

Original Research Article

BLOOD EOSINOPHILIA IN NEWLY DIAGNOSED PATIENTS WITH COPD AND ITS TREND IN DIFFERENT SEVERITIES OF COPD

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Abstract:

Objective: To determine blood eosinophilia in newly diagnosed patients with COPD and assess its trend across different severities of COPD. **Methodology:** This cross-sectional study was conducted at the Pulmonology Department, AIMC/Jinnah Hospital, Lahore, from 2 August 2025 to 2 November 2025, including 160 newly diagnosed COPD patients. Baseline demographic and clinical variables including age, gender, BMI, smoking history, and COPD severity according to GOLD classification were recorded. **Results:** The mean age was 56.8 ± 9.4 years, and 67.5% patients were male. Blood eosinophilia was observed in 52 patients (32.5%). Eosinophilia was present in 10.5% of patients with mild COPD, 26.7% with moderate COPD, 41.9% with severe COPD, and 42.1% with very severe COPD, showing a significant increasing trend across severity groups ($p=0.01$). **Conclusion:** Blood eosinophilia was present in a substantial proportion of newly diagnosed COPD patients and showed an increasing trend with greater severity of disease, suggesting a potential association between eosinophilic inflammation and COPD severity.

Keywords: Chronic obstructive pulmonary disease, eosinophilia, blood eosinophils, COPD severity, GOLD classification, inflammatory biomarkers.

INTRODUCTION

Chronic obstructive lung disease (COPD) is a disease that affects a large population around the world and is a major cause of public health due to its chronic nature, high morbidity, and mortality rates [1]. COPD is among the top causes of mortality globally epidemiologically, and its incidence relates closely to both non-modifiable and modifiable risk factors including tobacco smoking, environmental exposure and occupational risks [2,3]. The incidence of COPD per year worldwide is almost

400 million and in Pakistan, the prevalence of this crippling respiratory illness has been noted to be 13.8% [4,5]. Generally, COPD has an empirical treatment that includes inhaled bronchodilator drugs but in some instances the patients do not respond with the drugs due to a number of reasons including eosinophilia of blood. In this case, a research was done with an intention to establish the percentage of patients who have increased blood eosinophil count in patients who have recently

been diagnosed with COPD where it

was reported that in newly diagnosed cases of COPD the percentage of blood eosinophilia was 39.3% [6]. Moreover, its distribution between the various severities of COPD was also determined and it was reported that in mild COPD the frequency of blood eosinophilia was 13.6, in moderate COPD was 40.7, in severe COPD was 32.2 and in very severe COPD was 12.8 compared to this where another study reported that the frequency The frequency of mild, moderate, severe and very severe was 7.3%, 45.3%, 39.3% and 8.0% [6,8]. Research studies above indicate that a high percentage of patients with newly diagnosed cases of COPD may be asthma predominant COPD as indicated by blood eosinophilia. Nevertheless, as the majority of the newly diagnosed patients are not screened on this during the time of diagnosis, their treatment is still suboptimal and their misery persists even when they are on a treatment [9,10]. Also, there is little local information on this critical point of newly diagnosed COPD cases.

Objective:

- To compare frequency of blood eosinophilia in different severities of COPD.
- To find the frequency of various severities of COPD.

METHODOLOGY:

This Cross sectional study was conducted at Pulmonology Department, AIMC/Jinnah Hospital, Lahore from 2 August 2025 to 2 November 2025, Sample size was calculated using the WHO sample size calculator assuming 95% confidence level, 4% absolute precision, and anticipated frequency of mild COPD as 7.3%. The calculated sample size was 160 patients. Age of patients: 30-70 years old, both male, and female, having COPD diagnosed according to the operational definition. Patients with existing drug usage of COPD, patients with past history of any allergic morbidity, history of atopy, and persistent use of antihistamines were eliminated.

Data Collection

All patients who had attained informed consent and who met selection criteria and came to the Pulmonology Department, AIMC/Jinnah Hospital, Lahore were enrolled. The baseline data such as age, gender, body mass index, smoking status, and severity of COPD were recorded. A 5mL of blood was taken at each participant and sent to a differential leukocyte count test to determine eosinophil count of the blood and the presence of eosinophilia according to operational definition. The severity of COPD was determined based on the GOLD criteria. The treatment of patients was based on GOLD classification and eosinophil profile. All data were captured using a structured predesigned preform. The main result was the prevalence of eosinophilia in the blood of patients with COPD who were newly diagnosed. The Secondary outcome was to evaluate

the trend of eosinophilia in the various levels of COPD.

Data Analysis

Data were analyzed using SPSS version 20. Quantitative variables including age, BMI, and eosinophil count were presented as mean \pm standard deviation or median with interquartile range after assessment of normality using Shapiro-Wilk test. Qualitative variables including gender, smoking history, COPD severity, and presence of eosinophilia were presented as frequencies and percentages. Comparison of eosinophilia across different severities of COPD was performed using Chi-square test. Data were stratified for age, gender, and BMI to control effect modifiers. Post-stratification Chi-square test was applied, and p-value ≤ 0.05 was considered statistically significant.

RESULTS

A total of 160 newly diagnosed COPD patients were included, with a mean age of 56.8 ± 9.4 years. Most patients belonged to the 51–60-year age group (40.0%), followed by those older than 60 years (33.7%) and 30–50 years (26.3%). Males constituted the majority of participants (67.5%), while females accounted for 32.5%. Mean BMI was 25.9 ± 4.1 kg/m². A significant proportion of patients were smokers (63.8%), with a mean smoking burden of 21.6 ± 8.3 pack-years.

Table 1: Baseline Demographic and Clinical Characteristics (n=160)

Variable	Category	n (%) / Mean \pm SD
Age (years)	—	56.8 \pm 9.4
30–50 years		42 (26.3)
51–60 years		64 (40.0)
>60 years		54 (33.7)
Gender	Male	108 (67.5)
	Female	52 (32.5)
BMI (kg/m ²)	—	25.9 \pm 4.1
Smoking History	Smokers	102 (63.8)
	Non-smokers	58 (36.2)
Pack-years	—	21.6 \pm 8.3

According to GOLD classification, severe COPD (38.8%) and moderate COPD (37.5%) comprised the largest proportion of patients, while mild and very severe COPD each accounted for 11.9%. Blood eosinophilia was present in 52 patients (32.5%), while 67.5% had no eosinophilia. Mean eosinophil count was 298 ± 124 cells/ μ L.

Table 2: Distribution of COPD Severity According to GOLD Classification

COPD Severity	n (%)
Mild (GOLD I)	19 (11.9)
Moderate (GOLD II)	60 (37.5)
Severe (GOLD III)	62 (38.8)
Very Severe (GOLD IV)	19 (11.9)
Eosinophilia Present	52 (32.5)
No Eosinophilia	108 (67.5)
Eosinophil Count (cells/ μ L), mean \pm SD	298 \pm 124

Eosinophilia was present in 10.5% of mild COPD patients, increasing to 26.7% in moderate, 41.9% in severe, and 42.1% in very severe COPD. This trend was statistically significant ($p=0.01$), indicating a positive association between increasing COPD severity and frequency of eosinophilia.

Table 3: Trend of Blood Eosinophilia Across Different Severities of COPD

COPD Severity	Eosinophilia Present n (%)	No Eosinophilia n (%)	p-value
Mild (GOLD I)	2 (10.5)	17 (89.5)	
Moderate (GOLD II)	16 (26.7)	44 (73.3)	
Severe (GOLD III)	26 (41.9)	36 (58.1)	
Very Severe (GOLD IV)	8 (42.1)	11 (57.9)	0.01

Stratified analysis showed no significant association of eosinophilia with age greater than 60 years ($p=0.39$), male gender ($p=0.51$), or BMI ≥ 25 kg/m² ($p=0.73$). However, smoking was significantly more common among eosinophilic patients compared with non-eosinophilic patients (75.0% vs 58.3%, $p=0.04$).

Table 4: Stratified Association of Eosinophilia with Clinical Variables

Variable	Eosinophilia Present n	Eosinophilia Absent n	p-value
Age >60 years	20 (38.5)	34 (31.5)	0.39
Male Gender	37 (71.2)	71 (65.7)	0.51
BMI ≥ 25 kg/m ²	29 (55.8)	57 (52.8)	0.73
Smokers	39 (75.0)	63 (58.3)	0.04

	(%)	(%)	
Age >60 years	20 (38.5)	34 (31.5)	0.39
Male Gender	37 (71.2)	71 (65.7)	0.51
BMI ≥ 25 kg/m ²	29 (55.8)	57 (52.8)	0.73
Smokers	39 (75.0)	63 (58.3)	0.04

DISCUSSION

This cross-sectional study of newly diagnosed COPD patients revealed that blood eosinophilia was found in 32.5% of patients and this means that almost one-third of patients exhibited eosinophilic inflammation at the time of diagnosis. This observation confirms the idea that eosinophilic phenotype is a clinically meaningful subset among COPD and is in line with earlier studies that have found eosinophilia in a significant percentage of COPD patients but found variable prevalence rates based on patient samples and eosinophil threshold criteria. A key conclusion of the current study was the trend of the rising incidence of blood eosinophilia in the various severities of COPD where eosinophilia was lowest in mild COPD and gradually increasing in severe and very severe COPD. This statistically significant correlation indicates that eosinophilic inflammation might be associated with a higher severity of the disease in patients diagnosed recently [11]. These findings are not new to the previous studies in which the higher levels of blood eosinophils were found more frequently in patients with more advanced disease or increased inflammatory load. The results of our study thus indicate a potential connection between eosinophilia and the airflow limitation severity [12].

The increase in the number of eosinophils in severe patients could be evidence of a greater airway inflammation response, or a specific phenotype of inflammation that is more pronounced with disease progression. Previous studies have linked eosinophilic inflammation with airway remodeling, exacerbation predisposition and corticosteroid responsiveness, which partially could account for its clinical importance in COPD [13]. Even though exacerbation outcomes were not measured in our study, the trend between the GOLD severity groups is in favor of the possible role of the eosinophils as a disease phenotype biomarker. It is also interesting to note that, in this study, the smoking burden has been significantly correlated with eosinophilia. Not only could smoking lead to neutrophilic inflammation, but it also can affect eosinophilic pathways in vulnerable individuals [14]. Other studies have made similar associations, but the results have been inconsistent, and the association is likely to be a result of complicated inflammatory processes [15].

In contrast to smoking, stratified analysis did not reveal significant age, gender, or BMI differences in eosinophilia, indicating the observed relationship with COPD severity was somewhat independent of these variables [16]. This justifies the fact that eosinophilia

could be an inflammatory trait associated with an illness and not necessarily an expression of demographic heterogeneity. Clinically, the findings are significant as blood eosinophil count is cheap, available, and can be readily assessed in the routine practice. When linked to disease severity or inflammatory phenotype, it can offer beneficial background data at diagnosis and possibly be used to support personalized management approaches. As the importance of phenotype-guided COPD management is increasing, early detection of eosinophilic patients could have therapeutic consequences [17]. This research is limited. It was carried out at one single center and the sample size used was relatively small and this can limit generalization. Cross-sectional design does not allow any temporal correlations or causality. The exacerbation rates, longitudinal outcomes, or the response to treatment against eosinophilia were also not studied in relation to eosinophilia, which can further highlight its clinical importance.

CONCLUSION:

The conclusion is that blood eosinophilia occurred in a significant percentage of patients with newly diagnosed COPD and displayed a rising trend with increasing severity of the disease. Severe and very severe COPD patients had a greater prevalence of eosinophilia than mild and moderate COPD. These results imply the potential correlation between eosinophilic inflammation and COPD severity and justify the prospective use of blood eosinophils as a valuable biomarker in patients with newly diagnosed COPD.

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