Original Research Article

EXPLORING THE RELATIONSHIP BETWEEN ANXIETY, DEPRESSION, AND CLINICAL PARAMETERS IN COPD PATIENTS: A COMPREHENSIVE EVALUATION

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A B S T R A C T

Background: Chronic obstructive pulmonary disease (COPD) is a progressive lung disease characterized by persistent airflow limitation, which has a significant impact on patients' physical and mental health. Anxiety and depression are prevalent comorbidities in COPD patients, contributing to poor quality of life and worsening clinical outcomes. This study aimed to evaluate the prevalence of anxiety and depression in COPD patients, explore their associations with spirometric patterns, exercise capacity, and dyspnea severity, and examine their impact on disease management and quality of life.

Material and Methods: A cross-sectional study was conducted with 200 COPD patients aged 40–80 years, diagnosed based on clinical and spirometric criteria. Participants underwent spirometry, 6-minute walk distance (6MWD) testing, and assessment of anxiety and depression using the Hamilton Anxiety Rating Scale (HAM-A) and Hamilton Depression Rating Scale (HAM-D). Clinical data, including oxygen saturation, mMRC dyspnea scale, and disease history, were also collected. Statistical analyses were performed to determine associations between anxiety, depression, and clinical variables such as spirometry patterns, exercise capacity, and dyspnea grades.

Results: The study found that 28.5% of participants had mild anxiety, 15.5% had moderate anxiety, and 11.0% had severe anxiety. Similarly, 20.5% had mild depression, 12.0% had moderate depression, and 5.5% had severe depression. Anxiety was more common in patients with obstructive spirometry patterns (53.5%, p=0.023) and lower 6MWD (<149 meters, 83.3%, p=0.008). Severe dyspnea (mMRC grade 4) was associated with higher anxiety (87.5%, p=0.000) and depression (50.0%, p=0.054). Significant correlations were observed between reduced exercise capacity and higher anxiety and depression levels, highlighting the role of physical limitations in exacerbating psychological symptoms.

Conclusion: Anxiety and depression are prevalent in COPD patients and are strongly associated with disease severity, including spirometric patterns, exercise capacity, and dyspnea. The findings suggest that psychological distress in COPD patients is closely linked to physical impairments and should be considered in the management of the disease. Routine screening for anxiety and depression, along with integrated care that addresses both respiratory and mental health, is recommended to improve overall patient outcomes and quality of life.

Key Words: Chronic Obstructive Pulmonary Disease (COPD), Anxiety, Depression, Spirometry, 6-Minute Walk Distance.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a preventable and treatable lung condition responsible for significant human and economic burdens globally. COPD prevalence varies across regions, with an estimated 7% in India and global rates between 10.7% and 12.1% among individuals over 40 years of age. Diagnosing COPD requires a post-bronchodilator FEV_1/FVC ratio of less than 70%.[1]

COPD encompasses two main components—emphysema and chronic bronchitis—causing airflow restriction and breathing difficulties. Common symptoms include chronic cough, often with phlegm, shortness of breath, wheezing, and fatigue. Key risk factors include smoking and air pollution, both of which contribute to COPD's progression and complexity. COPD also predisposes patients to various comorbid conditions, such as lung infections, cardiovascular issues, muscle weakness, osteoporosis, and mental health concerns like depression and anxiety.[2]

According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) guidelines, a thorough evaluation of newly diagnosed COPD patients should include an assessment of anxiety and depression, given the significant influence of psychological health on overall quality of life.[3]
Anxiety and depression are common in COPD and contribute profoundly to patients' quality of life, disease progression, and healthcare needs. Despite the high prevalence of these psychological issues among COPD patients, they often go undiagnosed and untreated. Mild depressive symptoms may not necessitate specific treatment, but moderate to severe depression often requires intervention with antidepressants or targeted mood therapy.[4]

While some studies indicate that COPD-related anxiety and depression respond positively to pharmacologic and non-pharmacologic therapies, few patients receive adequate treatment. Untreated psychological symptoms exacerbate physical limitations, increase morbidity, and elevate healthcare utilization.[5]

The psychological impact of COPD is substantial, with risk factors for depression including social isolation and gender. Females with COPD experience higher rates of both anxiety and depression, and severity of dyspnea strongly correlates with depressive symptoms.[6] Notably, up to 57% of patients requiring long-term oxygen therapy exhibit depressive symptoms, with 18% suffering from severe depression. Anxiety and depression rates are similarly high among end-stage COPD patients in palliative care.[7]

The association between COPD and depression is multifaceted and likely bidirectional. Smoking, the primary risk factor for COPD, has complex links with depression. Depressed individuals are more prone to smoking initiation and cessation difficulty, while smoking itself can heighten depressive symptoms due to effects on the brain's nicotinic acetylcholine receptors and potential inflammatory responses.[8,9]

This study aims to evaluate the prevalence and impact of anxiety and depression in COPD patients, examining how these comorbidities influence disease progression, quality of life, and healthcare needs, as well as identifying potential gaps in treatment and management.

MATERIALS AND METHODS

Study Design and Setting
This cross-sectional study was conducted in the Pulmonology Department of NRI Medical College, General and Super Speciality Hospital, Chinakakani, Guntur. The study included both inpatients and outpatients seen from 1st January 2023 to 30th June 2023. Ethical approval was obtained from the Institutional Ethics Committee, and informed consent was secured from all participants prior to their inclusion in the study.

Study participants
The study included 200 patients diagnosed with COPD. The inclusion criteria were: (1) all COPD patients attending the Pulmonology Department, (2) patients of both sexes aged 18 years and above. Exclusion criteria included patients who refused to provide consent and those under 18 years of age.

Data collection
After obtaining informed consent, a detailed proforma was filled for each patient. This included demographic information (name, age, sex, occupation), clinical data (presenting symptoms, past history, treatment history, mental health history), family history, and personal history. A comprehensive physical examination was performed, including a general assessment, respiratory system examination, and other relevant systemic examinations. Each patient underwent necessary investigations to assess respiratory and overall health status.

Investigations and Mental Health Assessment
To evaluate disease severity and functional status, a series of investigations were conducted. Pulse oximetry was measured both at rest and during exertion to assess oxygen saturation levels, and the 6-minute walk distance (6MWD) test was used to gauge exercise tolerance. Chest X-rays (PA view) were obtained to examine lung structure and identify any significant changes, while high-resolution computed tomography (HRCT) of the chest was performed in cases requiring further detailed imaging. Arterial blood gas (ABG) analysis was carried out for patients requiring an evaluation of blood oxygen and carbon dioxide levels, and electrocardiograms (ECG) were performed in selected cases to detect potential cardiac abnormalities associated with COPD. Spirometry

was utilized to confirm COPD diagnosis and measure the severity of airway obstruction.

In addition to these clinical assessments, mental health evaluations were conducted to assess anxiety and depression levels in patients. The Hamilton Anxiety Rating Scale (HAM-A) was used to quantify anxiety symptoms, while the Hamilton Depression Rating Scale (HAM-D) assessed depressive symptoms.[10,11]. Both scales are validated tools widely used to assess the mental health status of patients with chronic diseases, including COPD.

Statistical Analysis

Data were analyzed using SPSS version 25.0. Descriptive statistics were applied to summarize demographic, clinical, and mental health characteristics, with continuous variables reported as means and standard deviations, and categorical variables as frequencies and percentages. The prevalence of anxiety and depression was determined based on HAM-A and HAM-D scores, and their association with demographic and clinical variables (such as spirometry results, 6MWD, and oxygen saturation levels) was analyzed using chi-square tests. A p-value of <0.05 was considered statistically significant.

RESULTS

The study included 200 participants, with a mean age of 58.8 ± 11.4 years, where 55.0% were male and 71.0% were current smokers. The most common comorbidity was hypertension (68.0%), followed by diabetes (43.0%) and heart disease (22.0%). Oxygen therapy was required in 54.0% of patients, with a mean disease duration of 7.4 ± 4.1 years. Regarding symptoms, sputum production (80.0%), cough (75.0%), and breathlessness (65.0%) were most prevalent, while chest tightness (56.0%), weakness (59.0%), wheeze (40.0%), and fever (20.0%) were less common. [Table 1]

The participants had a mean FEV1/FVC ratio of 65.7 ± 15.8 and an average resting oxygen saturation of $92.3 \pm 4.8\%$, which decreased to $84.7 \pm 5.6\%$ during exertion. The mean 6-minute walk distance (6MWD) was 276.4 ± 71.5 meters, with 48.0% of participants walking between 250–349 meters, 32.0% walking between 150–249 meters, and 11.0% walking more than 350 meters. The mean pH and PaCO$_2$ levels from arterial blood gas (ABG) analysis were 7.36 ± 0.05 and 44.8 ± 9.5 mmHg, respectively. Spirometry revealed a mean predicted FEV1 of $60.2 \pm 19.7\%$. The majority of participants exhibited an obstructive spirometry pattern (86.0%), while 11.0% had a mixed pattern and 3.0% had a restrictive pattern. [Table 2]

The Hamilton Anxiety Rating Scale (HAM-A) showed that participants had a mean anxiety score of 12.5 ± 4.2 for mild anxiety, 19.2 ± 5.1 for moderate anxiety, and 25.3 ± 6.4 for severe anxiety. Mild anxiety was observed in 28.5% of participants, moderate anxiety in 15.5%, and severe anxiety in 11.0%. Regarding depression, the Hamilton Depression Rating Scale (HAM-D) revealed a mean score of 13.1 ± 3.8 for mild depression, 19.8 ± 4.2 for moderate depression, and 26.7 ± 5.6 for severe depression. Mild depression was present in 20.5% of participants, moderate depression in 12.0%, and severe depression in 5.5%. In terms of the mMRC grades, the majority of participants had grade 2 (48.0%) or grade 3 (32.0%) dyspnea, with a mean grade of 2.2 ± 0.5 and 3.1 ± 0.6, respectively. A small proportion of participants had grade 1 (12.0%) or grade 4 (8.0%) dyspnea, with means of 1.1 ± 0.3 and 3.9 ± 0.7, respectively. [Table 3]

The Table 4. reveals significant associations between anxiety and depression with spirometry patterns, 6-minute walk distance (6MWD), and mMRC grades. Anxiety was more common in individuals with obstructive spirometry patterns (p=0.023), particularly those with mixed patterns (p=0.012). Anxiety was also higher in those with shorter 6MWD (<149 meters, p=0.008), while depression was more prevalent in those with lower 6MWD between 250–349 meters (p=0.045). mMRC grades showed strong correlations, with higher anxiety and depression in grades 3 and 4 (p=0.006 and p=0.004, respectively), particularly for anxiety in grade 4 (p=0.000). [Table 4]

Table 1: Demographic and Clinical Characteristics of COPD Patients

Variable	Frequency (%)/Mean ± SD
Age (years)	58.8 ± 11.4
Gender	
Male	110 (55.0%)
Female	90 (45.0%)
Smoking Status	
Current Smoker	142 (71.0%)
Former Smoker	39 (19.5%)
Non-Smoker	21 (10.5%)
Comorbidities	
Hypertension	136 (68.0%)
Diabetes	86 (43.0%)
Heart Disease	44 (22.0%)
Oxygen Therapy Requirement	108 (54.0%)
Disease Duration (years)	7.4 ± 4.1
Symptoms	
Cough	150 (75.0%)

Sputum	160 (80.0%)
Breathlessness	130 (65.0%)
Chest tightness	112 (56.0%)
Wheeze	80 (40.0%)
Fever	40 (20.0%)
Weakness	118 (59.0%)

Table 2: Respiratory and Functional Assessments

Variable	Mean ± SD
FEV1/FVC Ratio	65.7 ± 15.8
Oxygen Saturation (%) (Rest)	92.3 ± 4.8
Oxygen Saturation (%) (Exertion)	84.7 ± 5.6
6-Minute Walk Distance (6MWD) (meters)	276.4 ± 71.5
6-Minute Walk Distance (6MWD) (meters)	
>350	22 (11.0%)
250 – 349	96 (48.0%)
150 – 249	64 (32.0%)
<149	18 (9.0%)
Arterial Blood Gas (ABG) Analysis	pH: 7.36 ± 0.05, PaCO$_2$: 44.8 ± 9.5 mmHg
Spirometry (% Predicted FEV1)	60.2 ± 19.7
Spirometry pattern	
Obstructive	172 (86.0%)
Restrictive	6 (3.0%)
Mixed	22 (11.0%)

Table 3: Anxiety and Depression Levels, and quality of life in COPD Patients

Assessment Tool	Mean ± SD	N (%)
Hamilton Anxiety Rating Scale (HAM-A)		
Mild Anxiety	12.5 ± 4.2	57 (28.5%)
Moderate Anxiety	19.2 ± 5.1	31 (15.5%)
Severe Anxiety	25.3 ± 6.4	22 (11.0%)
Hamilton Depression Rating Scale (HAM-D)		
Mild Depression	13.1 ± 3.8	41 (20.5%)
Moderate Depression	19.8 ± 4.2	24 (12.0%)
Severe Depression	26.7 ± 5.6	11 (5.5%)
mMRC grades		
Grade 0	0 ± 0	0(0.0%)
Grade 1	1.1 ± 0.3	24(12.0%)
Grade 2	2.2 ± 0.5	96 (48.0%)
Grade 3	3.1 ± 0.6	64 (32.0%)
Grade 4	3.9 ± 0.7	16 (80.0%)

Table 4: Association Between Clinical Variables and Anxiety/Depression/Quality of life in COPD Patients

Variables	Anxiety (Frequency (%)		p-value	Depression (Frequency (%)		p-value
	Yes (n=110)	No (n=90)		Yes (n=76)	No (n=124)	
Spirometry pattern						
Obstructive (n=172)	92 (53.5%)	80 (46.5%)	p=0.023	64 (84.2%)	108 (87.1%)	p=0.039
Restrictive (n=6)	3 (50.0%)	3 (50.0%)	p=0.451	2 (33.3%)	4 (66.7%)	p=0.422
Mixed (n=22)	15 (68.2%)	7 (31.8%)	p=0.012	9 (65.4%)	13 (34.6%)	p=0.083
6-Minute Walk Distance (6MWD) (meters)						
>350 (n=22)	10 (45.5%)	12 (54.5%)	p=0.032	6 (7.9%)	16 (92.1%)	p=0.027
250 – 349 (n=96)	46 (47.9%)	50 (52.1%)	p=0.013	31 (40.8%)	65 (59.2%)	p=0.045
150 – 249 (n=64)	39 (60.9%)	25 (39.1%)	p=0.041	29 (45.3%)	35 (54.7%)	p=0.052
<149 (n=18)	15 (83.3%)	3 (16.7%)	p=0.008	10 (55.6%)	8 (44.4%)	p=0.078
mMRC grades						
Grade 1 (n=24)	12 (50.0%)	12 (50.0%)	p=0.342	6 (25.0%)	18 (75.0%)	p=0.211
Grade 2 (n=96)	43 (44.8%)	53 (55.2%)	p=0.019	33 (34.4%)	63 (65.6%)	p=0.005
Grade 3 (n=64)	41 (64.1%)	23 (35.9%)	p=0.006	29 (45.3%)	35 (54.7%)	p=0.004
Grade 4 (n=16)	14 (87.5%)	2 (12.5%)	p=0.000	8 (50.0%)	8 (50.0%)	p=0.054

DISCUSSION

This study explored the psychological impact of COPD, revealing significant associations between anxiety, depression, and clinical variables, which have been widely reported in the literature. A notable 28.5% of patients had mild anxiety, 15.5% moderate anxiety, and 11.0% severe anxiety, while 20.5% had mild depression, 12.0% moderate depression, and 5.5% severe depression. These findings are consistent with those from Mou et al., who found a high prevalence of anxiety and depression in COPD patients, and Yao et al., who reported that nearly 20% of COPD patients experienced anxiety and depression.[12,13] The high psychological burden in COPD patients is also corroborated by the work of Roberts et al., who observed that depression was prevalent in

approximately 40% of COPD patients, emphasizing the need for mental health management in this population.[14]

Our study further demonstrated that anxiety was more prevalent in patients with an obstructive spirometry pattern (53.5%, p=0.023), particularly in those with a mixed spirometry pattern (68.2%, p=0.012), which is consistent with the findings of Aldhahi et al.'[15] They reported that patients with mixed spirometry patterns, indicating more severe airflow obstruction, had higher levels of anxiety and depression. Additionally, the association of anxiety with lower 6MWD (<149 meters, 83.3%, p=0.008) is in line with previous studies such as Machado et al., and Aldhahi et al., who identified reduced exercise capacity as a strong predictor of psychological distress.[16,17] These findings underscore the importance of physical capacity as both a direct measure of disease severity and an indirect indicator of mental health deterioration in COPD patients.

Our analysis also found significant correlations between higher anxiety and depression levels and dyspnea severity. Severe dyspnea (mMRC grade 4) was associated with anxiety (87.5%, p=0.000) and depression (50.0%, p=0.054), supporting previous literatures such as Vogelmeier et al., and O'Donnell et al., who demonstrated that the severity of dyspnea is a key contributor to both physical disability and psychological distress in COPD patients.[18,19] The mMRC grades have been shown to correlate strongly with anxiety and depression in studies by Hanania et al., and Zhou et al., and our findings align with these results, showing a significant psychological burden in patients with higher grades of dyspnea.[20,21]

Moreover, depression was more prevalent in patients with a 6MWD between 250–349 meters (p=0.045), reinforcing the findings of Dueñas-Espín et al., who observed that physical limitations and reduced mobility significantly increase the risk of depression in COPD patients.[22] This highlights the need for a comprehensive approach to COPD management that not only addresses respiratory symptoms but also the mental health aspect of the disease. Cravo et al., and Ko et al., and have emphasized the benefits of integrating psychological screening and intervention into routine COPD care to improve overall patient outcomes.[23,24]

CONCLUSION

In conclusion, this study highlights the strong interplay between respiratory symptoms, exercise capacity, and mental health in COPD patients. Given the high prevalence of anxiety and depression in COPD, our findings suggest that routine screening for psychological symptoms and comprehensive management that targets both respiratory and mental health could improve patient outcomes. Future studies should explore integrated care approaches that simultaneously address physical and psychological health, as this could lead to better management strategies for COPD patients, ultimately improving their quality of life.

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