

PREPONDERANCE OF EOSINOPHILIA AT TERTIARY CARE CENTRE IN THE SOUTHWEST REGION OF PATNA: A RETROSPECTIVE CROSS-SECTIONAL STUDY

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Abstract

Background

Eosinophils are synthesized in response to inflammation in the body. The underlying disease can vary to a large extent. The data regarding the underlying causes is scarce.

Objectives

To determine the eosinophilia cases at the tertiary care center of the Southwest Region of Patna.

Materials and Methods

The present retrospective, observational, and hospital-based study was conducted. The blood samples of the patients participating in the study were tested for complete blood count on a hematology analyzer. The manual identification of the WBC and determination of the AEC was carried out on the blood samples. The demographic and clinical details of the patients were recorded and statistically analyzed.

Results

A total of 301 patients were reported to have eosinophilia. Of these, 203 (67.4%) were male, and 98 (32.6%) were female. The present study showed higher cases of eosinophilia in male patients. 13.6% of the participants with eosinophilia were within the age group of 21-30 years. 91.4% of the cases were under the moderate eosinophilia category. The majority of the patients had agriculture as their occupation.

Conclusion

In conclusion, the present study has detected that eosinophilia is frequent in the West Region of Patna. A thorough search for the etiological factors and other relevant investigations is essential for appropriate management.

Recommendation

Eosinophilia can be associated with various etiological factors. It is essential to determine the underlying cause to treat eosinophilia.

Keywords: Eosinophilia, Chronic Disorder, Inflammation

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Introduction

Eosinophils are the granulocytes of the leucocytes, they have acid granules, and they have multilobed nuclei when viewed under a microscope. The number of eosinophils is determined using a hematogram, and the complete blood cell count is determined [1]. The eosinophils are formed in the bone marrow, they are secreted in response to inflammatory markers such as interleukins. The interleukins are secreted in response to various pathological conditions which include arthritis, autoimmune disorders, especially parasitic infections such

as helminths, carcinoma, and other severe pathological conditions [2].

Eosinophils help in defensive mechanisms, it causes phagocytosis of the inflammatory pathogens and the cells. An increase in the eosinophils is known as eosinophilia. The normal eosinophil count is 500 eosinophils per cubic meter, a mild increase is more than 1500 per cubic meter, a moderate increase is 1500 to 5000 per cubic meter, and more than 5000 per cubic meter is known as hypereosinophilia [3]. The increase in the eosinophils can occur due to various conditions. Identification of the cause

of the increase in the eosinophils can help in analyzing the clinical history of the patients and could help in determining the further treatment plan.

Since the occurrence of eosinophilia is associated with various pathological conditions it increases the complexity of eosinophilia. Especially in the case of autoimmune disorders related to kidneys, the eosinophils infiltrate the tissue undergoing inflammation [4]. The underlying cause of eosinophilia plays a significant role in treating the condition. The eosinophils are severely increased in the case of primary eosinophilia. Whereas when it increases in response to any pathological condition, it is known as secondary eosinophilia [5]. The increase in the eosinophils also differs as per the geographical location. The literature related to eosinophilia is scarce in the eastern region of India. This study aims to determine the eosinophilia cases at the tertiary care center of the Southwest Region of Patna.

Method

Study design

The present retrospective, observational, cross-sectional, and hospital-based study.

Study setting

The study was conducted in the Department of Pathology, ESIC Medical College & Hospital Bihta, Patna, spanning from April 2024 to September 2024.

Participants

All the patients who attended the hematology laboratory for a complete blood count over 6 months were assessed for the occurrence of eosinophilia. Patients with carcinoma associated with the blood cells were not included in this study.

Bias

The study minimized potential bias by excluding patients with hematological malignancies that could confound eosinophilia-related findings. Additionally, standardized hematological analyses and manual verification of eosinophil counts were employed to ensure data accuracy and consistency.

Data collection

EDTA samples were collected for CBC which was performed on Nihon Kohden MEK 7300 hematology

analyzer. The hematology analyzer uses the scattering of light as a method of identifying the exact count of WBCs. The collected and diluted blood is injected into the analyzer. The WBCs are passed through a single file and the light is made to fall on the passing blood cell. The scattering of the light is measured to determine the exact type of leucocytes. The amount and direction of the scattering are analyzed to confirm the morphology of the leucocytes. Based on cellular morphology leucocytes are identified as eosinophils, basophils, neutrophils, monocytes, and lymphocytes.

Simultaneously, for manual determination peripheral smears of the blood are prepared and stained with Leishman stain. Manual differential counts of the WBC were performed in all the smears and examined for eosinophilia. Eosinophilia was considered as mild when the absolute eosinophil count (AEC) ranges from 500/ul to 1500/ul, moderate when AEC ranges from 1500/ul to 5000/ul, and severe when AEC is more than 5000/ul. (Tae Yun Park).

Statistical analysis

The categorical data such as the age, WBC count, and eosinophil count was taken as average and standard deviation. The frequency and the percentage were calculated for each of the diseases.

Ethical consideration

The institutional ethics committee gave approval for the study and informed consent was obtained from the participants.

Results

A total of 3013 patients attended the laboratory for a complete blood hemogram, however, 8 patients (0.26%) were excluded from the present study due to hematological malignancy. Out of 3005 patients, 301 patients (10.01 %) were reported to have eosinophilia. The present study showed higher cases of eosinophilia in male patients. A total of 203 (67.4%) out of 301 were male patients. The average age of the participants in the study was 19.4±5.3. The average WBC count of the participants was 9.7±1.2 cu/ml. Table no.1 gives the details of the demographic characteristics of the patients and the WBC count.

Table 1: Depicts the demographic and laboratory data of patients with eosinophilia

Sr no.	Demographic and laboratory data	Eosinophilia	Percentage
1	Male (Number of cases)	203	67.4%
2	Female (Number of cases)	98	32.6%
3	Average Age (in years)	19.4±5.3	-
4	Average WBC (10 ³ /ul)	9.7±1.2	-

Table 1 gives a representation of the gender distribution in the study. it shows 67.4% of the participants are males. The age-wise distribution of the patients suffering from eosinophilia showed that the majority of the patients suffering from eosinophilia were those in the age range of

21 -30 years. They were 13.6% and then the second major group was people with the age between 30 to 40 years. The least number of patients were found in the age group of 81-90 years, they were 0.33%. Table no.2 gives the details of the age-wise distribution of the patients with eosinophilia.

Table 2: Showing the distribution of cases with increased AEC according to the age group

Sr no.	Age Group (in years)	No. of cases of Eosinophilia (AEC > 500/UL)	Percentage
1	0-10	10	3.32%
2	11-20	25	8.32%
3	21-30	41	13.6%
4	31-40	27	8.9%
5	41-50	20	6.64%
6	51-60	26	8.6%
7	61-70	14	4.65%
8	71-80	11	3.65%
9	81-90	01	0.33%

Table no. 2 gives the age-wise distribution of the patients suffering from eosinophilia. The patients were classified as mild grade of eosinophilia, moderate grade of eosinophilia, and severe grade of eosinophilia. It was found that 275

cases (91.4%) had moderate eosinophilia followed by 22 cases (7.3%) of mild eosinophilia and 4 cases (1.3%) of severe eosinophilia. Table no.3 illustrates the number of cases as per the severity of eosinophilia.

Table no.3: Distribution of the cases as per the severity of eosinophilia

Sr no.	Category	Range	Frequency	Percentage
1	Mild	500 -1500 cu/L	22	7.3%
2	Moderate	1500 -5000 cu/L	275	91.4%
3	Severe	More than 5000 cu/L	04	1.3%

Table no.3 gives the presentation of the severity of eosinophilia. The majority of the patients suffering from eosinophilia had moderate severity. The occupations of the patients were recorded. The most common occupation in this cohort of population was found to be farming (237 cases, 78.8%), hence eosinophilia may be attributed to their occupation.

The cases of eosinophilia were categorized as per the diseases identified in the patients. The majority of the patients suffering from eosinophilia had chronic kidney diseases, followed by idiopathic causes. Other patients also had cirrhosis, urticaria, iron deficiency anemia, chronic pulmonary disorder, and other chronic disorders listed in table no. 4. The eosinophilia could have been caused by these underlying disorders.

Table no. 4: Details of the underlying disease in the eosinophilia patients

Sr no.	Chronic diseases	Frequency	Percentage
1	Chronic kidney disease	99	33.1%
2	Idiopathic	48	16.2%
3	High fever	33	11%
4	Iron Deficiency Anemia	33	11%
5	Cardiovascular disorder	18	6%
6	Pulmonary disorder	18	6%
7	Cirrhosis	12	4%
8	GERD	12	4%
9	Psoriasis	06	2%
10	Arthritis	06	2%
11	Urticaria	03	1%
12	Hemophilia	03	1%
13	RHD	03	1%

Discussion

The study identified a total of 301 eosinophilia cases out of 3005 patients, representing a prevalence of 10.01%. The majority of the cases were male (67.4%), with females comprising 32.6%. Most of the patients (91.4%) had moderate eosinophilia, while only a small percentage exhibited mild (7.3%) or severe (1.3%) forms. The most affected age group was 21-30 years, accounting for 13.6% of the cases. Agriculture was the predominant occupation among patients (78.8%), suggesting a possible link between farming and eosinophilia, potentially due to environmental or occupational exposures.

The leading underlying condition associated with eosinophilia was chronic kidney disease (33.1%), followed by idiopathic causes (16.2%), high fever, and iron deficiency anemia (each 11%). These findings highlight the diverse etiologies contributing to eosinophilia and emphasize the need for a thorough investigation of potential underlying conditions in affected patients. The high prevalence in males and those engaged in agriculture might reflect gender-related occupational or lifestyle factors that contribute to this condition.

In the study, the occurrence of eosinophilia was evaluated in a total of 3005 patients. 10.02% of the patients who visited the hospital were reported to have eosinophilia. Eosinophilia contributes to various inflammatory processes, including parasitic, helminth, bacterial, and viral infections, the pathogenesis of tumor immunity, allergic disease, and drug-induced reactions [6,7,8,9].

The study showed a male preponderance of eosinophilia, the cause of which remains unclear. The data is predominantly more inclined towards male patients as there was a greater number of males visiting the hospital compared to the number of females. Addiction is one of the causes of eosinophilia and addiction is more common among males than females [10,11]. Complete blood count is required to determine eosinophilia however, if the

problem exists then a detailed evaluation is required. The proper history of the patient plays a crucial role [12].

The primary focus is on the clinical features related to allergy and atopy. Common complaints of patients include inflammatory signs and symptoms such as redness, increased mucous secretion, and itching [13,14]. Allergic diseases and helminthic infections should be advised to look for ova and larvae of intestinal worms. Radiological examination can be helpful for diagnosis of parasites for example x-ray chest in cases of paragonimiasis or ascariasis. A CT scan can be performed for echinococcus and cysticercosis [15,16,17]. Fungal infection is associated with the formation of nasal polyps [18,19,20]. In this study, the cases of eosinophilia were categorized as per the diseases identified in the patients. The majority of the patients suffering from eosinophilia had chronic kidney diseases, followed by idiopathic causes. Other patients who also had cirrhosis, urticaria, iron deficiency anemia, chronic pulmonary disorder, and other chronic disorders were also reported in this study.

The eosinophilia can be primary and secondary depending on the occurrence if there are no inflammatory underlying disease associated then the eosinophilia is primary. Bone marrow examination and cytogenetic study are required to determine if the occurrence of eosinophilia is primary or secondary [21,22,23]. Secondary eosinophilia is a reactive phenomenon driven by eosinophilopoietic cytokine released by non-myeloid cells. Idiopathic Hypereosinophilic syndrome (HES) is the diagnosis of exclusion in patients with eosinophilia > 6 months with multiple organ involvement but without identifiable cytogenetic or molecular abnormalities [23,24].

Generalizability

The generalizability of the study findings is limited due to its retrospective, single-center design and the specific population studied, primarily patients from a tertiary care

hospital in the southwest region of Patna. Additionally, the high proportion of male participants and the predominance of agricultural workers may not reflect the broader population. Therefore, while the results provide valuable insights into eosinophilia in this region, caution should be taken when applying these findings to other geographical areas or diverse populations with different occupational and demographic profiles.

Conclusion

The present study has detected that eosinophilia is frequent in the western region of Patna. A thorough search for the etiological factors and other relevant investigations is essential for appropriate management.

Limitation

Limitations of the study include its retrospective nature and single tertiary center patient population. Although this study lacks the relationship between reported peripheral blood eosinophilia and its associated diagnosis, however, the prevalence of these diseases can be a helpful tool in the differential diagnosis.

Recommendation

Eosinophilia can be associated with various etiological factors. It is essential to determine the underlying cause to treat eosinophilia.

Acknowledgment

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List of abbreviation

CBC – Complete blood count
WBC- White blood cells
AEC – Absolute eosinophil count

Source of funding

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Conflict of interest

The authors have no conflicting interests to declare.

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