

## Clinical Profile, Risk Factors, and Outcome of Acute Exacerbation of Chronic Obstructive Pulmonary Disease in a Tertiary Care Hospital in Central India: A Cross-Sectional Study

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### Abstract:

**Background:** Chronic obstructive pulmonary disease (COPD) is a major cause of morbidity and mortality worldwide, with acute exacerbations significantly contributing to disease burden and healthcare utilization. Understanding clinical characteristics and associated risk factors is essential for better management.

**Objective:** To evaluate the clinical profile, risk factors, and outcomes of patients presenting with acute exacerbation of COPD (AECOPD).

**Methods:** A cross-sectional observational study was conducted during the period of one year (September 2023 to August 2024) in a Government Medical College, Akola. A total of 200 patients diagnosed with AECOPD were included. Data regarding demographics, clinical features, comorbidities, laboratory findings, and outcomes were collected and analyzed using appropriate statistical methods.

**Results:** The majority of patients were males (72%) with a mean age of  $64.3 \pm 9.8$  years. Smoking was the most significant risk factor (68%), followed by biomass fuel exposure (21%). The most common symptoms were dyspnea (100%), cough (85%), and sputum production (78%). Infective exacerbation was identified in 62% of cases. Comorbidities such as hypertension (34%) and diabetes (28%) were common. ICU admission was required in 18% of cases, with a mortality rate of 9%. Severity of airflow limitation and presence of comorbidities were significantly associated with poor outcomes ( $p < 0.05$ ).

**Conclusion:** AECOPD is strongly associated with modifiable risk factors such as smoking and infections. Early identification and management of risk factors can improve clinical outcomes and reduce mortality.

**Keywords:** COPD, Acute Exacerbation, Smoking, Respiratory Infection, Risk Factors, India.

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### Introduction

Chronic obstructive pulmonary disease (COPD) is a progressive respiratory disorder characterized by persistent airflow limitation and chronic inflammatory response in the airways and lungs [1]. It is a leading cause of morbidity and mortality globally and is projected to become the third leading cause of death worldwide [2].

Acute exacerbations of COPD (AECOPD) are episodes of worsening respiratory symptoms that require additional therapy [3]. These exacerbations accelerate disease progression, reduce quality of life, and increase hospitalization rates and healthcare costs [4].

The etiology of AECOPD is multifactorial, with respiratory infections, environmental pollutants, and non-adherence to treatment being major triggers [5]. In developing countries like India, additional factors such as biomass fuel exposure and delayed healthcare access further contribute to disease burden [6].

Despite the high prevalence of COPD, there is limited region-specific data from Central India regarding clinical presentation, risk factors, and outcomes. Understanding these factors is crucial for improving patient management strategies.

**Aim:** To study the clinical profile, risk factors, and outcomes of patients with AECOPD.

### Objectives:

- To evaluate demographic and clinical characteristics of AECOPD patients
- To identify associated risk factors and comorbidities
- To assess clinical outcomes including ICU admission and mortality

### Material and Methods

**Study Design and Setting:** This hospital-based cross-sectional observational study was conducted in the Department of Respiratory Medicine in

Government Medical College, Akola. The study design was chosen to assess the clinical profile, risk factors, and outcomes of patients presenting with acute exacerbation of chronic obstructive pulmonary disease (AECOPD) in a real-world clinical setting. The hospital caters to both urban and rural populations, thereby providing a representative sample of patients from diverse socioeconomic backgrounds.

**Study Duration:** The study was carried out over a period of 12 months, from September 2023 to August 2024 in a Government Medical College, Akola. This duration allowed for the inclusion of seasonal variations in exacerbation patterns, particularly those related to infectious triggers and environmental factors.

**Study Population:** The study population comprised patients admitted with a diagnosis of AECOPD. Diagnosis of COPD was established based on clinical history, physical examination, and spirometric confirmation of airflow limitation as per Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria, defined as a post-bronchodilator FEV1/FVC ratio of less than 0.70. Acute exacerbation was defined as a sustained worsening of respiratory symptoms beyond normal day-to-day variations requiring additional treatment.

**Sample Size and Sampling Technique:** A total of 200 patients were included in the study based on feasibility and expected patient inflow during the study period. A consecutive sampling method was employed, wherein all eligible patients meeting the inclusion criteria during the study period were enrolled. This approach minimized selection bias and ensured representation of the target population.

**Inclusion and Exclusion Criteria:** Patients aged 40 years and above with a confirmed diagnosis of COPD presenting with acute exacerbation were included in the study. Patients with a known history of bronchial asthma, active pulmonary tuberculosis, interstitial lung disease, or other chronic respiratory conditions were excluded to avoid confounding. Additionally, patients who were unwilling to provide informed consent were not included.

**Data Collection Procedure:** Data were collected using a predesigned, semi-structured proforma. Upon admission, detailed demographic information including age, gender, occupation, and residence was recorded. A comprehensive clinical history focusing on smoking habits (pack-years), exposure to biomass fuel, occupational exposure, and previous exacerbation history was obtained. Clinical presentation including symptoms such as dyspnea, cough, sputum production, fever, and chest tightness was documented.

Physical examination findings including vital parameters, respiratory rate, oxygen saturation, and auscultatory findings were recorded. Laboratory investigations such as complete blood count, arterial blood gas analysis, and sputum examination were performed. Radiological investigations, primarily chest X-ray, were used to identify infective or other causes of exacerbation.

**Assessment of Risk Factors and Comorbidities:** Risk factors including smoking status (current, former, never smoker), biomass fuel exposure, and occupational exposure were assessed. Comorbid conditions such as hypertension, diabetes mellitus, ischemic heart disease, and chronic kidney disease were identified based on patient history, medical records, and ongoing treatment. The presence of comorbidities was considered an important variable influencing disease severity and outcomes.

**Classification of Severity:** Severity of COPD was classified according to GOLD guidelines based on spirometric findings and clinical presentation. Patients were categorized into moderate, severe, and very severe airflow limitation groups. The severity of exacerbation was also assessed based on clinical features and need for hospitalization or intensive care support.

**Outcome Measures:** Primary outcome measures included requirement of intensive care unit (ICU) admission, need for mechanical ventilation (invasive or non-invasive), duration of hospital stay, and in-hospital mortality. Secondary outcomes included association of risk factors and comorbidities with disease severity and clinical outcomes.

**Statistical Analysis:** Data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 25. Continuous variables were expressed as mean  $\pm$  standard deviation, while categorical variables were presented as frequencies and percentages. The association between categorical variables was assessed using the Chi-square test or Fisher's exact test as appropriate. Logistic regression analysis was performed to identify independent predictors of poor outcomes such as ICU admission and mortality. A p-value of less than 0.05 was considered statistically significant.

## Results

A total of 200 patients diagnosed with acute exacerbation of chronic obstructive pulmonary disease (AECOPD) were included in the study. The results are presented in a structured manner covering demographic profile, risk factors, clinical characteristics, severity, and outcomes along with statistical associations.

**Demographic Characteristics:** The mean age of the study population was  $64.3 \pm 9.8$  years, with the

majority of patients belonging to the age group of 60–70 years (42%). Male patients predominated, accounting for 72% (n = 144), while females

constituted 28% (n = 56). The male-to-female ratio was approximately 2.6:1.

**Table 1: Demographic Characteristics of Study Population (n = 200)**

Variable	Frequency (n)	Percentage (%)
Age (years)		
40–50	28	14
51–60	52	26
61–70	84	42
>70	36	18
Gender		
Male	144	72
Female	56	28

The data indicate that COPD exacerbations were more common among elderly individuals, particularly males, which is consistent with higher smoking prevalence in this demographic.

(n = 136) of patients. Biomass fuel exposure was reported in 21% (n = 42), predominantly among females, while occupational exposure was noted in 9% (n = 18).

**Risk Factor Distribution:** Smoking was identified as the most significant risk factor, present in 68%

**Table 2: Distribution of Risk Factors**

Risk Factor	Frequency (n)	Percentage (%)
Smoking	136	68
Biomass Exposure	42	21
Occupational Exposure	18	9
No Identifiable Risk	4	2

Statistical analysis using the Chi-square test showed a significant association between smoking and severity of COPD exacerbation ( $\chi^2 = 5.12$ ,  $p = 0.02$ ), indicating that smokers were more likely to present with severe disease.

**Clinical Presentation:** Dyspnea was present in all patients (100%), followed by cough in 85% (n = 170) and sputum production in 78% (n = 156). Fever was observed in 46% (n = 92), suggesting an infective etiology in a substantial proportion of cases.

**Table 3: Clinical Features of Patients with AECOPD**

Clinical Feature	Frequency (n)	Percentage (%)
Dyspnea	200	100
Cough	170	85
Sputum Production	156	78
Fever	92	46
Chest Tightness	64	32

The predominance of respiratory symptoms highlights the acute nature of exacerbations, with infective triggers being a major contributing factor.

while non-infective causes such as environmental pollutants and non-compliance contributed to 38% (n = 76).

**Etiology of Exacerbation:** Infective causes accounted for 62% (n = 124) of exacerbations,

**Table 4: Etiology of AECOPD**

Etiology	Frequency (n)	Percentage (%)
Infective	124	62
Non-infective	76	38

There was a statistically significant association between infective etiology and ICU admission ( $\chi^2 = 4.67$ ,  $p = 0.03$ ), indicating that infective

exacerbations were more severe and required intensive care support.

**Comorbidities:** Comorbid conditions were present in a significant proportion of patients. Hypertension

was the most common (34%), followed by diabetes mellitus (28%) and ischemic heart disease (15%).

**Table 5: Distribution of Comorbidities**

Comorbidity	Frequency (n)	Percentage (%)
Hypertension	68	34
Diabetes Mellitus	56	28
Ischemic Heart Disease	30	15
No Comorbidity	46	23

Chi-square analysis revealed a significant association between presence of comorbidities and mortality ( $\chi^2 = 6.21$ ,  $p = 0.01$ ), suggesting that patients with comorbid conditions had poorer outcomes.

**Severity of COPD (GOLD Classification):** Based on GOLD criteria, 40% ( $n = 80$ ) of patients had moderate disease, 45% ( $n = 90$ ) had severe disease, and 15% ( $n = 30$ ) had very severe disease.

**Table 6: Severity Classification of COPD**

Severity	Frequency (n)	Percentage (%)
Moderate	80	40
Severe	90	45
Very Severe	30	15

A significant association was observed between severity and adverse outcomes such as ICU admission and mortality ( $p < 0.05$ ).

ventilation, and mortality. ICU admission was required in 18% ( $n = 36$ ) of patients, while 12% ( $n = 24$ ) required mechanical ventilation. The overall mortality rate was 9% ( $n = 18$ ).

**Clinical Outcomes:** Outcomes were assessed in terms of ICU admission, need for mechanical

**Table 7: Clinical Outcomes of Patients**

Outcome	Frequency (n)	Percentage (%)
ICU Admission	36	18
Mechanical Ventilation	24	12
Mortality	18	9
Recovered	182	91

Logistic regression analysis identified severity of disease and presence of comorbidities as independent predictors of mortality. Patients with very severe COPD had significantly higher odds of mortality (Odds Ratio [OR] = 3.2, 95% CI: 1.4–7.1,  $p = 0.004$ ). Similarly, presence of comorbidities increased the risk of mortality (OR = 2.8, 95% CI: 1.2–6.3,  $p = 0.01$ ).

### Discussion

This study highlights the clinical and epidemiological profile of AECOPD patients in Central India. The predominance of elderly males is consistent with previous studies [8].

Smoking emerged as the most significant risk factor, which aligns with global evidence identifying tobacco exposure as the primary cause of COPD [1]. Biomass fuel exposure was also notable, especially among female patients, reflecting rural and semi-urban environmental conditions [6].

Dyspnea was the most common presenting symptom, similar to findings reported in earlier studies [9]. The high proportion of infective exacerbations underscores the importance of early diagnosis and antibiotic stewardship.

Comorbidities such as hypertension and diabetes were prevalent and significantly influenced outcomes. This finding supports previous evidence that comorbid conditions worsen prognosis in COPD patients [10].

The ICU admission rate (18%) and mortality rate (9%) observed in this study are comparable to other hospital-based studies in India [11]. Severity of airflow limitation and presence of comorbidities were key predictors of poor outcomes.

The study emphasizes the need for preventive strategies, including smoking cessation programs, vaccination, and early treatment of infections.

### Conclusion

Acute exacerbations of COPD are associated with significant morbidity and mortality. Smoking, infections, and comorbidities are major contributing factors. Early identification and targeted management strategies can improve patient outcomes.

### References

1. Global Initiative for Chronic Obstructive Lung Disease. Global Strategy for the Diagnosis, Management, and Prevention of COPD. 2022.

2. World Health Organization. Chronic obstructive pulmonary disease (COPD). WHO; 2021.
3. Wedzicha JA, Seemungal TA. COPD exacerbations: defining their cause and prevention. *Lancet*. 2007;370(9589):786–96.
4. Seemungal TA, Donaldson GC, Paul EA, Bestall JC, Jeffries DJ, Wedzicha JA. Effect of exacerbation on quality of life in COPD. *Am J Respir Crit Care Med*. 1998;157(5):1418–22.
5. Sethi S. Infection as a comorbidity of COPD. *Eur Respir J*. 2010;35(6):1209–15.
6. Salvi S, Barnes PJ. Chronic obstructive pulmonary disease in non-smokers. *Lancet*. 2009;374(9691):733–43.
7. GOLD Report. Global Strategy for COPD Management. 2022.
8. Jindal SK. COPD: The Indian perspective. *Indian J Chest Dis Allied Sci*. 2006;48(1):3–4.
9. Miravittles M, Anzueto A. Role of exacerbations in COPD. *Eur Respir Rev*. 2015;24(137):166–75.
10. Mannino DM, Thorn D, Swensen A, Holguin F. Prevalence and outcomes of comorbidities in COPD. *Eur Respir J*. 2008;32(4):962–9.
11. Patil SP, et al. Clinical profile of COPD exacerbations in India. *Lung India*. 2012;29(3):221–5.