ORIGINAL ARTICLE

Frequency of Eosinophilia in patients with Acute Exacerbation of Chronic obstructive pulmonary disease

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Abstract

Background: Chronic obstructive pulmonary disease is a complex spectrum of diverse conditions characterized by chronic inflammation, incessant respiratory symptoms, acute exacerbation and progressive respiratory obstruction not fully reversible with post-bronchodilator and FEV1/FVC less than 0.7 and FEV1 less than 80% predicted. Less studies have focused on eosinophilic Chronic obstructive pulmonary disease (COPD) exacerbation in the Asia. The purpose of this study was to evaluate the role of eosinophilia in peripheral smear in hospitalized patients with Chronic obstructive pulmonary disease exacerbation in a local tertiary care hospital in Pakistan.

Objective: The purpose of this study was to determine the frequency of Eosinophilia in blood in Chronic obstructive pulmonary disease patients admitted with acute exacerbation.

Study design: Cross-sectional study

Setting: Department of Pulmonology ATH

Duration of study: September 2024 till February 2025

Material and Methods: This cross-sectional study was carried out in the department of pulmonology ATH after approval from ethical committee. Patient admitted with acute exacerbation of Chronic obstructive pulmonary disease within the age group 20 to 80 years were included in study. Eosinophilia is diagnosed in Chronic obstructive pulmonary disease patients by the presence of ≥ 2% eosinophils in blood.

Results:195 patients of Chronic obstructive pulmonary disease with acute exacerbation were included in study and were assessed for eosinophil count. Male patients were 122(62.5%) in number. Female were 73(37.4%) in number. Mean age was 45.3±2.7SD. The average BMI was 27.43 4±4.23 kg/m^2. Increased in eosinophilia was observed in 62 patients (31.79%).

Conclusion: Out of 195 patients admitted with Acute exacerbation of chronic obstructive pulmonary disease (AECOPD), prevalence of eosinophilia was 31.79%. In patients with acute exacerbation of Chronic obstructive pulmonary disease it can be used as an important biomarker.

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Introduction:

Chronic obstructive pulmonary disease is a complex spectrum of diverse conditions characterized by chronic inflammation, incessant respiratory symptoms, acute exacerbation and progressive respiratory obstruction not fully reversible with post-bronchodilator and FEV1/FVC less than 0.7 and FEV1 less than 80% predicted. In the year 2016 chronic obstructive pulmonary disease was 3rd predominant cause of death throughout the world while 8th greatest cause in health burden calculated by disability adjusted life years. Frequency and exacerbation lead to increase morbidity and mortality.[1] Risk factors responsible causing chronic obstructive pulmonary disease may be abnormal inflammatory response to toxic particles or gases like tobacco smoke, coal, biomass solid fuel, crop

residues etc. Acute exacerbation of chronic obstructive pulmonary disease means worsening of symptoms and deterioration of the Pulmonary Function Tests (PFTs) by infection or change in quality of air, leading to respiratory failure or even death.[2] Clinical features of chronic obstructive pulmonary disease includes cough, sputum production, or dyspnea.

Clinical diagnosis is supplemented by investigations such as Spirometric tests. Chronic obstructive pulmonary disease (COPD) is a progressive disease and repeated exposure to toxic agents cause a more rapid reduction in lung function and increases the risk for repeated exacerbations.[3] Early detection disease requires the recognition of non-invasive and genuine biomarkers that aid in identification of various types of chronic obstructive pulmonary disease phenotypes resulting in suitable and specific treatment.

Increase in eosinophils in serum has been identified in chronic obstructive pulmonary disease patients, playing important role in chronic obstructive pulmonary disease pathogenesis. Eosinophilia is diagnosed in chronic obstructive pulmonary disease patients by the presence of ≥2% eosinophils in blood. With development in recent era the role of controlling blood eosinophilia in chronic obstructive pulmonary disease management has been increased. Chronic obstructive pulmonary disease with increased eosinophilia is also used as a biomarker for exacerbations although exact prevalence of eosinophilia in chronic obstructive pulmonary disease patients is still not known, few researchers reports the prevalence of eosinophilia in approximately in 20% of chronic obstructive pulmonary disease patients.[4]

Eosinophilia detection from the sputum is far more time consuming and samples of sputum may not be sufficient. In contrast to this determination of eosinophils in blood is simple and practically a surrogate biomarker for sputum eosinophilia in chronic obstructive pulmonary disease.[5] Various studies have identified high blood eosinophils count in chronic obstructive pulmonary disease patients results in prolong hospital stay with increased risk of mortality.[6] In terms of pathogenesis, it is postulated that eosinophilia is because of expression of more complex chemokines including RANTES (regulated upon activation normal T-cell expressed and secreted) responsible for recruiting inflammatory cells such as eosinophils at the sites of inflammation.[7] The purpose of this study is to find out frequency of blood eosinophilia in chronic obstructive pulmonary disease patients with acute exacerbations. Most researches on the PBEC were on the Caucasians. Less studies have focused eosinophilic chronic obstructive pulmonary disease exacerbation in the Asian.

The purpose of this study was to evaluate the role of eosinophilia in peripheral smear in hospitalized patients with chronic obstructive pulmonary disease exacerbation in a local tertiary care hospital in Pakistan.

Material and Methods:
This cross-sectional study was carried out in the Department of Pulmonology, Ayub Teaching Hospital after approval from ethical committee from September 2024 till February 2025.

Patient admitted with acute exacerbation of chronic obstructive pulmonary disease within the age group 20 to 80 years were included in study. Asthmatic patients, patients on ATT, patient having pneumothorax, malignancy and congestive heart failure were excluded from study.

Patient's selection was through consecutive non probability sampling and assessed by detail history and clinical examination. Spirometery of patients was carried out for diagnosis of chronic obstructive pulmonary disease. Once diagnosed with chronic obstructive pulmonary disease, required investigations was carried out. Serum was sent for detection of eosinophil levels in hospital laboratory and values were recorded. Eosinophilia was defined as blood eosinophil level of more than 2% or peripheral blood eo-

Table 1: Baseline demographic details of patients

variable	Number	percentage
Gender		
Male	122	62.5%
female	73	37.4%
Age(years)		
<50	41	21.0%
50-65	96	49.2%
65-75	58	29.7%
BMI(kg/m^2)	27.43 4±4.23	

Table 2: Frequency of eosinophilia in patients of COPD according to gender (n=195)

Gender	Yes (>2% or >300 cells/µL)	No (≤2% or ≤300 cell/µL)
Male	41(66.1%)	81(60.9%)
Female	21(33.8%)	52(39.0%)
Total	62(31.79%)	133 (68.21%)

sinophil count of more than 300 cell/Ul.

Data was analyzed by SPSS version 20. Data was first recorded on proforma and was later assessed using SPSS. Categorical variables like sex were described in terms of frequencies and percentages. Mean and standard deviation were calculated for numeric data. Eosinophilia further stratified by age and gender.

Results:

195 patients of Chronic obstructive pulmonary disease (COPD) with acute exacerbation were included in study and were assessed for eosinophil count. Male patients were 122(62.5%) in number. Female were 73(37.4%) in number. Mean age was 45.3±2.7SD. The average BMI was 27.43 4±4.23 kg/m^2. 41-patients (21.0%) were less than 50 years old. 96 patients (49.2%) were found in the age group between 50 to 65 years. 58(29.7%) patients were between age group 65 to 75 years. Increased in eosinophilia was observed in 62 patients (31.79%). Out of these patients who had increased eosinophilia 41 patients were male (66.1%) and 52 patients (39%) were female.

Discussion:

Chronic obstructive pulmonary disease (COPD) is a frequent, avertable and curable disease that comprises of various respiratory symptoms and restriction in airflow along with alveolar abnormalities as a result of exposure to obnoxious and gases and particles. Tobacco being found to be main culprit.[8] Eosinophilic airway inflammation in chronic obstructive pulmonary disease patients is connected to aggravation and affectiveness to corticosteroids similar situation is found in eosinophilic asthma, patient usually exhibit features of inflammation as a result of coexisting asthma. It is not known how eosinophil cause chronic obstructive pulmonary disease and only few of the patients develop eosinophilic inflammation of the airway.

This has aroused interest of many researchers as a possible treatment goal for corticosteroid inhaled therapy. Chronic obstructive pulmonary disease 2023 report regarding Global initiative implies that eosinophil count in blood directs to treatment of not only fresh cases classified as GOLD E but also who show exacerbation in spite of using bronchodilators. (EOS) Eosinophils in the blood have been labelled as alternate biomarker and therapeutic guide for determining the type of airway inflammation due to the restricted accessibility of sputum collection in medical practice.[9] The eosinophilic phenotype causes 20-40% of chronic obstructive pulmonary disease exacerbations. Peripheral Blood Eosinophil Count is recognized predictor of the duration of hospital stay, response to steroid, prognosis, and rate of readmission.[10]

Prevalence of eosinophils in the blood has been found to be between 9% to 64% in various studies.[11,12] In our study 195 patients were included in study and 62 patients (31.79%) had increase eosinophilia in serum. The increase level of eosinophilis in the blood can be because of various reasons, due to different cut-off values of the eosinophilia count, numerous exclusion categories and use of drugs that influence eosinophil count (i.e., aminophylline, corticosteroids and population disparity, chronic obstructive pulmonary

disease various stages).

In a study conducted by Singh D et al showed that 37.4% of chronic obstructive pulmonary disease patients had eosinophilia and that it had a more desirable initial viewpoint with regards to baseline investigations.[13] Contrarily, Price D et al and Hasegawa K et al found a very lower airway eosinophilia in patients nearly 10% and 17% respectively.[14,15] Price D et al additionally posit an increase in chronic obstructive pulmonary disease aggravation in patients with airway eosinophilia and that decreasing airway eosinophilia with corticosteroids may lessen hospital admissions and the episodes of exacerbations.[14]

A descriptive study by Batool et al found that out of 150 patients 135(90%) male and 15(10%) female with eosinophilia prevalence of 63(42.0%) in patients with Acute exacerbation of chronic obstructive pulmonary disease presentation.[16] Our study comprised of 62.5% male and 37.4% female patients with a mean age was 45.3±2.7SD. A Research showed 51.5% males, 49.5% females with Acute exacerbation of chronic obstructive pulmonary disease with a mean age of 71.4±10.3 years.[17] Most studies show that greater age is a major threat of chronic obstructive pulmonary disease patients.

Current research reported that most of the patients suffering from chronic obstructive pulmonary disease were in the age group of 65-75 nearly 58 patients (29.7%), 51-65 years had 96(49.2%)and less than 50 years 29(21%) patients. An author reported the higher prevalence of chronic obstructive pulmonary disease in 60-70 years having 62.3% patients, followed by 40-59 years having 21.1% patients and ≥ 80 years with 16.7% patients.[18]

Patients presenting with acute exacerbation of chronic obstructive pulmonary disease eosinophil count as biomarker should be measured. For patients with less episodes eosinophil count measurements might not be useful. A trial named Mepolizumab has shown that people with increased episodes may improve from antieosinophilic medication depending on eosinophil levels. The other two RCTS namely METREX and METREO, in which Chronic obstructive pulmonary disease (COPD) patients with moderate or severe exacerbations getting triple inhalation treatment were included in study. Those with eosinophilic type Chronic obstructive pulmonary disease were included in METREO, but not in METREX, depending upon the blood eosinophil counts. These two studies also proved that in patients with exacerbations it is possible to further categorize exacerbation risk depending on blood eosinophil counts.[19]

Chronic obstructive pulmonary disease biomarkers have intrigued clinicians in terms of finding a way to treat the disease individually. Up till now no authentic biomarker individually or in amalgamation can be used in clinical practice. Considering the findings that the amount of a single blood eosinophil count appears to be associated with further risk for exacerbation and to determine the outcome to ICS therapy in clinical investigations, blood eosinophils have recently become apparent as a potential biomarker in selected individuals.[20]

Conclusion:
Out of 195 patients admitted with Acute exacerbation of chronic obstructive pulmonary disease, prevalence of eosinophilia was 31.79% (defined as ≥300 cells/μL). Most of the patients were male. In patients with acute exacerbation of chronic obstructive pulmonary disease it can be used as an important biomarker.

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Role and contribution of authors:
Masab Hanif, collected the data, references and did the initial writeup.

Nauman Hanif, collected the data and helped in introduction and discussion writing.

Sameeah Hanif, critically review the article and made final changes.

Mohammad Yasin, did the proof reading and corrections

Erum Khalid, helped in collection of data.

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