



Original Research Article

Serum IgE levels and absolute eosinophil counts with treatment response in patients with allergic rhinitis: A prospective study

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ABSTRACT

Introduction: Allergic rhinitis (AR) is a highly prevalent, chronic disease, with variable incidence rates. Clinically manifests as nasal discharge, congestion, nasal itching, sneezing and watery eyes. Treatment approach is based on duration and severity of symptoms. Second generation antihistamines are the drug of choice. Serum Ig E and Absolute Eosinophil Counts (AEC) have the potential to be the viable prognostic markers. The present study aims to assess the relationship of Serum IgE and AEC with treatment response in patients with allergic rhinitis.

Materials and Methods: 40 patients of allergic rhinitis were included in the study and were categorized into mild, moderate and severe allergic rhinitis according to ARIA guidelines. Pre-treatment sample for serum IgE and AEC was taken followed by 4 weeks of medical management according to categories. Post-treatment sample was taken and improvement assessed on the basis of fall in serum IgE and AEC levels.

Results: A total 40 patients were enrolled ranging from 14-60 years of age (mean age 28.75 ± 11.23 years) with female preponderance (52.5%). Most common presenting symptom being sneezing. Significant decline in pre-treatment AEC and serum IgE levels was observed.

Conclusion : The findings of the study indicates that treatment response had an association with AEC and Serum IgE levels.

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1. Introduction

Allergic rhinitis (AR) is a highly prevalent, chronic disease with variable incidence rates.¹ In recent literature its prevalence has been reported to range from 10% to 30% of all adults and as many as 40% of children.² In some populations its prevalence rate is reported to be as high as 50%.^{3,4} The prevalence of allergic rhinitis in India is around 11-30%.⁵⁻⁷ It is an inflammatory disease of the nasal mucous membranes.^{8,9} Allergen exposure of allergic individuals results in an Immunoglobulin E (IgE)-mediated inflammatory response, which is manifested clinically as

rhinorrhea, nasal congestion, postnasal discharge, nasal itching, sneezing, and itchy or watery eyes.

Treatment approach for allergic rhinitis is based on the duration of symptoms and severity of symptoms. Patients are advised to avoid known allergens. Second generation antihistamines are the first-line therapy for mild to moderate disease. Moderate to severe disease not responsive to antihistamines are treated by intra-nasal corticosteroids or a combination of decongestants, intra-nasal cromolyn, leukotriene receptor antagonists, and non-pharmacological therapies (e.g., nasal irrigation).

The selection of treatment approach for allergic rhinitis is dependent upon the assessment of severity of the disease and patient's clinical status. Serum IgE and

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absolute eosinophil count have emerged as possible viable investigations. An elevation in serum IgE levels is a marker of allergic inflammation and atopy.¹⁰ IgE has quantitative nature which is also helpful in predicting the outcome and has been identified as a prognostic indicator to determine the duration of therapy in allergic rhinitis cases.¹¹ Absolute eosinophil count (AEC) is another indicator that could be assessed easily even in low resource settings.¹² Hence, the present prospective study was carried out to assess the relationship of Serum IgE and absolute eosinophil counts with treatment response in patients with allergic rhinitis.

2. Materials and Methods

A total of 40 patients presenting with signs and symptoms of allergic rhinitis in the outpatient department of otorhinolaryngology and pulmonary medicine, Era's Medical College & Hospital, Lucknow were included in study based on the inclusion and exclusion criteria. All the patients were subjected to thorough clinical examination including complete ENT examination. Score for allergic rhinitis (SFAR) was calculated using the scale by Annesi-Maesano¹³ and symptom categorization according to Allergic Rhinitis and Its Impact on Asthma (ARIA) guidelines.¹⁴ All patients underwent diagnostic nasal endoscopy, absolute eosinophil counts, serum IgE and CT scan nose and paranasal sinuses if needed. All the patients were treated according to severity of symptom for 4 weeks followed by repeat eosinophil count and serum IgE estimation after treatment course.

2.1. Assessment of allergic rhinitis

Patients suspected of allergic rhinitis were assessed on 8 features of allergic rhinitis using score for allergic rhinitis (SFAR) which ranged from 0 to 16.¹³

Following features were taken into account:

1. Nasal symptoms in the past year, including sneezing, runny nose, and blocked nose when the subject did not have a cold or 'flu', in the past year (1 for each symptom).
2. Nasal symptoms accompanied by itchy-watery eyes (2 points).
3. Months of the year in which nasal symptoms occur. Seasonal rhinitis vs. perennial rhinitis could then be assessed according to the pollen calendar of each region (1 for seasonal, 1 for perennial).
4. Triggers of nasal symptoms including pollens, house dust mites, house dust and epithelia (2 points).
5. Perceived allergic status (2 points).
6. Previous medical diagnosis of allergy (2 points).
7. Previous positive tests of allergy (1 point).
8. Familial history of allergy (2 points).
9. The higher the score, the more likely the diagnosis of allergic rhinitis. A score ≥ 7 was used to diagnose

allergic rhinitis.

2.2. Assessment of serum IgE

IgE ELISA kit was used for assessment of serum IgE in IU/ml. Blood sample was collected and serum was immediately separated and stored at -20 degree celsius for evaluation later.

Patients were categorized into 3 groups based on ARIA¹⁴ guidelines and were given group wise treatment.¹⁵ (Table 1)

2.3. Inclusion criteria

Patients aged above 14 years of age or below 60 years of age and newly diagnosed patients of Allergic Rhinitis with SFAR >7 (out of 16)¹³ were included in the study.

2.4. Exclusion criteria

1. Patients of allergic rhinitis with other chronic illnesses.
2. Patients taking systemic corticosteroid.
3. Immuno-compromised patients- prolong use of steroids, diabetes, HIV.
4. Patient who have received allergen immunotherapy.
5. Known cases of asthma.

3. Results

A total of 40 patients of allergic rhinitis were enrolled in the study with age groups ranging from 14 to 60 years. Maximum number of cases (37.5%) were aged 21-30 years followed by those aged <20 years (27.5%), 31-40 year (17.5%), 41-50 years (15%) and 51-60 years (2.5%) respectively. Mean age of patients was 28.75 ± 11.23 years. Out of 40 patients, 21 were females (52.5%) and 19 were (47.5%) males. Male to female ratio of study population was 0.9. Sneezing (85%) was the most common presenting complaint followed by watery discharge (70%), itching (nasal, palatal, eyes) (65%), nasal blockage (32.5%) and throat irritation (15%) respectively.

Maximum number of patients were found to be in Group III (50%) followed by Group II (30%) and Group I (20%) respectively.

Pre-treatment absolute eosinophil count ranged from 144 to 1700/cumm with a mean of 612.30 ± 378.01 . On evaluating the association between groups of AR with AEC, the mean values showed a significant incremental trend with increasing severity ($p=0.004$). Post-treatment, AEC levels ranged from 80 to 700/cumm with a mean of 322.83 ± 148.62 /cumm. On comparing the mean pre- and post-treatment AEC levels, a significant decline in mean AEC levels from 612.30 ± 378.01 to 322.83 ± 148.62 /cumm was observed ($p<0.001$), thus indicating that declining AEC levels could be indicator of improvement. Mean AEC levels of post-treatment Group I and Group II AR patients were 315.86 ± 132.11 and 333.56 ± 170.10 /cumm respectively.

Table 1: Group wise treatment

Groups	Grading	Treatment
I	Mild intermittent	2 nd generation oral anti-histamines (levoceterizine 5mg once a day)
II	Mild-mod persistent	Intranasal corticosteroids {fluticasone propionate (0.05%) 2 sprays twice a day }
III	Severe persistent	Intranasal corticosteroids (fluticasone propionate) and oral 2 nd generation anti- histamines along with oral leukotriene receptor antagonist. (levoceterizine 5mg+ montelukast 10mg once a day)

Table 2: Mean pre and post treatment AEC and its relationship with the groups.

Group	Pre- treatment			Post-treatment		
	No. of cases	Mean AEC	SD	No. of cases	Mean AEC	SD
Group I (mild intermittent)	8	368.13	178.50	22	315.86	132.11
Group II (mild- mod persistent)	12	466.42	250.55	18	333.56	170.10
Group III (severe persistent)	20	797.50	413.00	-	-	-

Pre-treatment: F=6.316; p=0.004 (Sig); Post-treatment: ‘t’=0.370; p=0.713 (NS)

Table 3: Mean pre and post treatment Ig E level and its relationship with the groups.

Group	Pre treatment			Post- treatment		
	No. of cases	Mean IgE	SD	No. of cases	Mean IgE	SD
Group I (mild intermittent)	8	333.88	331.86	22	378.00	259.77
Group II (mild-mod persistent)	12	507.67	235.92	18	452.39	225.00
Group III (severe persistent)	20	673.15	220.34	-	-	-

Pre-treatment: F=5.596; p=0.008 (S); Post-treatment: ‘t’=0.956; p=0.345

Table 4: Comparison between pre- and post-treatment group showing improvement.

Pre treatment Group	Post-treatment group		
	Group I	Group II	Group III
Group I (mild intermittent)	7	1	0
Group II (mild-mod persistent)	6	6	0
Group III (severe persistent)	9	11	0

However, there was no significant association between post-treatment AR group and AEC levels (p=0.713). (Table 2)

Pre-treatment IgE levels ranged from 31 to 1024 IU/ml with a mean of 555.65±277.48 IU/ml. On evaluating the association between groups of AR, the mean values showed a significant incremental trend (p=0.008). Post-treatment, serum IgE levels ranged from 29 to 876 IU/ml with a mean of 411.48±244.55 IU/ml. on comparing the mean Pre- and post-treatment IgE levels, showed a decline from 555.65±277.48 IU/ml to 411.48±244.55 IU/ml (p<0.001), thereby showing a significant fall following treatment which might indicate that declining IgE levels could be indicators of improvement following treatment. Mean IgE levels of post-treatment Group I patients were 378.00±259.77IU/ml and Group II was 452.39±225.00 IU/ml, however, the difference was not found to be significant statistically.(S)

Following the treatment, a total of 22 (55%) patients were found to be in Group I and remaining 18 (45%) in Group II showing improvement in the clinical symptoms. Post- treatment, upgradation was seen in 1 out of 8 (12.5%)

of Group I patients, however, in Groups II and III 50% and 100% patients respectively showed downgradation. A total of 14/40 (35.0%) patients (all the Group I patients and 6 in Group II) did not show improvement.(Table 4). On evaluating the correlation between post-treatment AEC and IgE levels, it was found to be statistically non-significant (r=0.182; 0.262).

4. Discussion

Allergic rhinitis (AR) is an inflammatory disorder of the nasal mucosa caused by IgE-mediated early- and late-phase hypersensitivity responses.¹⁶ A total of 40 patients of AR with mean age of 28.75±11.23 years and female preponderance were categorized in mild, moderate and severe AR according to ARIA guidelines. Pre-treatment sample for serum IgE and AEC was taken followed by 4 weeks of pharmacological treatment according to categories. Post-treatment sample was taken and improvement assessed on the basis of fall in Serum IgE

and AEC levels. With respect to higher number of females as compared to males in present study, other studies also reported higher prevalence of allergic rhinitis in females as compared to males.^{17–19} In present study, the most common presenting symptom was sneezing (85.0%) followed by watery discharge (70.0%), Itching (65.0%) while less common presenting symptoms were nasal blockage (32.5%) and throat irritation (15.0%). In other studies too, sneezing, watery discharge and nasal congestion were some of the known symptoms associated with allergic rhinitis.²⁰

In present study, according to severity, at enrollment, half the patients (50%) were Group III (Severe persistent), 12 (30%) were Group I (Mild intermittent) and 8 (20%) were Group II (Mild-mod persistent). Mean absolute eosinophil count and serum IgE levels showed an incremental trend with increasing severity of disease which was statistically significant. A relationship between symptom severity and serum IgE levels was also reported by Katuara and Kimura²¹ in their study who reported that patients with allergic nasal diseases with complications had about 3 times higher serum IgE levels as compared to those without such complications. In another study Agha et al.²² also showed mean serum IgE levels of patients with allergic rhinitis to be significantly higher as compared to controls, thus showing the differentiating ability of serum IgE levels as seen in present study too.

In present study, following completion of treatment, a total of 22 (55%) patients were categorised as Group I and remaining 18 (45%) as Group II. Following treatment, it was seen that there was upgradation in 1 out of 8 (12.5%) of Group I patients, however, in Groups II and III 50% and 100% patients respectively showed down gradation. One of the difficulties in evaluating the response to treatment in terms of clinical grading is that being categorical in nature and involving subjective assessment, a number of patients despite responding to treatment do not show a down gradation. However, when we compared the pre-treatment and post-treatment serum IgE and AEC levels, we found a significant difference. In present study, for serum IgE we found a decline from 555.65 ± 277.48 IU/ml to 411.48 ± 244.55 IU/ml, thus showing a decline of 26% which was statistically significant. On the other hand for AEC we found a decline from 612.30 ± 378.01 /cumm to 323.83 ± 148.62 /cumm, thus showing a decline of 47% which was also statistically significant.

In another study, Srivastava et al.¹¹ assessed serum IgE and AEC levels as treatment response measures among cases of seasonal allergic rhinitis and found a reduction of 67.4% in serum IgE levels and 38.4% in AEC levels in the post-treatment phase. Contrary to findings of present study, where the change in serum IgE levels was lower (26%) as compared to change in AEC levels (47%), they found the reduction in serum IgE levels to be higher as compared to that in AEC levels. On comparison of the post-treatment absolute eosinophil count and serum IgE levels

between Group I and Group II patients, we did not find a significant difference between the two groups for both the parameters. This is a paradoxical scenario as compared to pre-treatment assessments where we found a significant association of clinical severity groups with both Serum IgE and AEC levels.

In present study, we found a significantly higher reduction in both AEC as well as serum IgE levels among patients who showed downgrading of their disease (responders) as compared to those not showing downgrading of disease (non-responders), these findings are in agreement with the observations of Manohar and Selvakumaram²³ who found that patients not showing reduction in IgE levels also did not show clinical improvement. These findings in effect show that serum IgE levels and AEC levels despite being two different dimensions of allergic rhinitis have a relationship with clinical manifestation.

5. Conclusion

The findings of the study indicate that treatment response had a positive association with absolute eosinophil count and serum IgE levels. This may help to guide the treatment in difficult to treat allergic rhinitis.

6. Source of Funding

None.

7. Conflict of Interest

None.

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