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Clinical Severity and Eosinophillic Count in Asthmatic Patients

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Abstract. Inflammatory effects are caused by eosinophils, which are activated by allergens. Persistent airflow restriction is caused by ongoing airway remodeling and eosinophilic airway inflammation Although recent studies have failed to confirm this as a measure of severe asthma among adult asthma patients, high blood eosinophil levels were linked to severe asthma. Therefore, this study's goal was to ascertain whether a high blood eosinophil count and the severity of asthma are related. In 2024, a cross-sectional poll was carried out from January to December. A pre-tested structured questionnaire was used to collect data on clinical, behavioral, and sociodemographic traits. Four milliliters of venous blood were extracted from asthmatic patients in order to perform a complete blood count and assess peripheral morphology. Fifty-five (55.0%) of the 100 patients that were included in the trial were female, and forty-five (45.0%) were male. They ranged in age from 13 to 70. The range of the absolute eosinophil count was 70/mm3 to 1400/mm3. According to the severity criteria for asthma, 15 patients (15.0%) had severe asthma, 56 patients (56.0%) had moderate asthma, and 29 patients (20.0%) had mild asthma. This study aimed to evaluate the relationship between the eosinophil count in the blood and the severity of the illness. However, the study discovered a link between these two variables, indicating a relationship between peripheral eosinophil count and asthma severity.

Highlights:

1. Among 100 asthma patients, 15% had severe asthma, 56% moderate, and 29% mild, with higher eosinophil counts linked to greater severity.
2. Patients with eosinophil counts >1000/mm³ showed the strongest association with severe asthma (p = 0.001).
3. Findings support blood eosinophil count as a useful indicator for predicting asthma severity and guiding management.

Keywords: Clinical Severity, Eosinophillic Count , Asthma

Introduction

One of the most common causes of impairment nowadays is asthma, a chronic illness marked by inflammation of the airways and an increased reaction that causes reversible constriction of the lower airways [1–3]. Its etiology is complicated [4]. In allergic inflammation, eosinophils, mast cells, basophils, and IgE are essential components [5]. The World Health Organization states that it is the most prevalent chronic illness, presently impacting over 235 million individuals globally. Globally, its

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prevalence is over 10% [6]. There are many different aspects to the pathophysiology of asthma. Its onset is mediated by multiple causes, making it clinically diverse [7].

Asthma is a chronic respiratory disease that affects the airways and is characterized by reversible and variable airflow limitation, respiratory symptoms, bronchial hyperresponsiveness, and structural remodeling [8]. The frequency of asthma rose by 12.6%, with an estimated 358.2 million cases worldwide.

Numerous studies have shown that asthmatic patients have higher serum IgE levels, which are correlated with the severity of their condition. The pathophysiology of asthma is characterized by eosinophil infiltration into the airway, which increases during acute flare-ups and causes persistent inflammation. Therefore, measuring the eosinophil count is thought to be a sign of airway inflammation in asthma. Eosinophils are seen in blood, sputum, bronchial lavage, and bronchial biopsy specimens from asthma patients; their quantity rises in proportion to the severity of the illness, airway blockage, and bronchial hyperreactivity [8-11].

Inflammatory effects are caused by eosinophils, which are activated by allergens. Persistent airflow restriction is caused by ongoing airway remodeling and eosinophilic airway inflammation [12]. A high blood eosinophil count triggers immune-modulatory responses, including airway inflammation, airway hyperresponsiveness, damage to the epithelium lining, and increased mucus secretion [13]. More than half of asthmatic individuals have eosinophilic inflammation. According to research, eosinophilia is linked to poorer lung function, as well as an increase in the intensity, frequency, and burden of symptoms of the condition [14–16].

Eosinophils play a significant role in predicting the severity and course of disease [17]. Eosinophils are therefore essential for diagnosing asthma. Furthermore, in eosinophilic airway inflammation, eosinophil counts have become a promising and readily quantifiable indicator [18, 19]. Although allergic sensitization has been identified as a risk factor for asthma, non-allergic asthma is more common in adults [20]. The prevalence of allergic asthma is highest in early childhood and gradually declines with age. After the age of 40, new cases of non-allergic asthma are more prevalent [21, 22].

Blood eosinophilia and sputum were evaluated by the ERS/ATS task team as indicators of severe asthma [23]. According to GINA, the blood eosinophil count is not a diagnostic indicator for asthma. Instead, it can be employed as a prognostic biomarker to forecast the effectiveness of treatment and as a diagnostic biomarker to detect asthma characteristics in people with type 2 inflammation [24]. Numerous cross-sectional and longitudinal studies have indicated that blood eosinophil counts are a risk factor for asthma exacerbation [25–27]. Eosinophil numbers, on the other hand,

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have not been connected to asthma flare-ups, according to recent follow-up studies [28, 29].

Methods

Over the course of a year, from January 2024 to December 2024, this prospective observational study was carried out with patients who arrived at Hospital exhibiting asthma symptoms. The study comprised all adult asthmatic patients (≥ 18 years old) who attended the Department of Medicine and during the study period, as well as 60 asthmatic patients who were hospitalized to the department. Patients with known chronic illnesses, including HIV/AIDS, hematological malignancies, chronic kidney disease, and tuberculosis, were excluded from this study after their medical records were reviewed.

Through in-person interviews and a structured, pre-tested questionnaire, the sociodemographic and behavioral traits of research participants were gathered. Clinical data about the study participants, such as the duration of asthma, family history, medication history, drug type, chronic disease, asthma severity and stages, asthma symptoms, and history of drug use other than asthma prior to three months, were collected using a checklist from the patient's medical record (chart review). Participants were sent to the laboratory room to have a blood sample obtained and evaluated after data was gathered through in-person interviews and chart reviews.

Four milliliters of venous blood were extracted from asthmatic patients by the knowledgeable lab technician using a syringe. It is then transferred into the tube containing the ethylene-diamine tetra-acetic acid anticoagulant in order to produce a complete blood count (CBC) and evaluate peripheral morphology. Three categories have been established for eosinophil counts: Group one, which is less than 500/mm3, Group two, which is between 501 and 1000/mm3, and Group three, which is greater than 1000/mm3. Using SPSS (version 27.0) software, chi-square analysis was used to examine both the count and the severity.

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Result

Table 1. The study participants' sociodemographic attributes (n = 100)

Variables	**Category**	**Frequency**	**Percent- age %**
Age	Mean = 37.65 SD= 6.12		
Sex	Male	45	45.0 %
	Female	55	55.0 %
Residence	Urban	60	60.0 %
	Rural	40	40.0%
Marital status	Single	21	21.0%
	Married	56	56.0%
	Divorced	23	23.0%
Education level	Unable to read and write	34	34.0%
	Primary school	41	41.0 %
	Secondary school	3	3.0%
	College and above	22	22.0%

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Table 2. The clinical characteristics of adult asthmatic patients (n = 100)

Variables	**Category**	**Frequency**	**%**
Family history of asthma	Yes	22	22.0%
	No	78	78.0%
Duration of asthma	≤ 5	41	41.0%
	6–10	27	27.0%
	> 10	32	32.0%
Severity of asthma	Mild	29	29.0%
	Moderate	56	56.0%
	Severe	15	15.0%
medication	Yes	69	69.0%
	No	31	31.0%
Comorbidities	Yes	38	38.0%
	No	62	62.0%

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Table 3. Distribution of eosinophils and severity-based asthma results.

Eosinophil distribution	Asthma findings			p. value
	Severe	Moderate	Mild	
< 500	2 2.0%	10 10.0%	9 9.0%	.434
501-1000	3 3.0%	22 22.0%	7 7.0%	0.021
> 1000	10 10.0%	24 24.0%	13 13.0%	.001
Total	15 15.0%	56 56.0%	29 39.0%	100 100.0%

Discussion

The purpose of this study was to assess the absolute eosinophil count as a gauge of a patient's asthma severity. One hundred participants with an asthma diagnosis were included in this one-year trial. Of the patients, 29 (29.0%) had mild asthma, 56 (65.0%) had moderate asthma, and 15 (15.0%) had severe asthma. There was discernible correlation between the two metrics when their absolute eosinophil count—a measure of the severity of their asthma—was examined.

In a study by Gibson, the total eosinophil count was found to be helpful in controlling the dosage of steroids and to be associated with asthma activity and early exacerbation detection [30]. Another study by Brightling came to similar conclusions, finding a strong link between serum eosinophil count, T cell activation, and asthma severity [31].

Another study, conducted between 2009 and 2010 in Sweden with 12,406 participants, also found that blood eosinophil counts and exhaled nitric oxide levels were independently associated with wheeze and asthma events in patients, although only intermediate or high blood eosinophil counts were associated with ED visits [32]. Furthermore, a 2014 study discovered a direct link between late-phase asthma symptoms and blood eosinophil count [33].

A 2012 study that looked at the variation of blood eosinophil counts in people with mild asthma over a 24-hour period questioned the value of a single eosinophil count.

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The study found that the eosinophil count levels varied significantly [34]. Similarly, a 2013 study conducted in London discovered that blood eosinophil counts were normal in 86% of children with severe asthma, suggesting that these patients' inflammatory processes cannot be accurately predicted by blood eosinophil counts [35].

Eosinophil-induced chronic inflammation can cause remodeling, a detrimental structural alteration of the airway walls that thickens the bronchi and reduces airflow. Damage from this inflammation may also occur in hyperresponsiveness, lung function loss, and tightness of the smooth muscles of the airways [36]. Additionally, remodeling may make exacerbations more frequent and more severe [37].

Conclusion

This study aimed to evaluate the relationship between the eosinophil count in the blood and the severity of the illness. However, the study discovered a link between these two variables, indicating a relationship between peripheral eosinophil count and asthma severity.

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