Biomedical and Biopharmaceutical Research
Abbreviation: Biomed. Biopharm. Res.
Volume: 22: Issue: 02 |Year: 2025
Page Number: 490-492

Clinical Correlation of Blood Eosinophil Count with Acute Exacerbations in Patients with Chronic Obstructive Pulmonary Disease (COPD)

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Article Received:29-06-2025

Article Accepted:21-07-2025

Abstract

Chronic Obstructive Pulmonary Disease (COPD) is a global health challenge marked by persistent respiratory symptoms and airflow limitation. Acute exacerbations of COPD (AECOPD) significantly impact morbidity and mortality. Eosinophils, a type of white blood cell, are involved in inflammatory responses and may play a role in the pathogenesis of AECOPD. This hospital-based observational study was conducted at Muzaffarnagar Medical College to examine the correlation between blood eosinophil levels and the severity of AECOPD. A total of 100 patients aged over 35 years with AECOPD were evaluated. Blood samples were analyzed for eosinophil counts, and spirometry was used to assess lung function. Results showed that 42% of patients had eosinophil counts ≥300 cells/μL. A significant correlation ($p < 0.00001$) was found between elevated eosinophil counts and exacerbation severity. These findings suggest that blood eosinophil levels could serve as a useful biomarker for assessing AECOPD severity and guiding corticosteroid therapy.

Keywords: COPD, AECOPD, Blood Eosinophilia, Inflammation, Corticosteroids, Biomarkers.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a persistent, progressive lung disease characterized by chronic airflow limitation and respiratory symptoms. It ranks among the leading causes of morbidity and mortality worldwide, largely due to acute exacerbations that complicate its natural history. Exacerbations are triggered by infections, environmental pollutants, and other inflammatory insults, resulting in worsened symptoms and functional decline. Recent advances have highlighted the role of eosinophils in a subset of COPD patients. Traditionally associated with asthma, eosinophils are increasingly recognized in COPD inflammation and have been linked to exacerbation severity and responsiveness to corticosteroid therapy. Blood eosinophil count, an accessible and cost-effective marker, may serve as a surrogate for airway inflammation and help guide clinical decisions. This study investigates the prevalence of blood eosinophilia in patients with AECOPD and evaluates its association with the clinical severity of exacerbations.

OBJECTIVES OF THE STUDY

1. To determine the prevalence of elevated blood eosinophil levels in AECOPD patients.
2. To evaluate the association between blood eosinophil counts and the clinical severity of COPD exacerbations

MATERIALS AND METHODS

Study Design: Hospital-based observational study
Study Duration: 18 months
Study Setting: Department of Respiratory Medicine, Muzaffarnagar Medical College
Sample Size: 100 patients

Inclusion Criteria

- Age ≥35 years

- Diagnosed with COPD as per GOLD guidelines
- Presenting with acute exacerbation
- Consent to participate

Exclusion Criteria

- Chronic conditions affecting eosinophil count (e.g., parasitic infection, hematologic disorders)
- Use of systemic steroids before admission
- Other chronic lung diseases (e.g., asthma, bronchiectasis)

Study Procedure and Evaluation

Patients were clinically assessed on admission. Blood samples were collected for complete blood counts including eosinophil levels. Lung function was assessed using spirometry during stable periods. Severity of AECOPD was categorized based on clinical symptoms and spirometric parameters.

Statistical Analysis

Data were analyzed using SPSS version 20. Descriptive statistics were applied to baseline characteristics. The chi-square test was used to evaluate associations between eosinophil levels and AECOPD severity. A p-value of <0.05 was considered statistically significant.

RESULTS

- 42% of patients had blood eosinophil counts ≥300 cells/µL.
- All patients with severe exacerbations had eosinophil counts ≥300 cells/µL.
- Significant correlation found between elevated eosinophil levels and AECOPD severity ($p < 0.00001$).

Table 1: Distribution of Patients by Blood Eosinophil Count

Eosinophil Count (cells/µL)	Number of Patients	Percentage (%)
< 300	58	58%
≥300	42	42%

Table 2: Severity of AECOPD in Relation to Eosinophil Count

Severity of AECOPD	Patients with <300 cells/µL	Patients with ≥300 cells/µL
Mild	43	00
Moderate	15	21
Severe	00	15
Very Severe	00	6

Figure 1: Blood Eosinophil Count Distribution

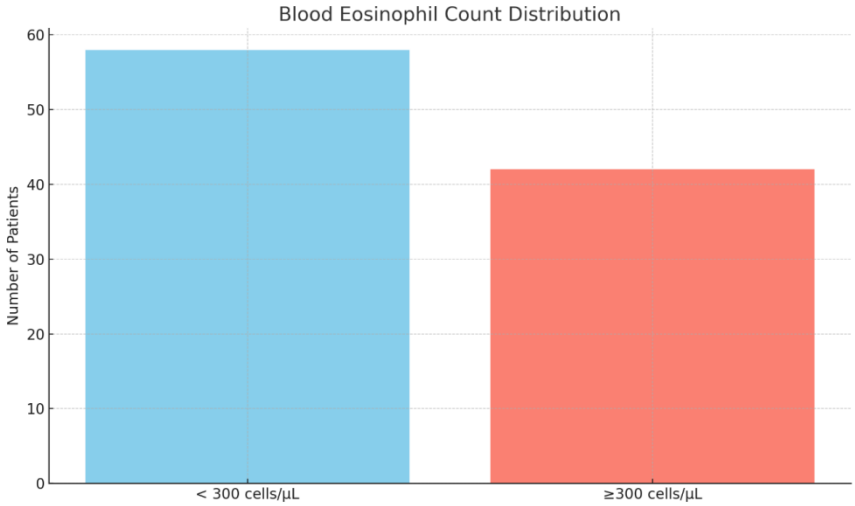
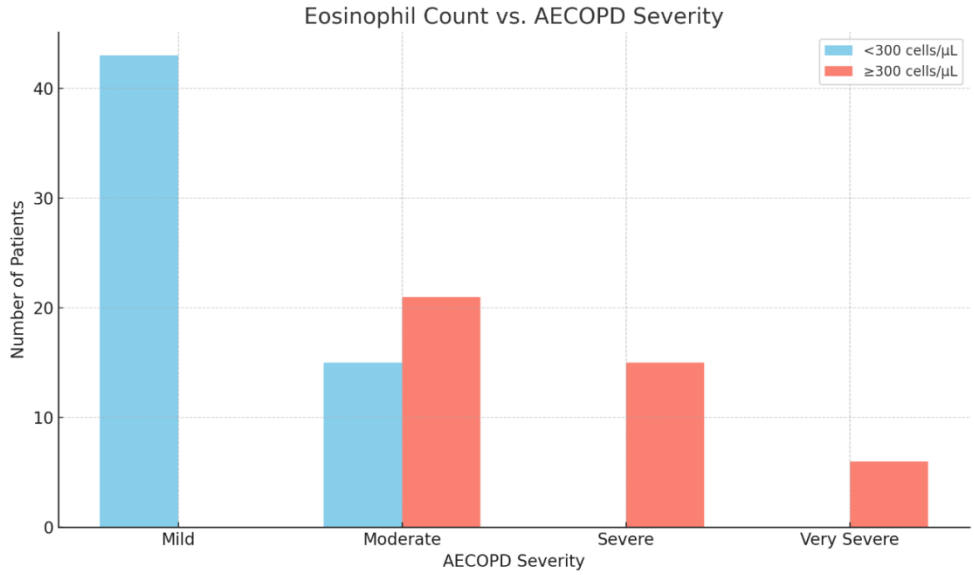


Figure 2: AECOPD Severity vs. Eosinophil Count



DISCUSSION

This study reinforces the emerging role of blood eosinophilia as a biomarker in the management of AECOPD. A strong association was observed between elevated eosinophil levels and the severity of exacerbations. Patients with counts ≥300 cells/µL were more likely to present with moderate to severe episodes, suggesting heightened airway inflammation. These findings are consistent with earlier studies that highlight eosinophils' contribution to disease exacerbation through mechanisms like cytokine release and epithelial damage. Eosinophil-guided therapy has shown promise in improving outcomes and reducing unnecessary corticosteroid use. Identifying eosinophilic phenotype patients allows for tailored therapy and potentially shorter hospital stays. Limitations include the single-center design and lack of longitudinal follow-up. However, the study adds to growing evidence advocating for routine eosinophil count evaluation in AECOPD patients. Incorporating this biomarker into clinical protocols can facilitate personalized medicine in COPD management.

CONCLUSION

Blood eosinophilia is significantly associated with exacerbation severity in COPD. It can be used as a biomarker to guide the use of corticosteroids and other anti-inflammatory therapies during AECOPD episodes.

Future Scope

Large-scale, multicenter, prospective studies are needed to validate these findings. Longitudinal research could help establish eosinophil-guided COPD management algorithms.

Conflict of Interest: Nil

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