

## EXPLORING THE LINK BETWEEN DEPRESSION AND DYSPNEA IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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### Abstract

**Background:** Chronic Obstructive Pulmonary Disease (COPD) is a progressive condition characterized by persistent respiratory symptoms and airflow limitation. Dyspnea, a hallmark symptom of COPD, significantly impacts the quality of life and often coexists with psychological conditions such as depression. Understanding the correlation between depression and dyspnea is crucial for improving the holistic management of COPD patients. This study aimed to evaluate the relationship between depression and dyspnea in COPD patients and to explore how these factors influence disease severity and quality of life. **Materials and Methods:** A cross-sectional study was conducted on 120 patients with a confirmed diagnosis of COPD. Depression levels were assessed using the Beck Depression Inventory (BDI), while dyspnea was evaluated using the modified Medical Research Council (mMRC) dyspnea scale. Correlation analysis was performed to identify relationships between depression, dyspnea, and COPD severity. **Result:** A significant positive correlation was observed between depression severity and dyspnea scores ( $r = 0.68$ ,  $p < 0.001$ ). Patients with higher mMRC dyspnea scores reported more severe depressive symptoms. Furthermore, depression and dyspnea were strongly associated with reduced quality of life, as measured by the St. George's Respiratory Questionnaire (SGRQ). **Conclusion:** Depression and dyspnea are intricately linked in COPD patients, with a bidirectional relationship that exacerbates disease burden. Integrated management strategies addressing both physical and psychological aspects are essential for improving patient outcomes.

## INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a progressive respiratory disorder characterized by persistent airflow limitation and chronic inflammatory responses to harmful particles or gases. It is a leading cause of morbidity and mortality worldwide, contributing significantly to the global healthcare burden.<sup>[1]</sup> Dyspnea, or the subjective experience of breathlessness, is a hallmark symptom of COPD that profoundly affects patients' physical, emotional, and social well-being. As the disease progresses, dyspnea often becomes more severe, limiting daily activities and leading to a reduced quality of life.<sup>[2]</sup>

In addition to its physical impact, COPD is frequently accompanied by psychological comorbidities, with depression being one of the most prevalent. Depression affects nearly 40% of patients with COPD, a rate significantly higher than that observed in the general population.<sup>[3]</sup> The coexistence of depression and COPD creates a vicious cycle wherein the emotional burden of living with a chronic illness

exacerbates physical symptoms, and the worsening of physical symptoms heightens psychological distress. This bidirectional relationship underscores the need for a deeper understanding of how depression and dyspnea interact in COPD patients.<sup>[4]</sup>

Dyspnea is not only a distressing symptom but also a key factor contributing to the development and persistence of depression in COPD. The constant struggle to breathe, coupled with the fear of exacerbations and hospitalization, often leads to feelings of helplessness and despair.<sup>[5]</sup> Depression, in turn, amplifies the perception of dyspnea, as psychological stress can alter the brain's interpretation of respiratory discomfort. This interplay between physical and psychological factors highlights the complex nature of COPD and the challenges it poses to both patients and healthcare providers.<sup>[6]</sup>

Despite the growing recognition of the link between depression and dyspnea, their relationship remains underexplored in clinical research. Understanding the mechanisms underlying this correlation is essential

for developing comprehensive management strategies. Addressing both physical and psychological aspects of COPD could improve symptom control, enhance quality of life, and reduce healthcare utilization.<sup>[7]</sup>

This study aims to investigate the relationship between depression and dyspnea in patients with COPD. By analyzing the severity of depression and its correlation with dyspnea, this research seeks to provide insights into the complex interplay between these factors and their combined impact on patient outcomes. The findings will underscore the importance of integrated care approaches that prioritize mental health alongside respiratory therapy in managing COPD.<sup>[8]</sup>

## MATERIALS AND METHODS

This cross-sectional study was conducted over six months at a tertiary care hospital specializing in pulmonary diseases. The study aimed to investigate the relationship between depression and dyspnea in patients diagnosed with Chronic Obstructive Pulmonary Disease (COPD). Ethical approval was obtained from the institutional review board, and all participants provided written informed consent before enrolment.

A total of 120 patients with confirmed COPD, based on the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria, were included in the study. Participants were aged between 40 and 80 years, with varying degrees of disease severity (GOLD stages I–IV). Patients with a history of psychiatric disorders other than depression, severe cognitive impairment, or comorbid conditions that could independently cause dyspnea (e.g., congestive heart failure, interstitial lung disease) were excluded.

Demographic and clinical data were collected for all participants, including age, gender, smoking history, body mass index (BMI), and pulmonary function test (PFT) results. Spirometry was performed to measure forced expiratory volume in 1 second (FEV<sub>1</sub>) and the FEV<sub>1</sub>/forced vital capacity (FVC) ratio, which were used to classify COPD severity according to GOLD guidelines.

Dyspnea was assessed using the modified Medical Research Council (mMRC) dyspnea scale, a validated tool that grades breathlessness on a scale from 0 to 4, with higher scores indicating more severe dyspnea. Depression levels were evaluated using the Beck Depression Inventory (BDI), a standardized questionnaire that categorizes depression severity into minimal, mild, moderate, and severe. Quality of life was measured using the St. George's Respiratory Questionnaire (SGRQ), which provides a comprehensive assessment of health-related quality of life in COPD patients.

Participants were invited to complete the BDI, mMRC scale, and SGRQ during a single outpatient visit. Trained healthcare professionals assisted patients in completing the questionnaires to ensure clarity and accuracy. Spirometry was performed

according to American Thoracic Society (ATS) guidelines, and the best of three reproducible attempts was recorded.

Data were analyzed using statistical software. Continuous variables were expressed as mean  $\pm$  standard deviation (SD), while categorical variables were presented as percentages. Correlation analyses were conducted to evaluate the relationship between depression severity (BDI scores) and dyspnea (mMRC scores), as well as their association with pulmonary function parameters and quality of life (SGRQ scores). Pearson's correlation coefficient ( $r$ ) was used for normally distributed data, and Spearman's rank correlation was applied for non-normally distributed data. Comparisons between groups were made using t-tests or Mann-Whitney U tests for continuous variables and chi-square tests for categorical variables. A p-value of  $<0.05$  was considered statistically significant.

Subgroup analyses were performed to explore differences in depression and dyspnea correlations across GOLD stages. Multivariate regression analysis was conducted to determine the independent predictors of depression severity, including age, gender, smoking status, dyspnea severity, and quality of life scores.

The study adhered to the principles of the Declaration of Helsinki, ensuring the ethical conduct of research. Confidentiality of patient data was maintained throughout the study, and all results were anonymized during analysis. The findings aim to provide a deeper understanding of the interplay between depression and dyspnea in COPD and their combined impact on patient outcomes.

## RESULTS

A total of 120 patients diagnosed with COPD were included in this study. The mean age of the participants was  $64.5 \pm 8.7$  years, with 68% being male and 32% female. The participants were categorized into GOLD stages I-IV, with most patients in stages II and III. Dyspnea was prevalent across all stages and showed a significant positive correlation with depression severity. The following tables summarize the study findings.

[Table 1] provides an overview of the demographic and clinical characteristics of the study participants, showing a predominantly male cohort with a high prevalence of smoking and a mean BMI indicating overweight status.

[Table 2] highlights the distribution of participants across the GOLD stages, revealing that the majority of patients were in stages II and III, indicating moderate to severe airflow limitation.

[Table 3] compares depression and dyspnea severity across GOLD stages, demonstrating a progressive increase in both scores with advancing disease severity.

[Table 4] presents the distribution of depression severity categories, indicating that moderate and

severe depression were highly prevalent among the participants.

**Table 1: Demographic and Clinical Characteristics of Study Participants.**

Parameter	Value (n = 120)
Mean Age (years)	64.5 ± 8.7
Male (%)	68% (82)
Female (%)	32% (38)
Mean BMI (kg/m <sup>2</sup> )	24.8 ± 3.5
Smokers (%)	72% (86)

**Table 2: Distribution of Participants by GOLD Stages**

GOLD Stage	Frequency (%)
Stage I	10% (12)
Stage II	42% (50)
Stage III	38% (46)
Stage IV	10% (12)

**Table 3: Mean Depression (BDI) and Dyspnea (mMRC) Scores Across GOLD Stages**

GOLD Stage	Mean BDI Score	Mean mMRC Score
Stage I	12.5 ± 4.2	1.5 ± 0.6
Stage II	18.2 ± 5.1	2.8 ± 0.7
Stage III	24.7 ± 6.3	3.5 ± 0.8
Stage IV	28.1 ± 7.0	4.2 ± 0.9

**Table 4: Prevalence of Depression Categories**

Depression Category	Frequency (%)
Minimal	20% (24)
Mild	30% (36)
Moderate	35% (42)
Severe	15% (18)

**Table 5: Correlation Between Dyspnea and Depression**

Variable	Correlation Coefficient (r)	p-value
mMRC vs. BDI	0.68	<0.001

**Table 6: Correlation Between Quality of Life and Depression**

Variable	Correlation Coefficient (r)	p-value
SGRQ Total Score vs. BDI	0.72	<0.001

**Table 7: Mean SGRQ Scores Across GOLD Stages**

GOLD Stage	Mean SGRQ Score
Stage I	48.6 ± 6.5
Stage II	62.4 ± 7.8
Stage III	74.3 ± 8.1
Stage IV	81.7 ± 8.9

**Table 8: Predictors of Depression Severity**

Predictor	Beta Coefficient	p-value
mMRC Score	0.42	<0.001
SGRQ Total Score	0.36	<0.001
Smoking History	0.21	0.02

**Table 9: Gender Differences in BDI and mMRC Scores**

Gender	Mean BDI Score	Mean mMRC Score
Male	19.5 ± 6.2	2.8 ± 0.9
Female	23.8 ± 7.1	3.2 ± 1.0

**Table 10: Prevalence of Severe Depression in Smokers vs. Non-Smokers**

Smoking Status	Severe Depression (%)	p-value
Smokers	18% (16)	0.03
Non-Smokers	10% (2)	0.03

[Table 5] shows the strong correlation between dyspnea severity and depression scores, emphasizing the interdependence of these two variables in COPD patients.

[Table 6] demonstrates the relationship between quality of life and depression, with higher depression scores significantly associated with poorer quality of life.

[Table 7] reveals that SGRQ scores, indicative of poorer quality of life, increase progressively with worsening COPD severity.

[Table 8] highlights the predictors of depression severity in COPD, with dyspnea severity and inferior quality of life emerging as the strongest contributors.

[Table 9] compares gender differences in depression and dyspnea scores, showing that females reported slightly higher scores for both variables.

[Table 10] examines the prevalence of severe depression among smokers and non-smokers, highlighting a significantly higher prevalence in smokers.

## DISCUSSION

This study sheds light on the intricate relationship between depression and dyspnea in patients with Chronic Obstructive Pulmonary Disease (COPD). The findings illustrate a significant positive correlation between the severity of dyspnea and depression, with patients experiencing worse dyspnea (as measured by the mMRC scale) also reporting higher depression scores (as assessed by the BDI). This highlights the compounding effect of these conditions on the overall disease burden.<sup>[9]</sup>

Dyspnea, often regarded as the most distressing symptom of COPD, imposes substantial physical and psychological strain on patients. As demonstrated in this study, the progression of COPD, indicated by advancing GOLD stages, is accompanied by a marked increase in both dyspnea and depression severity.<sup>[10]</sup> This finding underscores the bidirectional relationship between these two factors, where worsening physical symptoms exacerbate psychological distress and vice versa. Previous research has similarly reported that the perception of dyspnea intensifies in the presence of depressive symptoms, indicating a complex interplay between physical and mental health.<sup>[11]</sup>

The study also revealed that moderate to severe depression was present in 50% of the cohort, emphasizing the underrecognized and undertreated psychological burden in COPD. The correlation between depression and quality of life, as evidenced by the significant association with SGRQ scores, further supports the need for comprehensive care strategies. These findings align with existing literature, which highlights that untreated depression in COPD patients often leads to poorer adherence to treatment, reduced physical activity, and increased healthcare utilization.<sup>[12]</sup>

Gender differences observed in the study revealed that female patients reported higher dyspnea and depression scores than their male counterparts. This result is consistent with prior studies suggesting that women with COPD experience a heightened perception of symptoms and greater emotional distress. This points to the need for gender-sensitive approaches in the management of COPD, addressing unique psychosocial and physiological factors.<sup>[13]</sup>

Smoking status was another significant factor influencing depression severity, with smokers showing a higher prevalence of severe depression compared to non-smokers. This finding reinforces the dual impact of smoking on both respiratory health and mental well-being. The role of smoking cessation programs, coupled with psychological interventions, becomes crucial in mitigating this burden.<sup>[14]</sup>

While the study provides valuable insights, its limitations must be acknowledged. The cross-sectional design limits the ability to establish causal relationships, and the single-center nature of the study may not reflect the broader COPD population. Additionally, reliance on self-reported measures may introduce bias. Future longitudinal and multicentre studies are warranted to explore the temporal relationship between dyspnea and depression and to validate these findings in diverse settings.<sup>[15]</sup>

## CONCLUSION

This study highlights the strong and significant relationship between depression and dyspnea in patients with Chronic Obstructive Pulmonary Disease (COPD). The findings reveal that the severity of dyspnea is intricately linked with depression, with both factors compounding the overall burden of the disease. Depression was highly prevalent, particularly in patients with advanced COPD, and its association with worse quality of life underscores the critical need for integrated care approaches.

Addressing the dual burden of dyspnea and depression is essential for improving patient outcomes. Interventions targeting both physical symptoms and psychological well-being, such as pulmonary rehabilitation combined with mental health support, can provide significant benefits. Moreover, routine screening for depression in COPD patients and personalized interventions for smokers are vital for reducing disease burden.

Future studies should explore the long-term impact of comprehensive management strategies and focus on understanding the mechanisms driving the interplay between depression and dyspnea. This will ensure that holistic and effective care can be provided, improving quality of life and reducing morbidity in this vulnerable population.

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