Research Article

Factors associated with anxiety and depression in chronic obstructive pulmonary disease

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ABSTRACT

Background: COPD is a progressive condition with significant co morbidities and extra pulmonary manifestations. It is well known that anxiety and depression are the major psychiatric comorbidities associated with COPD. However, little is known about the factors associated with these conditions.

Methods: A cross sectional observational study was performed, including 320 patients who satisfied the inclusion criteria. They were interviewed as part of the study. Anxiety and depression were screened using hospital anxiety depression rating scale (HADS). All patients were subjected for clinical examination, pulmonary function tests and routine blood examination.

Results: We found that 59.4% of COPD patients had either anxiety or depression as co morbidity and 32.2% had both the psychiatric symptoms. 166 patients (51.9%) had anxiety and 127 patients (39.7%) had depression. The factors associated with anxiety and depression in COPD patients were hospitalization (in-patients), duration of disease, number of hospitalizations in the previous year, hypertension, MMRC grade, BMI, oxygen saturation, six minute walk distance, FEV1, FVC and BODE score. Linear regression analysis showed that the number of hospital admissions in the previous year was the most significant factor associated with both anxiety (p=0.008) and depression (p=0.020).

Conclusions: The number of hospital admissions in the previous year was the most significant factor associated with anxiety and depression in COPD.

Keywords: COPD, Anxiety and depression, HADS, Forced expiratory volume (1st second), Hospital admissions

INTRODUCTION

Global initiative for chronic obstructive lung disease (GOLD) defined chronic obstructive pulmonary disease (COPD) as "a common preventable and treatable disease, characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. Exacerbations and comorbidities contribute to the overall severity in individual patients."[1] The burden of COPD is likely to increase in coming decades because of continued exposure to COPD risk factors. The major risk factors include cigarette smoke, occupational dusts and chemicals, environmental tobacco smoke, indoor and outdoor air pollution, respiratory infections and the ageing.[1]

Though anxiety and depression are significant co-morbid conditions in chronic illnesses, little is known about the prevalence or risk factors for anxiety or depressive

symptoms in patients with chronic obstructive pulmonary disease in India.[2] The prevalence rates of anxiety and depression in COPD patients in India showed a wide variation and there is little data available about the factors which contribute significantly for the development of anxiety and depression in this chronic respiratory disease.[3,4]

Despite their impact on the morbidity associated with COPD, these psychological consequences are rarely addressed.[5] Majority of the cases go undiagnosed either due to lack of awareness among treating physicians or due to overlapping of symptoms. Untreated anxiety and depressive symptoms may increase physical disability, morbidity, and pressure on health care facilities.[6] Depression can lead to non-adherence and reduced efforts to follow medical advice, which will further accelerate the disease progression. Hence it is important to identify those who have clinically significant anxiety or depressive symptoms.

METHODS

Study design

This was a cross-sectional observational study conducted at the Department of Pulmonary Medicine, Government Medical College Hospital in Thrissur, South India. The institutional research committee of the hospital approved this study. We identified patients with COPD who met the GOLD criteria for diagnosis (presence of a post-bronchodilator FEV1/FVC <0.70). Subjects who could not comprehend the questionnaire were excluded. The investigator explained the aims of the study, the procedures involved and time required for participation. Those who had given informed consent were recruited as subjects for the study. They were interviewed as part of the study. Study proforma was designed to elicit socio demographic details like gender, marital status, occupation, medical comorbidity, socio economic status, educational status, as well as the other possible risk factors for anxiety and depression, and to record general examination findings including oxygen saturation, haemoglobin concentration, six minute walk distance, spirometry values and hospital anxiety depression rating scale scores (HADS). Socio-personal and other details were ascertained and recorded in the study proforma. The socioeconomic status was assessed using Kuppuswamy's socio-economic scale. Anxiety and depression were screened using hospital anxiety depression rating scale.[7] All patients were subjected for clinical examination, pulmonary function tests and routine blood examination.

Diagnosis of COPD

Spirometry was used to make the diagnosis; the presence of a post-bronchodilator forced expiratory volume in first second to forced vital capacity (FEV1/FVC) <0.70 confirmed the presence of COPD.[1]

Diagnosis of anxiety and depression

The hospital anxiety and depression scale (HADS) is a widely used screening tool to assess symptoms of depression and anxiety. It is not an instrument to diagnose mood disorders but a reliable and valid tool to assess the severity of symptoms of mood disorders.[8] The HADS measures depression and generalised anxiety in both inpatients and outpatients and in community settings. It contains 14 statements describing symptoms of depression and anxiety. Response options for each question range from 0 to 3 and ask patients about their agreement with the statements or how often they apply. There are seven statements for each depression and anxiety. Domain scores range from 0 (no depression or anxiety) to 21 and following the standard convention scores 8 indicate a probable clinical diagnosis of depression or anxiety.

Analysis of data

The obtained data was entered into the excel worksheet and analysis was done using SPSS software version 16. The patients were classified into four stages as per GOLD classification of severity of airflow limitation in COPD.[1] Their BODE index (body mass index [BMI], obstructive ventilatory defect severity, dyspnea severity, and exercise capacity) and the prevalence of anxiety and depression were calculated.[9] The relationship of various factors with anxiety and depression was analysed using chi-square test and independent samples t-test. Linear regression was done to find out the most significant associated factor to anxiety and depression.

RESULTS

320 patients were included in the study. Out of these, 290 patients (90.62%) were males and 30 patients (9.38%) were females. Of the 320 patients, 14 (4.4%) were in GOLD disease stage 1, 76 (23.7%) in stage 2, 127 (39.7%) in stage 3 and 103 (32.2%) in stage 4. Out of 320 patients, 221 patients (69.06%) were inpatients and 99 patients (30.94%) were outpatients. The mean age of the study population was 64.18±9.49 years (mean±SD). The socioeconomic status of the study population was calculated as per Kuppuswamy's scale. 213 patients (66.6%) were in lower socio-economic class (class 5), 97 patients (30.3%) in upper lower class (class 4), 9 patients (2.8%) in lower middle class (class 3) and 1 patient in upper middle class (class 2). None of the patients were in upper class (class 1).

278 patients (86.9%) had history of smoking. 103 patients (32.2%) were current smokers, 175 patients (54.7%) were ex-smokers and 42 patients (13.1%) were non-smokers. The mean smoking index was 762.48±665.62. The mean smoking index in GOLD stage 1 was 813.3±551, GOLD stage 2 was 753.2±690.8, GOLD stage 3 was 722.9±645.5 and GOLD stage 4 was 811.2±690.49. 218 patients (68.1%) had history of alcoholism.

The mean duration of illness was 7.15±6.32 years (mean±SD). In the GOLD stage 1, it was 4.0±4.52 years, stage 2 with 6.61±7.6 years, stage 3 with 7.23±6.6 years and stage 4 with 7.89±4.8 years. 154 patients (48.1%) had a history of prior hospitalization at least once in the previous year. 167 patients (52.2%) had history of inhaled corticosteroid (ICS) use, either as dry powder inhaler (DPI) or metered dose inhaler (MDI). The patients who could afford the treatment cost especially inhaler medications were 233 (72.8%). Only 188 patients (58.8%) had compliance to the treatment. The caretaker in 227 patients (70.9%) were spouses, children in 82 patients (25.6%), relatives in 4 patients (1.2%) and others in 7 patients (2.2%).

61 patients (19.1%) had history of diabetes mellitus, 69 patients (21.6%) had hypertension, 37 patients (11.6%) had cardiac disease, 64 patients (20%) had history of tuberculosis and, musculoskeletal diseases and psychiatric disorders in 4 patients each (1.2%). 5 patients had history of cerebrovascular accidents (1.6%) and other diseases history in 62 patients (19.4%). None of the patients reported any major life incidents (MLI) in the previous year.

95.6% patients presented with complaints of dyspnea. The other symptoms presented were cough (73.1%), sputum production (40%), wheezing (15.3%), chest tightness (14.4%), fever (34.1%), fatigue (35.3%), anorexia (14.4%), weight loss (10%) and other symptoms in 8.4% of patients. Dyspnea was measured using modified medical research council grading (MMRC). 70 patients (21.9%) were in MMRC grade 1, 119 patients (37.2%) in MMRC grade 2, 89 patients (27.8%) in MMRC grade 3 and 42 patients (13.1%) in MMRC grade 4. The mean body mass index (BMI) of the study population was 18.12 ± 3.43 kg/m^2. The mean BMI of patients in GOLD 4 stage was below 18 (17.004±3.36) whereas the rest had above 18.

The mean oxygen saturation of patients in GOLD stage 1 was 95.5±2.58%. In GOLD stage 2, it was 95.53±2.45% and 93.82±4.28% in GOLD stage 3. Patients in GOLD stage 4 had a mean saturation of 90.67±5.43%. The mean oxygen saturation of the study population was 92.98±7.05%. The mean six minute walk distance (6MWD) of the study population was 213.53±119.42 metres (m). The mean 6MWD in patients with GOLD stage 1 disease was 265.71±101.75 m, in GOLD stage 2 it was 256.25±119.33 m, and 226.46±117.91 m in GOLD stage 3, where as those in GOLD stage 4 was 158.99±103.42 m. The mean haemoglobin concentration was 10.09±5.79 gm%.

Of the 320 patients, 166 patients (51.9%) had anxiety (Figure 1) and 127 patients (39.7%) had depression (Figure 2). These patients had a HADS score of 8 or more than 8. The number of patients who had either anxiety or depression was 190 (59.4%). 103 patients (32.2%) had both anxiety and depression using HADS scale.

98 patients (30.6%) of study population had a BODE score less than 4. In this group, 24 patients had anxiety and 17 patients had depression. 84 patients (26.3%) had a BODE score of 5 and 6, in which 39 patients had anxiety and 22 patients had depression. In the 138 patients (43.1%) who had a BODE score of 7 or more than 7, 103 patients had anxiety and 88 patients had depression.
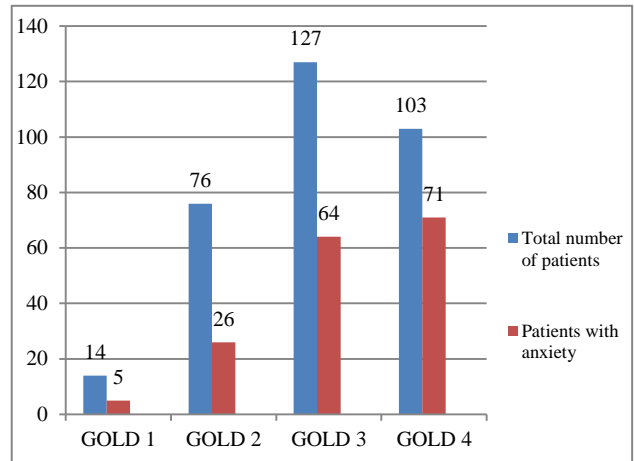

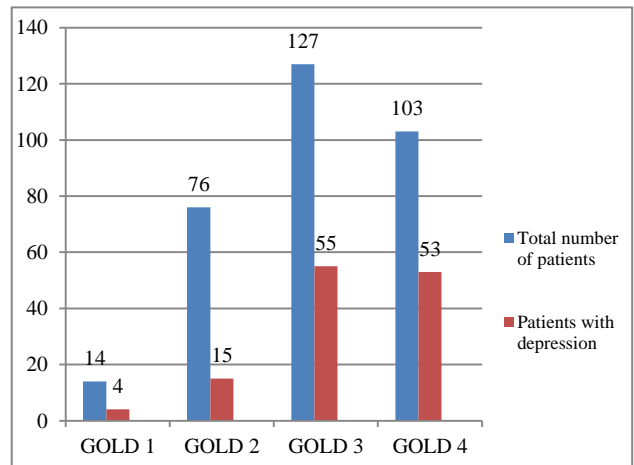**Figure 1: GOLD stage wise distribution of anxiety in COPD patients.**

Figure 2: GOLD stage wise distribution of depression in COPD patients.

The factors with significant association(p value≤0.05) with anxiety in COPD patients which was found during the analysis were in-patients, duration of disease, number of hospitalizations in the previous year, hypertension, MMRC grade, BMI, oxygen saturation, six minute walk distance, FEV1, FVC and BODE score (Table 1).

The factors associated with depression were in-patients, duration of disease, number of hospitalizations in the previous year, hypertension, MMRC grade, BMI, oxygen saturation, six minute walk distance, FEV1, FVC and BODE score. Also diabetes mellitus showed an association with depression (Table 2).

The linear regression analysis showed that the number of hospital admissions in the previous year was the most significant factor associated with both anxiety (p=0.008) and depression (p=0.020).

Table 1: Association of various factors with anxiety in COPD patients.

Characteristics	Patients without anxiety (mean±SD) n = 154	Patients with anxiety (mean±SD) n=166	p-value
Age in years	63.46±10.62	64.86±8.28	0.189
Duration in years	6.32±6.26	7.93±6.30	0.023
In-patients	n=86	n=135	<0.001
No of hospitalizations	0.49±0.88	1.48 ± 1.66	<0.001
Alcoholism	n=106	n=112	0.811
Smoking index	714.12±601.23	807.36±719.13	0.208
Diabetes mellitus	n=24	n=37	0.154
Hypertension	n=23	n=46	0.006
MMRC grade	1.90±0.81	2.71±0.93	<0.001
BMI in kg/m^2	18.52±3.09	17.74±3.68	0.041
Oxygen saturation in %	94.12±4.38	91.92±8.71	0.004
Six minute walk distance in m	259.88±117.69	170.54±104.24	<0.001
FEV1 in %	45.33±19.29	34.95±18.15	<0.001
FVC in %	63.31±22.83	52.08±21.46	<0.001
Haemoglobin in gm%	9.27±6.04	10.84±5.46	0.015
BODE score	4.81±2.12	7.04±2.22	<0.001

Table 2: Association of various factors with depression in COPD patients.

Characteristics	Patients without depression (mean±SD) n = 193	Patients with depression (mean±SD) n=127	p-value
Age in years	63.62±9.69	65.05±9.13	0.182
Duration in years	6.47±5.89	8.19±6.81	0.021
In-patients	n=111	n=110	<0.001
No of hospitalizations	0.60±0.95	1.61±1.78	<0.001
Alcoholism	n=134	n=84	0.542
Smoking index	730.45±672.91	811.17±654.01	0.287
Diabetes mellitus	n=30	n=31	0.059
Hypertension	n=33	n=36	0.019
MMRC grade	1.97±0.79	2.86±0.95	<0.001
BMI in kg/m^2	18.60±3.47	17.38±3.25	0.002
Oxygen saturation in %	93.94±4.21	91.52±9.75	0.002
Six minute walk distance in m	253.26±112.39	153.16±103.77	<0.001
FEV1 in %	43.94±19.80	33.88±17.11	<0.001
FVC in %	61.60±23.02	51.23±21.05	<0.001
Haemoglobin in gm%	9.53±6.11	10.94±5.18	0.032
BODE score	5.03±2.12	7.39±2.27	<0.001

DISCUSSION

We found that 59.4% of COPD patients had either anxiety or depression as co morbidity and 32.2% had both the psychiatric symptoms. This is significant for the fact that one in every three COPD patients coming to a doctor is suffering from either of these symptoms. Previous studies reported a prevalence ranging from 50 to 75% for anxiety and 37 to 71% for depression in patients with chronic obstructive pulmonary disease.[10] The present study showed that anxiety was present in 51.9% patients with COPD, where as depression in 39.7% which was comparable to available literature. An Indian study reported a prevalence of depression 57.02% cases and anxiety in 36.37% cases.[4] Another study from North India which was done in a tertiary care health facility to investigate the presence and risk factors of depression by

administering the nine-item Hindi version of patient health questionnaire-9 (PHQ-9) found that 33.3 percent patients had depression.[11]

A cross-sectional association was observed for anxiety/depression with disease severity and number of hospitalizations. Both anxiety and depression were significantly increased in hospitalized patients (p<0.001) and also noted that it was more in patients with higher number of hospital admissions in the previous year (p<0.001). 48.1% patients had a history of prior hospitalization at least once in the previous year. Those patients with severe disease were more anxious and depressed; there was significant relation with the MMRC dyspnea grade of the patient (p<0.000). The mean FEV1 was 34.95% in patients with anxiety (p<0.001) and 33.88% in patients with depression (p<0.001). The mean oxygen saturation also was significantly lower in patients with both anxiety (p=0.004) and depression (p=0.002). The mean six minute walk distance was 170.54 m in patients with anxiety compared to 259.88 m in patients without anxiety (p<0.001). In case of patients with depression, it was 153.16 m when compared to 253.26 m in patients without depression (p<0.001). The BODE score of patients with both anxiety and depression was more than 7 and also found as significant in either cases (p<0.001). The mean BMI of the patients with either anxiety or depression was below 18, and it was 17.74 for patients with anxiety (p=0.041) and 17.38 for patients with depression (p=0.002).

The age of the patient did not appear to be associated with both anxiety and depression whereas, the duration of the disease was significantly associated with both anxiety (p=0.023) and depression (p=0.021). Though smoking index was more than 700 in all groups, it did not have a significant association with anxiety or depression. Diabetes mellitus did not have a significant association with either anxiety or depression in COPD. Hypertension showed a significant association with both anxiety (p=0.006) and depression (p=0.019).

The factors associated with anxiety and depression in COPD patients were found as same during the present study. These include hospitalization(in-patients), duration of disease, number of hospitalizations in the previous year, hypertension, MMRC grade, BMI, oxygen saturation, six minute walk distance, forced expiratory volume (1st second), forced vital capacity and BODE score. The present study showed that the number of hospital admissions was the most significant factor associated with anxiety (p=0.008) and depression (p=0.020) in COPD.

A Korean study on the prevalence of depression and anxiety noted that FEV1 and smoking history were independent risk factors for depression in patients with COPD.[12] Kaneda R et al found that living alone, hospitalization, low BMI and low education level were related to anxiety and depression in COPD.[13] A cross-sectional study from Bhopal gave a strong relationship with low level of education, poor socio-economic conditions and advanced age to depression.[14]

Majority of the patients with anxiety and depression in this study had a BODE score of 7 or more than 7, which is associated with a higher mortality.[15] This indicates that those patients with a high BODE score has to be screened for anxiety and depression.

The strengths of the study include use of valid instruments and the evaluation was done by trained clinicians. The major limitations were absence of specialist evaluation for anxiety/depression and it was difficult to assume causality for anxiety and depression as it was a cross-sectional study.

CONCLUSION

The prevalence of anxiety and depression in chronic obstructive pulmonary disease is very high and a significant number of patients have both the co-morbidities. The number of hospital admissions in the previous year was the most significant factor associated with anxiety and depression in COPD.

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