A study of clinical presentation, precipitating factors, and predictors of severity among patients with Acute Exacerbation of COPD attending the Emergency department of a tertiary care center

Angana Parajuli[1]*, Nishant Pandey[2], Sulav Kumar Jha[2], Bistrit Dahal[2], Shreya Gautam[3]

[1]Department of General Practice & Emergency Medicine, Nepal Manipal Teaching Hospital, Pokhara, Nepal, [2]MBBS, Nepal Manipal Teaching Hospital, Pokhara, Nepal, [3]Department of ENT, Nepal Manipal Teaching Hospital, Pokhara, Nepal

ABSTRACT

Introduction: Chronic obstructive pulmonary disease (COPD) is a leading cause of morbidity and mortality worldwide. Acute exacerbations frequently lead to emergency visits and worsen patient outcomes. This study aimed to assess the clinical presentation, precipitating factors, and predictors of severity among patients with AECOPD (Acute exacerbation of chronic obstructive pulmonary disease). **Methods:** A descriptive cross-sectional study was conducted among 150 patients presenting with AECOPD to the emergency department of a tertiary care center in Pokhara, Nepal. Data on clinical features, risk factors, and investigations were collected and analyzed using SPSS 25.0. Multivariable logistic regression was used to identify predictors of ICU admission. **Results:** The mean age was 75.6±9.8 years, with female predominance 92(61.3%). Shortness of breath 147(98%) and cough 125(83.3%) were the most common symptoms. Recent upper respiratory tract infection 38(25.3%) was the most frequent trigger. ICU admission was required in 42(28%) of patients. Increased respiratory rate, lower oxygen saturation, cyanosis, and accessory muscle use were associated with severity. Respiratory rate, PaO_2, and serum creatinine were independent predictors of ICU admission. **Conclusions:** AECOPD mainly affects elderly patients and is commonly triggered by infections. Simple clinical and laboratory parameters can help identify severe cases early, allowing timely management and improved outcomes.

Keywords: Acute disease, chronic obstructive, intensive care units, pulmonary disease, risk factors.

***Correspondence:**
Dr. Angana Parajuli
Department of General Practice & Emergency Medicine
Nepal Manipal Teaching Hospital
Email: parajuli.angana@gmail.com
Contact: 9866007292
ORCID iD: https://orcid.org/0009-0004-6691-3600

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a major global health problem, affecting over 400 million people and ranking as the third leading cause of death worldwide.[1] The burden is particularly high in low- and middle-income countries. In Nepal, COPD is a significant public health concern with prevalence ranging from 22.7% to 43%, contributing substantially to morbidity, mortality, and healthcare burden.[2-4] COPD is a progressive lung disease characterized by persistent airflow limitation and chronic inflammation of the airways.[5,6] It is primarily associated with risk factors such as smoking, biomass fuel exposure, and air pollution.[1,2] A key feature of COPD is acute exacerbations (AECOPD), defined as episodes of worsening respiratory symptoms requiring additional treatment or hospitalization.[5] Patients with AECOPD commonly present with worsening dyspnea, cough, and increased sputum production, with symptoms varying in severity and often overlapping with other conditions.[7,8]

These exacerbations are clinically important as they lead to increased hospital admissions, reduced quality of life, and accelerated disease progression.[3,9] Exacerbations are triggered by multiple factors,

including respiratory infections, environmental pollution, smoking, and comorbid conditions.[9-11] Identification of these precipitating factors is essential, as they significantly influence disease severity, hospital admission, and outcomes.[3] In the emergency department, COPD is a major contributor to patients presenting with dyspnea, accounting for a substantial proportion of cases.[12] Severe exacerbations may require urgent interventions such as non-invasive ventilation or intensive care support, highlighting the importance of early recognition and management.[13] However, data from Nepal are limited, and are even more scarce in our region, particularly regarding the clinical presentation and precipitating factors of AECOPD in tertiary care emergency settings.[14]

Therefore, this study aimed to assess the clinical presentation and identify precipitating factors of AECOPD among patients attending the emergency department of Manipal Teaching Hospital. Understanding these aspects may help improve early diagnosis, management, and prevention strategies, thereby reducing the burden of COPD.

METHODS

This was a hospital-based descriptive cross-sectional study conducted in the Department of Emergency at Manipal Teaching Hospital, Pokhara, Nepal, after obtaining ethical approval from the Institutional Review Committee of Manipal College of Medical Sciences (Ref. No. MCOMS/IRC/623/GA). The study included patients aged 18 years and above presenting to the emergency department with a clinical diagnosis of acute exacerbation of chronic obstructive pulmonary disease (AECOPD) or previously diagnosed COPD based on prior spirometry, documented diagnosis, or long-term inhaler use. Patients who refused consent, those in whom COPD was not the primary diagnosis (such as acute heart failure, pneumothorax, or pulmonary embolism), patients referred from other centers with incomplete records, and cases with insufficient clinical data were excluded.

Data were collected using a structured proforma through history taking, clinical examination, and investigation review. Information included demographic characteristics; presenting symptoms; risk factors; and comorbidities. Clinical findings and investigations were also recorded. Emergency department outcomes were categorized as discharge, ward admission, ICU admission, or death.

The study was conducted from November 2025 to March 2026 to achieve the calculated sample size of 150. Data were entered into Microsoft Excel and analyzed using the Statistical Package for the Social Sciences (SPSS 25.0). Continuous variables were assessed for normality and expressed as mean ± standard deviation (SD), while categorical variables were presented as frequencies and percentages. Baseline characteristics, clinical presentation and precipitating factors of patients were summarized using descriptive statistics. For comparison between groups (ward admission vs. ICU admission), continuous variables were analyzed using the independent samples t-test (or Mann-Whitney U test where appropriate), and categorical variables were compared using the Pearson Chi-square test. Variables found to be clinically relevant or statistically significant ($p<0.05$) in univariate analysis were included in a multivariable logistic regression model to identify independent predictors of ICU admission. Adjusted odds ratios (AORs) with 95% confidence intervals (CI) were calculated. A p-value of <0.05 was considered statistically significant. Informed consent was obtained from all participants or their legally authorized representatives, and confidentiality of patient information was strictly maintained throughout the study.

RESULTS

A total of 150 patients presenting to the ER with acute exacerbation of chronic obstructive pulmonary disease (AECOPD) were included in the study. The mean age of the study population was 75.6 ± 9.8 years, with female predominance 92(61.3%). Most patients 134(89.3%) had a prior diagnosis of COPD, and a significant proportion were on regular inhaler therapy 126(84.0%) and home oxygen use 90(60.0%). Medication non-compliance in the preceding 7 days was observed in 7(4.7%) of patients. Shortness of breath 147(98%) was the most common presenting complaint followed by cough 125(83.3%) and chest discomfort 103(68.7%). Fever 32(21.3%) and fatigue 34(22.7%) were least common symptoms reported. The mean duration of symptoms was 3.89 ± 3.21 days for dyspnea, 3.87 ± 3.46 days for cough, 0.71 ± 1.54 for fever, 0.41 ± 1.59 for chest discomfort and 0.19±1.12 for fatigue. Regarding sputum characteristics, 121(80.7%) of patients reported increased sputum volume, while 36(24.0%) had a change in sputum color. Wheeze was present in 147(98.0%) of patients. Clinical signs such as use of accessory muscles and altered sensorium were observed in 74(49.3%) and 16(10.7%) of patients, respectively. (Table 1)

Table 1: Demographic profile, patient characteristics, and clinical presentation of patients with COPD exacerbation (N=150)

Variable	Value

Demographic Profile	
Age (years)	75.6 ± 9.8
Male	58(38.7%)
Female	92(61.3%)
Patient Characteristics	
Known COPD	134(89.3%)
Home oxygen use	90(60.0%)
Regular inhaler use	126(84.0%)
Missed/stopped medications (last 7 days)	7(4.7%)
Clinical Presentation	
Shortness of breath	147(98%)
Cough	125(83.3%)
Chest discomfort	103(68.7%)
Fatigue	34(22.7%)
Fever	32(21.3%)
Increased sputum volume	121(80.7%)
Wheeze	147(98.0%)
Use of accessory muscles	74(49.3%)
Change in sputum color	36(24.0%)
Altered sensorium	16(10.7%)

Among the identified precipitating factors, recent upper respiratory tract infection (URTI) symptoms were the most common, observed in 38(25.3%) of patients. Other factors included medication non-compliance 7(4.7%), dust or pollution exposure 6(4.0%), and poor inhaler technique 6(4.0%). Smoking and biomass fuel exposure were relatively uncommon, reported in 4(2.7%) and 1(0.7%) of patients, respectively. (Table 2)

Table 2: Precipitating factors for COPD exacerbation (N=150)

Factor	Frequency n(%)
Recent URTI symptoms	38(25.3%)
Dust/pollution exposure	6(4.0%)
Medication non-compliance	7(4.7%)
Poor inhaler technique suspected	6(4.0%)
Smoking	4(2.7%)
Recent travel/crowded place exposure	2(1.3%)
Biomass fuel exposure	1(0.7%)

URTI: Upper Respiratory Tract Infection

Out of the total patients, 108 were admitted to the ward and 42 required ICU admission. There was no statistically significant difference between the two groups in terms of age (p=0.541), gender distribution (p=0.226), presence of comorbid conditions (p=0.167), or precipitating factors such as active smoking (p=0.312) and recent URTI (p=0.324). However, several clinical parameters were significantly associated with ICU admission. Patients admitted to the ICU had a significantly higher respiratory rate (26.88 ± 2.81 vs. 23.02 ± 3.06; p<0.001) and lower oxygen saturation (89.60 ± 3.13 vs. 91.69 ± 5.02; p=0.013). Cyanosis was markedly more frequent in ICU patients (81.0% vs. 30.6%; p<0.001), as was the use of accessory muscles (100.0% vs. 29.6%; p<0.001). Other variables, including temperature, altered sensorium, TLC, renal function, albumin levels, arterial blood gas parameters (pH, PaO_2, $PaCO_2$, HCO_3), and lactate levels, did not show statistically significant differences between the two groups. (Table 3)

Table 3: Severity assessment based on ward versus ICU admission in relation to demographic, clinical, and laboratory parameters

Variable	Ward (n=108)	ICU (n=42)	p-value
Age (years)	75.33 ± 9.54	76.43 ± 10.54	0.541
Gender (Male)	45(41.7%)	13(30.9%)	0.226
Gender (Female)	63(68.5%)	29(31.5%)	
Comorbid condition	64(59.3%)	30(71.4%)	0.167
Active smoking	2(1.9%)	2(4.8%)	0.312
Recent URTI symptoms	25(23.1%)	13(31.0%)	0.324
Respiratory rate	23.02 ± 3.06	26.88 ± 2.81	<0.001*
SpO_2 (%)	91.69 ± 5.02	89.60 ± 3.13	0.013
Temperature (°F)	97.78 ± 1.53	98.14 ± 1.83	0.221
Cyanosis	33(30.6%)	34(81.0%)	<0.001*
Altered sensorium	9(8.3%)	7(16.7%)	0.149
Accessory muscle use	32(29.6%)	42(100.0%)	<0.001*
TLC	10.28 ± 3.46	11.44 ± 5.54	0.125
Creatinine	0.93 ± 0.31	1.03 ± 0.40	0.117
Albumin	3.98 ± 0.40	3.85 ± 0.47	0.087
pH	7.35 ± 0.07	7.33 ± 0.07	0.086
PaO_2	65.56 ± 24.09	70.50 ± 17.64	0.229
$PaCO_2$	56.47 ± 11.27	58.18 ± 9.36	0.384
HCO_3	29.92 ± 3.82	29.43 ± 3.71	0.477
Lactate	1.54 ± 0.83	1.60 ± 0.77	0.707

*p-value<0.05 represents statistical significance; ICU: Intensive Care Unit; SpO_2: Oxygen saturation; TLC: Total Leucocyte Count; PaO_2: Partial Pressure of Oxygen in Arterial Blood, $PaCO_2$: Partial Pressure of Carbon Dioxide in Arterial Blood; HCO_3: Bicarbonate level.

On multivariable logistic regression analysis, respiratory rate, PaO_2, and serum creatinine were identified as independent predictors of ICU admission. An increase in respiratory rate was significantly associated with higher odds of ICU admission (AOR 1.74; 95% CI: 1.40-2.17; p<0.001). Similarly, higher PaO_2 levels were associated with increased odds of ICU admission (AOR 1.04; 95% CI: 1.01-1.07; p=0.007). Elevated serum creatinine was also a significant predictor (AOR 7.11; 95% CI: 1.18-42.88; p=0.032). Other variables, including age, comorbid conditions, oxygen saturation, altered sensorium, $PaCO_2$, HCO_3, lactate, total leukocyte count, and hemoglobin, were not significantly associated with ICU admission. (Table 4)

Table 4: Multivariable logistic regression analysis for predictors of ICU admission

Predictor	Adjusted Odds Ratio (AOR)	95% Confidence Interval	p-value
Age	0.98	0.93 - 1.03	0.446
Comorbid condition	0.83	0.28 - 2.45	0.73
Respiratory rate	1.74	1.40 - 2.17	<0.001*
SpO_2 (%)	1	0.87 - 1.15	0.994
Altered sensorium	0.26	0.05 - 1.40	0.118
PaO_2	1.04	1.01 - 1.07	0.007*
$PaCO_2$	0.8	0.55 - 1.18	0.258
HCO_3	1.26	0.63 - 2.51	0.513
Lactate	1.05	0.54 - 2.03	0.887
Creatinine	7.11	1.18 - 42.88	0.032*
TLC	0.95	0.83 - 1.08	0.44

Hemoglobin	1.23	0.93 - 1.61	0.145

*p-value<0.05 represents statistical significance; SpO_2: Oxygen saturation; PaO_2: Partial Pressure of Oxygen in Arterial Blood, $PaCO_2$: Partial Pressure of Carbon Dioxide in Arterial Blood; HCO_3: Bicarbonate level; TLC: Total Leucocyte Count.

DISCUSSION

This study evaluated the clinical presentation, precipitating factors, and predictors of severity among patients with AECOPD presenting to the emergency department, highlighting the substantial burden of disease, particularly among elderly patients, and emphasizing the importance of early identification of high-risk features to guide management. The mean age in our study (75.6 ± 9.8 years) was higher than that reported in other studies (65.2 ± 9.1 years)[15], suggesting a relatively older population that may contribute to increased disease severity; additionally, while previous studies reported a male predominance (78.4%)[15], our study demonstrated female predominance (61.3%) emphasizing the role of local epidemiological factors.

Dyspnea was the most common presenting symptom 147 (98%), consistent with studies identifying it as the leading reason for emergency department visits in AECOPD[3,9], and it has also been reported as a major presenting complaint in up to 20.6% of all emergency visits, with COPD being one of the most common diagnoses (24.2%).[12] Respiratory infections were the most common precipitating factor in our study, with upper respiratory tract infection accounting for 25.3% of cases, consistent with multiple studies identifying infections as the primary trigger for AECOPD[9,10,15]; both bacterial and viral etiologies are implicated, with viral infections contributing to 40–80% of severe exacerbations[10]. Environmental factors such as air pollution and dust exposure were also observed and have been widely reported as contributors[9,10], with increasing PM2.5 levels associated with higher hospital visits and mortality, further emphasizing the impact of environmental exposure.[10]

In terms of clinical predictors, increased respiratory rate, use of accessory muscles, and hypoxemia were significantly associated with ICU admission, aligning with previous studies identifying these markers of respiratory distress as indicators of severe disease and poor outcomes.[3,9] Similarly, lower oxygen saturation and reduced PaO_2 levels have been consistently associated with increased severity and need for hospitalization[3], reinforcing the importance of careful clinical assessment in the emergency setting. Renal function markers also played a role, as elevated serum creatinine was an independent predictor of ICU admission in our study, consistent with findings where increased serum urea was associated with hospitalization[3], suggesting that systemic involvement and organ dysfunction reflect more severe disease.

Arterial blood gas parameters such as pH and $PaCO_2$ were not significantly associated with ICU admission in our study, contrasting with studies that identified severe respiratory acidosis (pH<7.30) as a strong predictor of mortality and ICU admission[15,16]; this discrepancy may be due to differences in patient population, earlier presentation, or timely management mitigating acid-base disturbances. The proportion of ICU admission in our study (28%) was higher than the 2-19% reported in some studies[10] but lower than rates up to 51.6%[16], likely reflecting differences in settings, admission criteria, and disease severity; although mortality was not assessed, previous studies report mortality rates of 6.4%–9.7% among hospitalized patients[15,16], indicating the serious nature of AECOPD.

Our findings support the importance of early risk stratification; while previous studies emphasized acidosis and leukocytosis[15], our study identified respiratory rate, oxygenation status, and renal function as key predictors, suggesting that simple bedside clinical and laboratory parameters are valuable for identifying high-risk patients and guiding ICU admission decisions. Although not directly assessed, factors such as frequent exacerbations, advanced disease stage (GOLD III–IV), elevated inflammatory markers (e.g., fibrinogen), and poor nutritional status have been associated with worse outcomes[5,9,10], providing additional context and areas for future research. Finally, treatment-related issues, including inappropriate medication use and prolonged steroid therapy, are common among hospitalized AECOPD patients[14]; although not evaluated in our study, these remain important considerations for improving patient outcomes and optimizing management strategies.

CONCLUSIONS

This study highlighted that, acute exacerbations of COPD are common among elderly patients and often present with symptoms like shortness of breath and cough. Respiratory infections were the most frequent trigger, showing the importance of early detection and prevention of infections. Key clinical signs such as increased respiratory rate, low oxygen levels, and higher creatinine were useful in identifying patients at risk of severe illness and ICU admission. Recognizing these factors early in the emergency setting can help doctors make quicker decisions and improve patient outcomes. Overall, better awareness, timely management, and preventive strategies can play a major role in reducing the burden of COPD exacerbations.

CONFLICTS OF INTEREST: None declared

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AUTHORS' CONTRIBUTIONS

AP did conceptualization, study design, supervision, data analysis, manuscript drafting, review and editing, manuscript drafting. NP did data analysis, manuscript drafting, manuscript review and editing. SKJ did data collection, data curation, literature review. BD did data collection, data curation. SG did literature review and data curation.

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