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Original Research Article

Study of eosinophil count in nasal smear and peripheral blood smear in children with allergic rhinitis

Sudha Rudrappa, Rajendra Kumar*, Vinay Kumar

Department of Paediatrics, Mysore Medical College and Research Institute, Mysore, Karnataka, India

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***Correspondence:**
Dr. Rajendra Kumar,
E-mail: drrajk77@gmail.com

ABSTRACT

Background: Allergic respiratory disorders are the common cases seen in Pediatrics OPD. With an appropriate history and detailed examination, the diagnosis usually may not be problematic and routine investigations may not contribute much for the final diagnosis but may help in ruling other possibilities. The objectives of this study were done to know the eosinophil counts in nasal and blood smear and to assess the feasibility of nasal cytogram which is simple, economical and reliable investigation in patients of allergic respiratory disorders.
Methods: A prospective clinical correlation study conducted in outpatient visiting Mysore Medical College and Research Institute, Cheluvamba hospital Department of Pediatrics and ENT Department KR hospital. 60 children of age group between 2 to 18 years were selected to estimate the eosinophil count in nasal and peripheral smear in allergic rhinitis. All allergic rhinitis cases based on clinical signs and symptoms were selected and investigated for nasal and blood eosinophilia. The nasal and blood eosinophilia were compared with each other and the clinical findings of allergic rhinitis were studied.
Results: In this study peak age incidence is between 6-10 years and there is equal gender distribution. Seasonal variation and pollen allergens were the most common risk factors for allergic rhinitis. Running nose and the nasal obstruction were the most common symptoms in children with allergic rhinitis followed by sneezing and itching. One tenth of the children with allergic rhinitis had bronchial asthma. Nasal eosinophilia contributes to the diagnosis of allergic rhinitis as compared blood eosinophilia. Mild intermittent variety of allergic rhinitis was the most common form of allergic rhinitis.
Conclusions: Among various risk factors for allergic rhinitis, seasonal variation and pollen allergens have significant association with the severity of allergic rhinitis. Among various symptomology, only itching had a significant relation to the severity of allergic rhinitis.

Keywords: Allergic respiratory disorders, Allergic rhinitis, Blood eosinophilia, Eosinophil, Gender distribution

INTRODUCTION

Allergic rhinitis is an Ig E mediated hypersensitivity disease of the mucous membrane of nasal airway characterized by sneezing, itching, watery nasal discharge and sensation of nasal obstruction. Allergic rhinitis is a common disease worldwide, affecting 10 to 25% of population globally. The International study of asthma and allergies in childhood (ISAAC) noted the prevalence of rhinitis with itchy watery eyes, in six to seven-year-old as 0.8 to 14.9 percent and in 13-14-year-old from 1.4 to 39.7 percent in different countries throughout the world.[1] Allergic rhinitis can begin at any age, but the most common occurrence is during the adolescence or young adulthood. Prevalence rates are similar for males and females and no racial or ethical variations are reported. It

has been noted that, the children of parents suffering from allergic rhinitis have a higher risk of developing allergy. If one parent has allergy, then the child developing allergic rhinitis may be 29% and may increase to 47% when both parents have the disease.[2] Allergic rhinitis significantly alters patients' social life, affects learning performance at school and work productivity Allergic rhinitis per se is not life threatening. But morbidity is significant when, Allergic rhinitis is associated with otitis media, Eustachian tube dysfunction, sinusitis, nasal polyps, allergic conjunctivitis, and atopic dermatitis. Sleeping disorders, learning difficulties and fatigue may also occur. Complications such as anaphylaxis and asthma have also been reported.

Clinical features

Allergic rhinitis is characterized by sneezing, watery rhinorrhoea, itching of nose and nasal obstruction. Watery rhinorrhea is usually very profuse. Itching of nose and nasal obstruction is of moderate severity. Symptoms of pruritus, nasal obstruction, sneezing and rhinorrhoea are thought to be due to sensory nerve stimulation, mucosal oedema and increased mucus secretions. There is a horizontal crease across lower half of bridge of nose, which is caused by repeated upward rubbing of tip of nose by palm and hand (i.e. allergic salute). The mucosa of nasal turbinates may become swollen (boggy), pale, bluish grey colour, thin and watery secretions. Thick and purulent secretions are usually associated with sinusitis.[3]

Laboratory tests

Accurate allergy testing is done for determining specific allergic triggers and for confirmation of diagnosis. Allergy skin test- (Immediate hypersensitivity testing) are in vivo method of determining immediate (IgE mediated) hypersensitivity to specific allergens. By injecting an extract of suspected allergens percutaneously, an immediate (early phase) wheal and flare reaction can be produced.In vitro allergy tests-RAST-radio allegro sorbent test allows measurement of amount of specific IgE to individual allergens in a sample of blood.[4] The amount of IgE produced to a particular allergen approximately correlates with allergic sensitivity to that substance. Patients with allergic rhinitis may have elevated levels of IgE and eosinophills than normal population. This test is however neither sensitive nor specific for allergic rhinitis. Smear is done by gentle scrapping of lateral nasal wall or collect blown secretions. Smear taken on to glass is fixed in ethanol and stained with may Grunwald or Giemsa. Microscopic examination is done for eosinophils, neutrophils, basophils, mast cells, epithelial cells and bacteria. If eosinophils are >than 10% allergy is confirmed.

Treatment

Management of allergic rhinitis includes allergen avoidance, pharmacotherapy, education and possibly immunotherapy. Surgery is rarely needed. Treatment strategies should involve both the upper and lower airway where the latter is also affected.[5]

METHODS

The aim of this present study was to analyse the eosinophil count in the blood and nasal smears of children with allergic rhinitis.

The study was conducted in 60 (sixty) children during December 2015 to December 2016.Children between 2 and 18 years who attended the outpatient Department of Pediatrics and department of ENT, Mysore medical college and research institute, Mysore, Karnataka were selected on the random basis after obtaining institutional ethical committee clearance. The history, clinical features and investigations were noted in a proforma specially designed for the study. Peripheral venous blood and nasal smear sample are collected from allergic rhinitis children selected for the study from each child.

Nasal smear preparation

Nasal secretion was collected by asking the child to blow his nose into a plastic wrap and then placed on a glass slide. If he was too young to do this or insufficient secretion was obtained, cotton tipped swab was inserted into a nostril and left for 60 seconds. The nasal secretion which was obtained was transferred onto a glass slide, teased out and allowed to air dry.

Peripheral smear preparation

A small drop of blood was placed about 1 or 2 cm from one end of a pre-cleaned slide and immediately another slide with a pre-cleaned edge was placed at an angle of 25 degrees and moved backwards to make contact with the drop. The drop of blood was spread quickly along the line of contact of spreader with the slide and allowed to air dry. Peripheral blood smear was studied using Leishman's stain whereas nasal smear was studied by Haematoxylin and Eosin (Hand E) stain.

Inclusion criteria

Allergic rhinitis based on typical history and clinical features in the age group 2 to 18-year-old children attending outpatient department of Cheluvamba hospital.

Exclusion criteria

- Children using nasal steroid spray
- Children who were coexisting / operated for deviated nasal septum
- Chronic sinusitis, chronic tonsillitis, CSOM
- Snuff powder users and pregnant mothers
- Patients with symptoms of allergic rhinitis who are not on any anti-histamines and steroid preparation since last one month.

Stastical analysis

Descriptive statistics with the mean, standard deviation and standard error were analysed. The Crosstabs procedure forms two-way and multi-way tables and provides a variety of tests and measures of association for two-way tables. All statistical analyses were performed with SPSS software (V.20.0). Authors assumed significance at the 5% level ($p<0.05$).

RESULTS

In the present study, majority of the patients with allergic rhinitis were in the age group of 6-10 years (58.3%), followed by 11-15 years (38.3%) and remaining 3.3% were in the age group of less than 5 years. Chi-square test revealed a significant difference between these age groups (p=.001). Patients in the age group 6 to 10 years showed high incidence of allergic rhinitis. In this study, incidence of allergic rhinitis was 50% in males and 50% in females. The mean age of male patients was 9.7333±2.98194 (6.00-15.00), females was 9.7667±2.97905 (4.00-15.00) and for the entire sample it was 9.7500±2.95517 (4.00-15.00).

Table 1: Distribution of the study population based on age and gender.

Age groups (in years)		Sex		Total
		Male	Female	
<5	Number	0	2	2
	Percent	0.0	6.7	3.3
6-10	Number	19	16	35
	Percent	63.3	53.3	58.3
11-15	Number	11	12	23
	Percent	36.7	40.0	38.3
Total	Number	30	30	60
	Percent	100.0	100.0	100.0

In this study, seasonal variation was the most common risk factor for allergic rhinitis accounting for 56.7%, followed by pollen with 43.3%. Animal allergens and family history of allergic rhinitis each showed an incidence of 26.7% in allergic rhinitis. Allergic rhinitis was least associated with food allergens (6.7%). Chi square test revealed a significant difference among risk factors like animal allergens (p=0.001), food allergy (p=0.001), seasonal variation (p=0.001), and family history (p=0.001).

Exposure to pollen did not serve as a significant risk factor for allergic rhinitis (p=0.302). In this study, running nose (90%) was the most common presenting symptoms in allergic rhinitis, followed by nasal obstruction (83.3%), itching and sneezing (73.3%). 43.3% of children who presented with allergic rhinitis had associated wheezing. Epistaxis (5.0%) and cough (1.7%) were the least common presenting symptoms in allergic rhinitis.

Table 2: Distribution of risk factors for allergic rhinitis in the study population.

Risk factors	No. of patients exposed	(%)	Test statistics
Animal dander	16	26.7	$X^2 = 13.067$ p = 0.001 (S)
Food allergy	4	6.7	$X^2 = 45.067$ p =0.001 (S)
Pollen	26	43.3	$X^2 = 1.067$ p = 0.302 (NS)
Seasonal variation	34	56.7	$X^2 = 13.067$ p = 0.001 (S)
Family history	16	26.7	$X^2 = 13.067$ p = 0.001 (S)

present study shows symptoms like running nose (90% ,p= 0.001), sneezing (73.3%, p=0.001), nasal obstruction (83.7%, p=0.001), itching (73.3%, p=0.001), epistaxis (5%, p=0.001), cough (1.7%, p=0.001), and fever (6.7%, p=.001) have significant association with allergic rhinitis. Chi square test showed no significant association of wheezing (43.3%, p=0.302) with allergic rhinitis. In this study, 90% of children had only allergic rhinitis whereas the remaining 10% of children had allergic rhinitis with bronchial asthma which was statistically significant (p=0.001). In this study population of 60 children, 48 children (80%) showed a nasal eosinophil count of >10cells/hpf, and the remaining 12 children (20%) had a nasal eosinophil count of <10cells/hpf which was statistically significant (p=0.001).

Table 3: Distribution of study population based on nasal eosinophil count.

Nasal eosinophil count	Number (n=60)	Percent	Test statistics
<10 cells/hpf	12	20.0	$X^2 = 21.600$ p =0 .001 (S)
>10 cells/hpf	48	80.0	
Total	60	100.0	

In this study only 21 children (35%) showed blood eosinophil count of >440cells/ mm^3 and the remaining 39 children (65%) had a blood eosinophil count of <440cells/mm^3 which was not significant (p=0.020).

Authors found no significant association between nasal and blood eosinophil count (p=0.417). Among 39 children with blood eosinophil count of <440cells/ mm^3, 30 children had a nasal eosinophil count of >10cells/hpf and remaining 9 children had a nasal eosinophil count of <10 cells/hpf.

Among 21 children with blood eosinophil count of >440 cells/ mm^3, 18 children had a nasal eosinophi count of >10 cells/hpf and remaining 3 children had a nasal eosinophil count of <10 cells/hpf.

Table 4: Distribution of study population based on the blood eosinophil count.

Blood eosinophil count	Number (n=60)	Percent	Test statistics
<440 cells/mm^3	39	65.0	$X^2 = 5.400$
>440 cells/mm^3	21	35.0	p = 0.020
Total	60	100.0	(NS)

DISCUSSION

Allergic rhinitis is a common disorder in children visiting OPD in clinical practice. With appropriate history and clinical examination diagnosis of allergic rhinitis is simple. Routine investigation may not contribute much for the diagnosis. To confirm the allergic nature of the disease, complicated tests like, skin hypersensitivity test, Radio allegro sorbent test, (RAST), enzyme-linked immunosorbent assay (ELISA), IgE assay may be necessary, which are practically not feasible in all patients.

Hence this study tries to find the feasibility of the nasal eosinophil count over the blood eosinophil count in allergic rhinitis children. Clinical profile nasal smear eosinophil, peripheral smear was analyzed as follows; in the study majority of allergic rhinitis cases visiting the OPD were in the age group of 6-10 years, accounting for 58.3% of cases.

Table 5: Distribution of signs and symptoms in various studies.

Signs and symptoms	Ghazi BM et al[9]	Kumar N etal[8]	Shetty SS et al[10]	Venkateswarlu V et al[6]	Present study
Rhinorrhoea	73.4	100	97.6	100.0	90.0
Nasal obstruction	67.0	80.9	19.0	22.2	83.3
Sneezing	63.0	50.8	52.4	94.4	73.3
Itching	45.5	38.1	69.0	-	73.3
Epistaxis	-	-	-	-	5.0
Cough	-	36.5	-	-	1.7
Wheezing	-	1.6	-	7.0	43.3
Fever	-	12.7	-	-	6.7

Table 6: Comparison of nasal eosinophil count in allergic disorders.

Study	Nasal eosinophil cut off value/ hpf	Percent
Crobach M et al[11] (n=363)	> 10 cells	18.0
Sanil A et al[13] (n=41)	> 10 cells	57.0
Venkateswarlu V et al[6] (n=50)	> 10 cells	55.5
Kumar N et al[8] (n=100)	> 10 cells	57.0
Present study (n=60)	> 10 cells	80.0

In the study there was equal gender distribution of allergic rhinitis, which was also found in the study by Venkateswarlu V et al.[6] Seasonal variation was the most common risk factor accounting for 56.7% followed by pollen allergen 43.3%. Among risk factor food allergy contributes to 6.7% which is not significant. The study by Pokharel PK et al, (6-12%) also showed the similar result.[7] Among 60 children, running nose was the most common symptom accounting for 90% of cases followed by nasal obstruction (83.3%). Similar results were seen in the study by Shetty SS et al and Kumar N et al.[8,10]

Nasal eosinophil and blood eosinophil count was done in all 60 cases and nasal eosinophil count of >10 cells/hpf is consider positive as per IAP recommendation. Many studies have taken different cut off values. Crobach M et al, have considered >10 cells/hpf as significant similar to the present study.[11]

Similarly, Chowdary VS et al, considered blood eosinophil count of >440 cell/mm^3 is considered as significant and this cut off value.[12]

In present study also blood eosinophil count of >440 cell/mm^3 is considered as significant. Various studies have found various results for nasal smear eosinophilia ranging from 18.0% to 80.0%. present study showed nasal smear eosinophilia of 80.0%. Similar results were found in the study conducted by Sanil A et al, and Kumar N et al, where there was nasal smear eosinophilia of 57%.[8,13]

CONCLUSION

Any child with symptoms of running nose and nasal obstruction should alert the pediatrician for a possible diagnosis of allergic rhinitis as these are the most common presenting symptom in allergic rhinitis followed by sneezing and itching. Nasal smear eosinophil count is simple, non-invasive and economical to diagnose allergic rhinitis than blood eosinophil count. One tenth of the children with allergic rhinitis had bronchial asthma as the comorbidity. Nasal eosinophilia contributes to the diagnosis of allergic rhinitis as compared blood eosinophilia. It is important to recognize risk factors like seasonal variation, pollen allergy and animal dander which helps in avoiding associated co morbidity. What this study adds: Nasal smear eosinophil count is simple, non-invasive and feasible method to diagnose allergic rhinitis.

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