity of the Turkish version of SF-36 were confirmed by Koçyiğit et al[17]. In our study, patients' quality of life was evaluated with SF-36 within the first 48 hours following admission to the hospital. The SF-36 questionnaire consists of 36 items that provide a measurement of the eight subscales of the life quality. These subscales are physical functioning (ten items), social functioning (two items), role limitations due to physical function (four items), role limitations due to emotional problems (three items), mental health (five items), energy/vitality (four items), pain (two items), and general health perception (five items). The scale evalu-

ation refer to the preceding four weeks. In the form, all items except 4 and 5 are Likert-type scales; while items 4 and 5 are yes/no format questions. The scale gives a total score for each subscale separately, rather than just a single total score. The subscale assessment of the life quality ranges between 0 and 100, which refers the worst (0 points) and the best health status (100 points)[16,17].

Statistical Analysis

The Statistical Package for the Social Sciences 21.0 (SPSS Inc., Chicago, IL, USA) was used to process the data; $p < 0.05$ was set as statistical significance. Normality of the data distribution was evaluated with the Kolmogorov-Smirnov test. Student's t-test was used to compare two independent groups' mean values, and Mann-Whitney U-test was used to compare their median values. Chi-square test was used to determine the relationship between categorical variables and correlation analysis was used to determine the relationship between numeric variables.

Results

The COPD patients at risk of malnutrition were older (73.38 ± 9.24 years) than the mean age (68.76 ± 10.85 years) of the patients ($p < 0.001$). The malnutrition risk was higher in illiterate ($p = 0.007$) and in retired patients ($p = 0.048$). The malnutrition risk was similar in both smoking, and nonsmoking patients ($p = 0.72$) and the majority of COPD patients, who smoked regularly in some period of their life (55 of 90 patients, 61.1%), had stopped smoking when enrolled in this study (Table 1).

The NRS-2002 evaluation according to the GOLD criteria showed that the risk of malnutrition was greater in patients with a severe and very severe stage of the disease ($p < 0.001$) (Table 1). FEV1 and forced vital capacity (FVC) ($p < 0.001$) and the FEV1/FVC ratio were lower in patients at risk of malnutrition than those without malnutrition ($p = 0.030$) (Table 2). According to NRS-2002 components, BMI was below 20.5 in 23.3 % of the patients, and 86.7 % of the patients experienced weight loss in the preceding three months. Food intake was reduced in 94.4 % of the patients in the preceding three weeks. Mild and moderate malnutrition stages were determined in 26.7 and 24.4 % of the patients respectively whereas 27.8 % of the patients experienced severe disease (Table 3). According to the SF-36 life quality subscale scores, the median values of physical function, physical role

Table 1: General characteristics of the 90 COPD patients who received treatment for COPD as inpatients, according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria.

	Malnutrition Risk				Total		χ^2	p
	Present		Absent					
	n	%	n	%	n	%		
Stages of the patients with COPD								
Moderate phase	4	11.8	30	88.2	34	37.8		
Severe phase	26	74.3	9	25.7	35	38.9	44.772	<0.001
Very severe phase	20	95.2	1	4.8	21	23.3		
Sex								
Male	27	55.1	22	44.9	49	100	0.009	1.00
Female	23	56	18	44	41	100		
Occupation								
Housewife (only women)	15	45.4	18	54.5	33	100		
Worker-civil servant	3	30.0	7	70.0	10	100	9.562	0.048
Retired	32	68.0	15	32	47	100		
Educational Status								
Illiterate	15	83.3	3	16.7	18	100		
Primary education	25	46.3	29	53.7	54	100		
Secondary education	10	66.7	5	33.3	15	100	12	0.007
Associate Undergraduate/ Graduate/ Post Graduate	0	0	3	100	3	100		
Regular Smoking Status								
Yes	32	58.2	23	41.8	55	100	0.395	0.681
No	18	51.4	17	48.6	35	100		
Total	**50**	**55.6**	**40**	**44.4**	**90**	**100**		
Current Smoking Status								
Yes	1	16.7	5	83.3	6	100		
No	31	63.3	18	36.7	49	100	4.771	0.72
Total	**32**	**58.2**	**23**	**41.8**	**55**	**100**		

n: number of patients, Regular smoking status: patients who smoked or not regularly in some period of their life, Current smoking status: patients who were smoking or not when enrolled in this study.

Table 2: Respiratory parameters of the 90 COPD patients who received treatment for COPD as inpatients.

Variables	Malnutrition Risk		p
	Present (n: 50)	Absent (n: 40)	
FEV1 (%)	35.84 ± 14.12	57.70 ± 14.29	<0.001
FVC (%)	57.96 ± 17.23	87.70 ± 17.70	<0.001
FEV1/FVC	58.09 ± 11.96	62.87 ± 7.41	0.030

n: number of patients, values represent mean ± standard deviation, FEV1: forced expiratory volume in 1 second, FVC: forced vital capacity

Table 3: Anthropometric and nutritional status and malnutrition stages of the 90 COPD patients according to Nutritional Risk Screening 2002 (NRS-2002) subscales.

Variables	n	%
BMI < 20.5		
Yes	21	23.3
No	69	76.7
Weight Loss		
Yes	78	86.7
No	12	13.3
Decrease in Food Intake		
Yes	85	94.4
No	5	5.6
Severe Disease Stage		
Yes	56	62.2
No	34	37.8
Malnutrition		
Absent	19	21.1
Mild	24	26.7
Moderate	22	24.4
Severe	25	27.8
Severity of the Disease		
Mild	67	74.4
Moderate	22	24.4
Severe	1	1.2
Total	**90**	**100.0**

n: number of patients, BMI: body mass index.

function, pain, general health, energy/vitality, social function, emotional role functioning, and mental health quality of life were 19.94, 16.11, 51.07, 31.6, 27.56, 43.33, 40.67, and 52.0, respectively. These values were lower in patients with risk of malnutrition than in patients with no malnutrition risk ($p < 0.001$) (Table 4). NRS-2002 risk scores increased and SF-36 life quality subscale scores decreased with the increasing age of patients ($p < 0.001$).

Physical function, physical role function, pain, general health, energy/vitality, social function, emotional role functioning and mental health quality of life subscale scores of patients positively correlated with each other; an increase in one of the subscales resulted in increase of the other subscales ($p < 0.001$). The strongest relationship was found between energy/vitality and general health scores ($r = 0.880$) whereas the weakest correlation was found between emotional role functioning and pain scores ($r = 0.480$, $p < 0.001$) (Table 5).

Discussion

The increase in the smoking epidemic and the change in the community structure of the population pyramid, especially in developing countries such as Turkey, have a major contribution to the COPD-related increase in mortality. The proportion of population which is aged over 60 years is expected to reach up to 20 % (2 billion) in the world in 2020. This change in the demographic structure of the world is faster than the change in the smoking epidemic and has contributed to the increase in the prevalence of COPD[18]. Several studies and published reports have shown that the highest prevalence of COPD is observed in individuals over 60 years of age[1,4], as also shown in the presented study.

COPD is often perceived as the disease of the elderly and male smokers. However, in recent years, similar COPD prevalence has been reported in men and women populations due to the increase in women smokers in the developed countries. In developing countries, the disease is still more common in males[5]. In our study, more than half of the enrolled COPD patients were male. In general, men smoke more than women in Turkey, fact suggesting that Turkish men are more prone to develop COPD.

Low educational level and socioeconomic status were reported to be among the risk factors affecting the prevalence of COPD[1]. A previous study also reported similar results to our study regarding the low level of education of patients with COPD[19]. Cigarette smoking is considered to be the most important risk factor for COPD. One study reported that 50 % of the smokers eventually develop COPD[20]. This is consistent with our results that 61.1 % of COPD patients (55 of 90 patients) had smoked regularly in some period of their life.

Spirometric measurements (FEV1, FVC, and FEV1/FVC percentage) are the basic parameters used in the diagnosis and evaluation of the severity of COPD[1]. Besides the assessment of pulmonary function tests in the diagnosis and severity of COPD, spirometric measurements are also useful indices for quality of life, exercise tolerance, health services and clinical outcomes such as mortality[21]. In this study, all of the respiratory function parameters (FEV1, FVC percent, and FEV1/FVC ratio) in patients at risk of malnutrition were significantly lower than those without malnutrition risk, fact that indicates the adverse effects of malnutrition on respiratory function. Development of malnutrition in 25 % of COPD patients and 50 % of the hospitalized patients is an indicator of the impact of nutritional status on COPD[22]. In the presented study,

Table 4: Distribution of the 90 COPD patients according to the Short Form-36 (SF-36) life quality questionnaire subscales.

Life Quality Subscales	Malnutrition Risk		Total	z	p
	Present (n: 50) Median (Lower-Upper)	Absent (n: 40) Median (Lower-Upper)			
Physical Function	5.0 (0 - 55)	35.0 (0 - 75)	19.94 ± 22.00	-6.146	<0.001
Physical Role Function	0.0 (0 - 50)	25.0 (0 - 75)	16.11 ± 24.38	-5.846	<0.001
Pain	41.0 (10 - 62)	63.0 (31 - 100)	51.07 ± 22.77	-5.987	<0.001
General Health	20.0 (0 - 50)	46.0 (20 - 67)	31.60 ± 19.17	-6.685	<0.001
Vitality	10.0 (0 - 40)	40.0 (10 - 70)	27.56 ± 17.90	-6.779	<0.001
Social Function	25.0 (0 - 62.5)	62.5 (25 - 87)	43.33 ± 20.88	-4.447	<0.001
Emotional Role Function	0.0 (0 - 100)	66.7 (0 - 100)	40.67 ± 38.54	-6.146	<0.001
Mental Health	32.0 (8 - 52)	52.0 (24 - 72)	39.73 ± 15.06	-5.846	<0.001

n: number of patients, values represent median and in brackets lower-upper or mean ± standard deviation.

Table 5: Relationship between age, Short Form-36 (SF-36) life quality subscale and Nutritional Risk Screening 2002 (NRS-2002) risk scores of the 90 COPD patients enrolled in the study.

Variables	FF	FR	Pain	GS	Vitality	SF	ER	MS	NRSS	Age	Sex	Education	Occupation
FF	1												
FR	0.714**	1											
Pain	0.591**	0.528**	1										
GH	0.724**	0.587**	0.674**	1									
Vitality	0.789**	0.619**	0.622**	0.880**	1								
SF	0.704**	0.641**	0.766**	0.786**	0.760**	1							
ER	0.539**	0.655**	0.480**	0.578**	0.527**	0.565**	1						
MH	0.690**	0.596**	0.678**	0.855**	0.863**	0.759**	0.558**	1					
NRSS	-0.663**	-0.612**	-0.728**	-0.763**	-0.764**	-0.773**	-0.573**	-0.731**	1				
Age	-0.523**	-0.297**	-0.394**	-0.497**	-0.581**	-0.535**	-0.261*	-0.454**	0.550**	1			
Sex	-0.108	-0.196	-0.040	-0.092	-0.107	-0.081	-0.213*	-0.059	-0.052	-0.015	1.000		
Educational status	0.267*	0.268*	0.182	0.192	0.248*	0.226*	0.151	0.189	-0.285**	-0.449**	-0.289**	1.000	
Occupational status	-0.034	0.061	-0.053	-0.136	-0.049	-0.090	0.101	-0.113	0.244*	0.238*	-0.778**	0.210*	1.000

*p<0.05, **p<0.001, FF: physical function, FR: physical role function, GH: general health, SF: social function, ER: emotional role function, MH: mental health, NRSS: Nutritional Risk Screening 2002 risk score.

the rate of the patients with BMI below 20.5 kg/m^2 was 23.3 % and the proportion of those at risk of malnutrition was 55.6 %, which is similar to the study investigating the prevalence of malnutrition risk with NRS-2002 method in 680 inpatients in which malnutrition was found to be 14.3 % and the ratio of the patients with BMI less than 20.5 kg/m^2 was 2.5 %[23]. In the sub-analysis of the disease, the highest rate of malnutrition risk was reported in patients with COPD and pneumonia[23]. The inconsistent results concerning the prevalence of malnutrition in various studies may result from the type of patients enrolled, hospital conditions, differences in treatment plans, the diversity of different societies, and methods used to assess nutritional status. In the present study, because the dietary habits of the patients were recorded with face to face interviews by the researchers, the exaggerated or missing information may be given by the participants. This could be considered a limitation of the study.

Measurements of life quality level in patients with chronic respiratory disease define the differences between better or worse health statuses of the patients and allow for better understanding of the benefits offered by the amendments in the treatment plans. In a retrospective study, Limsuwat et al[24] reported significantly lower SF-36 subscale scores in 41 patients who received pulmonary rehabilitation at the University health center in Lubbock, Texas between 2010 and 2012 compared to the standards of the American society. Similarly, in our study, the subscale scores of the SF-36 life quality in COPD patients were well below the standards of the Turkish society[25]. An association was determined between the quality of life and malnutrition in COPD patients, and malnutrition negatively affected their daily life[25]. D'Amelio et al[26] reported that out of 300 patients, 25 % were malnourished and 39 % were at risk of malnutrition, and malnutrition caused a significant reduction in physical and mental performance. In another study conducted in the Los Angeles, a negative correlation was found between malnutrition status and the SF-36 subscale scores in 705 patients, and malnourished patients had worse quality of life[27]. Obaseki et al[28] found a decrease in quality of life scores with the decreasing body weight. They suggested that low body weight can be considered among the independent risk factors affecting the quality of life in COPD patients. In the presented study, in agreement with the literature, physical role function, pain, general health, emotional role func-

tion, vitality, social functioning, and mental health quality scores were significantly lower thus the quality of life was the worse in patients who were at risk of malnutrition compared to the patients without malnutrition risk. This indicates that physical role function, pain, general health, vitality, social function, emotional role functioning and mental health decreases with the increasing malnutrition risk. Physical function, physical role function, pain, general health, vitality, social function, emotional role functioning, and mental health quality scores, which are the subscales of SF-36, correlated positively with each other thus an increase in any of them resulted in increases in the others.

The results of this study have shown that risk of malnutrition is high in patients with COPD and malnutrition negatively affects the quality of life. Therefore, the evaluation of the nutritional status of COPD patients should be an integral part of their clinical treatment plans aiming towards improving their quality of life.

Conflict of interest

Authors declared no conflict of interest.

Acknowledgements

This research project, coded TYL-2014-5343, was supported by Erciyes University Scientific Research Projects Unit.

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