Pakistan Journal of Intensive Care Medicine
eISSN: 2708-2261; pISSN: 2958-4728
www.pjicm.com
DOI: https://doi.org/10.54112/pjicm.v5i01.65
Pak. J. Inten. Care Med., volume 2025: 65
Original Research Article

FREQUENCY OF BLOOD EOSINOPHILIA IN PATIENTS WITH NEWLY DIAGNOSED CHRONIC OBSTRUCTIVE PULMONARY DISEASE

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(Received, 15th January 2025, Revised 06th March 2025, Accepted 16th April, Published 30th April 2025)

ABSTRACT

Background: *Chronic obstructive pulmonary disease (COPD) is a significant cause of morbidity and mortality worldwide. Blood eosinophilia is a potential biomarker for disease phenotyping and therapeutic guidance in COPD management. However, limited data exist on the prevalence of eosinophilia among newly diagnosed COPD patients in regional settings.* ***Objective:*** *To evaluate the frequency of blood eosinophilia in patients newly diagnosed with COPD.* ***Study Design:*** *Cross-sectional study.* ***Setting:*** *Department of Pulmonology at Saidu Group of Teaching Hospital, Swat.* ***Duration of Study:*** *26-09-2024 to 26-12-2024.* ***Methods:*** *A total of 144 patients aged 30–80 years with newly diagnosed COPD (post-bronchodilator FEV_1/FVC ratio <0.70) were included. Patients with comorbid asthma, bronchiectasis, or active tuberculosis were excluded. Blood eosinophilia was defined as an absolute eosinophil count >500 cells/µL. Demographic details and comorbid conditions were recorded. Data were analyzed using SPSS version 24. Chi-square and independent t-tests were applied, with p-values ≤ 0.05 considered statistically significant.* ***Results:*** *The mean age of participants was 58.3 ± 10.5 years, with a male predominance (61.8%). Blood eosinophilia was observed in 52 (36.1%) patients. Hypertension and diabetes mellitus were present in 53.5% and 45.1% of patients, respectively. No statistically significant associations were found between eosinophilia and demographic or comorbidity profiles (p > 0.05).* ***Conclusion:*** *Blood eosinophilia was present in approximately one-third (36.1%) of patients with newly diagnosed COPD. These findings support the relevance of eosinophil count in the initial assessment of COPD, potentially aiding in future phenotypic classification and individualized treatment strategies.*

Keywords: Chronic Obstructive Pulmonary Disease, Blood Eosinophilia, Smoking, Biomarker

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a chronic inflammation of the respiratory system that is mainly due to exposure to tobacco smoke, fuel from biomass smoke, or air pollution that includes toxic gases, coal fragments, and inorganic trace pollutants. Tobacco smoking is recognized as the primary risk factor for the development of COPD; nevertheless, only about 45–50% of those who smoke cigarettes are affected by the disease (1). COPD stands as the third leading cause of mortality worldwide, following ischemic cardiovascular disease as well as neoplasms (2). In 2017, chronic respiratory diseases were responsible for over 544 million cases worldwide, with COPD accounting for 55.1% of cases in men as well as 54.8% in women (2). In 2015, the global incidence of COPD was 174 million, resulting in approximately 3.2 million deaths attributed to the disease. The average incidence of COPD in the adult population over 40 years in Europe is 15% (3-5). An extensive analysis of studies conducted in nearly 30 countries over 14 years from 1990 to 2004 revealed that the likelihood of developing COPD is higher among people who have a history of smoking (6).

Eosinophilic inflammation starts with the infiltration and migration of eosinophils from the bloodstream into airways, a process stimulated by C-C motif chemokine ligands CCL11 and CCL5. Airway epithelial cells release upstream cytokines in reaction to harmful agents and recruit T helper-2 and innate lymphoid cells, which secrete IL-5, promoting eosinophil maturation and release (7, 8). Elevated eosinophil counts have been noticed in COPD patients' central and peripheral airways, as identified through bronchial biopsies, bronchoalveolar lavage, and sputum analysis (9). An expanded profile of T2 inflammation within eosinophilic COPD, encompassing mechanisms that include IL-13-driven pathways (10). Blood Eosinophilia frequency was 39.3% in newly diagnosed COPD patients (11).

Recent studies have suggested that elevated eosinophil levels may be associated with increased exacerbation risk and disease severity in COPD. However, local literature on this subject is scarce. This study aims to determine the frequency of blood eosinophilia in patients with newly diagnosed chronic obstructive pulmonary disease at our hospital. This study's findings will aid our health professionals in identifying the significance of eosinophilic inflammation at the onset of COPD, which could lead to more effective personalized treatment strategies tailored to mitigate exacerbation risk and improve long-term management of this debilitating respiratory condition.

METHODOLOGY

After obtaining ethical approval from our hospital, this cross-sectional study was conducted in the Department of Pulmonology at Saidu Group of Teaching Hospital, Swat, from 26-09-2024 to 26-12-2024. One hundred and forty-four patients were enrolled using consecutive non-probability sampling, an anticipated eosinophilia frequency 39.3%[11], a 95% confidence level, and an 8% margin of error.

Patients aged 30 and 80 years with COPD, defined by symptoms including chronic cough, sputum production, dyspnea, or wheezing, and a post-bronchodilator FEV1/FVC ratio of less than 0.70 on spirometry, were enrolled. Patients undergoing tuberculosis treatment, those with asthma, interstitial lung disease, or bronchiectasis, were dropped from the study.

After obtaining consent from all participants, we collected demographic details from the patients. Clinical histories such as smoking status and comorbidities like diabetes and hypertension were documented. Venous blood samples (3–5 mL) were collected under aseptic conditions for CBC analysis from all the patients, with all

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laboratory procedures supervised by an experienced consultant. Blood eosinophilia was defined as an absolute eosinophil count > 500 cells/µL measured via complete blood count (CBC).

SPSS 25 was used to analyze the collected data. Age, BMI, and eosinophil counts were calculated using mean ± standard deviation, while gender and comorbidities were calculated using frequencies and percentages. Chi-square test was applied to evaluate associations with a p-value ≤0.05 considered statistically notable.

RESULTS

The average age of patients was 58.28 ± 10.50 years, reflecting a mature population typical of this condition. Blood eosinophilia levels showed an average of 504.76 ± 100.70 µL across the group. While the Body mass index, an indicator of general health, stood at 26.69 ± 2.18 kg/m² in our study.

The demographic makeup revealed 89 (61.8%) males, while 55 (38.2%) patients showed a huge male predominance. Diabetes was present in 65 (45.1%) patients, while hypertension affected 77 (53.5%) patients in our study. The rest of the demographic details can be viewed in Table 1, which includes our patients' residence status, occupation status, education status, and socioeconomic background.

Regarding blood eosinophilia, which was a critical marker in our analysis, about 52 (36.1%) patients had exhibited elevated levels. In comparison, 92 (63.9%) did not, which indicates that eosinophilia was present in a notable but not dominant percentage of the cohort (Table 2). The stratification of blood eosinophilia and various demographic characteristics can be seen in Table 3. However, no notable associations were found within each stratum.

Table 1: Demographic profile and comorbidities

Demographic profile and comorbidities		N	%
Gender	Male	89	61.8%
	Female	55	38.2%
Diabetes	Yes	65	45.1%
	No	79	54.9%
Hypertension	Yes	77	53.5%
	No	67	46.5%
Smoking	Yes	42	29.2%
	No	102	70.8%
Education status	Educated	79	54.9%
	Uneducated	65	45.1%
Occupation status	Employed	59	41.0%
	Unemployed	85	59.0%
Socioeconomic status	Low background (Monthly income < 30K PKR)	44	30.6%
	Middle background (Monthly income 30K to 80K PKR)	85	59.0%
	Upper background (Monthly income > 80K PKR)	15	10.4%
Residence	Rural	68	47.2%
	Urban	76	52.8%

Table 2: Frequency of blood eosinophilia

Blood eosinophilia	Frequency	Percent
Yes	52	36.1
No	92	63.9
Total	144	100.0

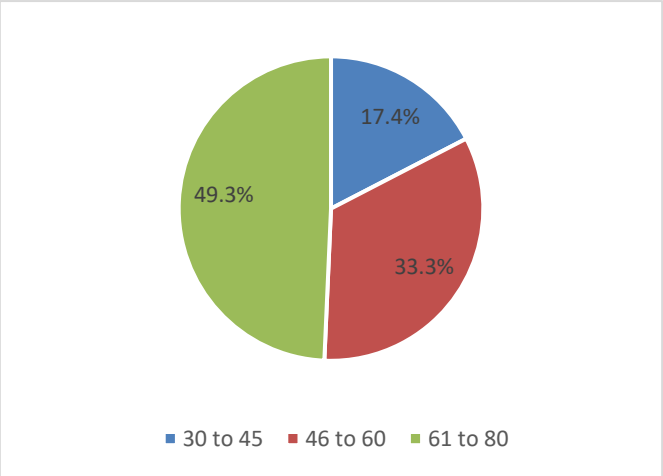

Figure 1: Age distribution of patients

Table 3: Stratification of Blood eosinophilia with various demographic variables

Demographics		Blood eosinophilia				P value
		Yes		No		
		N	%	N	%	
Gender	Male	29	55.8%	60	65.2%	P > 0.05
	Female	23	44.2%	32	34.8%	
Diabetes	Yes	22	42.3%	43	46.7%	P > 0.05
	No	30	57.7%	49	53.3%	
Hypertension	Yes	30	57.7%	47	51.1%	P > 0.05
	No	22	42.3%	45	48.9%	
Education status	Educated	27	51.9%	52	56.5%	P > 0.05
	Uneducated	25	48.1%	40	43.5%	
Occupation status	Employed	23	44.2%	36	39.1%	P > 0.05
	Unemployed	29	55.8%	56	60.9%	
Socioeconomic status	Low background (Monthly income < 30K PKR)	21	40.4%	23	25.0%	P > 0.05
	Middle background (Monthly income 30K to 80K PKR)	25	48.1%	60	65.2%	
	Upper background (Monthly income > 80K PKR)	6	11.5%	9	9.8%	
Residence	Rural	25	48.1%	43	46.7%	P > 0.05
	Urban	27	51.9%	49	53.3%	
Smoking	Yes	11	21.2%	31	33.7%	P > 0.05
	No	41	78.8%	61	66.3%	

P < 0.05 indicates statistical significance unless otherwise stated.

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DISCUSSION

The average age of patients in our study was 58.28 ± 10.50 years reflecting a mature cohort typical of chronic obstructive pulmonary disease (COPD) though slightly younger than the 63.72 years by Khan et al. and 63.4 years reported by Kiani et al. (11, 12) This age difference may be due to regional variations in COPD onset or socioeconomic factors influencing access to healthcare facilities.

Blood eosinophilia levels in our study averaged around 504.76 ± 100.70 µL, aligning well with the thresholds by Kiani et al., which identified eosinophil counts >200 cells/µL in 395/973 patients (40.6%).[12] However, our finding of 36.1% with elevated eosinophilia is identical to 39.3% reported by Khan et al and 44% reported by Abbas et al. (11, 13). These variations might reflect differences in diagnostic criteria or population-specific profiles of inflammation. Kiani et al used a cutoff of ≥200 cells/µL, whereas Khan et al. defined eosinophilia as ≥2% of total leukocytes. Such methodological discrepancies underscore the need for standardized eosinophil thresholds in COPD research.

The male predominance observed in our cohort resonates with trends in the literature, such as 76.2% males in the eosinophilic group by Kiani et al and 78% by Abbas et al's cohort (12, 13). This consistency highlights the global burden of COPD in males, likely tied to higher smoking/vaping rates and occupational hazards. However, Khan et al's study reported a more balanced gender distribution (57.3% males), suggesting regional differences in risk factors like biomass exposure, which affected about 50.7% of their cohort (11). Notably, our study did not explicitly analyze biomass exposure, which we consider a limitation that future work should address to contextualize gender disparities.

Body mass index (BMI) averaged around 26.69 ± 2.18 kg/m², indicating an overweight but non-obese population. This fits well with Kiani et al's study's 29.2 kg/m² BMI in eosinophilic patients and 29.0 kg/m² in non-eosinophilic groups, though their cohort had higher average BMI values than ours (12). Khan et al. did not report BMI, limiting direct comparisons with our study (11). The marginally lower BMI in our cohort could reflect nutritional or lifestyle differences in our study population. Interestingly, none of the reviewed studies associated BMI with eosinophilia, suggesting that obesity may not directly drive eosinophilic inflammation in COPD. However, metabolic comorbidities like diabetes (45.1% in our cohort) and hypertension (53.5%) were prevalent in our study. These comorbidities were not extensively analyzed in the reviewed studies, representing a gap in existing literature. Still, we found no notable associations with these comorbidities in our research, which can be viewed in Table 3.

The prevalence of diabetes and hypertension in our cohort surpassed the rates mentioned by Kiani et al. (16.4% and 64.5%, respectively). This discrepancy may be due to the regional differences in metabolic disease burden or variations in comorbidity screening protocols. For instance, Kiani et al. excluded patients having autoimmune diseases or malignancies, potentially underrepresenting metabolic disorders (12). The high comorbidity rates in our study emphasize the need for integrated care models addressing both COPD and metabolic health conditions, which is a factor underemphasized in current COPD management guidelines.

Eosinophilia's role as a biomarker in COPD remains contentious. In our study, the 36.1% prevalence of eosinophilia suggests that it's a pretty prevalent condition in COPD patients. Kiani et al identified eosinophilia as an independent risk factor (HR=1.44, p=0.03), particularly in patients with severe COPD. Similarly, Cui et al. noted that 20–40% of stable COPD patients exhibited eosinophilic inflammation (14).

Our finding that eosinophilia was not associated with gender and age aligns well with Khan et al., who reported no notable associations with gender and age as well (p>0.05) (11). We observed that 29.2% of patients were smokers in our study, Kiani et al, observed higher smoking pack-years in eosinophilic patients, a relationship which must be explored in future studies.

CONCLUSION

In conclusion, we observed a frequency of 36.1% of eosinophilia in our cohort of COPD patients, which tends to be alarming, reinforcing its role as a common risk factor for COPD phenotype. We suggest early laboratory screening for eosinophilia in COPD patients.

DECLARATIONS

Data Availability Statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department Concerned. (135-ERB/024)

Consent for publication

Approved

Funding

Not applicable

CONFLICT OF INTEREST

The authors declared an absence of conflict of interest.

AUTHOR CONTRIBUTION

MUHAMMAD SHOAIB (Postgraduate Resident)

Manuscript Writing, Conception of Study, Data Collection, Development of Research Methodology Design, manuscript Review, and final approval of manuscript.

Manuscript revisions, critical input.

Study Design.

AKHTAR ALI KHAN (Assistant Professor)

Manuscript drafting.

Conception of Study, Final approval of manuscript.

Data entry, data analysis, and drafting the article.

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