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Emotional Impact of Long Term Chronic Obstructive Pulmonary Disease

Talha Saad[1] Jyoti Tiwari[2] Wahid Khan[3] Jamal Akhtar[4] Rahul M Deo[5]
[1] *Dept of Tuberculosis and Chest Diseases, Bundelkhand Government Medical College Sagar, MP,*
[2] *Dept of General Medicine, Bundelkhand Government Medical College Sagar, MP,*
[3]*Dept of Internal Medicine,Royal Court AffairsHospital,Muscat ,Oman*
[4]*Dept of Tuberculosis and Respiratory Diseases,Aligarh Muslim University,Aligarh*
[5]*Dept of Psychiatry , Bundelkhand Government Medical College Sagar, MP,*

Abstract:
Background: *Although it has been repeatedly suggested from western studies that chronic obstructive pulmonary disease (COPD) is associated with lot of emotional impact. A study was undertaken to investigate whether depression occurs more often in patients with COPD than in controls. The demographic and clinical variables associated with depression were also determined.*
Methods*: Patients with a registered diagnosis of obstructive airway disease in general practice, aged ≥40 years, forced expiratory volume in 1 second (FEV_1) <80% predicted, FEV_1reversibility ≤12%, FEV_1/VC ≤ predicted – 1.64 × SD, and a history of smoking were selected. A random sample of subjects without a registered diagnosis of asthma or COPD aged 40 years or older acted as controls. Depression was assessed using the Centers for Epidemiologic Studies Depression (CES-D) scale.*
Results*: In patients with severe COPD (FEV_1 <50% predicted), the prevalence of depression was 25.0% compared with 17.5% in controls and 19.6% in patients with mild to moderate COPD. When the results were adjusted for demographic variables and comorbidity, the risk for depression was 2.5 times greater for patients with severe COPD than for controls (OR 2.5, 95% CI 1.2 to 5.4). In patients with mild to moderate COPD this increased risk of depression was not seen. Living alone, reversibility of FEV_1 % predicted, respiratory symptoms and physical impairment were significantly associated with the scores on the CES-D scale.*
Conclusion*: Patients with severe COPD are at increased risk of developing depression. The results of this study underscore the importance of reducing symptoms and improving physical functioning in patients with COPD.*

I. Introduction

COPD, defined as not fully reversible air-flow obstruction [1] is now the fourth leading cause of death in the world[2]. Among the many aspects of COPD, depression is a serious concern, because it is generally associated with longer hospitalization, poor survival rate, and impaired physical and social functioning[3].Patients with depression also characteristically make fewer attempts to improve their health[4,5] . Therefore, examining symptoms of depression is an important part of comprehensive COPD treatment.

Anxiety is defined by a feeling of indefinable insecurity, which characterizes the psychological component of anxiety disorders. Depression, which comes from the Latin *depressio* meaning "press down", denotes an illness for some or a syndrome for others, whose central manifestation is a mental state characterized by marked lassitude, reduced self-esteem and pessimism. These disorders are common in COPD, anxiety and dyspnoea are closely linked, and depression is more frequent in COPD than in other chronic diseases.
One study suggested that the first hospitalization for COPD occurs sooner in patients with concomitant anxiety and/or depression. One hypothesis is that dyspnoea might be perceived more intensely and earlier in these patients[6].

Similarly, proven airway obstruction is associated with a higher frequency of generalised anxiety disorder or panic disorder[7].Depression affects between 20% and 60% of COPD patients depending on the study, COPD stage and the scale used[8]. The mortality and readmission rate among anxious and/or depressive COPD patients increases during the 30 days following hospitalisation [9]. The presence of depression has prognostic value, as shown in a study in COPD patients hospitalised for exacerbation[10]. Mortality following a COPD exacerbation was greater among the depressive patients.

The present study uses a large number of patients and a control group to investigate whether depression occurs more often in patients with mild to moderate COPD and those with severe COPD than in controls, and the aspects of COPD particularly related to depression.

The study was approved by the medical ethics committee of the Bundelkhand Government Medical College ,Sagar,Madhya Pardesh.

II. Method

All patients who visited the Bundelkhand Government Medical college and Hospital from January 2010 to March 2013 for treatment of COPD were considered as possible study subjects. First we screened patients by reviewing their charts and then evaluated them for the inclusion criteria. Patients who satisfied the criteria and agreed to participate were then surveyed.

Study Population

The inclusion criteria were:

- COPD diagnosis as defined by the Global Initiative for Chronic Obstructive Lung Disease (GOLD)1 (spirometry was newly performed at this time)
- Stable medical condition, without exacerbation or infection in the preceding 2 weeks
- No orthopedic problem interfering with the 6-min walk test
- $S_{pO2} \geq 90\%$ on ambient air
- Able to safely complete the 6-min walk test
- Not currently taking an antidepressant (the degree of depression may be affected by antidepressant; depressed patients not taking antidepressants were not excluded)
- Absence of severe disease such as active malignancy or human immunodeficiency virus, which may influence the degree of depression.

All eligible subjects (n=1106) who were willing to participate underwent a lung function test to confirm a diagnosis of COPD and filled in a questionnaire between January 2011 and March 2013 (n=659, response 60%). Patients who met the criteria for COPD were included (n=162). Lung function data and questionnaire data were obtained on the same day.

Selection Of Control

A random sample of 676 subjects was taken from 13 general practices who were not diagnosed by the GP as having asthma or COPD and who were aged 40 years or older.All those controls were excluded persons with poor cognitive functioning (n=26) or with an end stage disease

(n=8). All eligible controls (n=642) who were willing to participate filled in a questionnaire between January 2011 and March 2013 (n=445, response 69%). In addition, all controls with missing data on more than half of the items of the measure for depression were excluded (n=62) as well as controls with self-reported obstructive pulmonary disease (n=24).

Measurement of depression

The Centers for Epidemiologic Studies Depression (CES-D) scale was used to assess the presence of depressive symptoms. Those with a score of 16 or higher on the CES-D were considered possible cases for depression. The CES-D is validated and widely used in epidemiological studies as an indicator for clinical depression in populations[11].In case less than half of the items on the CES-D were incomplete, missing data were replaced by the mean scores of the valid data of each participant.

To determine the presence of comorbid diseases, all participants were asked to complete a questionnaire on chronic diseases.The following diseases were listed: locomotive diseases (rheumatoid arthritis, arthrosis, slipped disc, disorder of the back for >3 months), hypertension, serious heart diseases or myocardial infarction, sinusitis, migraine, dizziness with falling, ulcer stomach/duodenum, cancer, atherosclerosis, thyroid diseases, diabetes, serious intestinal diseases for >3 months, serious skin diseases, gall bladder diseases, stroke, chronic cystitis, kidney stones, thrombosis, epilepsy, liver diseases, and renal diseases.

In addition, information on the following variables was obtained by questionnaire: sex, age, highest form of education received (low level: primary school, lower vocational training, school for lower general secondary education; high level: pre-university education, high vocational training or university).

Symptoms and physical functioning were assessed using the symptoms and activity components of the St George's Respiratory Questionnaire (SGRQ)[12].The symptoms component is concerned with the frequency and severity of respiratory symptoms, and the activity component is concerned with activities that are limited by breathlessness.

Analysis of data

The prevalence of depression was determined by calculating the percentage of patients and controls with a score of 16 or higher on the CES-D. To determine whether the prevalence of depression was higher in patients than in controls, logistic regression analyses were performed in which the results were adjusted for demographic variables and comorbidity. In this model the dependent variable was the score on the CES-D (16 or higher/lower than 16) and the independent variable was the research group (patient/control). Age, sex,

education, type of insurance, living conditions, and comorbidity were included as covariates. All analyses were carried out using SPSS 8.0.2 for Windows.

III. Results

General characteristics

A total of 162 patients with COPD and 359 controls were included in the study. Their characteristics are shown in table 1. Sixty of the patients had an FEV_1 <50% of the predicted value (37.0%) and thus suffered from severe airway obstruction; 102 patients had an FEV_1 50–80% of the predicted value (63.0%). In both patient groups the majority were men (73.3%,

70.6%), had a low level of education (88.1%, 85.0%), and had other chronic diseases (65.5%, 71.0%). Fewer of the controls were men (40.4%), had a low level of education (80.1%), or had chronic diseases (57.0%). The mean age of controls (65.6 years) was comparable to that of patients (67.8, 66.2 years).

Table 1: General characteristics of patients and controls

	COPD patients (FEV_1<50%) (n=60)	**COPD patients ($FEV_1$50–80%) (n=102)**	**Controls (n=359)**
Male sex	44 (73.3%)	72 (70.6%)	145 (40.4%)
Low education	52 (88.1%)	85 (85.0%)	274 (80.1%)
Living alone	10 (16.7%)	30 (29.4%)	92 (25.8%)
Comorbidity	36 (65.5%)	66 (71.0%)	179 (57.0%)
Mean (SD) age (years)	67.8 (8.7)	66.2 (10.3)	65.6 (12.8)
Mean (SD) reversibility FEV_1 (%)	4.2 (4.1)	5.6 (3.9)	–

Prevalence of depression

In table 2 the results are presented on the prevalence of depression in patients with COPD and in controls. In the COPD patients as a whole, 21.6% had a score of 16 or more on the CES-D scale compared with 25.0% of patients with severe COPD (FEV_1 <50%), 19.6% of those with mild to moderate COPD (FEV_1 50–80%), and 17.5% of the controls. As demographic variables and comorbidity were thought to be important prognostic variables which could confound the differences in the prevalence of depression between patients and controls, the results were adjusted for these variables. In the multivariate analysis there appeared to be no risk for depression in the total group of COPD patients (OR 1.5, 95% CI 0.8 to 2.6) or in the subgroup of patients with mild to moderate COPD (OR 1.1, 95% CI 0.5 to 2.1), but patients with severe COPD had a 2.5 times greater risk for depression than controls (OR 2.5, 95% CI 1.2 to 5.4).

Table 2: Prevalence of depression in patients with COPD compared with controls

	n	**CES-D ≥16**	**Adjusted OR (95% CI)**
CES-D=Centers for Epidemiologic Studies Depression scale.			
Univariate results and results adjusted for sex, age, education, health insurance, living situation, and comorbidity (logistic regression analysis).			
COPD (whole group)	162	35 (21.6%)	1.5 (0.8 to 2.6)
Severe COPD (FEV_1 <50% predicted)	60	15 (25.0%)	2.5 (1.2 to 5.4)
Mild to moderate COPD (FEV_1 50–80% predicted)	102	20 (19.6%)	1.1 (0.5 to 2.1)
Controls	359	63 (17.5%)	1.0

Determinants of depression

The prevalence of depression was also calculated in several subgroups of COPD patients (table 3). In these subgroups the prevalence of depression ranged from 15.2% (absence of comorbidity) to 50.0% (severe impaired physical functioning). Depression also occurred often in patients with a reversibility in FEV_1 of ≤1.1% (44.8%), in patients with a score on the symptoms dimension of the SGRQ of ≤71.98 (39.4%), and in patients who lived alone (37.5%).

Table 3: Relationship between demographic and disease-related variables and depression (CES-D) in patients with COPD (n=162): prevalence in subgroups and logistic regression analysis

	n	CES-D ≥16	Crude OR (95% CI)	Adjusted OR† (95% CI)
*p<0.01 (χ^2 test).				
†Adjusted for all other variables.				
‡Score = 71.98 on symptoms dimension SGRQ (mean + 1 SD).				
§Score = 68.69 on activities dimension SGRQ (mean + 1 SD).				
≥65 years	99	17 (17.2%)	0.5 (0.2 to 1.1)	0.7 (0.2 to 1.9)
<65 years	63	18 (28.6%)	1.0	1.0
Men	116	21 (18.1%)	0.5 (0.2 to 1.1)	0.8 (0.3 to 2.2)
Women	46	14 (30.4%)	1.0	1.0
Low education	137	29 (21.2%)	0.9 (0.3 to 2.7)	0.8 (0.2 to 3.0)
High education	22	5 (22.7%)	1.0	1.0
Living alone	40	15 (37.5%)*	3.1 (1.4 to 6.8)	2.8 (1.0 to 7.8)
Living with others	122	20 (16.4%)	1.0	1.0
Presence comorbidity	102	25 (24.5%)	1.8 (0.7 to 4.5)	2.4 (0.7 to 8.1)
Absence comorbidity	46	7 (15.2%)	1.0	1.0
FEV_1 <50% predicted	60	15 (25.0%)	1.4 (0.6 to 2.9)	0.8 (0.3 to 2.5)
FEV_1 ≥50% predicted	102	20 (19.6%)	1.0	1.0
Reversibility ≤1.1%	29	13 (44.8%)*	4.1 (1.7 to 9.7)	3.7 (1.3 to 11.0)
Reversibility 1.1–12%	133	22 (16.5%)	1.0	1.0
Severe symptoms‡	33	13 (39.4%)*	3.2 (1.4 to 7.3)	2.8 (0.9 to 8.6)
Mild to moderate symptoms	129	22 (17.1%)	1.0	1.0
Severe impaired physical function§	20	10 (50.0%)*	4.7 (1.8 to 12.4)	5.6 (1.6 to 19.9)
Mild to moderate impaired physical function	142	25 (17.6%)	1.0	1.0

IV. Discussion

In this study we found that the prevalence of depression in COPD patients with severe airways obstruction (FEV_1 <50%) was 25% and that they had a 2.5 times greater risk of depression than controls who were comparable for demographic variables and the presence of comorbidity. In patients with mild to moderate COPD no increased risk for depression was seen. We also found that living alone, reversibility in FEV_1 % predicted, respiratory symptoms, and physical impairment were related to depression in patients with COPD, whereas age, sex, insurance type, education, FEV_1, and comorbidity were not.

The first was conducted by Light evaluating the association between physical factors and depression in 1985[13].Until 2007, most studies denied an association between depression and physical measurements of COPD. In contrast, most studies since 2008 have affirmed a positive association between depression and physical measurements of COPD. That lack of concordance might be owing to the wide variation in nationality, measurement tools, study design, and diagnostic criteria[14].The homogenous severity of COPD makes it especially difficult to detect a relationship. For example, most studies found a significant relationship between

dyspnea and depression; however, some studies conducted with subjects who had relatively mild obstruction did not find an association[15].

The associations between depression and some physical parameters are indisputable, but the interpretation is difficult. The simplest explanation is that depression is caused by COPD symptoms or limited quality of life. Another explanation is that depression makes physical signs and symptoms worse. The following evidence supports this hypothesis: subjective sensation of dyspnea increased with depression, even with normal lung function[16], and 6MWD depends on both physical and psychological factors[17,18]. The other explanation is that systemic inflammation lowers both physical and mental status. There is a recent accumulation of evidence that somatic factors such as inflammation cytokines are also related to depression in COPD patients[19,20]. Further research is expected to clarify the interaction between physical factors and depression.

The CES-D scale which we used as a measure for depression is not designed to determine the presence of clinical depression, but rather the presence of depressive symptoms [21] .Patients with a score of [16] or higher are considered possible cases. The percentage of patients with actual clinical depression may thus have been lower than was found in this study. . Furthermore, an overestimation of actual cases of depression does not influence the estimated risk of depression in patients with COPD as overestimation will be the same in patients and in controls.

In previous studies the prevalence of depression in patients with COPD ranged from 6% to 46%[22-26 ,27-30] This variation in prevalence can be partly attributed to the use of different measures for depression. In the one study that also used the CES-D scale, a prevalence of depression of 29% was found[27]. The reason why depression occurred more often in this study than in our study may be that it included patients with more severe airways obstruction who were eligible for a rehabilitation programme. As disease and demographic characteristics of the patient population included in the study also influence the extent to which depression occurs, the prevalence of depression in patients with COPD does not exist. It is therefore difficult to compare prevalence rates from studies that included different populations.

Since previous studies suffered from several methodological problems such as small sample sizes and the absence of proper control groups, it remained inconclusive whether patients with COPD were more at risk than controls for the development of depression[26].Furthermore, many studies only included patients with a restricted range of pulmonary function. The results of these studies are only valid for specific patients—for example, those receiving oxygen therapy[2]or with an exacerbation30. Another reason for conflicting results between studies is that, in several studies, patients and controls were not comparable with respect to important prognostic factors. In some studies patients and control subjects were only matched on age and sex [24-26] while other studies also matched on education and social class[31]. Furthermore, in some studies patients with comorbidity were exclude[25,25,28,30] while in others these patients were included [32].

Our study did not suffer from these methodological problems as we were able to include a large sample of COPD patients with a broad range of severity of disease and a large number of controls. Furthermore, as we adjusted our results for the presence of chronic disease, it became clear that comorbidity, which frequently occurs in patients with COPD, is not responsible for the increased risk of depression in these patients.

Limitations

This study had some limitations.

- More than 90% of COPD patients in our study have emphysema. In Western countries, emphysema type is less common.
- The majority of subjects were male.
- There were several confounders, such as socio-economic status.

V. Conclusion

In conclusion, depressive symptoms are common in patients with COPD and those with severe COPD have a 2.5 times greater risk of developing depression than controls. As depression is a disorder which remains easily undiagnosed due to underrepresentation and because the symptoms are not very specific, it is important to consider this disorder in patients with COPD.

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