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Clinical Profile and Outcomes of Hospitalized Patients with Acute Exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD): A Prospective Observational Study

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Abstract

Introduction: Globally, hospitalization and death from acute exacerbations of chronic obstructive pulmonary disease (AECOPD) account mostly for Improving care particularly in resource-limited environments like Pakistan depends on an awareness of the clinical profile and outcomes of patients hospitalized with AECOPD.

Methodology: Over 12 months, January 2023 to December 2023, this prospective observational research was carried out at the Ayub Teaching Hospital (ATH), Abbottabad. Enrolled were 121 individuals in all who were hospitalized with AECOPD. Demographic, clinical, comorbidity, treatment, and outcome data were gathered. To evaluate correlations and determinants of outcomes, statistical tests included chi-square, t-test, and logistic regression.

Results: The mean age was 65.2 ± 9.7 years, with 69.4% males and 30.6% females. A history of smoking was noted in 81.8% of patients. The most frequent symptoms were dyspnea (92.6%), productive cough (84.3%), and wheezing (76.0%). Hypertension (41.3%) and ischemic heart disease (36.4%) were common comorbidities. Non-invasive ventilation was used in 35.5%, and 9.1% required invasive ventilation. ICU admission occurred in 27.3% of cases, with an in-hospital mortality rate of 8.3%. The average hospital stay was 6.3 ± 2.7 days. Leukocytosis and need for invasive ventilation were significantly associated with ICU admission and mortality ($p<0.05$).

Conclusion: AECOPD continues to pose significant clinical burden, especially in older patients with comorbidities. Early identification of high-risk individuals and prompt management may improve outcomes. Strengthening inpatient care and follow-up strategies is essential to reduce complications and mortality.

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Introduction

COPD is a major global health concern characterized by persistent respiratory symptoms and airflow limitation due to airway and/or alveolar abnormalities [1]. Usually resulting from major exposure to harmful particles or gasses, especially tobacco smoke, this is a gradual and incapacitating disorder. The second is with around 3.23 million deaths in 2019 alone, COPD ranks third in the world's leading cause of mortality according to the World Health Organization (WHO) [2, 3]. The burden of COPD is expected to increase further due of continuous exposure to risk factors and aging populations globally [4]. Acute exacerbations of COPD (AECOPD) are defined as episodes of worsening respiratory symptoms beyond normal day-to--day variations, often leading to increased morbidity, mortality, and healthcare use [5]. Usually brought on by respiratory infections, environmental toxins, or poor medication adherence, these flare-ups cause faster lung function drop, worse quality of life, and increased risk of hospitalization [6].

A particularly susceptible group is hospitalized patients with AECOPD, who generally show with severe symptoms, comorbidities, and a significant risk of readmission or mortality within short times frames. The prognosis of AECOPD patients is much influenced by many clinical factors including the degree of airflow restriction, presence of comorbidities (e.g., cardiovascular disease, diabetes, or anemia), past history of exacerbation, and inflammatory markers [7]. Guidance of treatment choices, best use of resources, and enhancement of general patient care all depend on an awareness of the clinical profile of these patients upon admission and identification of predictors of adverse events [8].

Delayed diagnosis, underreporting, limited access to specialist treatment, and extensive exposure to indoor air pollution from biomass fuel use increase COPD's impact in underdeveloped nations like Pakistan [9].Localized studies are crucial to grasp how demographic, environmental, and systemic healthcare variables affect disease progression and treatment results given the variety of COPD presentations and healthcare infrastructure throughout areas [10]. Previous research in high-income countries has led to well-defined management protocols; however, such evidence may not be directly applicable to low- and middle-income countries like Pakistan [11]. Therefore, region-specific data are crucial for tailoring interventions that reflect the realities of clinical practice, resource availability, and patient needs in these settings.

This study addresses the existing gap by prospectively evaluating the clinical profile and outcomes of hospitalized AECOPD patients, with the objective of identifying key prognostic factors and informing context-specific management strategies.

Materials and Methods

Study Design and Setting

This prospective observational study was conducted at the Department of Pulmonology, Ayub Teaching Hospital (ATH), Abbottabad. The study spanned duration of 12 months, from January 2023 to December 2023.The aim of the study was to evaluate the clinical profile, treatment modalities, and outcomes of patients with AECOPD, and to identify predictors of mortality and ICU admission.

Sample Size Calculation

The sample size was calculated using a standard formula for observational studies, based on the expected prevalence of adverse outcomes (e.g., in-hospital mortality, ICU admission, or need for mechanical ventilation) among patients hospitalized with AECOPD. Assuming a 10% prevalence of severe outcomes, a 95% confidence level, and a 5% margin of error, the minimum required sample size was estimated to be 106. To account for potential dropouts or incomplete data, an additional 15% was added, resulting in a final sample size of 121 patients.

Inclusion and Exclusion Criteria

Patients aged 40 years and above who were admitted with a primary diagnosis of acute exacerbation of chronic obstructive pulmonary disease (as per GOLD criteria) were included in the study. AECOPD was defined as an acute worsening of respiratory symptoms requiring hospitalization. Patients were included if the diagnosis was confirmed by clinical history, physical examination, and previous spirometry reports demonstrating a post-bronchodilator FEV_1/FVC ratio of less than 0.70. Patients with alternative diagnoses such as bronchial asthma, interstitial lung disease, active pulmonary

tuberculosis, or congestive heart failure were excluded to maintain diagnostic accuracy.

Data Collection

Data were collected using a structured proforma by trained medical personnel. Demographic information (age, sex, smoking status), clinical parameters (symptom duration, comorbidities, baseline oxygen saturation, respiratory rate), laboratory results (complete blood count, arterial blood gases, serum electrolytes), and radiological findings (chest X-ray or HRCT if performed) were recorded upon admission. Details regarding treatment received during hospitalization, including use of systemic corticosteroids, antibiotics, bronchodilators, oxygen therapy, and need for non-invasive or invasive mechanical ventilation were also documented.

Outcomes assessed included length of hospital stay, need for ICU admission, need for mechanical ventilation, in-hospital complications, and mortality. Follow-up was conducted until discharge or death.

Statistical Analysis

SPSS version 26.0 housed the gathered data for statistical analysis. Dependent on the distribution, continuous variables were stated as means ± standard deviations or medians with interquartile ranges. Presented as frequencies and percentages were categorical variables. Using chi-square test for categorical data and independent t-test or Mann-Whitney U test for continuous variables, as suitable, associations between clinical parameters and outcomes were investigated. Considered statistically significant was a p-value of under 0.05.

Ethical Consideration

The investigation was carried out in conformity with the ethical standards set forth by the institute's institutional review board (IRB). Before the research began, written informed permission was sought from each participant or legal guardian. The studies followed the local ethical standards and the criteria of the Declaration of Helsinki.

Results

A total of 121 patients with a confirmed diagnosis of Acute Exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD) were enrolled in the study. The mean age of the patients was 64.8 ± 9.3 years, with a male predominance (n=86, 71.1%) compared to females (n=35, 28.9%). The most common risk factor was smoking, with 82 patients (67.8%) identified as current or former smokers. The average duration of COPD among the study population was 6.7 ± 3.5 years, reflecting a chronic disease course. Regarding comorbid conditions, hypertension was observed in 52 patients (42.9%), ischemic heart disease in 36 (29.8%), and diabetes mellitus in 32 (26.4%). These baseline characteristics underscore the burden of comorbidities and long-standing smoking exposure among patients admitted with AECOPD, factors that may influence disease progression and clinical outcomes. As shown in table 1.

Table 1: Baseline Demographics and Clinical Characteristics (n = 121)

Variable	Value
Age (years), mean ± SD	64.8 ± 9.3
Male, n (%)	86 (71.1%)
Female, n (%)	35 (28.9%)
Smoking history, n (%)	82 (67.8%)
Duration of COPD (years)	6.7 ± 3.5
Hypertension, n (%)	52 (42.9%)
Ischemic heart disease, n (%)	36 (29.8%)
Diabetes mellitus, n (%)	32 (26.4%)

The clinical profile of patients admitted with AECOPD revealed mean disease duration of 6.7 ± 3.5 years prior to admission, reflecting the chronic and progressive nature of COPD. The most frequently reported symptom was dyspnea, observed in 112 patients (92.5%), followed closely by productive cough in 106 patients (87.6%) and wheezing in 77 (63.6%). Less common symptoms included cyanosis, noted in 34 patients (28.1%), and fever in 28 (23.1%). Comorbidities were prevalent, affecting 78 patients (64.5%), with hypertension (42.9%), ischemic heart disease (29.8%), and diabetes mellitus (26.4%) being the most common underlying conditions. These findings highlight the typical symptom burden and comorbidity profile associated with AECOPD presentations (as illustrated in Figure 1).

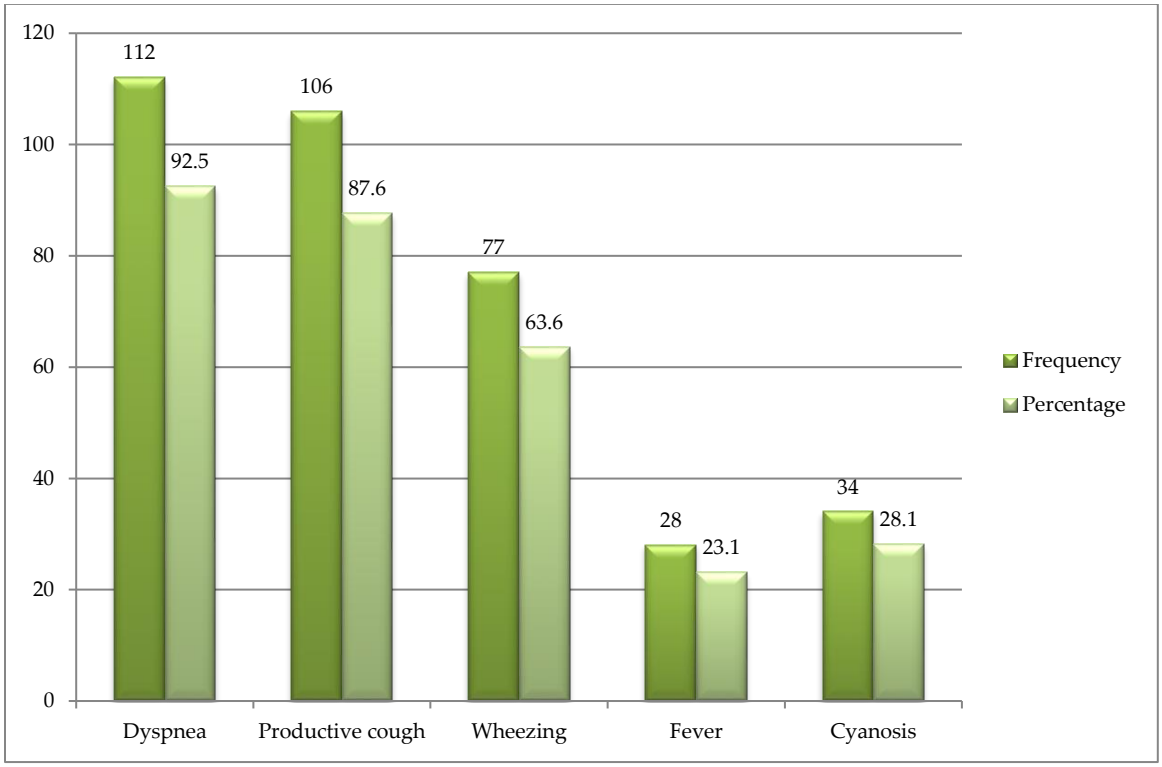

Figure 1: Presenting Symptoms and Physical Examination Findings

Laboratory and radiological assessments provided valuable insights into the physiological derangements in patients with AECOPD. The mean hemoglobin level was 13.2 ± 1.8 g/dL, indicating a generally preserved hematologic profile, while leukocytosis (WBC >11,000/mm³) was detected in 51 patients (42.1%), suggestive of systemic inflammation or infection. Arterial blood gas analysis showed impaired oxygenation, with a mean PaO_2 of 56.3 ± 10.4 mmHg, elevated $PaCO_2$ of 48.9 ± 7.6 mmHg, and a mean pH of 7.36 ± 0.05, reflecting varying degrees of respiratory acidosis. Radiological findings were also significant: hyperinflated lung fields were the most frequent abnormality, seen in 71 patients (58.6%), followed by bilateral infiltrates in 38 patients (31.4%), and cardiomegaly in 19 patients (15.7%). These findings collectively underscore the typical pathophysiological features of AECOPD and the presence of potential complications such as infection and right heart strain (Table 2).

Table 2: Laboratory and Radiological Findings

Parameter	Mean ± SD / Frequency	Percentage
Hemoglobin (g/dL)	13.2 ± 1.8	N/A
WBC > 11,000/mm³	51	42.1%
PaO_2 (mmHg)	56.3 ± 10.4	N/A
$PaCO_2$ (mmHg)	48.9 ± 7.6	N/A
pH	7.36 ± 0.05	N/A
Bilateral infiltrates	38	31.4
Hyperinflation	71	58.6
Cardiomegaly	19	15.7

During hospitalization, various treatment modalities were employed to manage the patients' conditions. Systemic corticosteroids were the most commonly administered therapy, given to 116 patients (95.9%),

followed closely by antibiotics, which were prescribed to 107 patients (88.4%). Bronchodilators were used universally in all 121 patients (100%), highlighting their fundamental role in acute management.

Non-invasive ventilation (NIV) was utilized in 43 patients (35.5%), while a smaller proportion, 11 patients (9.1%), required invasive mechanical ventilation. The average duration of hospital stay was 6.3 ± 2.1 days, reflecting the intensity and complexity of care required for these patients. As illustrated in figure 2.

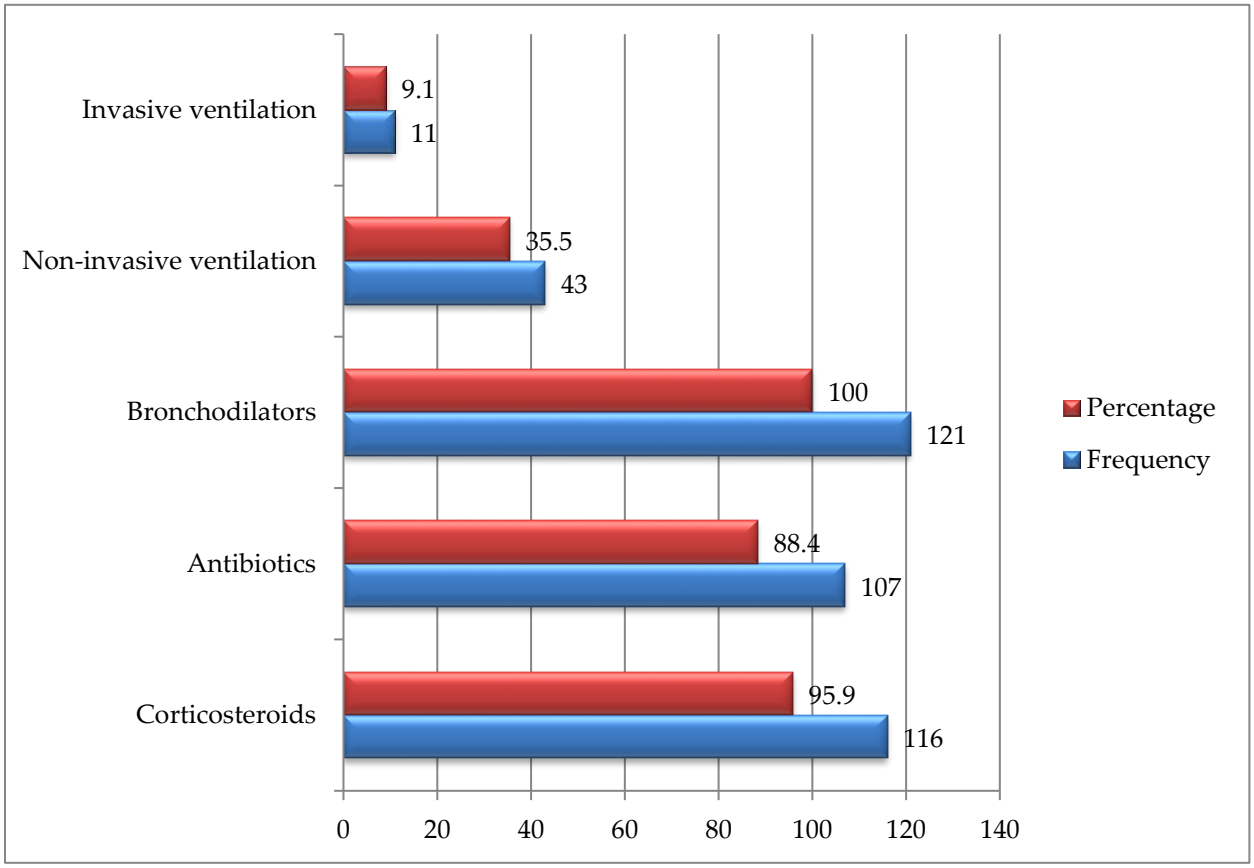

Figure 2: Treatment Modalities Used During Hospitalization

Among the 121 patients included in the study, 17 (14.0%) required admission to the intensive care unit (ICU), while 10 patients (8.3%) succumbed during hospitalization. The remaining 111 patients (91.7%) were successfully discharged following clinical stabilization. Statistical analysis revealed several significant associations: male patients were more likely to require non-invasive ventilation (NIV) compared to females (41.8% vs. 20.0%, p = 0.021), indicating a gender-related difference in respiratory support needs. Patients with comorbid conditions experienced significantly longer hospital stays, averaging 6.9 ± 2.3 days compared to 5.4 ± 1.7 days in those without comorbidities (p = 0.004). Notably, all patients who required invasive mechanical ventilation had fatal outcomes, showing a strong association between invasive ventilation and in-hospital mortality (p< 0.001). Additionally, leukocytosis was found to be significantly more prevalent among patients who were admitted to the ICU (p = 0.038), suggesting its potential role as a marker of severe illness. As shown in table 3.

Table 3: Outcomes and Statistical Associations

Variable	Outcome	p-value
ICU admission (n = 17)	14.0%	N/A
In-hospital mortality (n = 10)	8.3%	N/A

Comorbidities vs. LOS	6.9 vs. 5.4 days	0.004
Male vs. Female NIV use	41.8% vs. 20.0%	0.021
Invasive Ventilation vs. Death	Yes (100%)	<0.001
Leukocytosis vs. ICU admission	Yes (64.7%)	0.038

Discussion

This prospective observational study provides comprehensive insights into the clinical profile and outcomes of patients hospitalized with AECOPD at a tertiary care hospital in Pakistan. The mean age of patients was 65.2 ± 9.7 years, with a predominance of males (69.4%). This reflects the global epidemiological trend where older males, especially those with a significant history of smoking, are more commonly affected by COPD and its exacerbations.

A high proportion of patients (81.8%) had a history of smoking, further emphasizing its critical role as a modifiable risk factor. Dyspnea (92.6%), productive cough (84.3%), and wheezing (76.0%) were the most common presenting symptoms, consistent with the classical manifestations of AECOPD. These symptoms align closely with findings from prior international and regional studies, which have documented similar symptom patterns among hospitalized AECOPD patients [12].

Regarding comorbidities, hypertension (41.3%) and ischemic heart disease (36.4%) were most prevalent. This is in accordance with previous studies that highlight the frequent coexistence of cardiovascular diseases in COPD patients, often worsening their prognosis and complicating management [13]. The mean hospital stay of 6.3 ± 2.7 days is also comparable with earlier data showing that AECOPD admissions typically range from 5 to 10 days depending on severity and comorbid conditions [14].

The need for ventilatory support was significant, with 35.5% requiring non-invasive ventilation and 9.1% requiring invasive mechanical ventilation. ICU admissions occurred in 27.3% of cases, and the mortality rate was 8.3%. These figures are closely in line with published studies, where ICU admissions for AECOPD range between 20–30%, and mortality varies from 6% to 12%, depending on the presence of comorbidities and need for invasive ventilation [15]. Our findings confirmed that leukocytosis and the requirement for invasive ventilation were significantly associated with increased mortality and ICU admission ($p<0.05$), echoing previous research highlighting the role of systemic inflammation and respiratory failure as strong predictors of poor outcomes [16].

Laboratory and radiological findings in this study also provided valuable diagnostic and prognostic information. The mean hemoglobin level of 13.2 ± 1.8 g/dL and the presence of leukocytosis in 42.1% of patients are consistent with systemic inflammatory responses typically observed in AECOPD [17]. Arterial blood gas analysis revealed hypoxemia (PaO_2 = 56.3 ± 10.4 mmHg) and hypercapnia ($PaCO_2$ = 48.9 ± 7.6 mmHg), with an average pH of 7.36 ± 0.05, reflecting the severity of respiratory compromise during exacerbations. Radiologically, hyperinflation was the most common finding (58.6%), followed by bilateral infiltrates (31.4%) and cardiomegaly (15.7%), which are frequently associated with poor oxygenation and overlapping cardiac pathology. These findings correlate with prior research indicating that radiographic abnormalities, particularly hyperinflation and infiltrates, are markers of disease severity and can predict adverse outcomes in hospitalized patients [18]. Thus, integrating these parameters into clinical decision-making may help guide early interventions and improve prognosis.

Limitations and Future Suggestions

First of all, it was carried out in a single tertiary care hospital, therefore restricting the generalizability of the results to different medical environments. Second, long-term follow-up post-discharge data were not gathered, therefore limiting understanding of long-term mortality and readmission rates. Thirdly, some patients cited history accounts because spirometry results were not available for all of them upon admission. Finally, not thoroughly evaluated were possible confusing elements such socioeconomic level, drug compliance, and environmental exposures. Long-term follow-up to assess outcomes including readmissions, quality of

life, and survival as well as multicenter trials to improve generalizability should be included of future investigations. Furthermore, further research on the function of inflammatory indices and biomarkers in AECOPD disease severity and outcome prediction will direct individualized therapy plans.

Conclusion

In a tertiary care environment, this research underlines the clinical burden and outcomes of hospitalized patients with acute aggravation of chronic obstructive pulmonary disease (AECOPD). Most of the patients were senior men with a history of smoking and other comorbidities, which added to their lengthier hospital stays and more severity. Both non-invasive and invasive ventilation was widely used; death was strongly correlated with mechanical support need. These results highlight the need of early identification, thorough treatment, and preventative programs to reduce hospitalizations and enhance outcomes in COPD sufferers.
Ethical Considerations

Authors' contributions

Conceptualization and supervision: HQ, AAK; **Methodology:** UI, AY; **Investigation, writing original draft and review:** SUB, HQ, AAK; **Data collection:** SUB, AY; **Data analysis:** UI.

Conflict of interest

The authors declared no conflict of interest.

References

1. Kaleem Ullah M, Parthasarathi A, BiligereSiddaiah J, Vishwanath P, Upadhyay S, Ganguly K, Anand Mahesh P. Impact of Acute Exacerbation and its phenotypes on the clinical outcomes of Chronic Obstructive Pulmonary Disease in Hospitalized patients: a cross-sectional study. Toxics. 2022 Nov 6;10(11):667.

2. Liang C, Mao X, Niu H, Huang K, Dong F, Chen Y, Huang K, Zhan Q, Huang Y, Zhang Y, Yang T. Characteristics, management and in-hospital clinical outcomes among inpatients with acute exacerbation of chronic obstructive pulmonary disease in China: Results from the phase I data of ACURE study. International journal of chronic obstructive pulmonary disease. 2021 Feb 25:451-65.

3. You L, Niu H, Huang K, Dong F, Yang T, Wang C. Clinical features and outcomes of acute exacerbation in chronic obstructive pulmonary disease patients with pulmonary heart disease: a multicenter observational study. International Journal of Chronic Obstructive Pulmonary Disease. 2021 Oct 22:2901-10.

4. Morantes-Caballero JA, Fajardo Rodriguez HA. Effects of air pollution on acute exacerbation of chronic obstructive pulmonary disease: a descriptive retrospective study (pol-AECOPD). International Journal of Chronic Obstructive Pulmonary Disease. 2019 Jul 11:1549-57.

5. Berenyi F, Steinfort DP, Abdelhamid YA, Bailey MJ, Pilcher DV, Bellomo R, Finnis ME, Young PJ, Deane AM. Characteristics and outcomes of critically ill patients with acute exacerbation of chronic obstructive pulmonary disease in Australia and New Zealand. Annals of the American Thoracic Society. 2020 Jun;17(6):736-45.

6. Lei J, Yang T, Liang C, Huang K, Wu S, Wang C. Comparison of clinical characteristics and short-term prognoses within hospitalized chronic obstructive pulmonary disease patients comorbid with asthma, bronchiectasis, and their overlaps: findings from the ACURE registry. Frontiers in medicine. 2022 Feb 25;9:817048.

7. Galerneau LM, Bailly S, Terzi N, Ruckly S, Garrouste-Orgeas M, Cohen Y, Ha VH, Gainnier M, Siami S, Dupuis C, Darmon M. Management of acute exacerbations of chronic obstructive pulmonary disease in the ICU: an observational study from the OUTCOMEREA database, 1997–2018. Critical Care Medicine. 2023 Jun 1;51(6):753-64.

8. Byron C, Osadnik CR. Physical Activity Profiles among Patients Admitted with Acute Exacerbations of Chronic Obstructive Pulmonary Disease. Journal of Clinical Medicine. 2023 Jul 26;12(15):4914.

9. Li X, Wu Z, Xue M, Du W. Smoking status affects clinical characteristics and disease course of acute exacerbation of chronic obstructive pulmonary disease: a prospectively observational study. Chronic Respiratory Disease. 2020 Mar 25;17:1479973120916184.

10. Noorudheen Z. A Study On Association Between Clinical And Bacteriological Profile In Patients Of Acute Exacerbation Of Chronic Obstructive Pulmonary Disease In A Tertiary Care Centre (Doctoral dissertation, Rajiv Gandhi University of Health Sciences (India)).

11. Morasert T, Jantarapootirat M, Phinyo P, Patumanond J. Prognostic indicators for in-hospital mortality in COPD with acute exacerbation in Thailand: a retrospective cohort study. BMJ open respiratory research. 2020 May 1;7(1):e000488.

12. Kunadharaju R, Sethi S. Treatment of acute exacerbations in chronic obstructive pulmonary disease. Clinics in chest medicine. 2020 Sep 1;41(3):439-51.

13. Cavailles A, Melloni B, Motola S, Dayde F, Laurent M, Le Lay K, Caumette D, Luciani L, Lleu PL, Berthon G, Flament T. Identification of patient profiles with high risk of hospital re-admissions for acute COPD exacerbations (AECOPD) in France using a machine learning model. International Journal of Chronic Obstructive Pulmonary Disease. 2020 Apr 30:949-62.

14. Waseem Javid WJ, Khawaja MA. Clinical profile and microbiological spectrum in acute exacerbation of chronic obstructive pulmonary disease.

15. Javid W, Khawaja MA. Clinical Profile and Microbiological Spectrum in Acute Exacerbation of Chronic Obstructive Pulmonary Disease. National Journal of Medical Research. 2019 Apr 1;9(2).

16. You Y, Shi GC. Blood eosinophils and clinical outcome of acute exacerbations of chronic obstructive pulmonary disease: a systematic review and meta-analysis. Respiration. 2021 Dec 29;100(3):228-37.

17. Bhardwaj MA, Saini VA, Kaur JA. Evaluation and Correlation of Serum C-Reactive Protein and Procalcitonin Levels in Acute Exacerbation and Stable Phase of Chronic Obstructive Pulmonary Disease Patients: An Observational Study. J. Clin. Diagn. Res. 2021 Dec 1;15:24-8.

18. Waeijen-Smit K, DiGiandomenico A, Bonnell J, Ostridge K, Gehrmann U, Sellman BR, Kenny T, van Kuijk S, Peerlings D, Spruit MA, Simons SO. Early diagnostic BioMARKers in exacerbations of chronic obstructive pulmonary disease: protocol of the exploratory, prospective, longitudinal, single-centre, observational MARKED study. BMJ open. 2023 Mar 1;13(3):e068787.