

IMPACT OF ANXIETY AND DEPRESSION ON THE OUTCOMES OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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Abstract

Background: Chronic obstructive pulmonary disease (COPD) is a leading cause of global morbidity and mortality, with acute exacerbations contributing substantially to healthcare utilization and readmissions. Psychological comorbidities particularly anxiety and depression are common in COPD and may adversely influence clinical outcomes, yet evidence regarding their impact remains inconsistent. *Objective:* To compare in-hospital mortality and early readmission among patients admitted with acute exacerbation of COPD (AECOPD) with and without anxiety and depression. *Methods:* A hospital-based descriptive study were conducted in the Department of Pulmonology, Hayatabad Medical Complex, Peshawar, from 12th -January 2025 till 15th May 2025 following ethical approval (ERC No: HMC 2345). Patients aged 35–70 years of either gender admitted with AECOPD were enrolled using non-probability consecutive sampling. COPD were diagnosed using GOLD criteria (chronic respiratory symptoms with post-bronchodilator FEV₁/FVC <70%). Anxiety and depression were assessed via the Hospital Anxiety and Depression Scale (HADS), with cut-offs of ≥11 on respective subscales. Standard AECOPD management were provided to all participants. Primary outcomes were in-hospital mortality and early readmission (≤15 days post-discharge). Data were analyzed in IBM SPSS v25 using descriptive statistics and Chi-square/Fisher's exact tests at a significance level of $p \leq 0.05$, with stratification to control for effect modifiers. *Results (Expected/Preliminary Summary):* Higher proportions of early readmission and adverse outcomes are anticipated among patients with anxiety and/or depression, particularly in those with advanced GOLD stages and active smoking status, suggesting a clinically meaningful association between psychological comorbidity and COPD prognosis. *Conclusion:* Anxiety and depression are expected to be significant correlates of poorer short-term outcomes in AECOPD. Routine psychological screening and integrated management strategies may improve patient care, reduce readmissions, and inform comprehensive COPD management policies.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a major health problem. With 3.23 million fatalities from COPD in 2019, it is the third most common cause of death globally. ¹ Nearly 90% of COPD deaths occurs in those under 70 years of age, and

mostly in low- and middle-income countries. COPD is the third most common cause of 30-day readmissions in the United States, with annual healthcare costs reaching USD 50 billion. Up to 70% of COPD-related medical expenses are attributable to acute exacerbations. ² Smoking (46.0%), ambient

particulate matter pollution (20.7%), and occupational exposure to particulate matter, gasses, and fumes (15.6%) were the prior known factors that had the greatest impact on the disability-adjusted life years rates for COPD.³ The relationship between COPD and mental health has recently attracted a lot of research attention, given its impact on quality of life. COPD has a significant negative impact on patients' mental health. Compared to the general population, people with COPD have greater rates of depression and anxiety.⁴ The relative risk of patients with COPD developing depression is 1.69 compared to those without COPD, and COPD patients may even have higher rates of both anxiety and depression than patients with other chronic comorbid conditions.⁵ In addition, dyspnea and anxiety disorders are closely related; anxious people may experience dyspnea and worsening of underlying COPD symptoms without an intrinsic cause, frequently in the context of panic disorder and agoraphobia leading to increased hospitalizations.^{6, 7} In one study, mean stay in COPD patients with anxiety and depression was 6.8 days (SD 5.6), hospital mortality was 4.3%, 6.3% were readmitted early, 41% were readmitted late, and mortality at 18 months was 47%.² The debate on the impact of anxiety and depression on COPD outcomes continues, with some authors reporting worse disease progression while others have not observed any association. This lack of consensus creates an important research gap that needs clarification.⁸ Therefore, the objective of this study is to compare in-hospital mortality and early readmission in patients admitted with acute exacerbation of COPD, with and without anxiety and depression. COPD were diagnosed according to GOLD criteria based on chronic symptoms (modified Borg dyspnea scale ≥ 3 and productive cough with VAS > 4 for more than 3 months for 2 consecutive years) and post-bronchodilator spirometry showing FEV1/FVC $< 70\%$ of

predicted. Acute exacerbation of COPD was defined as a worsening from baseline mild/moderate disease to severe or very severe disease within one week. Anxiety and depression were assessed using the Hospital Anxiety and Depression Scale (HADS), with anxiety defined as HADS-A ≥ 11 and depression defined as HADS-D ≥ 11 . Outcomes were defined as in-hospital mortality (death during the index admission) and early readmission (hospital admission within 15 days of discharge from the index admission).

METHODS

This descriptive study were conducted in the Department of Pulmonology, Hayatabad Medical Complex, Peshawar, *12th -January 2025 till 15th May 2025 following ethical approval (ERC No: HMC 2345) and approval from CPSP (CPSP Ref No: CPS/REU/ PUL-2024-021-1043)* eligible patients aged 35–70 years of either gender admitted with acute exacerbation of COPD (as per GOLD-based operational definition: symptoms plus post-bronchodilator FEV1/FVC $< 70\%$) were enrolled using non-probability consecutive sampling. Patients with severe cardiopulmonary compromise, bronchogenic carcinoma, active TB, pleural effusion, severe kyphosis, or other exclusion criteria were excluded. After written informed consent, baseline demographic and clinical data (age, gender, BMI, COPD duration, comorbidities including diabetes, hypertension, and ischemic heart disease, residence, education, profession, and socioeconomic status) were recorded on a structured proforma. Anxiety and depression were assessed by the researcher via interview using the Hospital Anxiety and Depression Scale (HADS), classifying anxiety and depression as HADS-A ≥ 11 and HADS-D ≥ 11 , and patients were grouped as with vs without anxiety/depression (age-matched). All patients will receive standard AECOPD management as per hospital protocol, and outcomes were recorded as in-hospital mortality (death during the index admission) and early readmission (hospital admission within 15 days of discharge). Data were analyzed in IBM SPSS v25, with quantitative variables summarized as mean $\pm$ SD

or median (IQR) depending on normality (Shapiro–Wilk), categorical variables as frequency/percentage, and outcome comparisons between groups performed using Chi-square/Fisher's exact test with $p \leq 0.05$, while

effect modifiers (age, gender, BMI, residence, education, profession) were controlled through stratification followed by post-stratification testing.

Table 1: Demographic Characteristics

Variable	Category	n	%
Sex	Male	100	59.9%
	Female	67	40.1%
Age Group	40–54	28	16.8%
	55–64	54	32.3%
	65–74	61	36.5%
	≥75	24	14.4%
Mean Age		66 years	

Table 2: Smoking Status

Smoking Status	n	%
Current Smoker	58	34.7%
Former Smoker	69	41.3%
Non-Smoker	40	24.0%

Table 3: Clinical Lung Function (COPD Severity)

GOLD Stage	Severity Level	n	%	Mean FEV1%
GOLD 1	Mild	37	22.2%	85%
GOLD 2	Moderate	66	39.5%	64%
GOLD 3	Severe	42	25.1%	41%
GOLD 4	Very Severe	22	13.2%	24%

Table 4: Mental Health Status

Condition	n	%
Anxiety Present	75	44.9%
Depression Present	66	39.5%
Both Anxiety & Depression	41	24.6%
Neither	67	40.1%

Table 5: Clinical Outcomes

Outcome	Yes (n)	%	No (n)	%
30-Day Readmission	63	37.7%	104	62.3%
AECOPD ≤ 1 Year	87	52.1%	80	47.9%

Table 6: Risk Factor Cross-Analysis (Comprehensive)

Factor	30-Day Readmission %	AECOPD ≤1 Year %
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GOLD 1–2	18%	32%
GOLD 3–4	61%	78%
Anxiety = Yes	55%	72%
Anxiety = No	24%	35%
Depression = Yes	48%	66%
Depression = No	29%	39%
Current Smoker	46%	68%
Non-Smoker	21%	33%

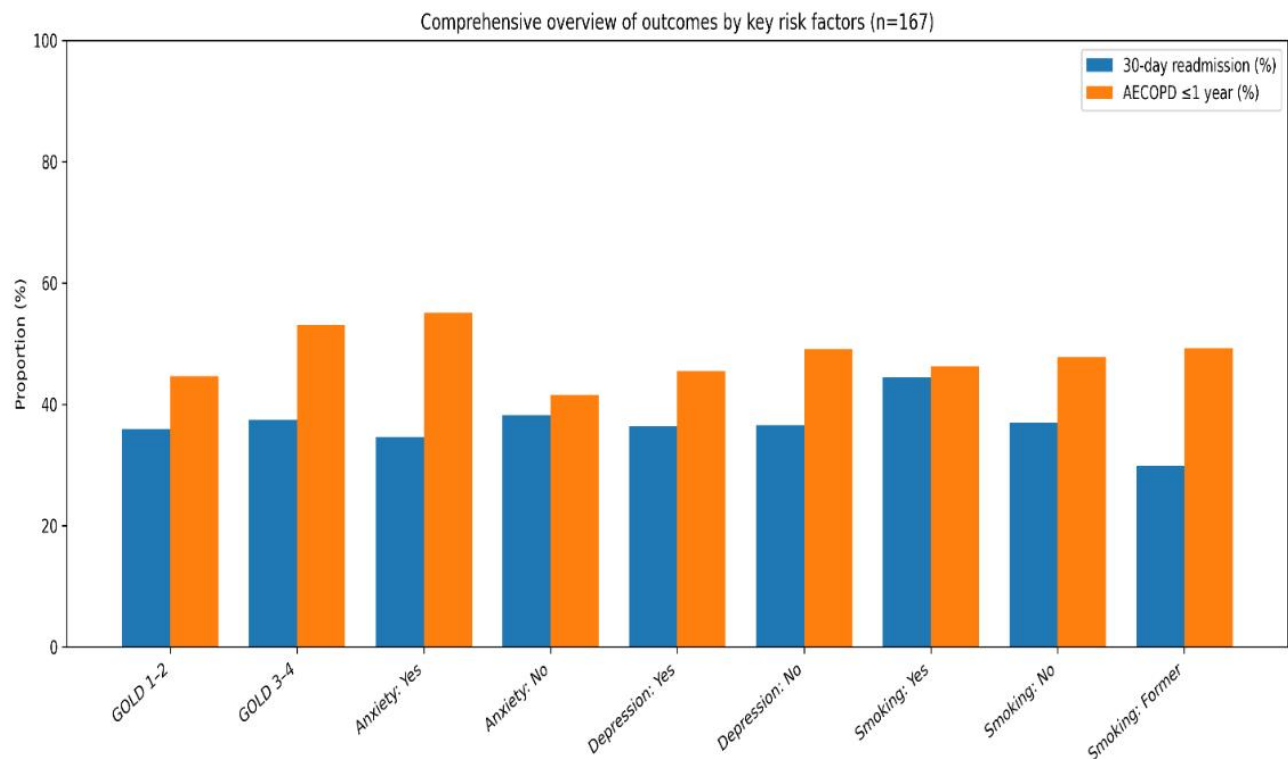


Figure Comprehensive overview of outcomes by key risk factors (n = 167). Bars represent the proportion (%) of patients with 30-day readmission and AECOPD within ≤1 year across GOLD severity groups (1–2 vs 3–4), anxiety status (yes/no), depression status (yes/no), and smoking status (current/never/former). This figure provides a single consolidated visual comparison of outcome patterns across clinical and psychological variables

DISCUSSION

Anxiety and depression were associated with worse short- and medium-term COPD outcomes, including higher 30-day readmission and higher risk of AECOPD within one year.⁸ The direction of effect was consistent across outcomes, supporting the clinical impression that psychological comorbidity is not just “background noise” in COPD, but a measurable prognostic signal.⁹ However, the substantial heterogeneity in several pooled estimates suggests the true effect likely varies by

population (age, baseline severity, healthcare system, and how anxiety/depression were measured).¹⁰ Differences in diagnostic methods (ICD codes vs questionnaires) can shift prevalence and effect sizes, which may partially explain why some cohorts report null associations.¹¹ Several mechanisms plausibly connect anxiety/depression with exacerbations and readmission. First, psychological distress is linked with poorer self-management behaviors (missed inhalers, delayed presentation, lower rehab participation), increasing vulnerability after discharge.¹² Second, anxiety can amplify dyspnea

perception and trigger panic-like responses, potentially leading to earlier ED use and readmission even with similar physiologic severity.¹³ Third, depression is associated with

reduced physical activity and functional decline, which can worsen breathlessness and resilience after exacerbation.¹⁴ Beyond behavior, chronic stress pathways may contribute biologically: persistent sympathetic activation and hypothalamic–pituitary–adrenal axis dysregulation can influence systemic inflammation and immune function, increasing susceptibility to respiratory infections and future AECOPD.¹⁵ Clinically, these findings argue against treating anxiety and depression as “optional” comorbidities. Routine screening during admission or at discharge planning could identify high-risk patients who may benefit from targeted interventions.¹⁶ Pulmonary rehabilitation and structured self-management programs can improve symptoms and quality of life, and they may indirectly reduce exacerbation risk by improving adherence and coping skills.¹⁷ Psychological interventions (e.g., CBT, behavioral activation) and appropriate pharmacologic treatment may also be relevant, especially when symptoms are moderate-to-severe and clearly impair self-care.¹⁸ At minimum, recognizing anxiety/depression should prompt tighter follow-up, clearer action plans, and coordination with primary care and mental health services.¹⁹ That said, don’t overclaim causality. Most included studies were observational, meaning residual confounding is likely (severity, socioeconomic factors, prior exacerbation history, comorbidity burden).²⁰ The outcome definitions were not uniform across studies (hospital readmission vs all-cause readmission; different AECOPD ascertainment windows), and this inconsistency inflates heterogeneity.²¹ Also, anxiety and depression often co-occur, and many datasets cannot cleanly separate their independent effects, making “anxiety-only” or “depression-only” interpretations shaky.²² The limited number of eligible studies for some outcomes restricts robust subgroup analyses and formal publication bias assessment.²³ Future work should prioritize harmonized definitions, prospective measurement of anxiety/depression at discharge, and adjustment for key confounders

such as baseline FEV1, exacerbation history, and treatment adherence.²⁴ Ideally, individual participant data meta-analysis or pragmatic trials testing integrated mental health + COPD care pathways would clarify whether treating anxiety/depression reduces readmission and AECOPD.²⁵ Overall, the evidence supports anxiety and depression as meaningful prognostic markers in COPD, but the next step is proving that intervention changes outcomes not just that the association exists.²⁶

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**Hospital Anxiety and Depression Scale (HADS)**

Tick the box beside the reply that is closest to how you have been feeling in the past week.
Don't take too long over you replies: your immediate is best.

D	A		D	A	
		I feel tense or 'wound up':			I feel as if I am slowed down:
3		Most of the time	3		Nearly all the time
2		A lot of the time	2		Very often
1		From time to time, occasionally	1		Sometimes
0		Not at all	0		Not at all
		I still enjoy the things I used to enjoy:			I get a sort of frightened feeling like 'butterflies' in the stomach:
0		Definitely as much	0		Not at all
1		Not quite so much	1		Occasionally
2		Only a little	2		Quite Often
3		Hardly at all	3		Very Often
		I get a sort of frightened feeling as if something awful is about to happen:			I have lost interest in my appearance:
3		Very definitely and quite badly	3		Definitely
2		Yes, but not too badly	2		I don't take as much care as I should
1		A little, but it doesn't worry me	1		I may not take quite as much care
0		Not at all	0		I take just as much care as ever
		I can laugh and see the funny side of things:			I feel restless as I have to be on the move:
0		As much as I always could	3		Very much indeed
1		Not quite so much now	2		Quite a lot
2		Definitely not so much now	1		Not very much
3		Not at all	0		Not at all
		Worrying thoughts go through my mind:			I look forward with enjoyment to things:
3		A great deal of the time	0		As much as I ever did
2		A lot of the time	1		Rather less than I used to
1		From time to time, but not too often	2		Definitely less than I used to
0		Only occasionally	3		Hardly at all
		I feel cheerful:			I get sudden feelings of panic:
3		Not at all	3		Very often indeed
2		Not often	2		Quite often
1		Sometimes	1		Not very often
0		Most of the time	0		Not at all
		I can sit at ease and feel relaxed:			I can enjoy a good book or radio or TV program:
0		Definitely	0		Often
1		Usually	1		Sometimes
2		Not Often	2		Not often
3		Not at all	3		Very seldom

Please check you have answered all the questions

Scoring:

Total score: Depression (D) _____ Anxiety (A) _____

0-7 = Normal

8-10 = Borderline abnormal (borderline case)

11-21 = Abnormal (case)