Effect of Respiratory Functions, Quality of Life, Anxiety and Depression on the Number of Exacerbations in Patients with Chronic Obstructive Pulmonary Disease

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Abstract

Aim: Diagnosis and treatment of comorbidities in chronic obstructive pulmonary disease (COPD) facilitates the control of the disease, and evaluation and improvement of quality of life is an important part of the follow-up of the disease. Therefore, this study aimed to investigate the effects of pulmonary function, quality of life, anxiety and depression on exacerbations in COPD

Methods: Between May 2007 and May 2008, 70 patients with COPD admitted to the pulmonary medicine outpatient clinic were included in the study and followed up for one year in terms of exacerbations. Quality of life questionnaires and anxiety and depression assessment scale were applied at the first interview.

Results: The mean age of the patients was 64.24±10.62 years. The male patients was 88.6% and there was a significant correlation between gender and number of exacerbations (p=0.045). No significant correlation was found between respiratory functions and depression and the number of exacerbations (p=0.368, p=0.134, respectively). There was a moderate positive correlation between exacerbations and anxiety (p<0.001, r=0.468). Patients with lower quality of life questionnaire scores had significantly more frequent exacerbations. The physical (p=0.004) and mental (vitality and mental role limitation) subscales of the Short form-36, the independence (p=0.011) and physical (p=0.031) subscales of the World Health Organization Quality of Life-103, and the symptom (p=0.005), effect (p=0.001) and total (p=0.004) subscales of the St. George's respiratory questionnaire were significantly associated with the number of exacerbations.

Conclusion: Similar to the studies in the literature, this study revealed that male gender, anxiety and poor quality of life are associated with number of exacerbations in COPD, a systemic, irreversible disease characterized by exacerbations. Based on this, better exacerbation control can be achieved by improving the quality of life and treating the accompanying psychological factors with the utilization of quality of life questionnaires and scales assessing psychological status in the follow-up of patients with COPD.

Keywords: Anxiety; Chronic obstructive pulmonary disease; depression; exacerbation; Quality of life

1. Introduction

Chronic obstructive pulmonary disease (COPD) is associated with intermittent exacerbations characterized by acute deterioration in symptoms of chronic breathlessness, cough and sputum production. Hospitalizations for acute exacerbations constitute the most important part of patient care. The presence of depressive symptoms in COPD patients is associated with an increase in severe exacerbations, decreased physical activity, increased dyspnea and impaired quality of life[1-2].

As in all chronic diseases, COPD, in addition to the organ dysfunction it causes, increases concerns about the future due to factors such as continuous medication use and hospital dependency, and leads to hopelessness and anxiety[3]. Anxiety and depression are the most common mental disorders in chronic respiratory system diseases. Numerous studies indicate an increased incidence of depression and anxiety in COPD patients. Although comorbid psychological symptomatology has been reported in 22-48% of people with COPD, most of the literature focuses on identifying risk factors for anxiety or depression separately[3]. Despite such a high prevalence, these two conditions often go unrecognized and untreated.

In chronic diseases, quality of life is further impaired by comorbid depression. The physical symptoms and social isolation caused by chronic disease lead to depressive effect, while depression decreases the ability to fight the disease and makes it difficult to tolerate the disease. Risk factors for COPD exacerbations include poor

quality of life, decreased physical activity, and frequent exacerbations, which may be directly or indirectly related to the effects of patients' mental disorders associated with COPD[1-4]. Rehospitalization for exacerbation is common and occurs in 60% of patients within 1 year following the last exacerbation[4]. In one study, depression and anxiety were associated with a higher risk of recurrence in COPD patients admitted for emergency treatment[5]. Cognitive and behavioral therapy applied to COPD patients has been shown to increase exercise capacity[6]. Quality of life deterioration in COPD is reflected by decreased energy, mobility and sleep, emotional disturbance, anxiety, depression, dissatisfaction with life and somatic preoccupation. Underlying symptoms of anxiety and/or depression are often underreported, underdiagnosed and undertreated. It may predict severe respiratory exacerbations and severity of COPD and asthma leading to impaired quality of life and increased healthcare utilization compared to patients without these symptoms[7]. Our aim was to investigate the impact of respiratory function, quality of life, anxiety and depression on exacerbations in COPD patients.

2. Materials and Methods

Between May 2007 and May 2008, 70 consecutive outpatients with COPD admitted to Trakya University Medical Faculty Chest Diseases Outpatient Clinic and staged according to the Global Initiative for Chronic Obstructive Lung Disease guidelines (postbronchodilator FEV1/FVC ratio <0.70 and GOLD 1 FEV1≥80%, GOLD 2 FEV1 50-79%, GOLD 3 30-49%, GOLD 4: <30%) were included in the study. Patients with pregnancy, active autoimmune disease, or active malignancy were excluded from the study. The study was planned prospectively. According to the number of exacerbations, patients with more than 2 exacerbations were classified as group E, and those with 0 or 1 exacerbation were classified as group A/B (GOLD)[9]. The Effect of Respiratory Functions, Quality of Life, Anxiety and Depression on The Number of Exacerbations in Chronic Obstructive Pulmonary Disease Patients The quality of life questionnaires, St. George's Respiratory Questionnaire (SGRQ), Short-Form36 (SF-36), World Health Organizations Quality Of Life -103 (WHOQOL-103) and Hamilton anxiety (HADS-A) and depression (HADS-D) rating scale were administered to the patients at the first interview. Patients were followed up for one year in terms of the number of exacerbations. At the end of one year, the total number of exacerbations was recorded. As exacerbation criteria, the criteria defined by Anthonisen et al. were used[8]. These were an increase in worsening of dyspnea, sputum volume and purulence. Approval for the study was obtained from the local ethics committee (03.04.2008 date and 07/09 number of). Written informed consent was also obtained from each patient. The principles of the Helsinki Declaration were adhered to throughout the study.

2.1. Statistical analysis

The conformity of the data to normal distribution was analyzed by one sample Kolmogorov Smirnov test. Independent samples t test was used for variables showing normal distribution, Mann Whitney U test and Spearman correlation analysis were used for variables not showing normal distribution in the investigation of differences between the number of exacerbations (0-1, ≥2) and stage (1-2,3-4) groups. Chi-square test was used to investigate the difference of categorical variables between groups. P<0.05 was accepted as the limit of statistical significance. Statistica 7.0 (Serial Number: 31N6YUCV38, Edirne/ Türkiye) package program was used for statistical analysis.

3. Results

The mean age of the patients included in the study was 64.24±10.62 years and 88.6% were male. Of the patients, 6% were non-smokers, 73.1% were former smokers and 20.9% were smokers. The distribution according to stages was as follows; 17.1% patients were in GOLD stage 1, 45.7% patients were in GOLD stage 2, 20% patients were in GOLD stage 3 and 17.1% patients were in GOLD stage 4. 62.9% of the patients had 0-1 exacerbations and 37.1% had ≥2 exacerbations. The mean number of exacerbations was 1.24±1.39. The mean anxiety score was 15.30±6.36 (HADS-A). Depression was not detected in 90% of the patients, mild depression was detected in 7.1% and major depression was detected in 2.9%. The mean depression score was 2.84±3.70 (HADS-D). **Table 1** shows the overall characteristics of the patients included in the study.

Table 1

General characteristics of the patients in the study (n:70)

General characteristics of the patients	n(%)
Age	64.24±10.6
Gender	
Man	62 (88.6)
Women	8 (11.4)
Smoke status	
Nonsmoker	4 (6)
Ex smoker	52 (73.1)
Smoker	14 (20.9)
Stage	
1	12 (17.1)
2	32 (45.7)
3	14 (20)
4	12 (17.1)
Number of Exacerbation	1.24 ±1.39
Anxiety score	15.30±6.36

Table 2

Relationship between the number of Exacerbation and age, gender, marital and educational status

		Number of exacerbation		
		0-1 (n=44) n (%)	≥2 (n=26) n (%)	p
Age		64.50 ±11	63.69±10	0.742
Gender	Woman	2 (4.5)	6 (23.1)	
	Man	42 (95.5)	20 (76.9)	0.045
Marital status	Single	1 (2.3)	0 (0)	
	Married	40 (90.9)	23 (88.5)	0.599
	Divorced	3 (6.8)	3 (11.5)	
Education Status	Illiterate	1 (2.3)	1 (3.8)	
	Primary School	31 (70.5)	18 (69.2)	
	Middle school	4 (9.1)	2 (7.7)	
	High school	4(9.1)	3 (11.5)	0.989
	College	4 (9.1)	2 (7.7)	

Table 3

Distribution of stages according to the number of exacerbation

	Number of exacerbation n (%)		p
	0-1	≥2	
1	7 (15.9)	5 (19.2)	
2	21 (47.7)	11 (42.3)	0.923
3	8 (18.2)	6 (23.1)	
4	8 (18.2)	4 (15.4)	

Eight (11.4%) of the patients were female. Of the female patients, 25% had 0-1 exacerbation and 75% had ≥2 exacerbations. Among male patients, 67.7% had 0-1 exacerbations and 32.3% had ≥2 exacerbations. There was a significant difference between patients with 0-1 and ≥2 exacerbations in terms of gender distribution (p=0.045). **Table 2** shows the demographic characteristics of the patients included in the study according to the number of exacerbations.

The distribution of the patients according to stages was as follows; 17% were in stage 1, 45.7% in stage 2, 20% in stage 3 and 17.1% in stage 4. There was no significant difference between the stages according to the number of exacerbations (p=0.923). There was also no significant difference between the number of 0-1 exacerbations and ≥2 exacerbations in patients grouped as stage 1-2 and stage 3-4 (p=0.861). **Table 3** shows the distribution of patients staged according to GOLD according to the number of exacerbations.

Quality of life of the patients included in the study was measured with general and disease-specific tests. Between patients with 0-1 and ≥2 exacerbations, the physical of the SF-36 was measured as physical impact (p=0.009), physical role limitation(p=0.010), general health (p=0.002) and the mental health was measured as vitality (p=0.020), mental role limitation (p=0.018). 018), physical health (p=0.031) and independence (p=0.011) of WHOQOL 103, symptom (p=0.005), impact (p=0.001) and total score (p=0.004) of SGRQ (**Table 4**).

Figure 1

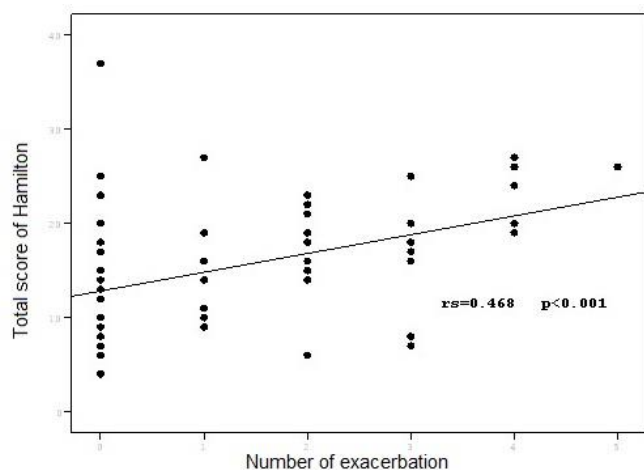Correlation between anxiety score and number of exacerbation

Table 4

Distribution of the number of exacerbation and quality of life questionnaire scores

		Number of exacerbation			
		0-1	≥2	p	
SF-36(PHA)	Physical function	63.64±32.82	40.58±33.20	0.009	0.004
	Physical role limitation	60.80±46.81	29.81±43.02	0.010	
	Pain	77.75±17.59	72.15±18.65	0.154	
	General health	61.02±19.27	45.19±22.24	0.002	
SF-36(MHA)	Social function	67.61±24.90	61.54±23.69	0.384	0.093
	Mental role limitation	68.94 ±44.54	42.31±47.66	0.018	
	Sanity	66.27±22.03	58.15±21.50	0.112	
	Energy	62.73±20.35	50.19±21.23	0.020	
WHOQOL-103	Physical health	69.50±16.40	59.69±18.25	0.031	
	Psychological health	72.30±13.51	69.37±16.74	0.515	
	Level of independence	71.16±17.85	57.63±21.19	0.011	
	Social area	63.78±13.76	60.50±15.54	0.480	
	Environment	71.92±12.744	65.44±16.73	0.127	
	Personal beliefs	74±19.80	71.63±21.88	0.676	
	Social pressure	83.77±19.88	76.03±24.58	0.165	
SGRQ	Symptom	46.84±21.55	61.80±17.33	0.005	
	Activity	51.24±33.94	65.42±27.89	0.092	
	İmpact	25.28±22.23	45.36±22.53	0.001	
	Total	36.83±22.85	54.21±20.08	0.004	

SF-36: Short Form-36, PHA: Physical Health Area, MHA: Mental Health Area WHOQOL-103: World Health Organization Quality Of Life-103, SGRQ: St George's Respiratory Questionnaire.

Depression was absent in 90% of the patients. There was no statistically significant relationship between those with 0-1 exacerbations and those with ≥2 exacerbations in terms of depression (p=0.134) (**Table 5**).

Table 6 shows the Hamilton anxiety score according to the number of exacerbations. Hamilton anxiety total score (HADS-T) was 13.48±6.18 in patients with 0-1 exacerbations and 18.38±5.52 in patients with ≥2 exacerbations. There was a statistically significant difference between patients with 0-1 exacerbations and patients with

≥2 exacerbations in the anxiety score (p<0.001) and total score (p<0.001).

While a moderate positive correlation was found between the number of exacerbations and anxiety score (r=0.468; p<0.001), no significant correlation was found between depression scores (r=0.054; p=0.655) (**Figure 1**).

The mean FEV1 was 1.62 L in patients with 0-1 exacerbations and 1.48 L in patients with ≥2 exacerbations. No statistically significant relationship was found between the number of exacerbations and pulmonary function (p=0.368).

Table 5

Distribution of depression according to the number of exacerbation

	Number of exacerbation n (%)		p
	0-1	≥2	
None	40 (90.9)	23 (88.5)	
Mild	4 (9.1)	1 (3.8)	0.134
Major	0 (0)	2 (7.7)	

Table 6

Distribution of anxiety scores according to the number of exacerbation

	Number of exacerbation		p
	0-1	≥2	
Psychic	3.91±2.47	5.12±2.79	0.086
Somatic	9.57±4.41	13.15±3.80	0.000
Total	13.48±6.189	18.38±5.52	0.000

4. Discussion

In our study of 70 patients with COPD, we found a significant relationship between the number of exacerbations and low quality of life, male gender and anxiety. Patients with low quality of life scores and functional performance were found to have high number of exacerbations. Poor quality of life was found in the physical and mental subgroups of SF-36, WHOQOL-103 subgroups, symptom and impact subgroups of SGRQ and total score.

The prevalence of depression in COPD patients was 10%. There was no statistically significant relationship between the number of exacerbations and the presence of depression.

There was a moderate positive correlation between anxiety scores and number of exacerbations. It was observed that the disease was prevalent among males and increased with age. The gender difference is explained by the fact that males smoke more and more exposed to toxic substances due to their occupation. It is thought that this difference will disappear in the near future with the gradual increase in smoking habit in females[9]. In our study, in accordance with the literature, the majority of our COPD patients were male and older age.

In a study reported that SF-36 is a valid questionnaire to assess quality of life in COPD patients and its physical components are an indicator of exacerbation and mortality. In our study, general and disease-specific quality of life questionnaires were used[10]. Quality of life scores of patients with 0-1 exacerbation were compared with those with more than two exacerbations. A statistically significant difference was found in the physical health of SF-36 in the physical impact, physical role limitation, and general health groups; in the vitality and mental role limitation groups in the mental health domain. Additionally, a statistically significant difference was found in the physical health and independence level domains of WHOQOL 103; and in the symptom, impact and total scores of SGRQ (p<0.05). (**Table 5**). In a 416-patient study on hospital readmission due to exacerbation in COPD patients, some of the risk factors for exacerbation were decreased respiratory function, age, poor quality of life, and decreased physical activity. In the same study, patients readmitted to hospital (due to exacerbation) were found to have high SGRQ scores and low quality of life. This study showed that health status is an important risk factor for readmission[11].

A study found that impaired health status and high SGRQ scores were significant risk factors for hospital readmission in the next 12 months[12]. The EFRAM (Estudi del Factors de Risc d' Aguditzacio de la MPOC) study in Spain showed that high levels of physical activity reduced the risk of hospital readmission. Again, found that those who had the lowest score in the health status, sensory skills, scale of SF-36 used in the EFRAM study were at a higher risk of exacerbation[4]. Most of the mortality and morbidity in COPD can be attributed to exacerbations. Mortality due to exacerbations is gradually increasing[13]. It is thought that poor quality of life may reduce current life expectancy in COPD patients[14]. This shows the important relationship between exacerbations, mortality and quality of life. In a study of 321 stable COPD patients shown that SGRQ total score and SF-36 physical function score were associated with disease-specific and overall mortality in COPD patients[15]. In our study, as seen in many studies reported above, patients with low quality of life scores and functional performance were found to have frequent exacerbations.

Psychological conditions (anxiety and depression) accompanying morbidity in COPD are quite common and often associated with increased disability. These conditions also reduce quality of life and are often not investigated in the clinical management of COPD patients. Although different methods have been used in various studies, depression has been reported between 7-42% in COPD patients[16]. They found depressive disorder in 25% of COPD patients and anxiety in 44.4%. It is thought that shortness of breath, activity limitation and recurrent exacerbations in COPD lead to anxiety[17]. In a study conducted in 2005, significantly increased admission was found in the presence of anxiety in patients and no relationship was found between depression and admission due to an exacerbations. In the same study, a significant relationship was found between anxiety, depression and health status, and high SGRQ scores (low quality of life) were found in patients presenting with an exacerbations[18]. A study found that anxiety and depression were associated with a higher risk of relapse in asthma and COPD patients admitted for emergency treatment5. The EFRAM study found that patients with low health status were more likely to be admitted for an exacerbations[4]. One study found that patients with both chronic disease and depression had more functional impairment than patients with depression and chronic disease alone, and therefore these patients needed more primary care and emergency care[19-20]. In another study conducted to determine the level of anxiety in COPD patients, the anxiety score was found to be higher in the group with severe COPD, but the difference was not statistically significant[21].

In our study, we found a moderate positive correlation between anxiety scores and the number of exacerbations, which was similar to the literature. We found depression in 10% of our patients, but we did not find a statistically significant difference between the level of depression and the number of exacerbations. This may be due to

the wide range of demographic characteristics of the patients, the inclusion of patients from all stages in the study, and the patients' perception of depressive complaints as a part of their disease.

4.1. Limitations

The fact that the study was conducted between 2007 and 2008 is a limitation. This is because GOLD updates its guidelines annually. Additionally, the unequal distribution of male and female patients could influence the prevalence of anxiety and depression, which may pose another limitation for this study.

5. Conclusion

In our study, a significant correlation was found between the number of exacerbations and poor quality of life, male gender and anxiety. Based on this, we believe that the factors that constitute quality of life should be taken into consideration when determining the severity of the disease and evaluating treatment interventions and that the use of quality of life questionnaires in outpatient clinics would be appropriate. In addition to medical treatment, psychological and social assistance should be provided to improve quality of life and rehabilitation programs should be emphasized. Psychological problems accompanying the disease in COPD affect quality of life, patient compliance, treatment duration and costs, mortality and morbidity. Therefore, evaluating patients psychologically and treating appropriate patients will make it easier to control COPD. COPD should be considered as a chronic systemic disease and should be analyzed in all aspects. Future studies that utilize multi-center designs and incorporate various anxiety and depression scales, in accordance with the current GOLD criteria, could contribute significantly to the literature.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request. Thesis Number: 230357, https://tez.yok.gov.tr/ https://tez.yok.gov.tr/UlusalTezMerkezi/TezGoster?key=UPP_Zu9 isEmWGFXFCBYasdZ3Av56qA9ZbZjHy1aVXBzTWP-Nr-wlfbrtN-aOcquf

Conflict of Interest

The authors declare that they have no conflict of interest.

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Ethics Approval

All methods were carried out in accordance with relevant guidelines and regulations. This study was performed in line with the principles of the Declaration of Helsinki. Ethics approval was obtained by the Trakya University ethics committee (03.04.2008 date and 07/09).

Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Author Contributions

All the authors contributed to the study's conception and design. All the authors commented on previous versions of the manuscript. All the authors read and approved the final manuscript.

Artificial Intelligence statement

No artificial intelligence was used for the writing of the submitted work.

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